The objective of this manual is to provide the user with the technical skills how to use this tool in the assessment of the LVEF (Left Ventricle Ejection Fraction).
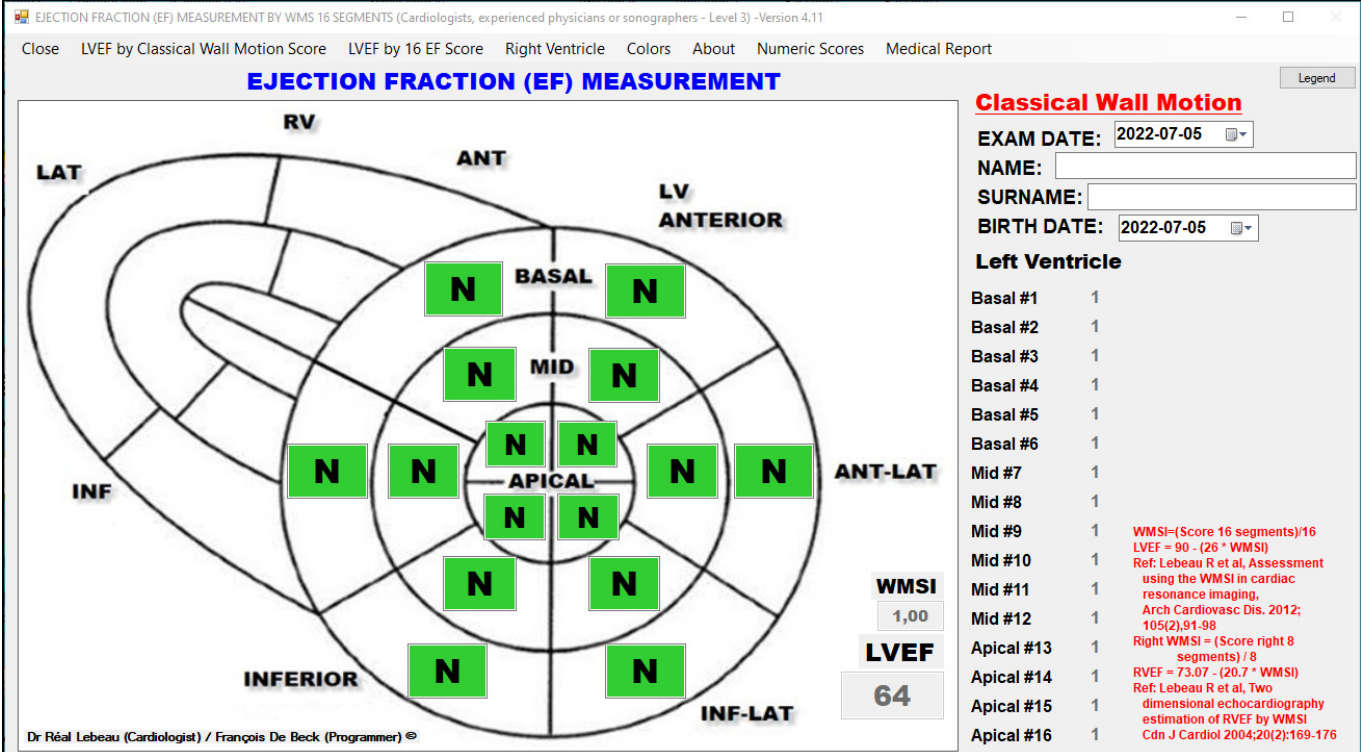

IMPORTANT NOTICE

The use of this utility requires a personal computer or laptop running under a **Microsoft Windows operating system**.

Download and **save** the downloaded file in a location of your choice on your personal computer or laptop.

Launch the utility (EF_Evaluation_Cardiologists.exe) with a double-click on the icon .

The application will start:

By default, all 16 segments of the left ventricle are activated, and all 7 options (**N/H/A/MH/SH/D/AN**) are available for the evaluation. The corresponding values of the **Classical Wall Motion Score** model are used in the calculation of the **LVEF**, **WMSI** and **RVEF**.

