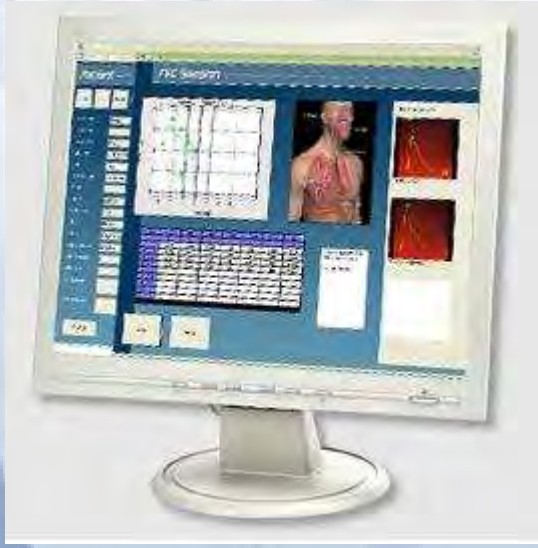
ThorSoft spirometry software



Getting started - Introduction to the spirometry software

The spirometry software is a professional configurable pulmonary diagnostics software application that fully supports several spirometry procedures. The software currently supports FVC (normal, post, and pre), MVV and VC spirometric procedures and oximetry procedure, measuring the following parameters:

- FVC procedure: FVC, FEV1, FEV1/FVC, FEV6, FIVC, FIV1, EV, PEF, PIF, FEF25, FEF50, FEF75, FIF25, FIF50, FIF75,MMEF2550, MMEF2575, FET, ELA, ZeroTime, EOTV, PEFT
- VC procedure: VC, IVC, IC, ERV, TV, TI, TE, VE, RR, TV/TI, TE/TI
- MVV procedure: MVV

Predictions algorithms currently implemented in the application are Knudson, E.R.S. '93 / Knudson, Crapo & Bass / Knudson, E.R.S. '93 / Zapetal, Barcellona / Zapetal, NHANES III, Pneumobill / Knudson /Austrian / Polgar for children.

The application is ergonomically designed to be user friendly and easily configurable. The application can be personalized with a wide range of settings:

- language selection
- prediction method
- spirometer hardware (wavefront device family, internal simulators)
- medical report template collection (also editable by the user)
- automated repeated use of medical procedures (FVC, MVV, VC) easy control with hotkeys
- enable / disable curve acceptability criteries (selectable: ATS/ERS or NLHEP)

See more configuration possibilities on Setting page description.

Several ways are available for data input and output like:

- patient and examination data synchronization between the memory of the stand-alone spirometer device and the PC based database
- directory-tree based or XML based patient and examination data import and export from PC to PC
- GDT interface (input / output)
- printout of the reports
- picture of the patient
- voice commands / automatic interpretation

Also the application is providing an intelligent assistance for Physicians such as:

- live quality control of new FVC curves

- built-in decision-making uncertainty management system on best FVC curve
- innovative visualization of pulmonary tracts and symptoms

The application is built for reduced hardware requirements. The software runs on Windows 2000 or later Microsoft Windows based systems and it's delivered in an easy to use install package.

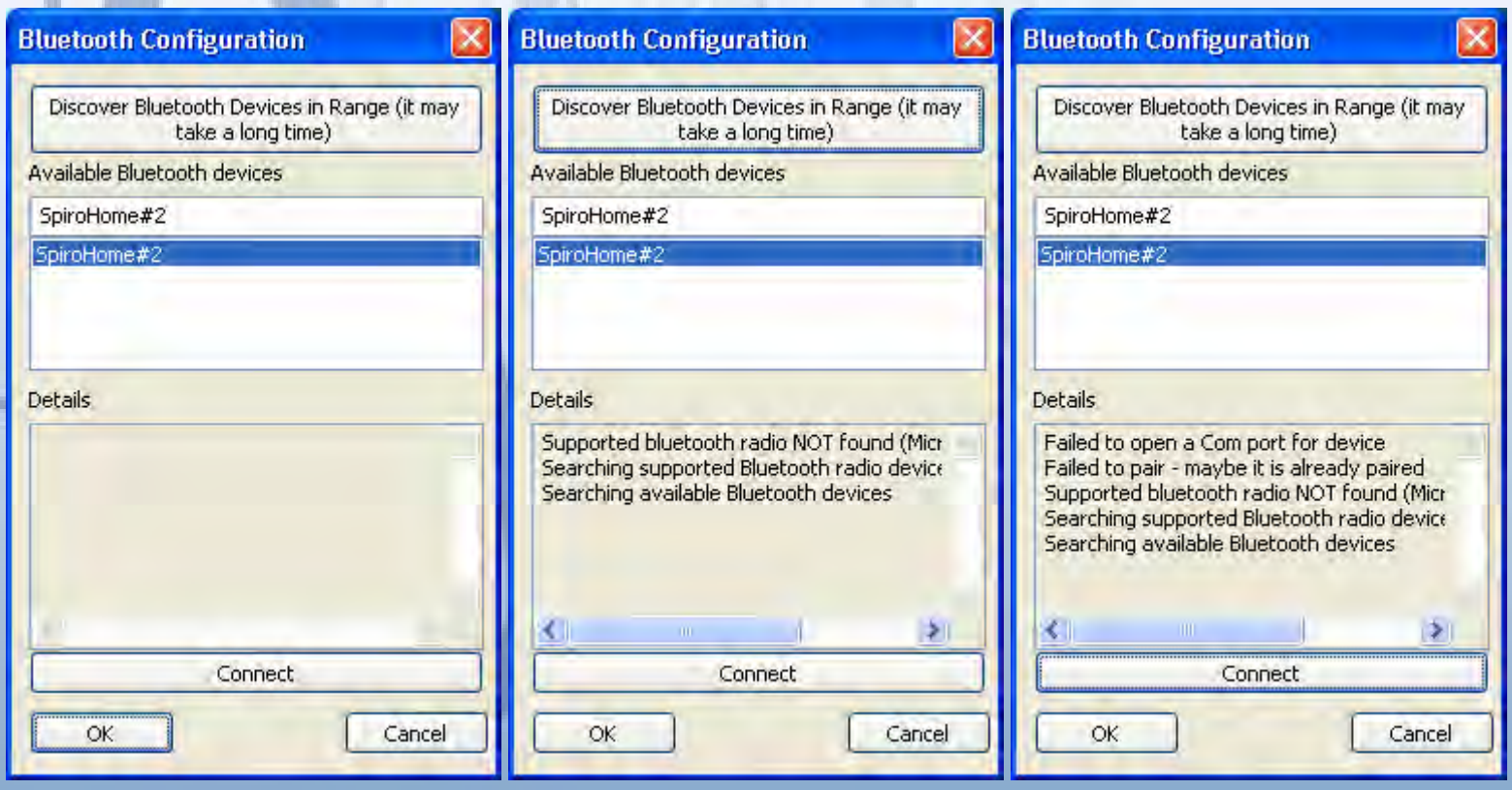
Installing the software

Please see the installation guide for more details.

Connecting the Spirometer device to the system and it's usage with the application

Application supports USB and Bluetooth communication toward wavefront spirometer. Communication type can be set on Settings page (Connection type parameter). Bluetooth communication currently supports only Microsoft protocol stack.

- Switch on the Bluetooth enabled flow meter device
- Open Bluetooth Configuration dialog.
- Click "Discover Bluetooth Devices in Range (it may take a long time)" - the details of searching for Bluetooth device are displayed in the Details message box
- Select **SpiroHome#2** from the combo box
- Click "Connect" to connect to the flowmeter device. The application will set automatically the COM port number on the Settings page and opens the COM port to communication - the details of opening COM port and pairing the device are displayed in the Details message box



USB / Bluetooth / serial port connected device can be disconnected / connected while running the application, the reconnection is automatic. On the title of main dialog the connection status is always displayed.

For more details please see the installation guide and the wavefront spirometer user manual.

