11 Esophagus

This application generates a set of time-activity curves for a dynamic esophageal study, based on an ROI that you define. Typically, it is done on patients who have difficulty in swallowing, have gastro-esophageal reflux, or have peristalsis problems. It has these methods

- Gastro-Esophagus Reflux
- Esophagus

The methods are used to create these Preferences:

- Gastro-Esophageal Reflux
- Esophagus

For information on loading requirements, and on calculations and algorithms used in this application, see the appropriate section in the *NM Application Suite Reference Manual*.

NOTICE

For the Time Activity Curves displayed in this application, the first point is the time for the end of the first frame. For example, if the first frame is 60 sec., the first point in the curve is not 0, but 60 (if seconds are the units; it would be 1 if the units were minutes). This reflects the fact that the frame completion is at the end of the time span.

Esophagus Tutorial

In this tutorial you will learn how to perform a esophageal analysis. You will learn how to load the esophageal data, draw the necessary ROIs, and review the results and images.

NOTICE

This tutorial is designed to use a particular sample patient that works well to illustrate certain features of the software. Nothing prevents you from substituting your own patient, but be aware that it may not load the same way or produce similar results. If you try to load your own data and it fails because of automatching, see section “Editing Auto Matches” on page 27.

If you would like to start this tutorial over at any time, just click **Restart** in the application. This reloads the data as it does in the first workstep, as long as the default Preference has not been changed.

Setup

1. In the IntelliSpace Portal Patient Directory’s Local Devices list, select the NM Demo Data folder.
2. From the list of patients, select NM ESOPHAGUS.

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From the list of patients, select Patient Name **NM Esophagus** with Patient ID **Oesophagus**.

3. Click on the arrow in the Analysis menu and select the NM Esophagus application.
4. If the Preferences Data Manager is not open, open it now and select the Esophagus Preference by clicking on its **Apply Preference** icon ( ).

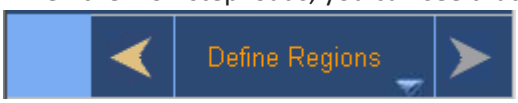
   The patient data automatches with the Preference by default, so you do not need to load data into buckets individually. When this happens, the application proceeds directly to the next workstep (Define Regions) automatically.

   If you wanted to load different data, you would have to go back to the Setup workstep. By way of example, we will do that next.
5. Click the Previous Workstep button to go back to the Setup workstep
6. Click on the Transit dropdown list .
7. Scroll down to the bottom of the image list and select **Clear Bucket**.
8. Notice that the Transit has a red exclamation point. This indicates that it requires data.
9. Click on the Transit dropdown list again and select FLOW Ant.

   This clears the exclamation point and allows you to proceed to the next workstep.
10. Click the Next Workstep button to proceed to the Define Regions workstep.

Define Regions

When the workstep loads, you can see that the Next Workstep button is grayed out:



This indicates that a requirement for the workstep has not been met. Different applications may have different requirements: drawing certain ROIs, setting parameters, etc. When all requirements have been met, the button becomes available.

This application provides a composite image of the data so you can be sure to enclose all the pixels in all the images at once. The composite viewer includes a slider at the bottom so you can exclude some of the beginning or ending frames. It also displays a cine so you can refer to the whole sequence of images if necessary.

1. Adjust the slider at the bottom of the anterior composite viewer so only frames 1-60 are used in the composite by dragging the right-hand slider to the left.