Left ventricle scores		Right ventricle scores	
Hyperkinesia Normal (N)	1	Hyperkinesia Normal (N)	1
Hypokinesia (H)	2	Hypokinesia (H)	2
Akinesia (A)	3	Akinesia (A)	3
Mild Hypokinesia (MH)	1,5	Mild Hypokinesia (MH)	1,5
Severe Hypokinesia (SH)	2,5	Severe Hypokinesia (SH)	2,5
Dyskinesia (D)	4	Dyskinesia (D)	4
Aneurysm (AN)	5	Aneurysm (AN)	5

The selected options are displayed in color.

Let's identify the various elements of the menu bar and other components of the form.

| Close | LVEF by Classical Wall Motion Score | LVEF by 16 EF Score | Right Ventricle | Colors | Numeric Scores | Medical Report | About |

- **Close**   Used to close the application. Note however that if you have not produced a **Medical Report**, you will have to confirm the abandonment of information from the form.
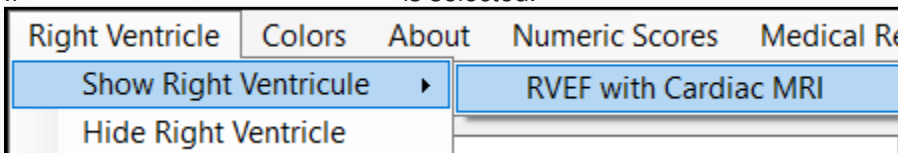
- **LVEF by Classical Wall Motion Score**   Allows you to reset the form to the same default settings as when opening the form (IE The 16 segments of the left ventricle are activated, and the 7 evaluation options (**N/H/A/MH/SH/D/AN**) are available for the assessment of the LVEF and the values from the **Classical Wall Motion Score** are used).

- **LVEF by 16 EF Score**   When selected, this option resets the form to the **16 EF Score** assessment model. The 7 evaluation options (**N/H/A/MH/SH/D/AN**) are available and these are the values of the **16 EF Score** model which are used for the calculation of **LVEF**. The window will display the corresponding percentages.

Left ventricle scores	
Hyperkinesia Normal (N)	4
Hypokinesia (H)	2,5
Akinesia (A)	1
Mild Hypokinesia (MH)	3
Severe Hypokinesia (SH)	2
Dyskinesia (D)	-1
Aneurysm (AN)	-2

Right Ventricle	Colors	Nun
Show Right Ventricle		
Hide Right Ventricle		

- When selected, this option "**activates**" or "**deactivates**" automatically the possibility of also assessing the segments of the right ventricle. **The form is not reset during this selection. The calculations in progress are still valid.**

- If **Show Right Ventricle** is selected.

Right Ventricle	Colors	About	Numeric Scores	Medical Re
Show Right Ventricule	▶	RVEF with Cardiac MRI		
Hide Right Ventricle				

  - ✓ By choosing **RVEF with Cardiac MRI**, the assessment of the RVEF will have a maximum of 58 with a minimum of 14.

o   The form display becomes for RVEF with Cardiac MRI :

EJECTION FRACTION (EF) MEASUREMENT BY WMS 16 SEGMENTS (Cardiologists, experienced physicians or sonographers - Level 3) -Version 4.11

Close   LVEF by Classical Wall Motion Score   LVEF by 16 EF Score   Right Ventricle   Colors   About   Numeric Scores   Medical Report

EJECTION FRACTION (EF) MEASUREMENT

Legend

Classical Wall Motion

EXAM DATE: 2022-07-05

NAME:

SURNAME:

BIRTH DATE: 2022-07-05

Left Ventricle		Right Ventricle	
Basal #1	1	Basal #1	1
Basal #2	1	Basal #2	1
Basal #3	1	Basal #3	1
Basal #4	1	Mid #4	1
Basal #5	1	Mid #5	1
Basal #6	1	Mid #6	1
Mid #7	1	Apical #7	1
Mid #8	1	Apical #8	1
Mid #9	1		
Mid #10	1		
Mid #11	1		
Mid #12	1		
Apical #13	1		
Apical #14	1		
Apical #15	1		
Apical #16	1		