Starting the application

Double click on the software's icon to start the application. When the software starts the Search/Select Patient screen appears. Every medical procedure has a separate color schema: FVC - blue, MVV - red, VC - green and each form related to the different medical procedures have the same corresponding background color. Patient and Visit screen will remain blue for all the procedures as these screen are common and not part of any of the procedures.

Navigation in the software

Navigation is easy in the software. Beside the mouse control hotkeys/keyboard shortcuts are also available for the users. Navigation using hotkeys is much faster and convenient particularly in cases when many people need to be examined in a short time.

Keyboard shortcuts:

- "Enter" button takes the user to the next screen in the process flow,
- Left arrow and right arrow is used for scrolling the parameter grid columns to the left or to the right on the Session Result Page,
- Up arrow and down arrow is used for scrolling up and down in the patients list on the Patient list screen,
- Keyboard can be used for selecting the next user with last name starting with the pressed character,
- Backspace is used for declining the recorded trials on session pages (FVC, MVV, VC),
- ESC is used for closing the dialog box in focus.
- F1 button can be used to view this help.

For easier access of mostly used features there is a Toolbar available:

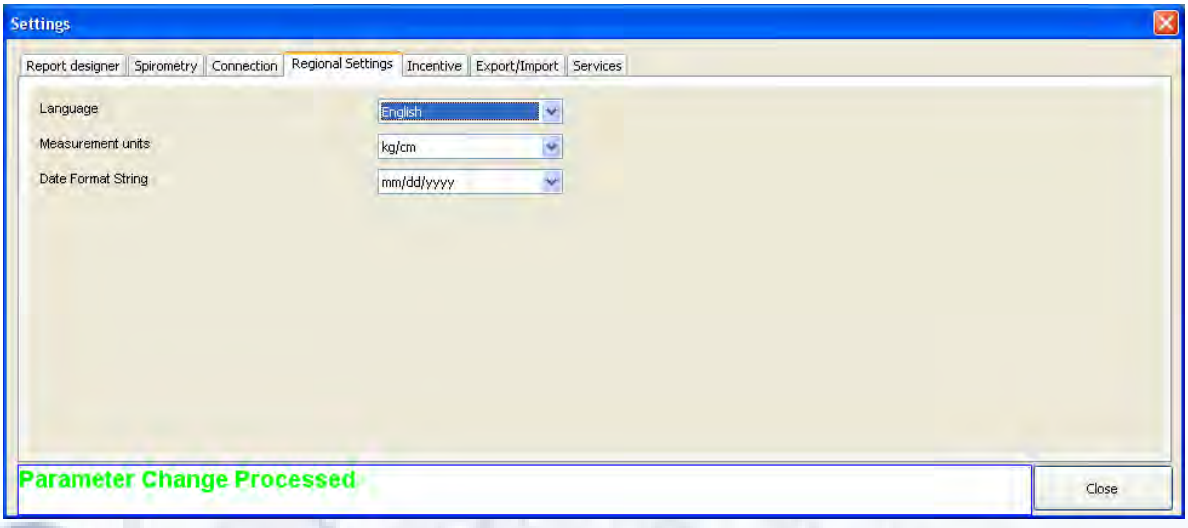
From left to right:

- displays Patient screen
- starts FVC measurement (displays Visit page first)
- starts MVV measurement (displays Visit page first)
- starts VC measurement (displays Visit page first)
- starts SpO2 measurement (displays Visit page first)
- displays FVC result page
- displays MVV result page

- displays VC result page
- displays SpO2 result page
- starts Settings page
- displays application help

Settings screen - Configuring the application

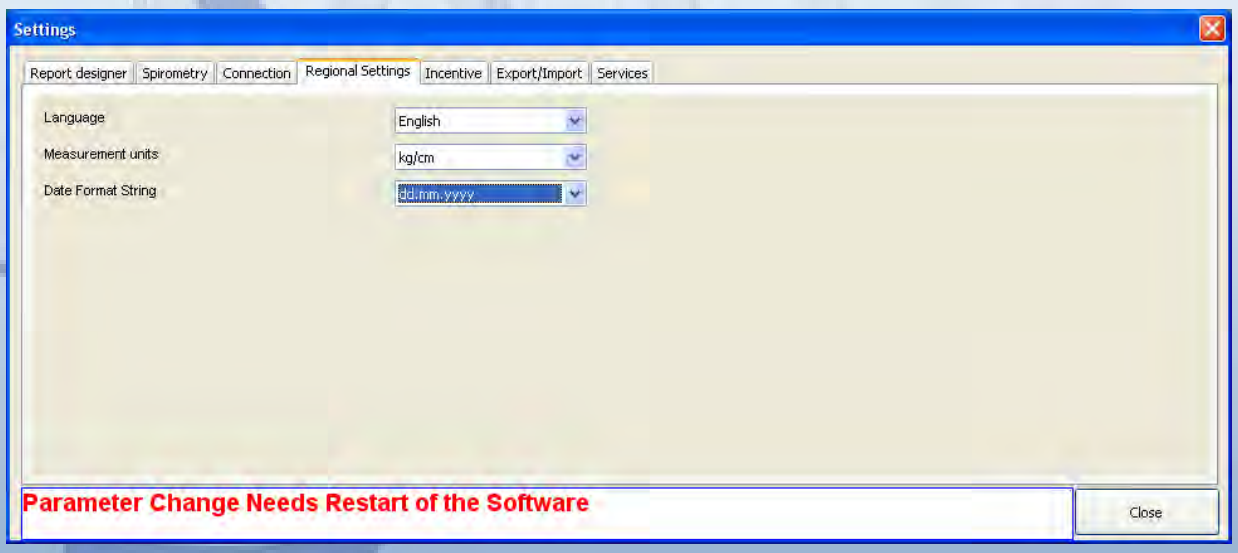
This screen is reachable from the main menu of the application by navigating to the Settings menu item and clicking on the Settings button.



At the bottom of the panel there is an information window that can contain two kind of text:

Parameter change processed: the changes take effect immediately, the program will use the new settings after closing the Settings window.

Parameter change needs restart of the software: the changes will take effect only after restart of the program.



This form is for the advanced users - parameters of the application can be set and saved. The following pages can be selected:

- Riport designer

- Spirometry
- Connection
- Regional settings
- Incentive
- Export/Import
- Services

Riport designer:

Default XXX report template is the default printing template for the FVC, POST FVC, PRE FVC, MVV ,VC, Compare two FVC, FVC trend and Calibration check procedures. This can be chosen from available report templates. The procedure result report page is generated based on the given report template.

Report headers: Here can you configure the report template header.

Printer type: reserved.

Spirometry:

Prediction Method is the method used for calculating the predicted values for the given patient's details like gender, age, ethnic group, etc. Many Prediction methods are available for selection.

Procedure is the type of the testing procedure, like FVC, MVV and VC. Only the actual selected and saved procedure type will be used in the actual testing process even in case of repeatedly done testing processes. This means that the user needs to set the Procedure parameter only one time and able to conduct as many test as needed without changing the settings. To access an other than current procedure the Procedure parameter on the Setting form should be changed. The default value is FVC.

Automatic control of the curve quality. Three values can be set, "No", "ATS/ERS" or "NLHEP". If this parameter is set to "ATS/ERS" or to "NLHEP" it means that the flow can be continued using the Accept button which is activated only when the session is in alignment with the recommendation of selected criteria. The criteria to accept the session is the reproducibility in ATS/ERS mode, meaning that there shouldn't be more than 5 percent difference between the FVC parameters of two of the curves with the highest FVC, FEV1 or FVC + FEV1 parameters. If the parameter is set to "No" that means that just one complete FVC curve is enough to accept the session, the Accept button is activated and the process can be continued on the Result page. The decision support system and the computer interpretation are not working. For both the values the quality control of the curves are operating (coughing, not fully forcing expiration, etc.). Every new curve is going through the quality control evaluation. The Decline button is activated in both the situation, using it will remove all the curves recorded for the session, from both the diagram and the parameter table and reinitializes the session.
You must restart the program before the new settings will take effect.

