

User Manual



medspace.CA

*<http://medspaceVR.com>*TM

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Introducing medspace.CA™

medspace.CA™ is a virtual operating theatre room complete with a realistic and fully moveable digital fluoroscopy C Arm radiography equipment, an impatient surgeon and interactive control panel for exposure settings. Students have different viewing options to allow for true immersion and workflow processes and can interact with all pieces of equipment via drop down menus or short cut keys. Key features include:

- Interaction with all pieces of equipment via drop down menus or short cut keys
- Simulated Operating Room – the equipment needs to be manipulated to achieve the resultant images not the patient.
- Altering camera perspectives, including viewing as the radiographer; from the collimator; from the sides and above the operating table. Selection is via drop down menu or short cut Function keys.
- Extra features like a “sarcastic” surgeon.
- A resulting virtual image directly relating to individual C Arm positioning and exposure selection
- The ability to use “pulse/shot” x ray or “screening” mode
- Student image comparison with pre-programmed “Ideal”
- Student immersion in the “process” of placing equipment in an appropriate position to enable full equipment movement and to be in view for the surgeon

Safety Warning

Viewing of 3D virtual software can make users feel unwell. If any of the following is experienced, please inform your educator, and temporarily cease using the software. The following symptoms may occur individually or in combination:

- general discomfort
- dizziness
- difficulty focusing
- vertigo
- headache
- fatigue
- nausea

General Instructions

- Click on a piece of equipment, patient, or body part to activate the relevant control panel.
- Alternatively, select from the drop down menus.
- Click outside of the panel to close it.
- Distance travel locks have been implemented on the machine so it will lock at selected points.
- The "[Short Cut](#)" keys follow the order of the drop down menu

The medspace.CA™ Interface

To start medspace.VR™ go to the Windows start menu and navigate to the medspace.VR™ menu. Click on the medspace.VR™ link, with your Left Mouse Button (LMB). Alternatively, you can double click the medspace.VR™ desktop icon with your LMB 

Note Load time will depend on the hardware configuration you are using. Refer to the 'Administrator's Manual' for recommended hardware configurations.

Upon loading you will be presented with the *Module* selection screen. LMB click on the 'CA' button



The medspace.VR™ module selection Interface.

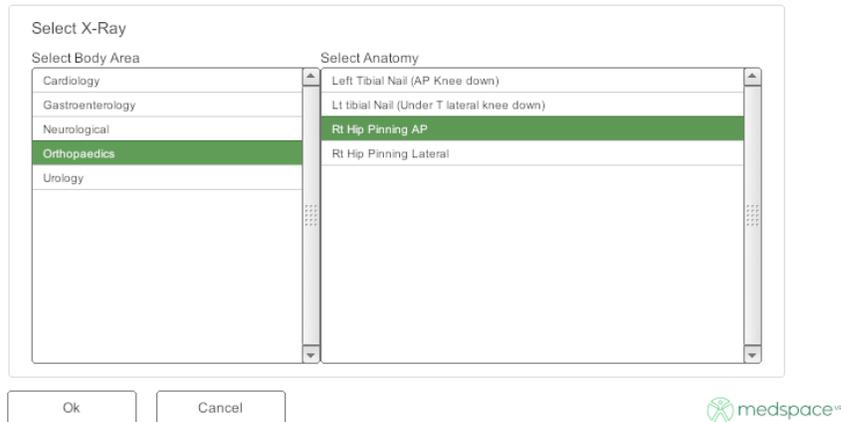
On the following *Mode* panel LMB click the 'Tutorial' button.



The medspace.CA™ mode selection panel.

The *Procedure* panel will be displayed.

Tutorial

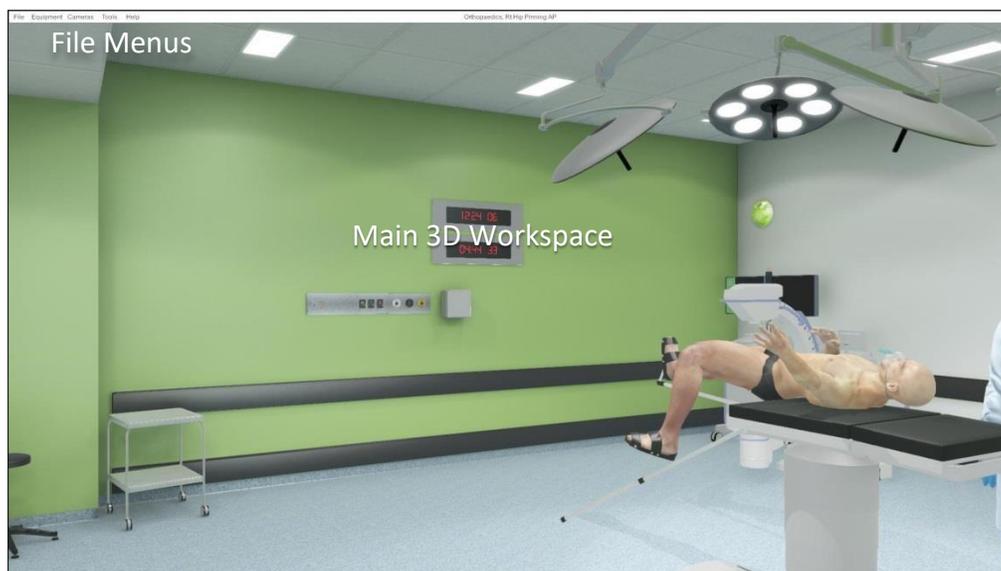


Select the desired procedure by selecting a combination from the '*Select Body*' column and the '*Select Anatomy*' column and click 'Ok' as detailed in the example above.



Students can only select a procedure that the Administration has previously created in medspace.CA™. Administrators refer to the separate 'Administrator's Guide' for information on the administration interface and operation.

When the medspace.CA™ module loads you will be presented with the 3D working interface.



The medspace.CA™ 3D Workspace Interface.

The medspace.CA™ interface is composed of two distinct areas. These are:

- I. The ribbon bar **File** menus
- II. The **3D workspace**

The menus allow access to common functions such as 'navigation' and 'help' as well as detailed access and control of all aspects of the software. Users can also choose to access machine and patient functions through the file menus or directly through the 3D interface.

The 3D work interface allows for direct manipulation of the C-arm machine and positioning of the monitors. Users can move independently throughout the environment whilst interacting with equipment.

The Menu

The menus consist of seven independent headings. Each menu heading contains one or more drop-down sublevels. The menu items and their drop-downs are detailed below.