WMSI=(Score 16 segments)/16
LVEF = 90 - (26 * WMSI)
Ref: Lebeau R et al, Assessment using the WMSI in cardiac resonance imaging, Arch Cardiovasc Dis. 2012; 105(2),91-98
Right WMSI = (Score right 8 segments) / 8
RVEF = 80.00 - (22.0 * WMSI)
Ref: Lebeau R et al, Two dimensional echocardiography estimation of RVEF by WMSI
Cdn J Cardiol 2004;20(2):169-176

RV   ANT   LAT   LV ANTERIOR   BASAL   MID   APICAL   ANT-LAT   INF   INFERIOR   INF-LAT

WMSI 1,00   WMSI 1,00

RVEF 58   LVEF 64

Dr Réal Lebeau (Cardiologist) / François De Beck (Programmer) ©

This Show Right Ventricle option is only available for evaluation according to the **LVEF by Classical Wall Motion Score** model.

Colors | Numeric Scores
Colored Scores
Non Colored Scores

o   The scores selected for each of the segments will be displayed with a color specific to the score or not.

Numeric Scores | Medical Rep
Show Numeric Scores
Hide Numeric Scores

o   This option will make visible or hide in the right part of the form, the table of digital scores associated with the assessment options selected for the various segments of the left and right ventricles.

o **Medical Report** This option will open another form allowing you to produce a medical report that you can save on your computer in a file, print it or attach it to an email.
- ✓ Before selecting the **Medical Report** option:
    - ▪ Complete the cardiac diagnostic
    - ▪ Capture an image of the completed form in the Windows clipboard
        - • 2 methods to do this:
        - • Press simultaneously the **Windows + Shift + S** keys and cover the form to capture with the cursor, or
        - • Press simultaneously the **Shift + PrintScrn** keys
    - ▪ Once in the medical report, paste the captured image **AFTER** the note #3 using the **Crtl + V** keys.

o **About** This option will display the main publications with reference to the calculation of the ejection fraction used in this application.

o **Legend** This option displays the scores used for the calculations in the current form
- ✓ For the **Classical Wall Motion Score** model

Left ventricle scores		Right ventricle scores	
Hyperkinesia Normal (N)	1	Hyperkinesia Normal (N)	1
Hypokinesia (H)	2	Hypokinesia (H)	2
Akinesia (A)	3	Akinesia (A)	3
Mild Hypokinesia (MH)	1,5	Mild Hypokinesia (MH)	1,5
Severe Hypokinesia (SH)	2,5	Severe Hypokinesia (SH)	2,5
Dyskinesia (D)	4	Dyskinesia (D)	4
Aneurysm (AN)	5	Aneurysm (AN)	5

- ✓ For the **16 LVEF Score** model (**LV 16 segments simplified WMS-EF**)

Left ventricle scores	
Hyperkinesia Normal (N)	4
Hypokinesia (H)	2,5
Akinesia (A)	1
Mild Hypokinesia (MH)	3
Severe Hypokinesia (SH)	2
Dyskinesia (D)	-1
Aneurysm (AN)	-2

- ✓ For the **8 RVEF Score** model (**RV 8 segments simplified WMS-EF**)

Right ventricle scores with Cardiac MRI	
Hyperkinesia Normal (N)	7
Hypokinesia (H)	4
Akinesia (A)	2
Mild Hypokinesia (MH)	6
Severe Hypokinesia (SH)	3
Dyskinesia (D)	-1
Aneurysm (AN)	-2

Example: RVEF TicTacToe (drlebeau.info)
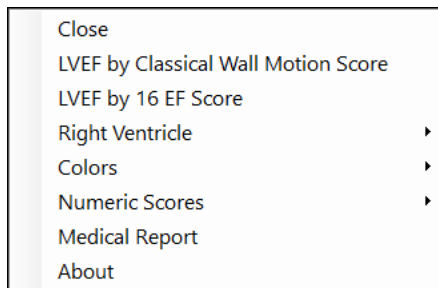
More form components.