Best FVC Curve Calculation is an adjustable method whereof the program calculates the best curve (FVC, FEV1, FVC + FEV1)

Accept FVC curve after a while: In the FVC measurement window, when the measurement is done, the program automatically accept the curve after a short time

Enable zero flow correction: In the FVC measurement window, there is a zero flow correction before the measurement, if it's enabled.

Connection:

Signal Source is the source of the incoming data. Users can select from two options:

- spirometer device, for taking the test the device needs to be connected to the PC through USB/Bluetooth/Serial port.
- the internal FVC curve simulator, which simulates a test recorded from a real spirometer

COM port number. The number of serial (COM) port if Bluetooth/serial port connection is selected.

Connection Type: USB / Bluetooth - Serial port

Regional settings:

Language is the language on which the application text (labels, buttons, etc.), help, report templates are displayed, voices are played back. The language is defined in simple external text files, so a new language can be added by the user/distributor itself or by the manufacturer in an easy way. The default value is English.

Measurement unit: Kg/m or lb/inch

Date string format: Here you can configure the date format

Incentive:

Show incentive below age: below the selected age the selected incentive is shown in FVC session page, in other case the anatomic animation is shown.

Incentive Type: Two kinds of incentive can be set: a teddy bear behind curtains and a cake with candles.

Incentive Level: Three levels can be set: 60%, 80% and 100% of FEV1 value.

Export/Import:

GDT name: if the program is used in GDT protocol environment, the GDT name of the application can be specified here. The application only processes GDT file if the file defines it as sender of receiver the GDT file.

Services:

Camera: Patient camera can be enabled or disabled.

Voice comments: Voice comments and commands can be enabled or disabled ("Please start the forced expiration and inspiration" etc.).

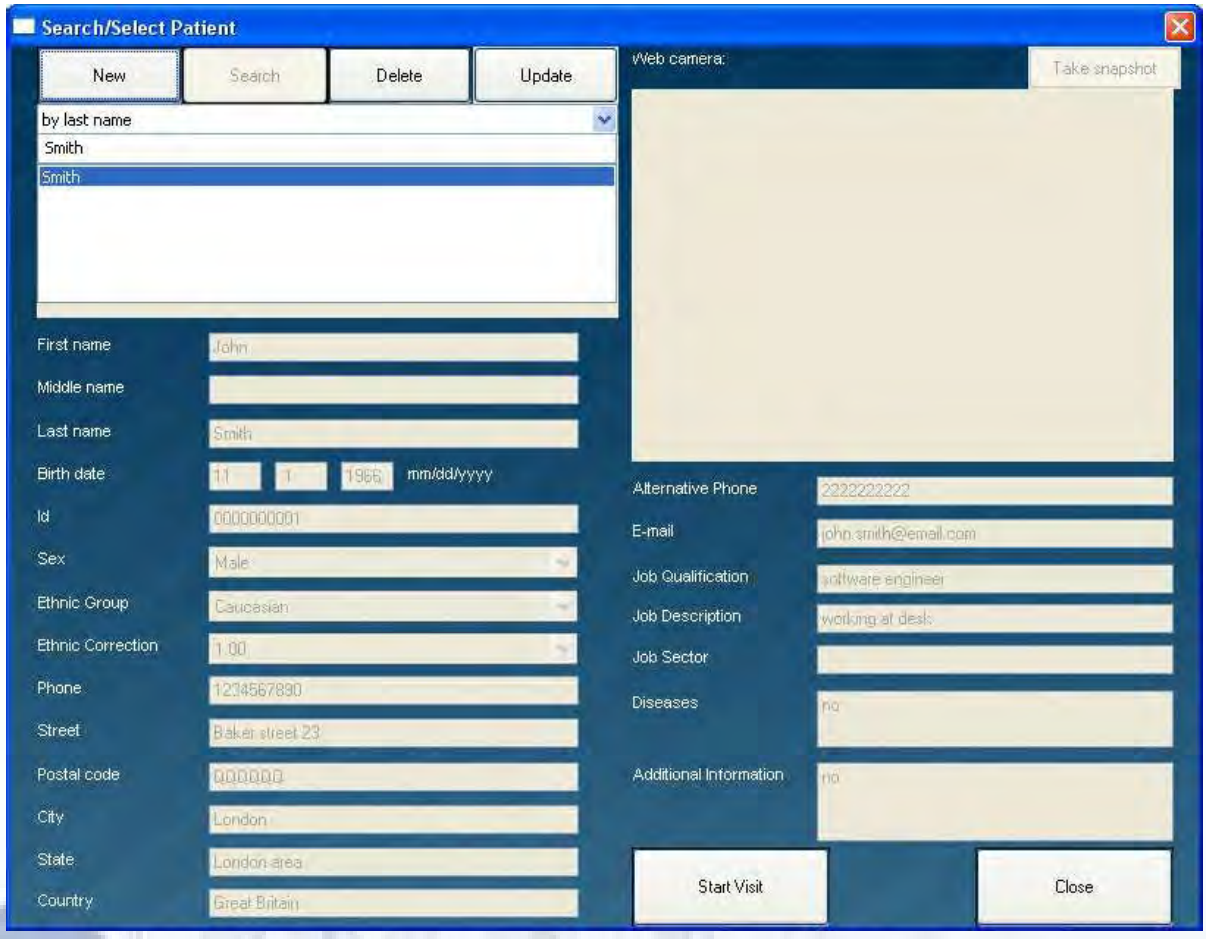
On Screen Keyboard Automatic Management: reserved.

Patient screens - Search/Select Patient and Add new patient screens

The Search/Select Patient screen automatically appears when the application starts. The screen is reachable from the main menu of the application and by clicking on the Patient menu item.

The Patent screen is a multifunctional screen. The same screen is used for Searching or Selecting a Patient, for Adding a new Patient to the database, for Updating Existing Patient and Deleting Existing Patient. The buttons on the screen are enabled or disabled also the labels on the buttons shall change depending on the current functionality. The **Save** / **Start Visit** and **Cancel** buttons are always enabled on the screen. The **Start Visit** button is available only on the Search/Select Patient screen and **Save** button is available on the Add New Patient and Update Patient screen. The **Take snapshot** button is available on the Add New Patient screen and Updating Existing Patient and there is no image already saved to the patient.

Search in the patient's list



Searching/Selecting a patient is the default functionality of the screen. The Search/Select Patient functionality is active when the form opens or it can be activated by pressing the Search button on the screen. In the search/select Patient mode the Search button is disabled, the New, Delete and Update buttons are enabled.

Patients can be search by name, by Id or by last type of measurement by selecting correspondent method from the dropdown list under the Update button. Then the user has the following search options:

- browsing the patients with selected method in the combo box under the New button. The box is populated from the database with the previously saved or uploaded patient's data. If the patient list has more names than what the combo box can show one time a scrollbar appears on the left side of the combo box that can be used to move up and down in the list of the patients.
- typing the last name or the Id of the patient into the combo box.

The patients saved to the database needs to be selected to be the actual patient. Once a patient is selected the details of the patient is populated in the fields. The following data is populated:

- First name
- Middle name
- Last name
- Birth date, the date format is specified next to the date field.
- unique ID of the patient (like Social Security Number)

- Sex
- Ethic Group

- Ethnic Correction

- Phone
- Street
- Postal code
- City
- State
- Country
- Alternative Phone
- E-mail
- Job Qualification
- Job Description
- Job Sector
- Diseases
- Additional Information
- Picture of the Patient

The data of the already saved patients can be updated by first pressing the Update button next to the Delete button then changing the data and pressing the Update button on the bottom of the screen.

The fields are empty by default.

Only those patient data can be populated which were previously saved in the database by the user. By pushing the Start Visit button the Patient screen closes and the Visit screen appears, see section Visit Screen.