The '**File**' menu gives users access to commonly used commands and contains two items.

Menu Item	Description
Return to Main	<i>Return to the module selection panel</i>
Exit	<i>Exit the application</i>

The '**Equipment**' menu gives users access to commonly used commands and contains three items.

Menu Item	Description	Shortcut keys
Base	<i>Selecting this menu item displays the C-arm base with associated controls in the workspace.</i>	1
C-arm	<i>Selecting this menu item displays the c-arm controls in the workspace.</i>	2
Monitors	<i>Selecting this menu item displays the dual monitors in the workspace.</i>	3

The '**Cameras**' menu gives users access to preprogrammed viewpoints within the workspace and contains seven items

Menu Item	Description	Shortcut keys
Radiographer	<i>Selecting this menu item switches to the 'first person' radiographer view. This is the default view.</i>	Ctrl + 1
X-ray tube	<i>Selecting this menu item switches to looking through the X-ray emitter in the direction of the beam travel.</i>	Ctrl + 2
Top	<i>Selecting this menu item switches to the view above looking towards the patient</i>	Ctrl + 3
Left	<i>Selecting this menu item switches to the view from the left looking towards the patient</i>	Ctrl + 4
Right	<i>Selecting this menu item switches to the view from the right looking towards the patient</i>	Ctrl + 5
Front	<i>Selecting this menu item switches to the view from the front (patient's head) looking towards the patient</i>	Ctrl + 6
Rear	<i>Selecting this menu item switches to the rear (patient's feet) looking towards the patient.</i>	Ctrl + 7

The '**Tools**' menu contains one item

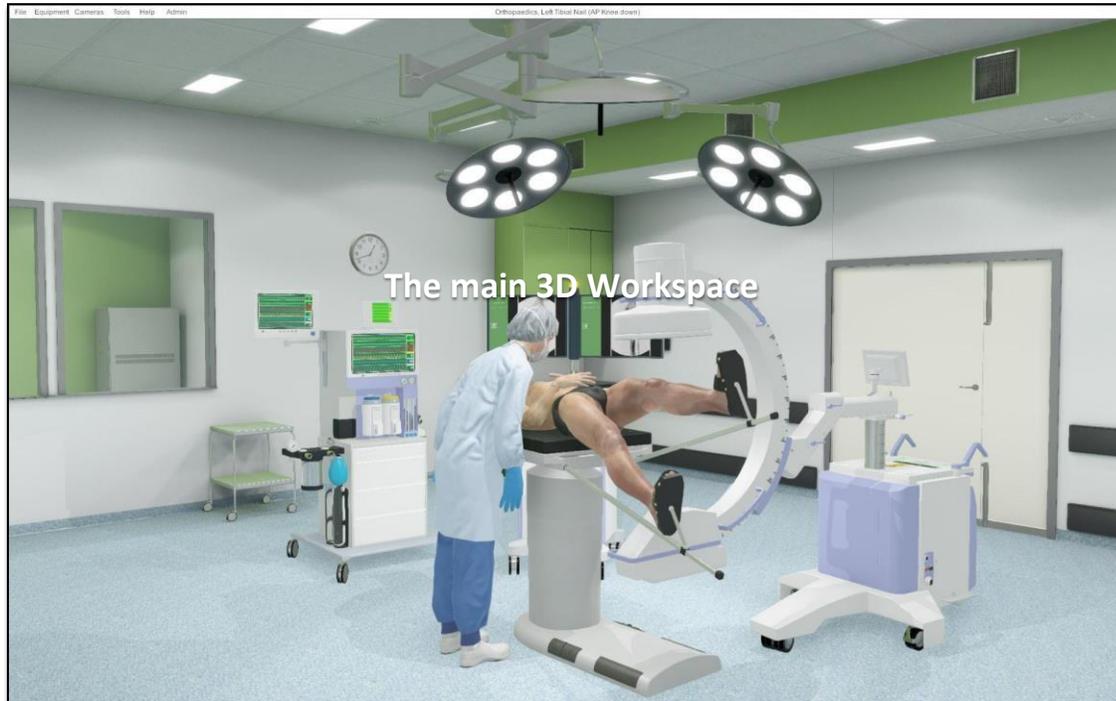
Menu Item	Description
Bone	<i>Selecting this menu item switches to the skeleton of the patient. Selecting it again returns to the normal patient view.</i>

The '**Help**' menu contains two items

Menu Item	Description
Help	<i>Selecting this menu item opens the medspace.VR™ user manuals</i>
About	<i>Selecting this menu item provides software details such as current build.</i>

The medspace.CA™ Workspace

The 3D Workspace is where users conduct procedures. All aspects of x-ray acquisition process are carried out within this 3D workspace. Users navigate within the space and interact with equipment.



The main medspace.CA™ 3D workspace.

The medspace.CA™ work environment consists of:

- A digital C-arm x-ray machine with associated exposure panel and image display system
- A moveable trolley containing the image monitors

Clicking with the LMB (left mouse button) on any of these above items will display their associated interactive controls. Users can navigate freely within the environment whilst selecting items and the patient for manipulation.

Refer to the '[Navigation](#)' section of this manual for instructions on moving within the environment.

Refer to the '[Workflow](#)' section of this manual for instructions on equipment controls and interactivity.

Keyboard Functions and Navigating

There are a few methods for interacting and moving around inside the medspace.VR™ 3D environment.

A combination of keystrokes and mouse buttons should be used to navigate.

Keyboard functions (Directional keys)

Both the arrow keys and the **W,S,A,D** keys can be used as directional keys to move around the environment.



Arrow keys allow the following movement:

Forward (Up arrow), Backwards (Down arrow), Pan Left (Left arrow) and Pan Right (Right Arrow)



W,S,A,D keys allow the following movement:

Forward (**W** Key), Backwards (**S** Key), Pan Left (**A** Key) and Pan Right (**D** Key)

Mouse Functions (Selecting objects and looking around)

The mouse buttons serve various functions.



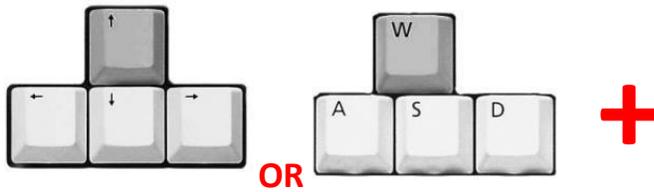
- **Left Mouse Button (LMB)** – This button is the action button. You can use it to select objects in the exhibition and complete input actions such as check boxes.
- **Right Mouse Button (RMB)** – This button is used to **rotate** about the environment. Hold the **RMB** down and then move your mouse sideways to rotate about. Use this in combination with the **direction keys** to move freely around the environment. For example, you can simply use the forward and backward directional keys to move in those directions while holding down the **RMB** to steer.