EXAM DATE: `2020-02-09` By default, the current date is displayed. A calendar tool ( ) is available in order to change the date by clicking on it. You can also quickly modify manually the date by clicking on the digits of the date and typing the new value.

BIRTH DATE: `2020-02-09` By default, the current date is displayed. A calendar tool ( ) is available in order to change the date by clicking on it. You can also quickly modify manually the date by clicking on the digits of the date and typing the new value.

NAME:
SURNAME: This section allows you to enter the patient's first and last name information. This information will be copied automatically to the medical report when you click the **Medical Report** option.
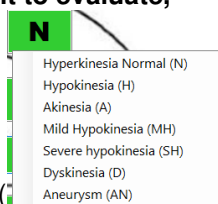
Accessing the context menu

In addition to the menu appearing at the top of the form, you have access to a contextual menu by right-clicking on your mouse anywhere on the form, except in the evaluation zones of the left and right ventricle segments. The floating menu will display:

> Close
> LVEF by Classical Wall Motion Score
> LVEF by 16 EF Score
> Right Ventricle ▶
> Colors ▶
> Numeric Scores ▶
> Medical Report
> About

Using this application/utility

Once you have selected the appropriate options in the menu bar, the only 2 methods available to you for evaluating a segment are:
1. **On the segment to evaluate,**

> **N**
> Hyperkinesia Normal (N)
> Hypokinesia (H)
> Akinesia (A)
> Mild Hypokinesia (MH)
> Severe hypokinesia (SH)
> Dyskinesia (D)
> Aneurysm (AN)

   o Right-Click ( ),
   o A floating menu will display the 7 options,
   o Select the appropriate diagnostic in the list,
   o The selected score with its associated color will display in the assessed segment (and the numeric score displays to the to the right of the window):

   EXAMPLE: in the **Classical Wall Motion Score** model, selecting **H** will show a score of **2** when the numeric scores are displayed
   o The **LVEF**, **RVEF** et **WMSI** are automatically recalculated.

2. **Or, you can also COPY any segment evaluation to another segment,**

   o First click on an existing value (The source) (**A**)

   o Now click on the segment to evaluate (the target) (**N**)

   o Immediately after the click on the target, it will display the copied value along with the appropriate color and score to the right: **A**

   o The **LVEF**, **RVEF** et **WMSI** are automatically recalculated.

At any time, you can decide to reset the form or modify the different options in the menu bar.

Using the medical report

Alternative to the Medical Report option

Press PrtScn. This copies the entire screen to the clipboard. You can paste the screenshot into any program that displays images, like Paint or Microsoft Word.

Press Alt + PrtScn. This copies the active window to the clipboard, which you can paste into another program.

Press the Windows key (⊞) + Shift + S. The screen will dim and the mouse pointer will change. You can drag to select a portion of the screen to capture. The screenshot will be copied to the clipboard, which you can paste into another program. (only works under Windows 10 installed.)