Adding a new patient

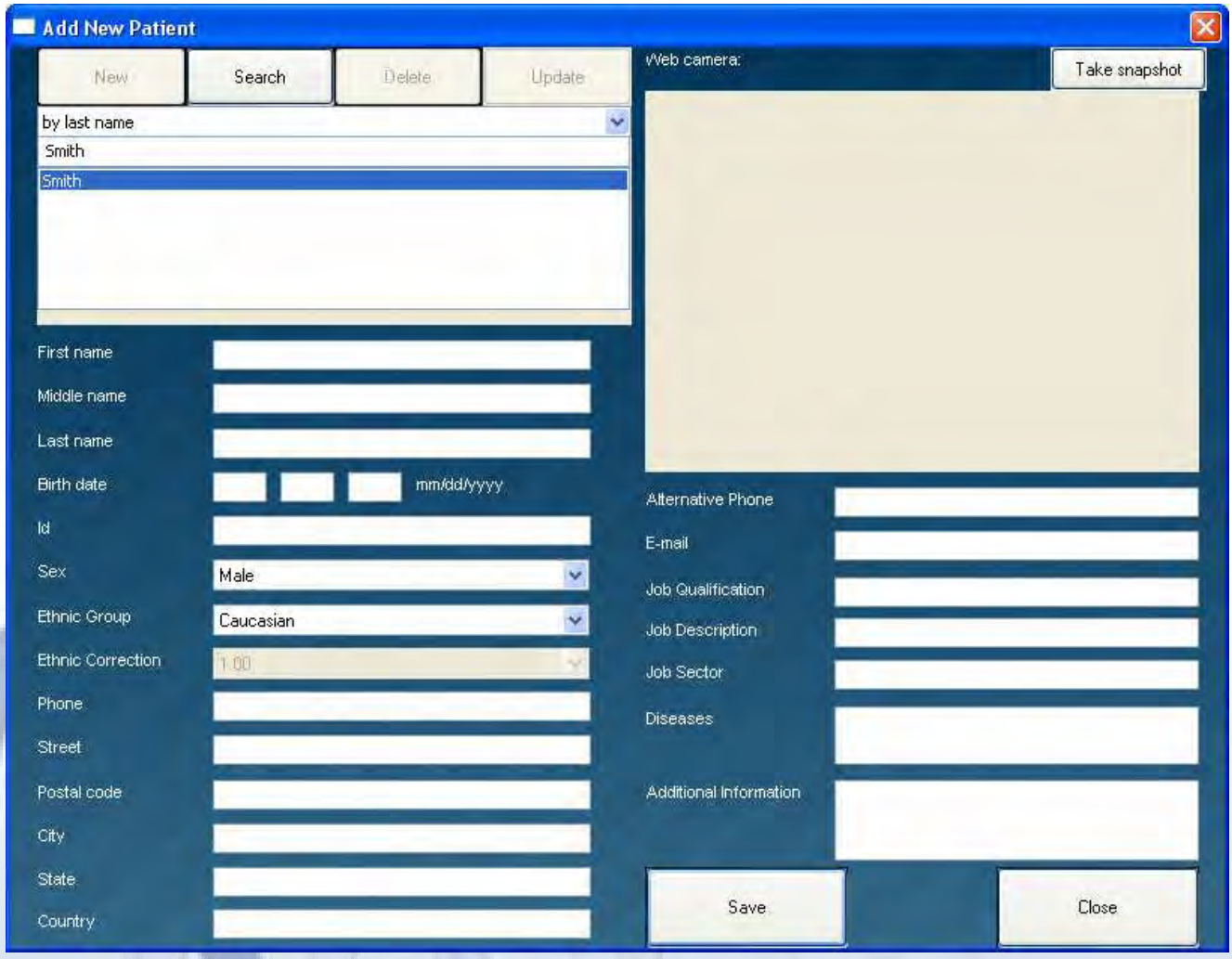
Add New patient functionality can be activated by pressing the New button on the screen. In the Add new Patient mode the New button is disabled and the Search, Delete, Update buttons are enabled. The dropdown list and the combo box are also disabled and all the fields are cleared out except for the Sex and the Ethnic Group. Those fields are populated with default values. The data of the new patient needs to be entered. First name, last name, birth date, id are mandatory fields.

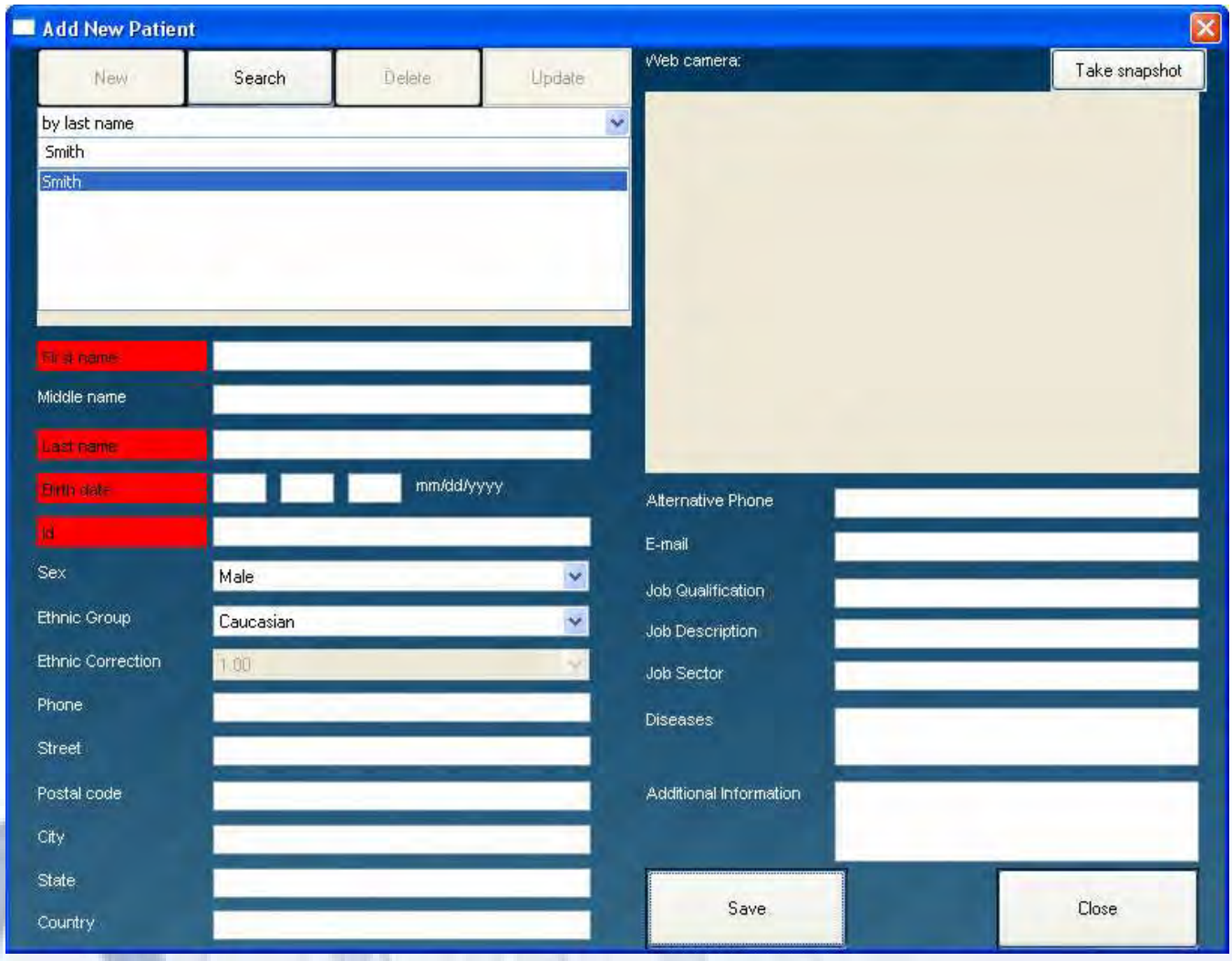
The default date is the date of the current day. In the most cases the birth date does not match with it. Birth date can be given filling up 3 edit boxes according to pattern YYYY-MM-DD. Meaning first edit box from left to right is the year on 4 digits (e.g. 1974), the middle one is the month (e.g. 11), the last one is the day (e.g. 1).