Note This is a very effective and efficient way to navigate the 3D environment.

Tip You can travel faster through the 3D environment by holding down the 'SHIFT' key while moving.

Moving and Turning

Use either the **arrow keys** or the **W,S,A,D** keys to move forward, backwards or pan sideways. Use the **RMB** in combination with the directional keys to turn corners and look around. The images below demonstrate moving forward in the 3D environment while using the mouse to steer.



Hold down either the **Up** Arrow key or the **W** key and



Hold down the **Right Mouse Button** while moving the mouse sideways

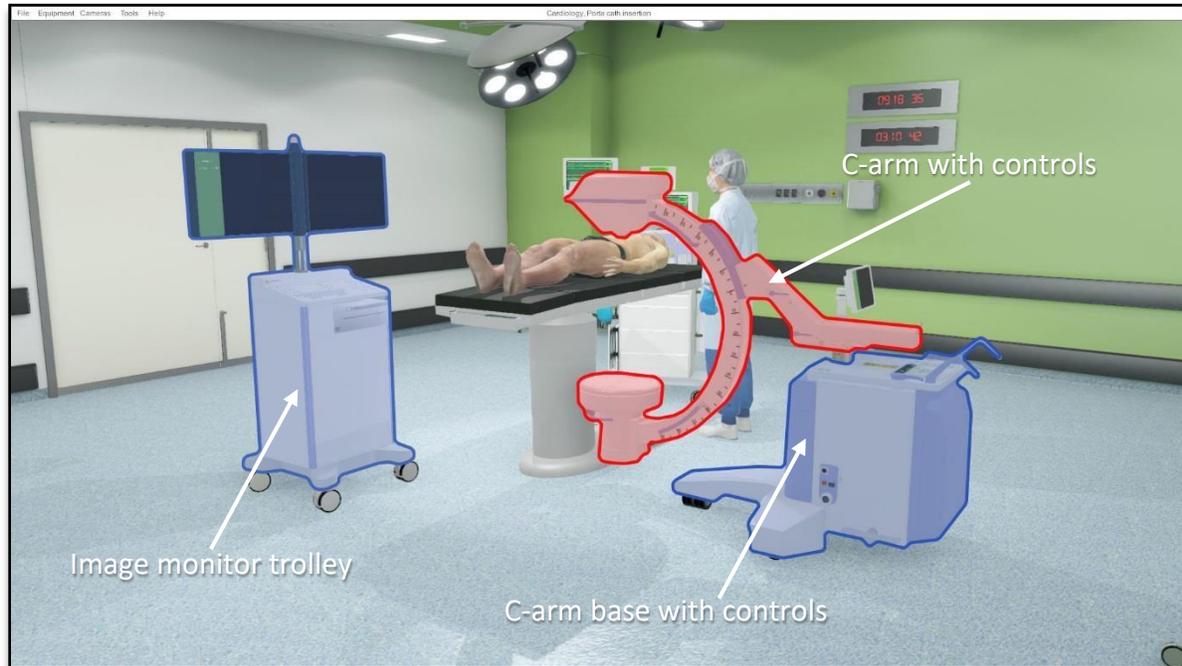
Workflow

The following section describes the tools and procedures used to perform an x-ray.

The first section is the basics of how to bring up each tool and what it looks like.

Accessing equipment interactively within the 3D workspace

Clicking the equipment in the 3D workspace with the LMB or using the shortcut keys will display their associated controls. The following section describes how to display and use controls.



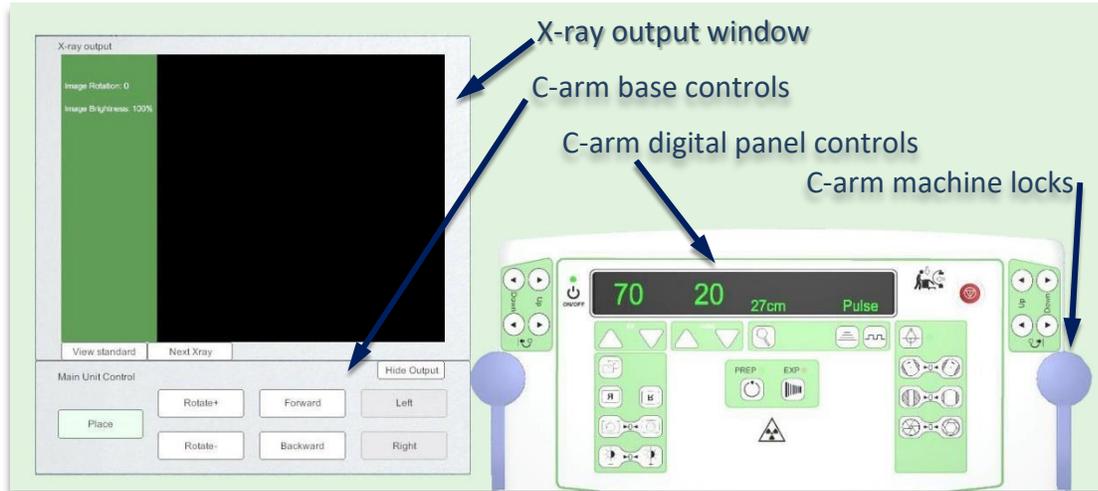
The highlights above show the interactive elements within the main workspace.

Clicking with the LMB within any of the above highlighted areas will display the associated controls for the selected item.

Individual Equipment Controls

C-ARM Base Machine Controls

Clicking anywhere on the Base of the C-ARM machine with the LMB or using the '1' key will display all the controls for the machine other than the arm controls. The following interface will display when the "Base" has been selected.



C-ARM Base machine controls.