Press the Windows key (⊞) + PrtScn. This saves the entire screen as an image file. You can find it in the "Pictures" folder, in a subfolder called "Screenshots."
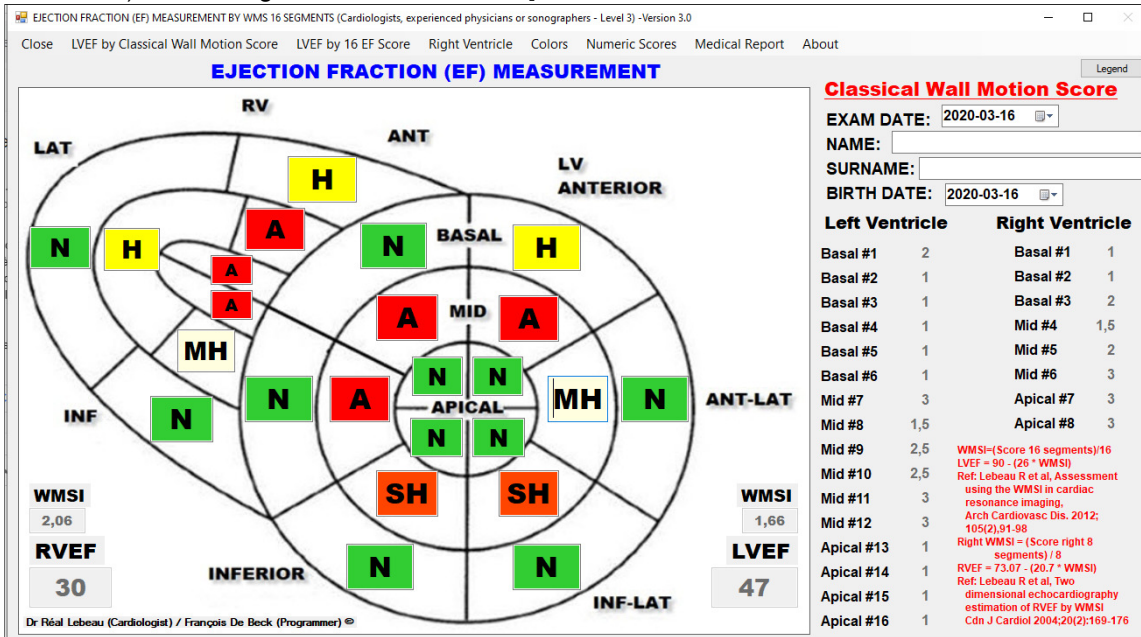

As already mentioned earlier in this document, before selecting the **Medical Report** option, make sure
   ✓ The LV evaluation is complete
   ✓ An image of the completed form is available in the Windows Clipboard
      ▪ Press **Windows + Shift + S** keys simultaneously and surround the form with the cursor, or
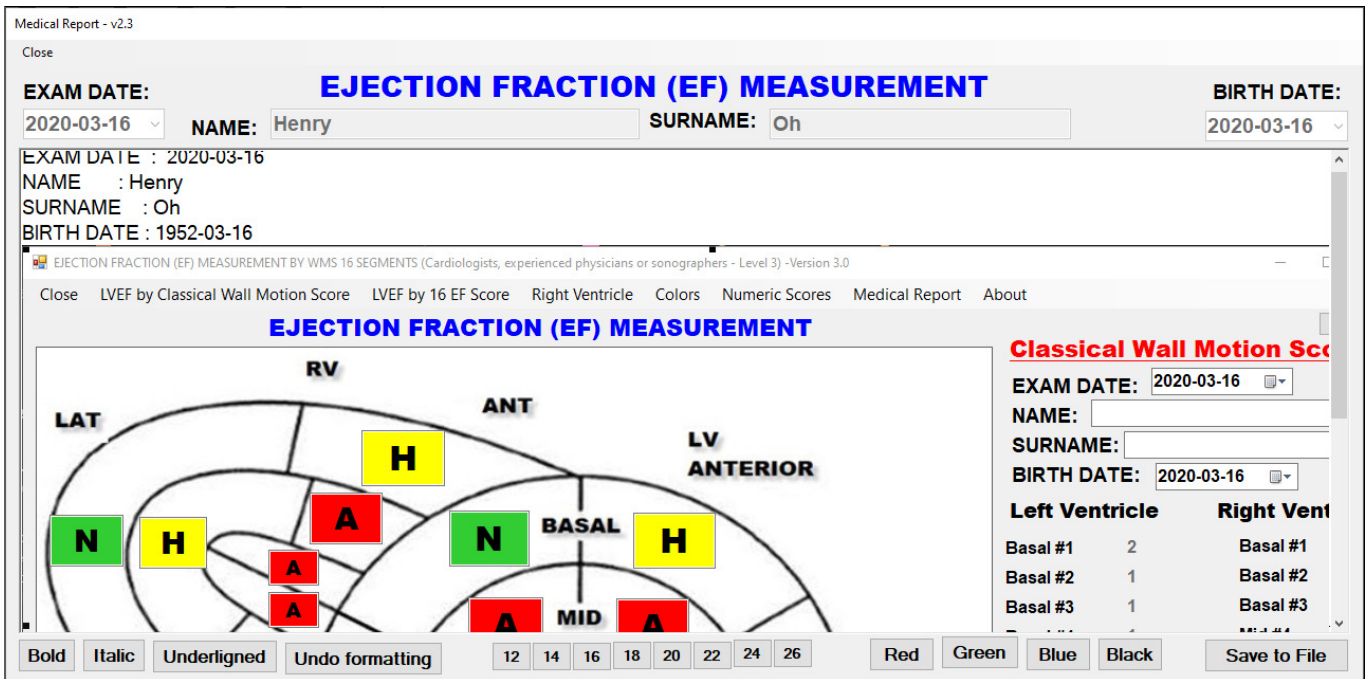   ▪ Press the **Shift + PrintScrn** keys simultaneously.