Once the Save button is pushed the input fields are validated and the data can be saved to the database only if all the mandatory fields are entered and the data format is correct. In case if the mandatory fields are not filled or any of the values are not entered properly then the field name of the incorrect data is highlighted in red like shown in the screenshot on the right side. Data cannot be saved unless the values of the incorrect fields are fixed. By pressing the TAB key the cursor jumps to the next field or to the next combo box.

By pressing enter or by clicking on the Save button and the data is correct the new patient will be stored in the database, the screen will change to the Search/Select Patient mode and the edit boxed will be filled with the previously entered patient's data.

The ethnic correction field is only editable if the Ethnic Group is "not defined".





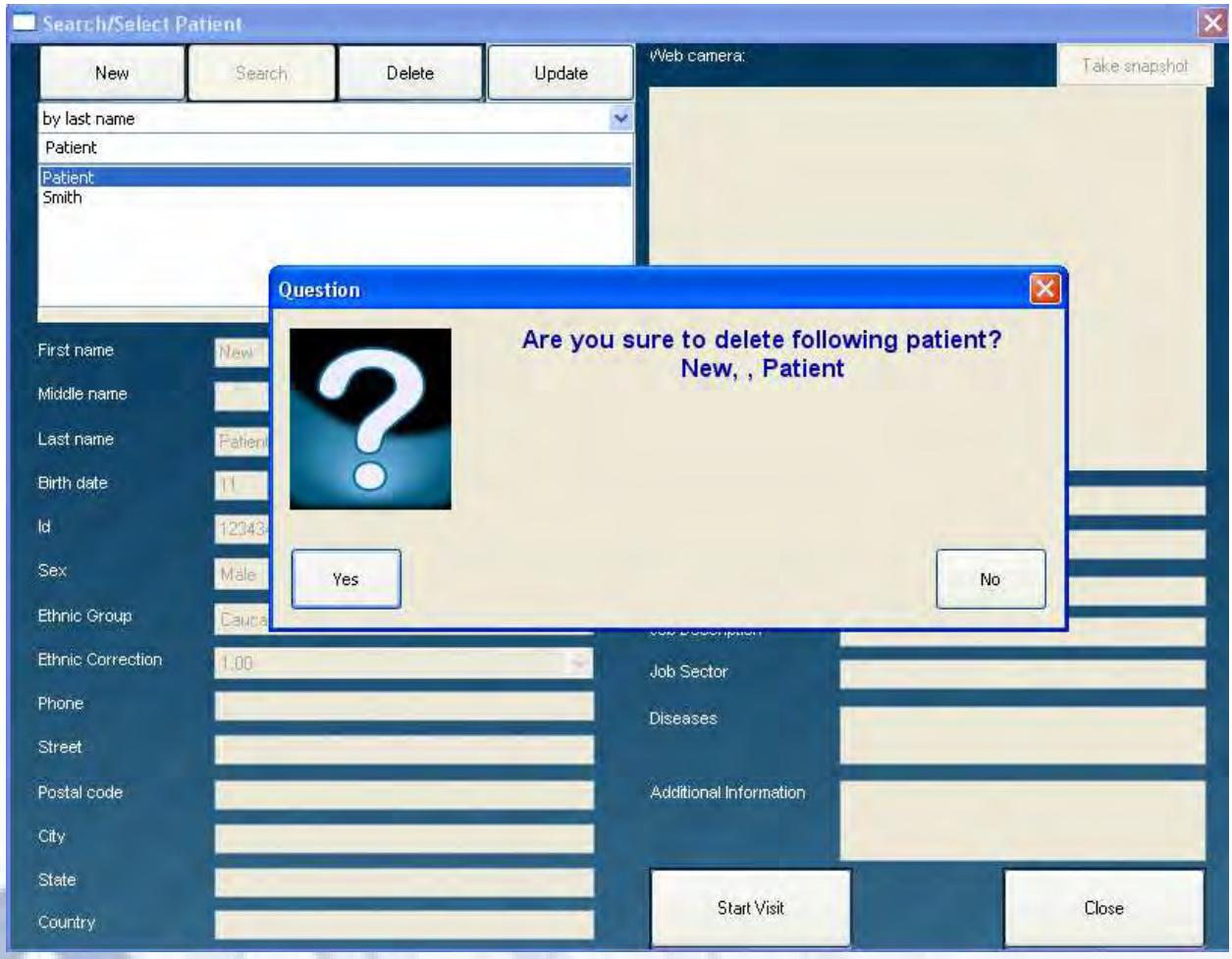
Taking a photo on patient is possible only once either on New Patient or on Update Patient pages. If taking a photo is available and camera is available and enabled (Settings page Camera parameter) there is a live camera on the screen. pressing **Take Snapshot** button the image is captured. Storing is done if Save button is hit. The idea behind storing patient's picture is to remembering better the patient.