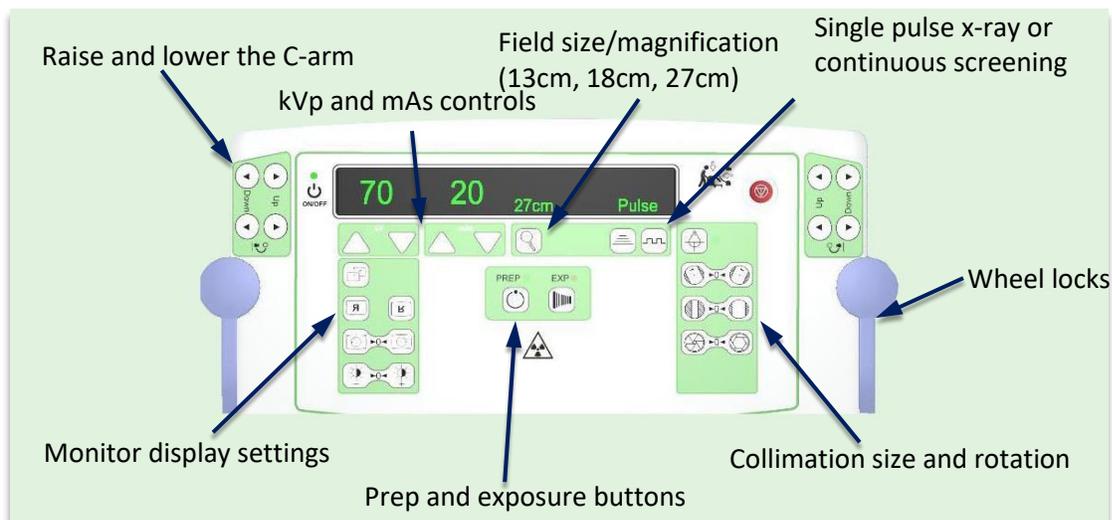
Button	Description
Place	Place the C-arm in a starting position around the operating table prior to final placement. Top view is usually the most useful camera view for this.
Rotate +/-	Rotate the entire C-arm Base around its central axis. Use the SHIFT key while pressing the buttons to move quickly
Forward/Backward	Move the C-arm Base forwards or backwards. Use the SHIFT key while pressing the buttons to move quickly. (When machine locks are positioned as above).
Left/Right	Pan the C-arm base Left or Right. Use the SHIFT key while pressing the buttons to move quickly. (When machine locks are turned 90° to above image).
View Standard	View the technical standard for the procedure.
Next Xray	Start a new X-ray
Hide Output	Hide the image output window

C-arm Main Unit Controls description

The controls are separated into three areas, these are:

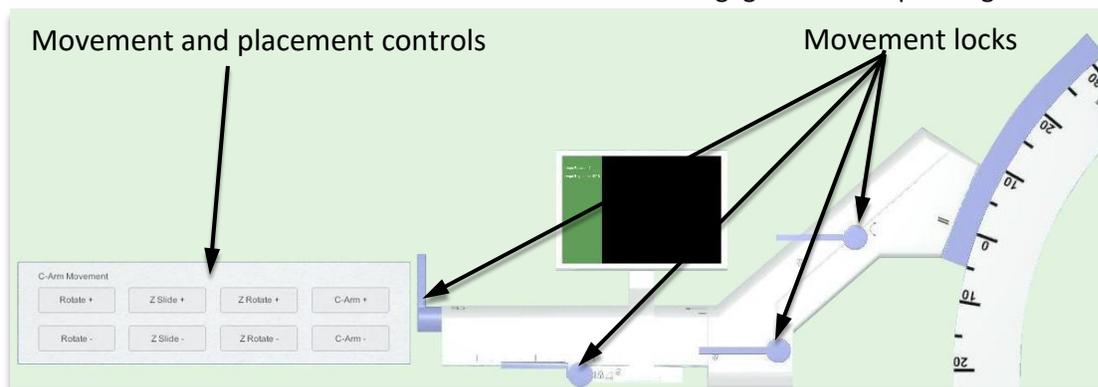
- The C-arm base controls for movement and placement
- The digital panel controls for imaging tasks and raising the C-arm mast
- The machine locks

Clicking a button or lock with the LMB will activate the associated imaging functionality or movement controls. The following buttons are active on the digital control panel



C-ARM Arm Controls

Clicking anywhere on the actual C-arm with the LMB will display the movement controls and C-arm locks. C-arm movement and rotation is dependent on which locks are engaged and disengaged. The below locks must be clicked to unlock and this in turn will engage the corresponding menu movement.

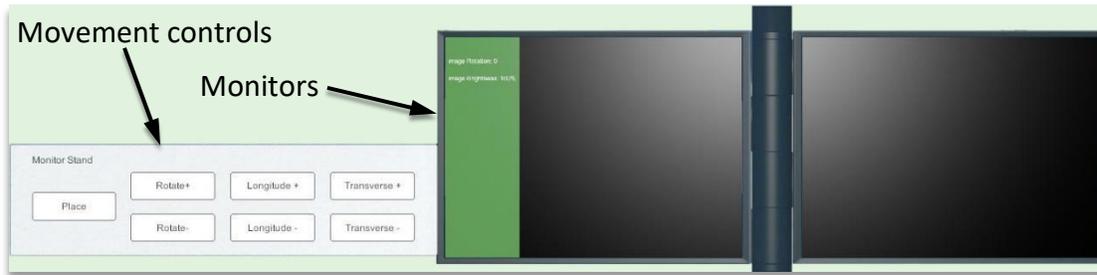


The C-arm control panel showing movement locks.

Button	Description
Rotate +/-	Rotate the C-arm about the Y axis when unlocked. Use the SHIFT key while pressing the buttons to move quickly.
Z Slide +/-	Slide the C-arm in and out along the Z axis when unlocked. Use the SHIFT key while pressing the buttons to move quickly.
Z Rotate +/-	Rotate the C-arm about the Z axis when unlocked. Use the SHIFT key while pressing the buttons to move quickly
C-Arm +/-	Rotate the imaging arm when unlocked. Use the SHIFT key while pressing the buttons to move quickly.

Monitor Controls

Clicking anywhere on the monitor trolley with the LMB will display the trolley movement controls and the twin monitors.



C-arm twin monitors and trolley movement controls.

Button	Description
Place	Place the monitor trolley in a starting position around the operating table prior to final placement. The "top" camera view is usually the most useful.
Rotate +/-	Rotate the trolley around the Y axis.
Longitude +/-	Move the trolley longitudinally relative to the table.
Transverse +/-	Move the trolley transversely relative to the table.

Step By Step Guide

This tutorial will take you through the following steps.