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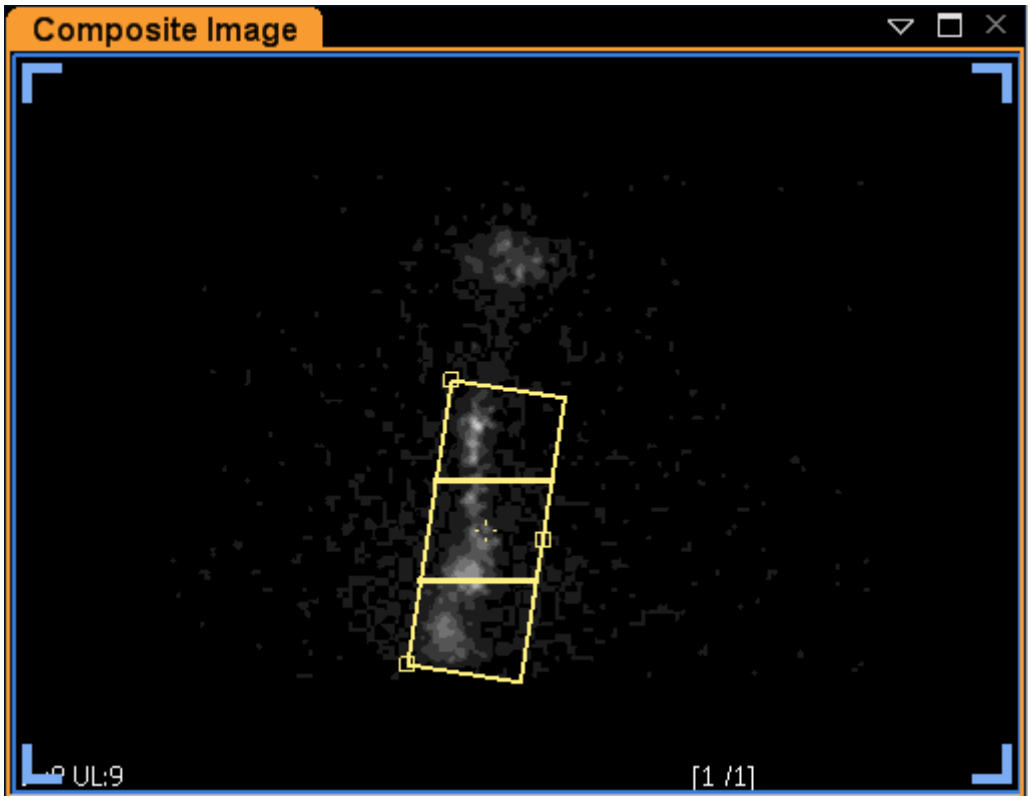
2. Following the instruction at the top of the composite viewer to draw the esophagus, draw an approximate ROI by clicking to define three points of a rectangle (you will draw a more precise one later). Here is an example of an approximate ROI:



Notice that the Esophagus Draw Region icon is now an eraser:

3. Click the eraser to delete the ROI.

   The eraser changes back to a pencil, indicating that you can redraw the ROI.

4. Click the viewer's Maximize button.

   This allows you to use a larger window if that is useful. If not, click the button again to restore the default view.

5. Now draw the ROI more correctly, using whatever conventions apply in your situation.
6. Hover the cursor over the ROI line and notice that the control points are indicated by boxes.
7. Drag the control points to edit the ROI so it is exactly correct, however you define that. (Remember, if you need to redraw the whole ROI, click the region's eraser.)
8. If you have not restored the viewer to the default view, do that now by clicking on the Restore icon (formerly Maximize).

9. Notice that the Next Workstep button is now available. This indicates that all conditions for the current workstep have been met and there are no more ROIs to be drawn.

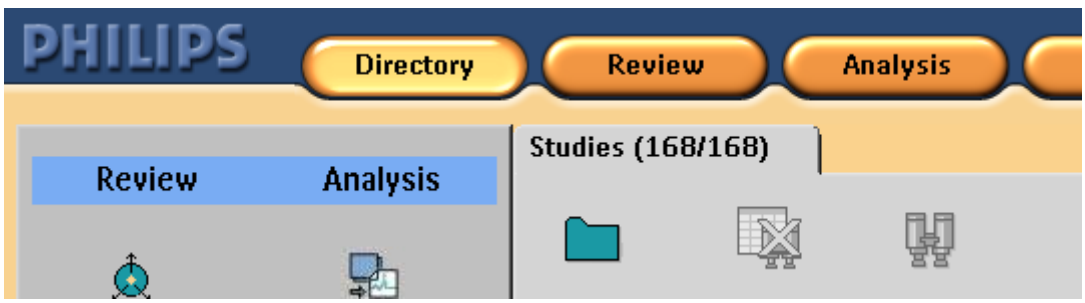
10. Advance to the next workstep by clicking the Next Workstep button.