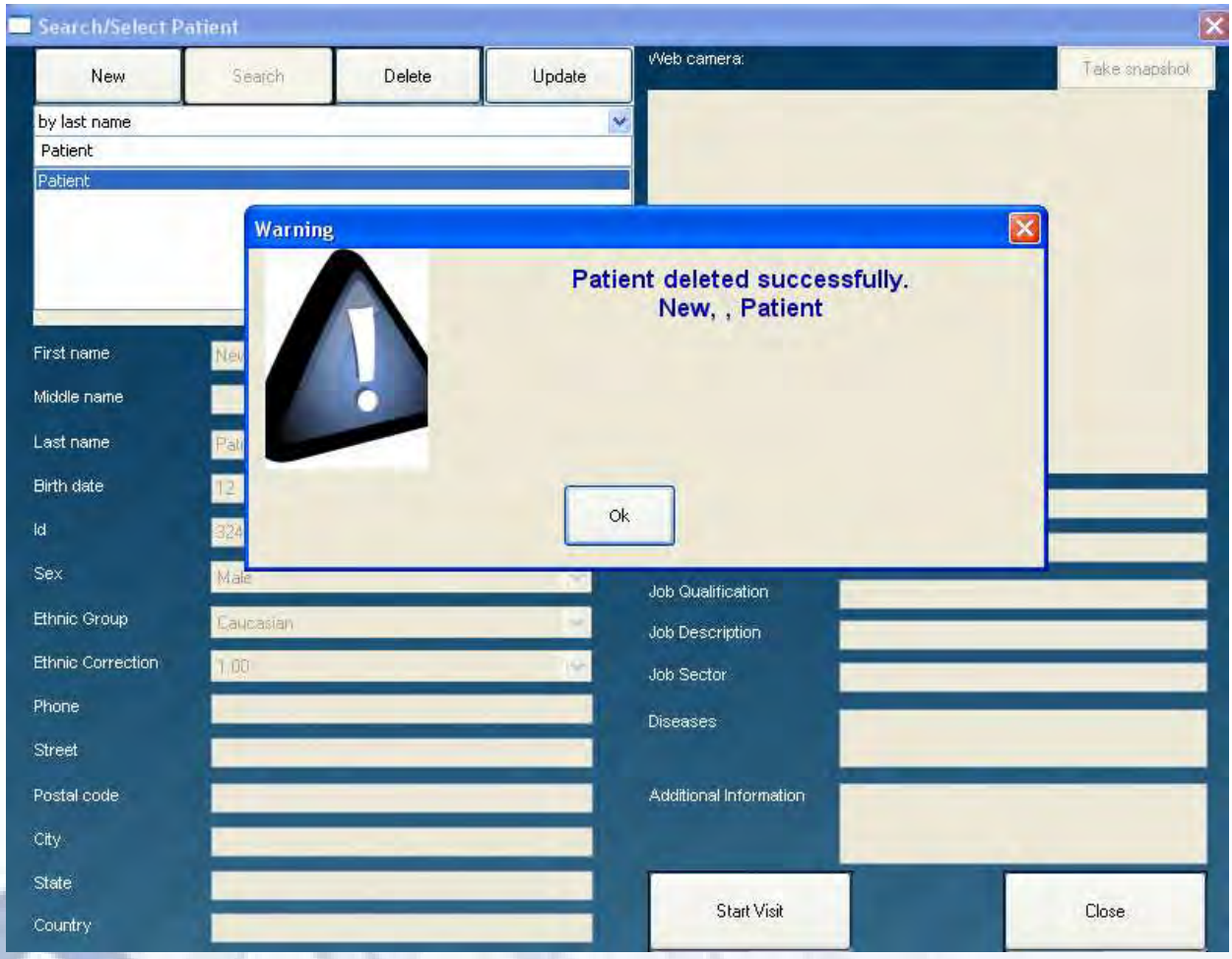
Updating a patient

The Update patient process is almost the same as New Patient process. The only difference that in update there are already valid data filled into page. The Id cannot be updated because data synchronization process with standalone handheld spirometer needs this unique ID.

Deleting a patient

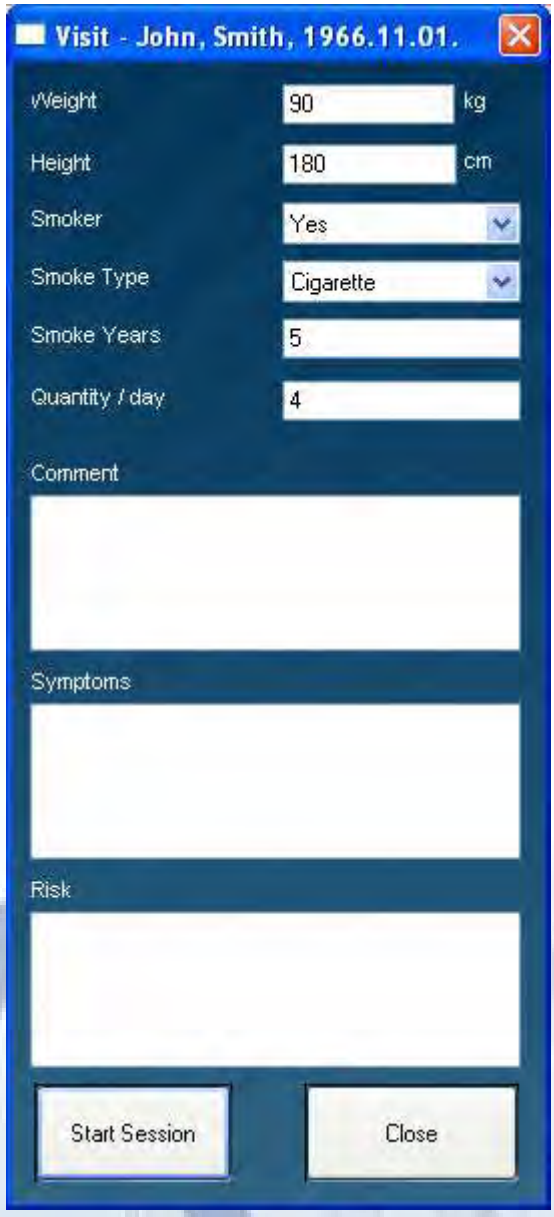
The patient who will be deleted needs to be selected first. When the patient is selected by pressing the Delete button the patient's data is removed from the database and the next patient's data will be displayed from the list.When the Delete button pressed, the following window pops up, if the User press Yes, the patient will be deleted permanently.


Search/Select Patient
New
Search
Delete
Update
Web camera:
Take snapshot
by last name
Patient
Patient
Smith
Question
Are you sure to delete following patient?
New, , Patient
Yes
No
First name
Middle name
Last name
Birth date
Id
Sex
Ethnic Group
Ethnic Correction
Phone
Street
Postal code
City
State
Country
Job Sector
Diseases
Additional Information
Start Visit
Close



Visit Screen

The screen is reachable by clicking on the Start Visit button on the Search/Select Patient screen after selecting the correct patient.



When the screen appears the data of the last visit for the selected patient is given to the Visit form. The patient's first name, last name and birth date is displayed in the header of the screen. If the actual visit is the first visit for the patient only default values are populated in the fields.

The following data can be entered:

- weight: weight of the patient given in kilograms. Needs to be a number. This is a mandatory field. The default value is 90 kg (198 pounds). This value is required by the prediction algorithm.
- height: height of the patient given in centimeters. Needs to be a number. This is a mandatory field. The default value is 180 cm (71 inch). This value is required by the prediction algorithm.
- Smoker: a selection to show if the patient is a smoker or not. Options are Yes, No or Formal. This is an optional field.

- Smoke Type: the type of the smoking equipment can be specified. The options are cigarette, cigar, pipe and other. This field is only enabled in case if answer 'Yes' was selected for the previous question ('Smoker'). If the option 'None' is selected the selection for the pervious question (Smoker: Yes/No) will be automatically changed to No and the answer field for the Smoke Type question is disabled.
- Smoke years: the number of years of the smoking period of the patient. Needs to be a number. Not a mandatory field. The default value is 0.
- Quantity/day: number of the cigarettes smoked on a day by the patient. Needs to be a number, not a mandatory field. The default value is 0.
- Comment: any comment that the user needs to mention. Not a mandatory field. Empty by default.
- Symptoms: the symptoms mentioned by the patient. Not a mandatory field. Empty by default.
- Risk: risks specified by the user. Not a mandatory field. Empty by default.

When the Start Session button is pushed the data is validated. Incorrectly entered fields and empty mandatory fields are highlighted in red. When the user pushes Start Session and the data is correct the data for the visit is stored in the database.

The screen closes without saving the data to the database when the user pushes the Close button.