- [Starting medspace.VR™](#)
- [Selecting a Module and Mode](#)
- [Selecting a Tutorial](#)
- [Room Preparation and Initial Equipment Placement](#)
- [C-arm Movement](#)
- [Base Movements](#)
- [C-arm Height Adjustment](#)
- [Skeleton View](#)
- [kVp and mAs Controls](#)
- [Magnification](#)
- [Single Pulse and Continuous X-ray Screening](#)
- [Monitor Display Settings](#)
- [Collimation size and rotation](#)
- [Taking the Exposure](#)
- [Trouble Shooting](#)

Starting medspace.VR™

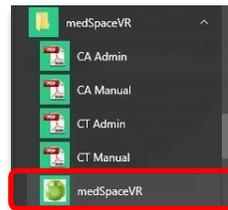
There are two ways to start the medspace.VR™ program. You can either:

Double click the medspace.VR™ icon on the desktop with your **LMB**



OR

Click the medspace.VR™ start menu shortcut with the **LMB**.



Selecting a Module and Mode

On start the 'Module' selection screen will appear.



The 'Module' Selection Screen

Click on the 'CA' button with the LMB. The module selection screen will be replaced with the 'Mode' selection screen.



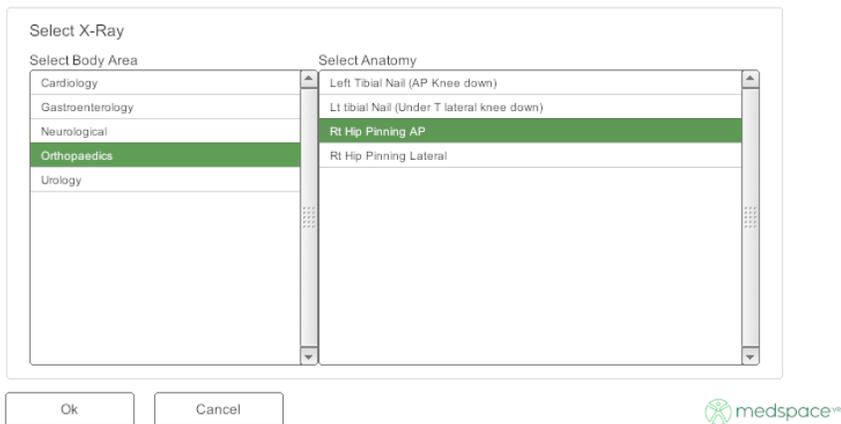
The 'Mode' selection screen

Click on the 'Tutorial' button with the LMB.

Selecting a Tutorial

Clicking the 'Tutorial' button will display the available tutorials panel. You cannot move forward until a tutorial has been selected.

Tutorial



The Tutorial Selection Panel

In the following example we will be conducting a hip pinning procedure. Select 'Orthopaedics' from the 'Select Body Area' column and 'Rt Hip Pinning AP' from the 'Select Anatomy' column. Click the 'OK' button with your LMB.

Room Preparation and Initial Equipment Placement

Clicking the 'Ok' button on the Projection Selection Panel will place you in the medspace.VR™ work environment.



The medspace.CA™ environment

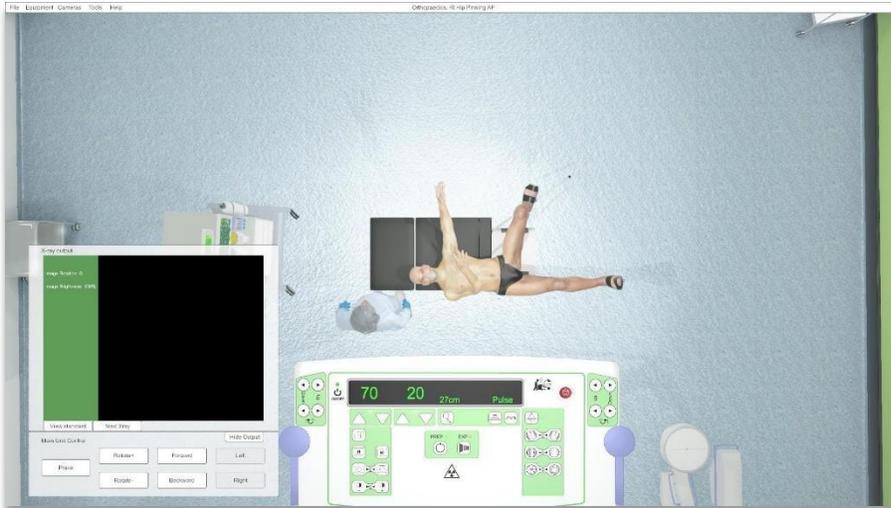
The first step is to position the C-arm roughly in the correct position.

It is important to note that the best view for initial equipment placement is from above the table using the 'Top' view - Ctrl + 1

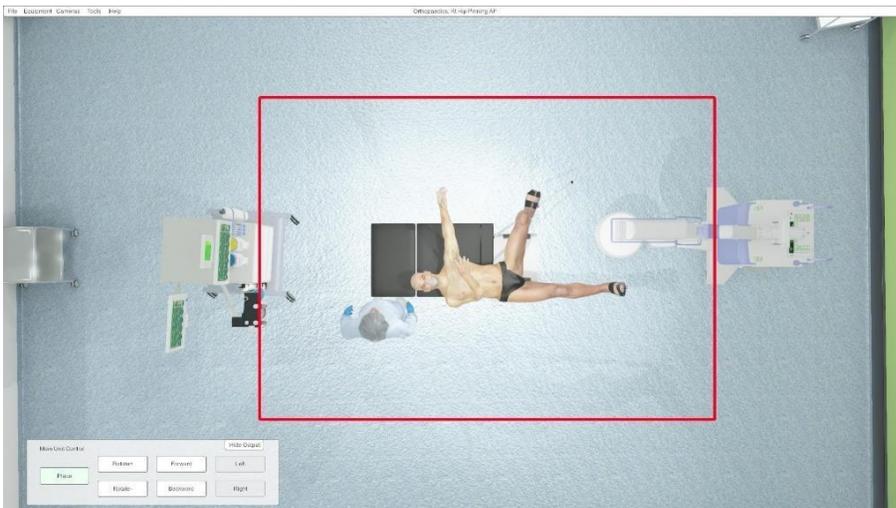
1. Click on the C-arm base with the LMB or use the short cut key '1'
2. Click the "Place" button. The C-arm is now 'attached' to your mouse and a red rectangle is outlined around the table.
3. Move the C-arm to a good start position relative to the table and surgeon. The C-arm cannot be placed inside the boundaries of the rectangle. If the C-arm collides with any other object such as the table, patient or surgeon, a sound will be emitted, and the screen will be overlaid with red.