Review Results

In this workstep, you can review the quantification results. For a list of the results displayed, see the “Results” section later in this chapter. You can also save the page as a Secondary Capture (as you can in any workstep). Secondary Captures can be either single-frame or multi-frame. Multi-frame allows you to embed a cine.

Now create a Secondary Capture of the results:

1. If it is not already selected, click the Scroll button ( ) and drag upward in the cine viewer to scroll to the first frame. The frame number is displayed in the lower right of the viewer.
2. In the Image Tools Manager, click the arrow on the **Save all images** button ( ) and select **Secondary Capture**.
3. Type in a description for the Secondary Capture.
4. Check the **RGB** option.
5. Click **Save**.
6. Click on the orange IntelliSpace Portal **Directory** button at the top of the screen (the active button in the image below) to display the Patient Directory and notice that the saved image is listed in the Series list at the bottom, and also in the NM Images list (which isthe tab next to Series).



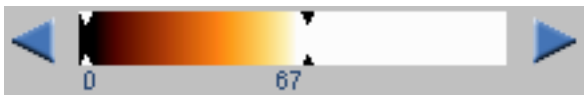
7. Return to the application by clicking on the orange IntelliSpace Portal **Analysis** button at the top.
8. Advance to the next workstep by clicking the Next Workstep button.

Review Images

This workstep provides multiple layouts to view the images. Click on each layout to view its contents. Layouts with a dark blue background are unavailable. You can also hide and show individual viewers:

1. Click the triangular Remove button in the upper left viewer to remove the viewer from the display area.

2. From the Global Image Tools, select the **Utilities** tab.
3. Click **Show Hidden Viewers** () to list currently hidden viewers.
4. Select the hidden viewer to redisplay it.
5. Use the Image Colorbar in the Image Tools Manager to adjust the background (white bar) and brightness (black bar).
6. Right-click on the Image Colorbar to open a menu that lets you select Colormap, Intensity, and Pixel Values:



When you are done, click **Exit** to exit to the Patient Directory. If you are prompted to save images, click **No** unless you want to save any new images.

Using Esophagus

By default, this application draws a rectangular bounding box with three sections around the esophagus. You can adjust the box using its control points, or change the drawing mode to manual to use a different drawing shape.

This allows you to get esophageal transit information by segment, including time activity curves, empty ratio, and peak ratio.

Esophagus Results

- Cine with all ROIs
- Time Activity curve for each of the ROI segments
- Empty Time (sec) for each segment and the whole esophagus
- Peak Ratio for each segment and the whole esophagus
- Splash display of the images
- Time Activity curve for the whole
- A “condensed” image for each dynamic dataset, in which each column is the sum across the y-axis of each frame of the dataset; the columns are presented side-by-side in frame order.

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If you do not see all the result images in the Review Results workstep, it may be that one or more viewers are hidden. If you suspect this, try using the **Show Hidden Viewers** tool in the **Utilities** Data Manager. See section “Review Results Workstep” on page 27 for details.

Preferences

To change the Preferences for this application:

1. Select the **Preferences** Data Manager
2. Click **Open Preference Editor** at the bottom of the Preferences section (the second icon ).
3. Make changes in the preferences window using the information in the table below.

For details on editing Preferences, see section “Creating and Editing Preferences” on page 59.

You can save this parameter as Preferences:

Parameter	Default	Description
Review Compress Factor	0	Compression value for review data

Gastro-Esophagus Reflux

This allows you to get a time activity curve.

Gastro-Esophagus Reflux Results

- Cine with all ROIs
- Time Activity curve for the whole
- Splash display of the images

If you do not see all the result images in the Review Results workstep, it may be that one or more viewers are hidden. If you suspect this, try using the **Show Hidden Viewers** tool in the **Utilities** Data Manager. See section “Review Results Workstep” on page 27 for details.

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You can save these parameters as Preferences:

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Parameter	Default	Description
Review Compress Factor	0	Compression value for review data

Review Layouts

Below are the layouts in the Review workstep:

- Splash Display
- SC images
- Custom Display

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