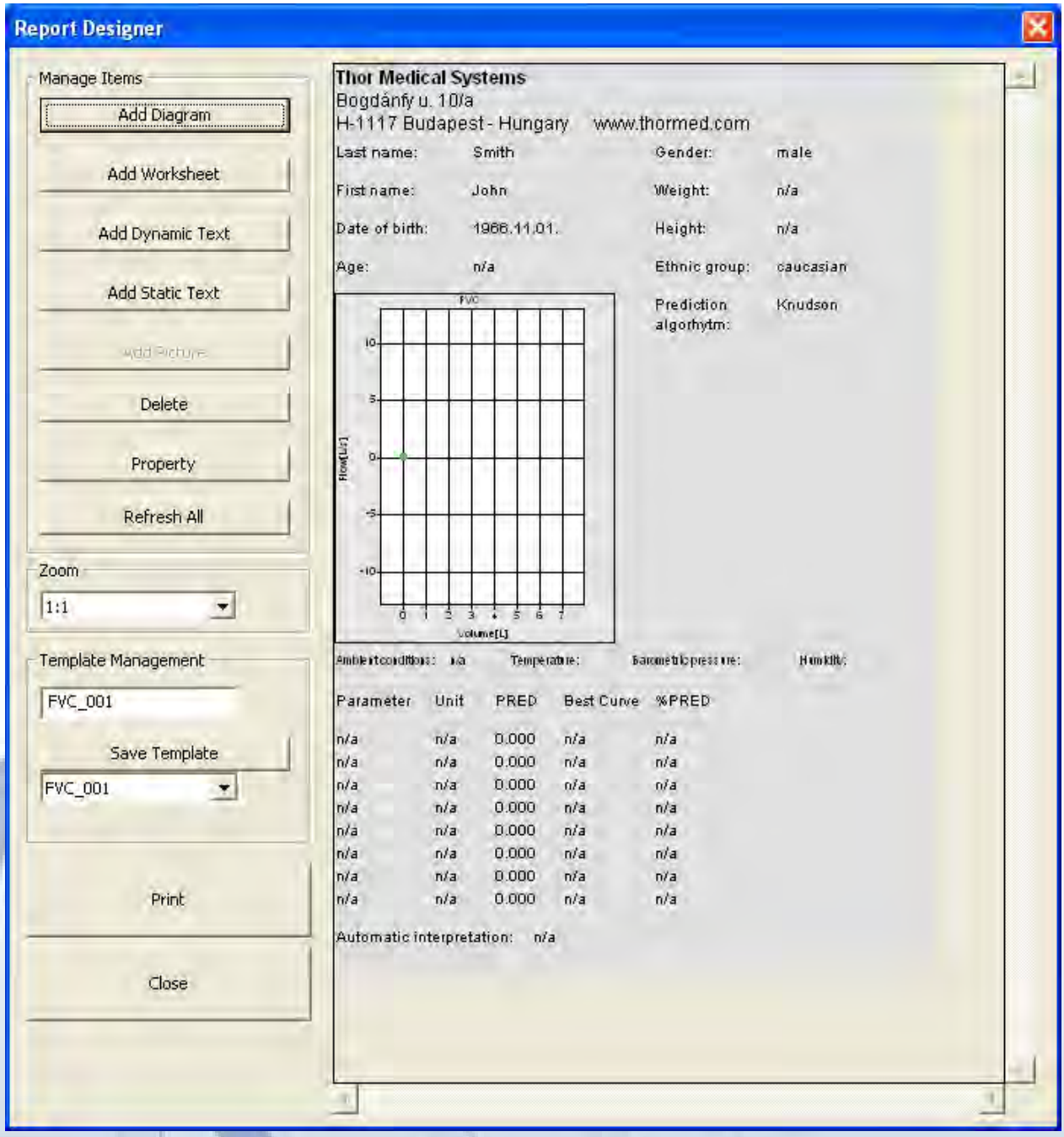
Report Designer screen

This screen is reachable from the main menu (Tools) of the application by navigating to the Report Designer menu item. Report Designer is the tool for editing existing printing design templates and creating new printing design templates. The printable form can be designed and printed out on an A4 paper size. Other paper sizes are available upon patient request.

All the medical procedures are using the same report page design. The design is generated based on the report template set in the Settings menu. The templates are filled with actual data at the end of the procedure (actual curves, parameters in the tables).

The following components can be added and edited on a template:

- diagram
- worksheet (table) (reserved)
- static text (like labels) for text that is fixed and not changed when the screen loads at the end of the procedure
- dynamic text (like the patient's last name) for text which is populated with the data entered or calculated previously during the procedure.
- picture (reserved)



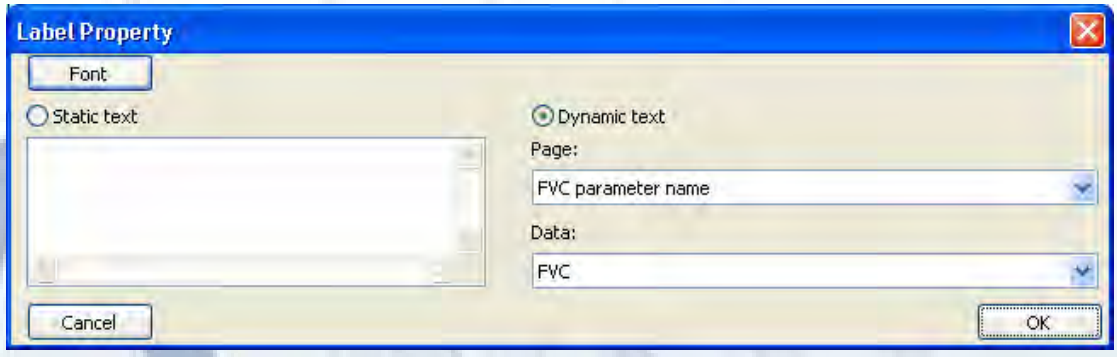
Components can be added / deleted by using the buttons on the left control bar or by using the right mouse button on the canvas; in this case a pop-up menu appears. Each component has its own properties. When selecting one component by clicking on it with mouse a light green outline box is displayed around the component to show which component's properties are editable at the moment. Only that component can be edited which was previously selected.

A grid is added to the page to allow easier arrangement of the components vertically and horizontally. This grid can be shown or hidden from a check box.

The following properties can be set:

- for diagrams:
  - type of the diagram: FVC, FVC-Vt, MVV, VC

- for static and dynamic text:
  - the type of the text, static or dynamic
  - in case of static labels the text can be given in a textbox
  - in case of dynamic text, the source parameters of the data need to be specified.
    - Page means the group of the data like FVC best params, VC unit, patient data etc.
    - The data means the exact data that is displayed from the page. E.g. for VC_Param_NAME page the Data list is the following : VC, IVC, IC, ERV, TV, TI, TE, VE, RR, TV/TI and TE/TI.
  - type of the font. The button opens the Font panel where the font type, the font style, the font size, couple of effects and the color code



All the components can be moved and resized by mouse. The items can be moved using the mouse by dragging and dropping at the correct position when the cursor is displayed as a four way arrow. The items can be resized using the mouse by holding one side of the outline box of the item when the cursor is displayed as a two way arrow.

The order of the different components overlapping each other can be changed as well in the right mouse button menu. In case if any of the components are overlapping each other the order of the items can be specified by bringing one component to the front or sending it back behind the other component.

When the reporting screen displays the default template will be shown with actual data.

FVC Procedure Screen

The screen is reachable by clicking on the Start Session button on the Visit Screen. To run the FVC procedure in the application the Procedure setting on the Settings screen needs to be set to 'FVC'. For more detailed explanation on how to run a test see the **FAQ** section

In case of FVC Procedures the color schema for all the related screens is blue.

The screen has the following sections:

- *FVC diagram with predicted points* on the top left corner of the screen. On the x axis is the volume of the air exhaled out by the patient given in Liters and on the y axis the air flow given in Liter/second. The predicted values (FEF25, FEF50, FEF75 and FVC) are marked with light green dots. Each curve is matching one measurement trial. Each of the curves is displayed with different colors matching the colors of the different trials as displayed in the FVC parameter table below the FVC diagram.

- *FVC-Vt diagram* is on the top center of the screen over the operator note window. On the x axis is the time of the exhalation and inhalation given in seconds and on the y axis is the volume of the air given in Liters.

- *FVC parameter table* is (for all trials) in the bottom right corner of the screen left to the function buttons. This table shows the actual result values of the measurement trials. The table is horizontally scrollable by the left and the right arrows or by mouse. The maximum number of trials is 8. The first row in the table has the name of the measured FVC parameters. The parameters are FVC, FEV1, FEV1/FVC, FEV6, FIVC, FIV1, EV, PEF, PIF, FEF25, FEF50, FEF75, FIF25, FIF50, FIF75,MMEF2550, MMEF2575, FET, ELA, ZeroTime, EOTV, PEFT . The second row shows the unit for each of the parameters. The third row shows the predicted values calculated with the patient's details like the height, weight, age, etc. From the forth row to the last row the actual result values are shown for each of the measurement trials.

- *Operator Note:* below the FVC - Vt diagram. The user of the program can write notes to this textbox, which later can be seen on the results page.

- *Quality Control display* is on the right side of the screen, over the New Curve button. Quality control images are only displayed if the measurement seems to be corrupted. Maximum number of quality control images is 3. Issues like cough, early termination, not fully forced etc. are algorithmically detected and displayed after each completed measurement to help the user and the patient producing acceptable FVC curve. For more details see below.