Repeat for monitor placement

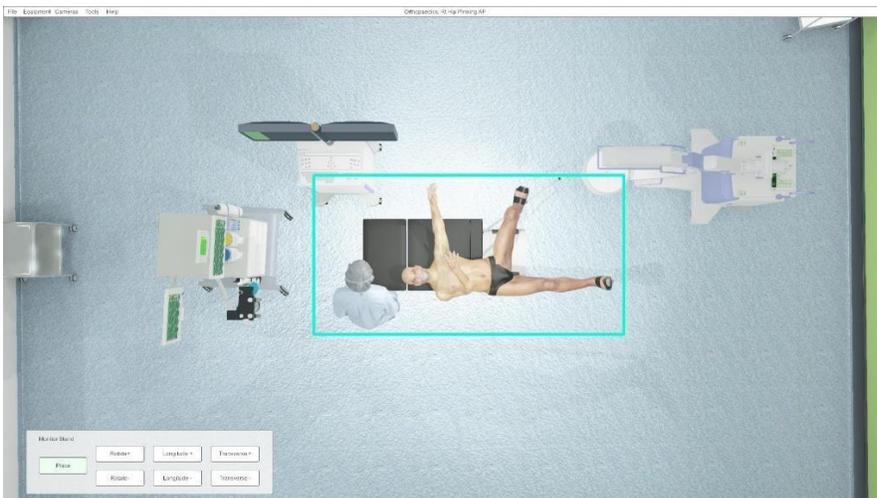
4. Click on the Monitor trolley with the LMB or use the short cut key '3'.
5. Click the "Place" button. The Monitor trolley is now 'attached' to your mouse and a blue rectangle is outlined around the table.
6. Move the Monitor trolley to a good starting position relative to the table and surgeon. The Monitor trolley cannot be placed inside the boundaries of the rectangle. If the trolley collides with any other object such as the table, patient or surgeon, a sound will be emitted, and the screen will be overlaid with red.



Top view prior to placing the C-arm and trolley in a initial starting position



Top view showing the boundary area for the C-arm initial placement.



Top view showing the boundary area for the Monitor initial placement.

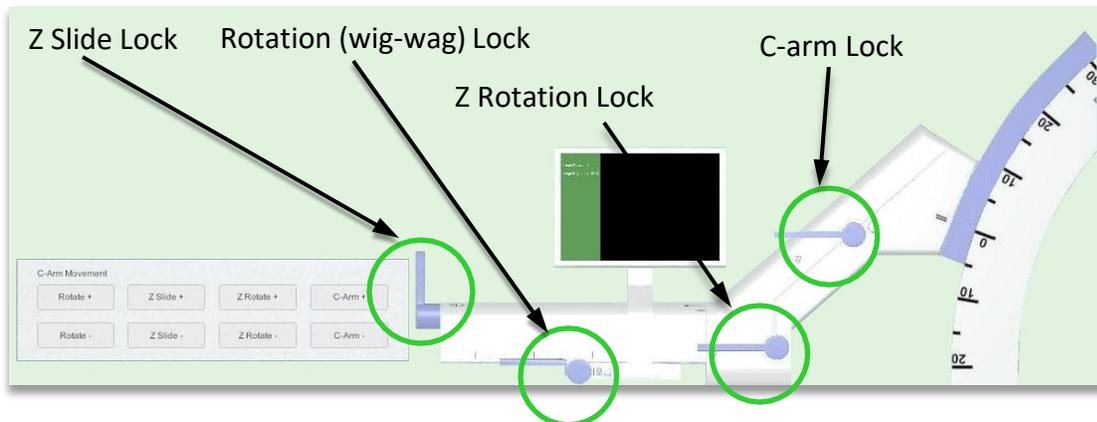
Before the C-Arm is positioned, think about whether the detector or the x ray source is at the top. You may need to spin the C-Arm around its 'Z' axis and the surgeon does not want you to do that during surgery! You will need to consider the full range of movement if a lateral is required.



- To alter the C-Arm orientation (detector/tube at the top) select the C-Arm
- Either
 - Use the drop down menu under “Equipment – C Arm”
 - Click on the C-Arm
 - Use **short cut key 2**
- Select the appropriate lock and left click on it to unlock the C-Arm Z axis rotation

C-arm movement

There are four ranges of movement of the C-Arm



1. **Rotation** (wig-wag) of the C-Arm on the base column
2. **Z slide** C-Arm slide forward and back with base remaining fixed
3. **Z rotation** C-Arm spin left or right of column to alter detector at the top or the bottom

4. C-Arm to go from vertical to horizontal C Arm position

To move the C-Arm, click on a lock with the LMB. This will move the lever to either “locked” or ‘unlocked’ position.

The corresponding ‘C-arm Movement’ buttons will be enabled.

Click on the buttons with the LMB to move the C-arm in the chosen direction.

To speed movement up, press and hold the shift key whilst holding the desired movement key.

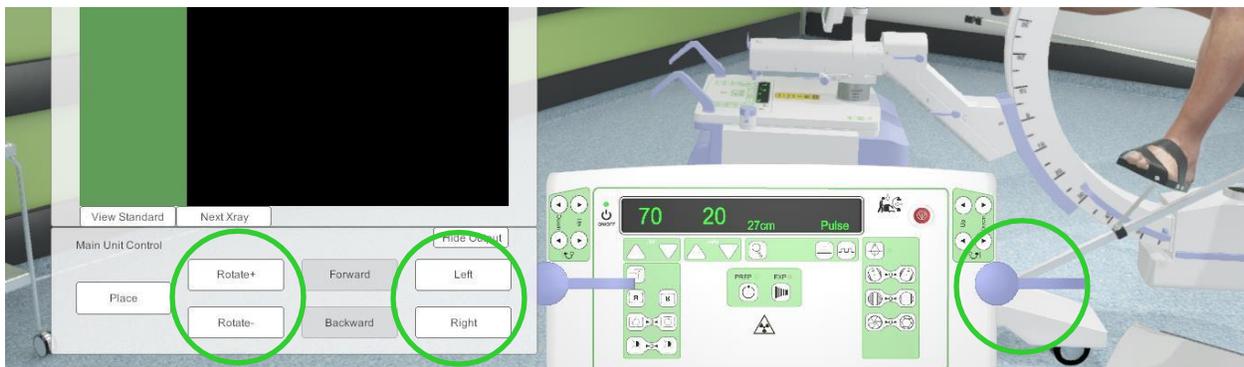
*This machine is capable of ‘under the table lateral’ when the **detector is on top** for an AP/PA projection and ‘over the table lateral’ when the **tube is on top** for an AP/PA projection.*