And once in the medical report, you can paste this image of the form using the **Crtl + V** keys.

EXAMPLE OF PROCEDURE: With the assessed segments below (including date, last name / first name, comments) as an image in the **Windows Clipboard**:

We click on the **Medical Report** option. Please note that the information from the header of the form has been transferred automatically. After **COPYING** the image of the form (after Birth Date), we get:
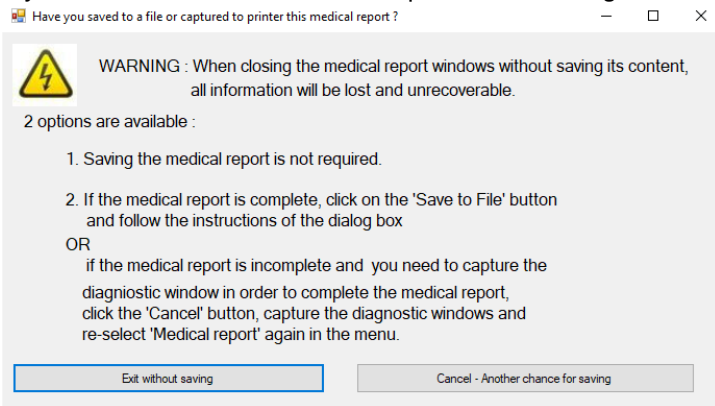

All the text present in this form can be modified. If necessary, after the **PASTED** image, additional text for the patient record can be added at the end of the rich text area.

The options (Bold | Italic | Underligned | Undo formatting | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | Red | Green | Blue | Black) at the bottom of the form allows you to format (change the emphasis, the font size or the color) any the highlighted text in the area.

The button **Save to File** will save the medical report in RTF (Rich Text Format) format under the name and in the location of your choice on your hard drive. RTF files are compatibles with **MS-Word** and other editing software. This will enable you to edit / modify them at your convenience later. You will also be able to print them or attach them to an email without any problem.

The menu option **Close** allows you to close the **medical report** and return to the main form.
If you have not saved a medical report, the following form is displayed:

> Have you saved to a file or captured to printer this medical report ? — □ ✕
>
> ⚠ WARNING : When closing the medical report windows without saving its content,
> all information will be lost and unrecoverable.
>
> 2 options are available :
>
> 1. Saving the medical report is not required.
>
> 2. If the medical report is complete, click on the 'Save to File' button
>   and follow the instructions of the dialog box
> OR
>   if the medical report is incomplete and you need to capture the
>   diagniostic window in order to complete the medical report,
>   click the 'Cancel' button, capture the diagnostic windows and
>   re-select 'Medical report' again in the menu.
>
> [Exit without saving]   [Cancel - Another chance for saving]

- o Select **Cancel - Another chance for saving** to return to the main form and have another chance to produce a medical report

- o Or select **Exit without saving** if you do not intend to produce a medical report.