Base Movements

To move the base select it either by using the drop down menu; clicking on the base of the C-Arm or short cut key 1



Table 1 Movement forward and backward (lock lever facing end on)

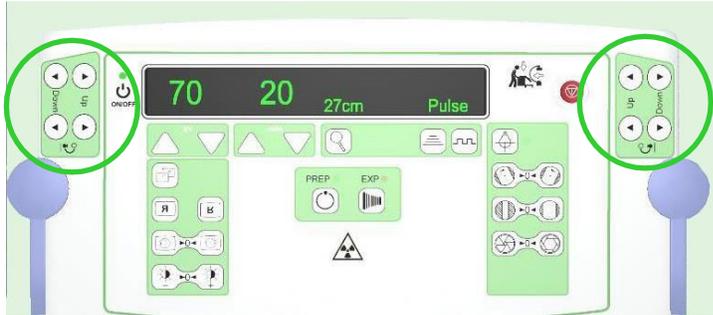


Rotation and left and right (when directional levers are sideways)

Lock levers indicate the direction of movement. Click on the lever and it will alternate between forward/backward and left/right.

C-Arm Height Adjustment

To raise the height of the C-Arm on the base, click and hold with the LMB on the up and down arrows on the base console.



Monitor Movement

Click on the Monitor trolley with the LMB or use the short cut key '3'
The monitors can be rotated, moved longitudinally and moved transversely



Top view showing monitor controls

Place the monitors using the 'Place' button.

Once placed where you want it, click on the movement buttons to finely adjust the final position.

Skeleton View

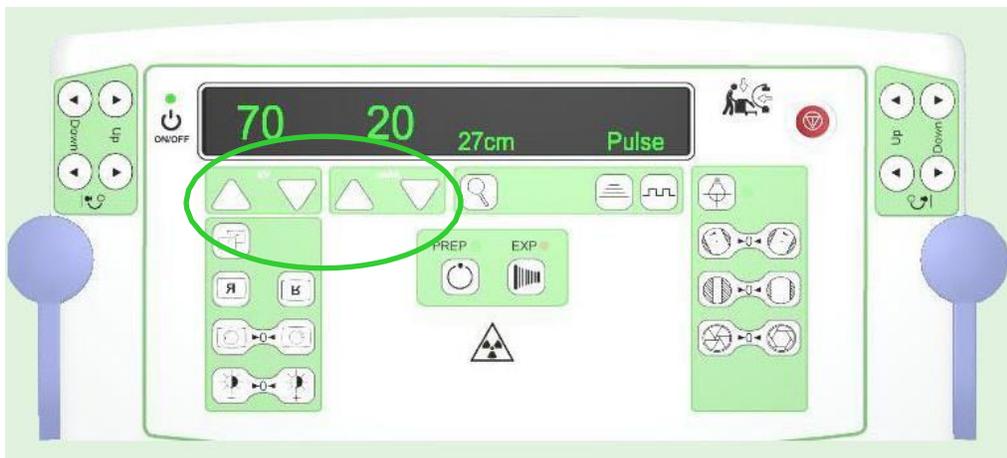
Skeleton view can be enabled through the 'Tools' menu by selecting the 'Bone' option. Alternatively use the shortcut key Ctrl + 8.



Skeleton view

kVp and mAs Controls

Once the C-arm has been positioned in the correct position the exposure settings can be set. The kVp and mAs controls are located on the C-arm base. Select the base by either using the dropdown menus, the shortcut keys or simply clicking on the C-arm base with the LMB.

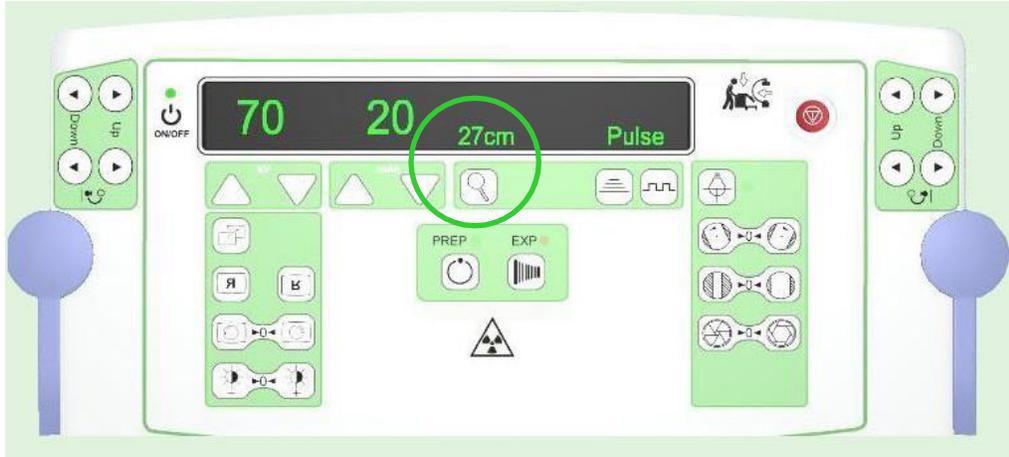


C-arm exposure controls

Use the Up/Down buttons to adjust both kVa and mAs settings by clicking on the buttons with the LMB. Each mouse click will result in an increment of one unit. The resulting setting will be displayed on the digital screen above the buttons in real-time.

Field Size/Magnification

The C-arm allows for set field size of 13cm, 18cm and 27cm.

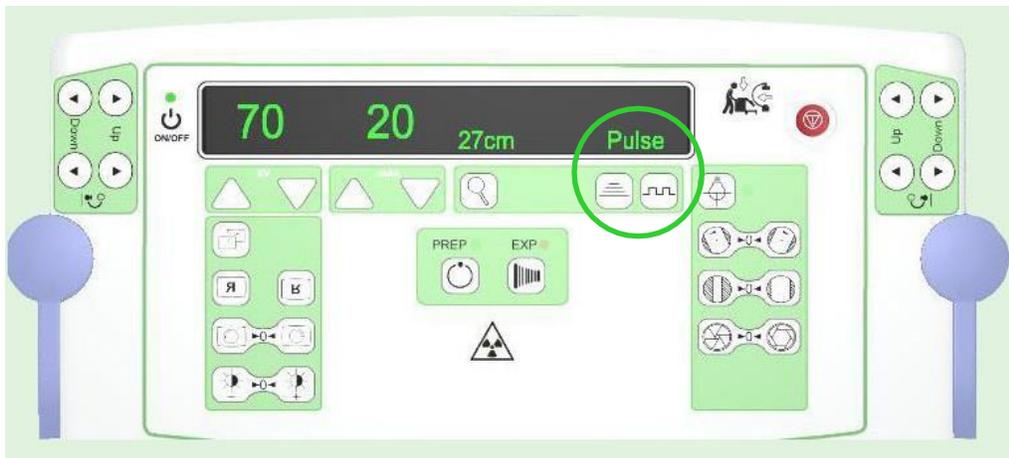


Magnification settings

To change the field size, simply click on the magnification button with your LMB. Each time you click the button the field size decreases as the magnification will increase. To set a less magnified setting, simply continue to click the button until the field size cycles to the setting you want.

Single Pulse and Continuous X-ray Screening

The C-arm allows you to switch between single pulse X-ray mode and continuous screening.

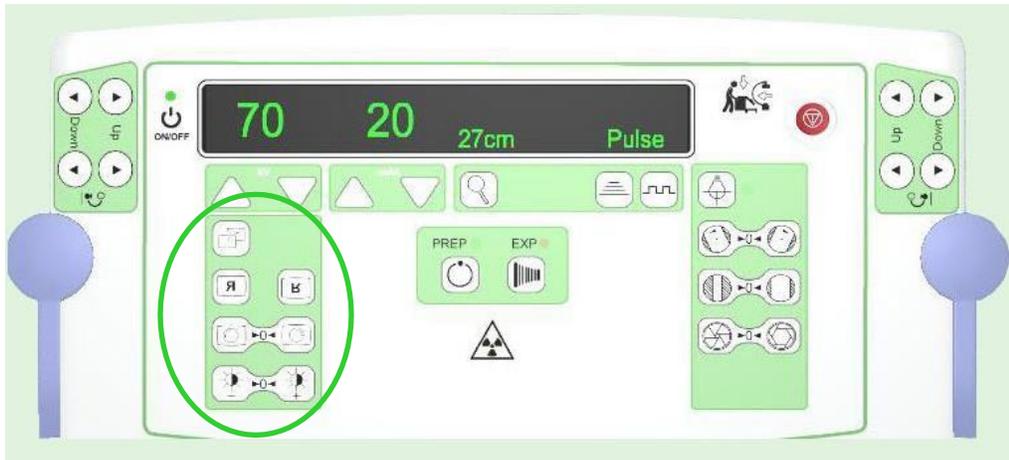


Continuous and Pulse screening options

To switch between Pulse and Screening modes, click the appropriate button on the console with your LMB. The mode will be displayed on the digital screen above the buttons.

Monitor Display Settings

The C-arm allows you to manipulate the monitor output images. The monitor display setting allows you to perform a range of image functions.



Monitor display settings

The following display settings are available and can be activated by clicking on the relevant buttons with the LMB.

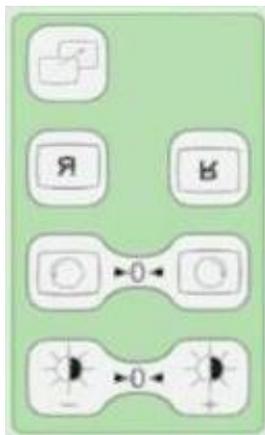


Image hold - Display the current image on the right-hand monitor

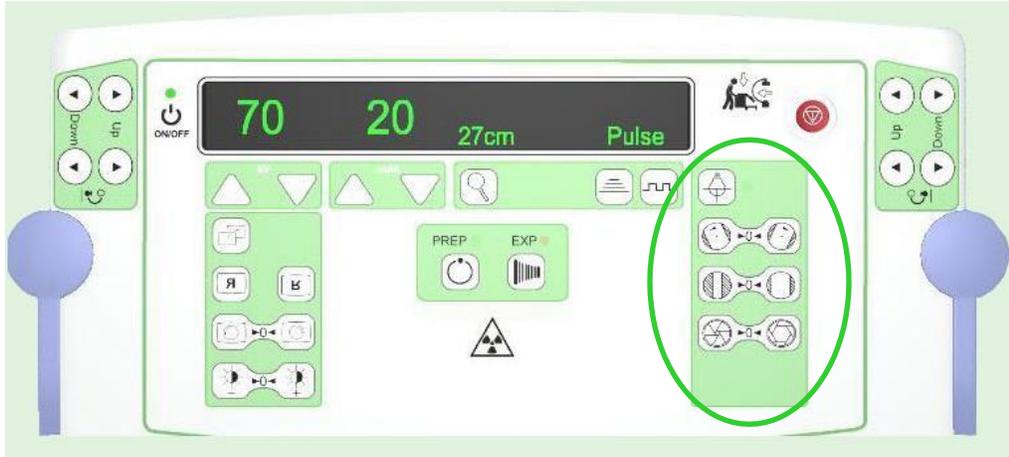
Reverse the image – horizontal or vertical flip

Rotate the image clockwise or anti-clockwise

Adjust the contrast of the image

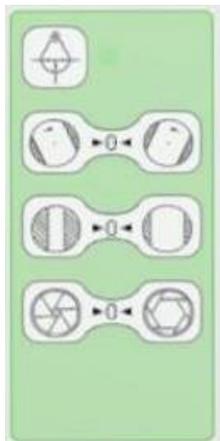
Collimation size and rotation

The C-arm allows you to manipulate the collimator size and rotation by clicking on the relevant buttons on the console.



Collimation size and rotation settings

The following collimation settings are available and can be activated by clicking on the relevant buttons with the LMB.



Turn the crosshair light on/off

Adjust the Collimator rotation

Adjust the Collimator clipping

Adjust the collimation size

Taking the Exposure

Once you have positioned the C-arm where you want it and set relevant exposure settings, you are ready to take an exposure.



Click on the 'PREP' button with your LMB and wait for the Green light.

Once the Prep light has come on click the 'EXP' button. The red LED light will be displayed as the exposure is taken.

Trouble Shooting

The machine will not move into position

- Check you are not hitting anything (table, patient, surgeon, monitors etc)
- Just as in real life, you may need to manipulate more than one lock to gradually manoeuvre the c-arm without hitting anything

The patient isn't correctly lateral so I can't get a good image

- As in real life, the radiographer has little say in the position of the patient. Therefore, it is the c-arm that needs to be angled in order to get the correct projection of the anatomy required.

Help and Support

Support Options:

Website: <http://medspacevr.com>

Email: support@medspacevr.com

User Forums: <http://www.medspacevr.com/forum/>

Please allow 24 hours for support requests to be answered following receipt of your query.

Contact Details:

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