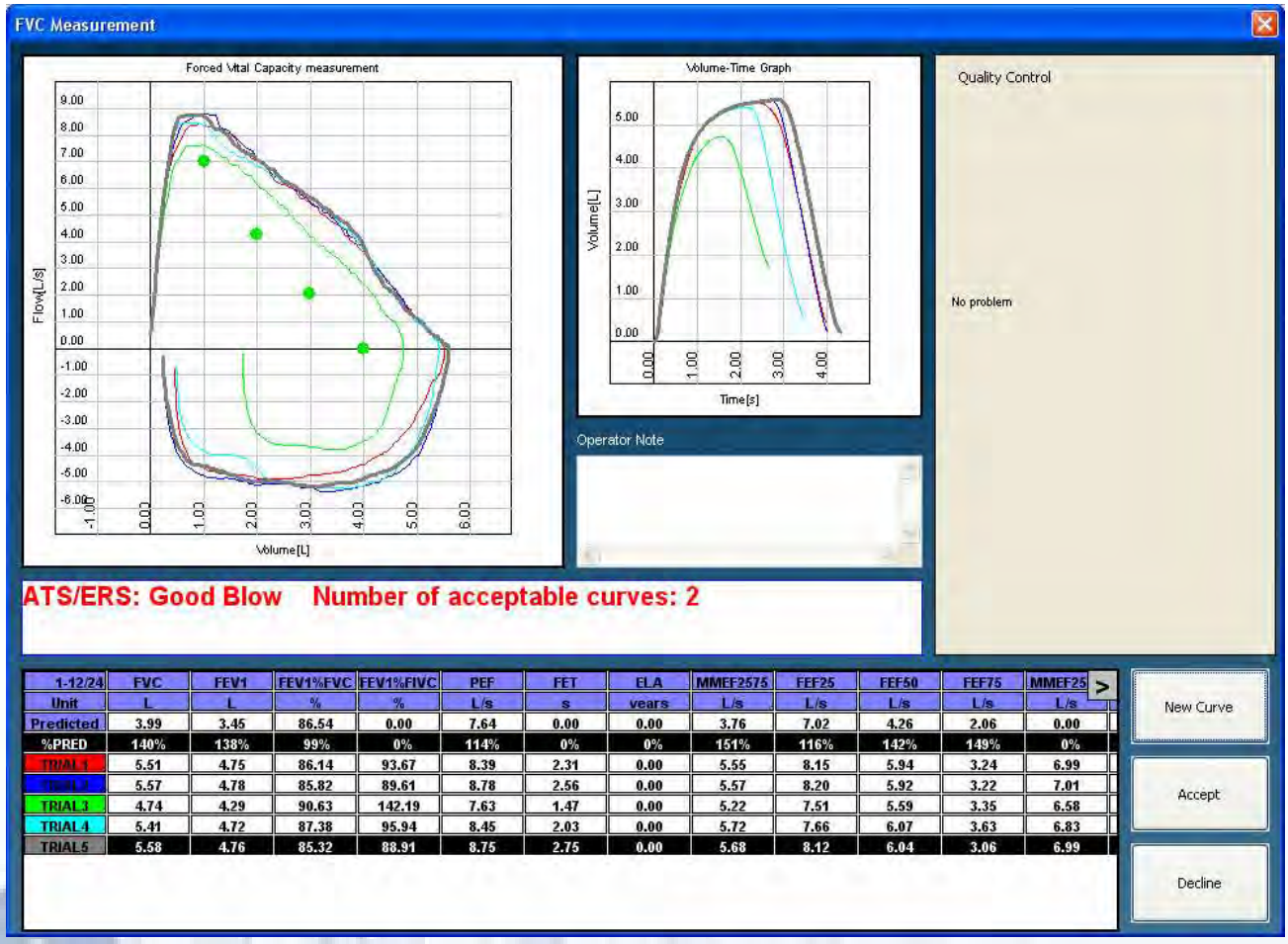
- *Spirometry Workflow Manager* is under the FVC and FVC-Vt diagrams. It displays the messages from RAM QC (Recommended Automated Maneuver QC) standards assessed on the basis of the curves.

Function buttons on the screen are:

- New Curve - beginning of the FVC measurement, where several FVC curves can be measured but the program selects only the best curve. For more details see below.

- Accept - accepting the session, the best curve is saved to database. Button is enabled only when at least one curve is recorded.

- Decline - not accepting and restarting the session. **WARNING: decline deletes all curves in the session in which it is activated**. All data will be lost. Can be pushed any time.

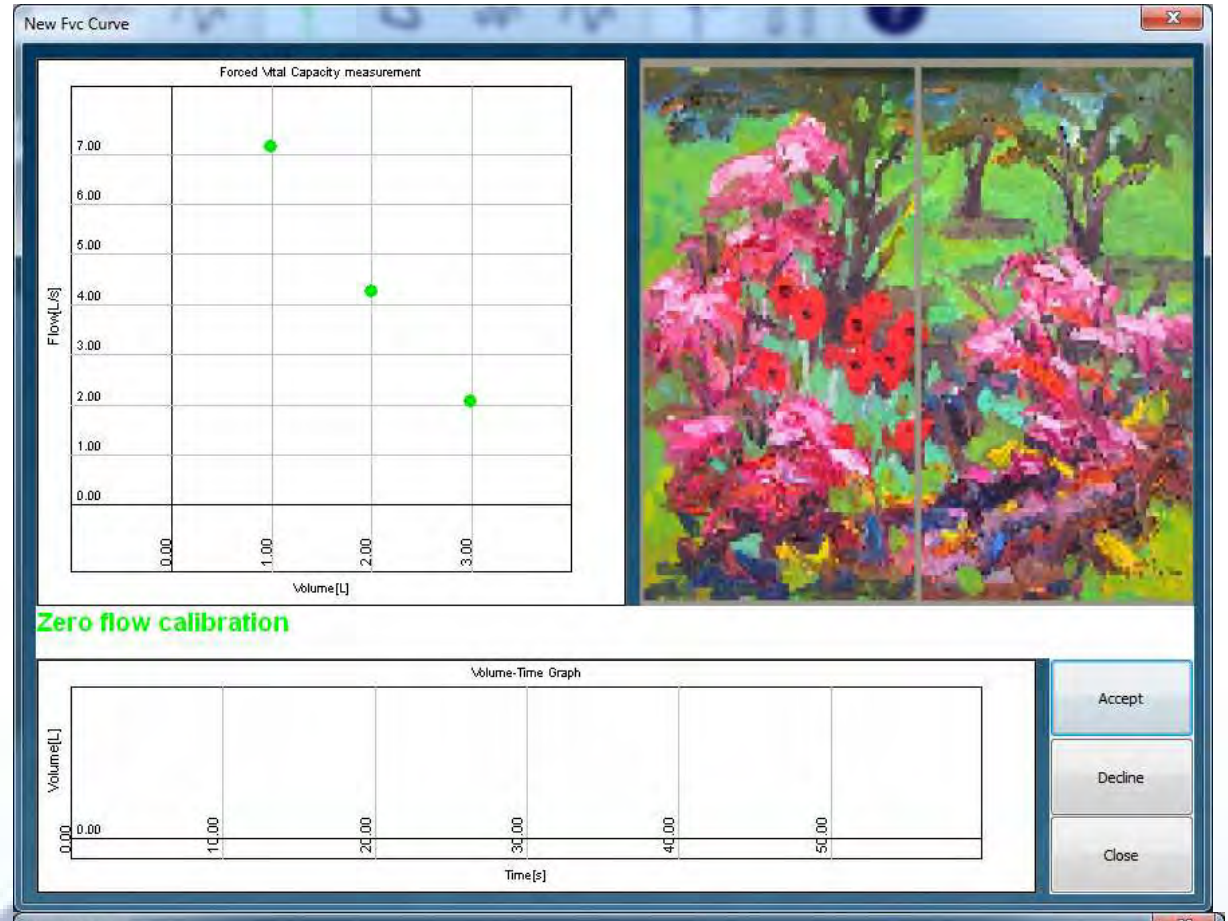


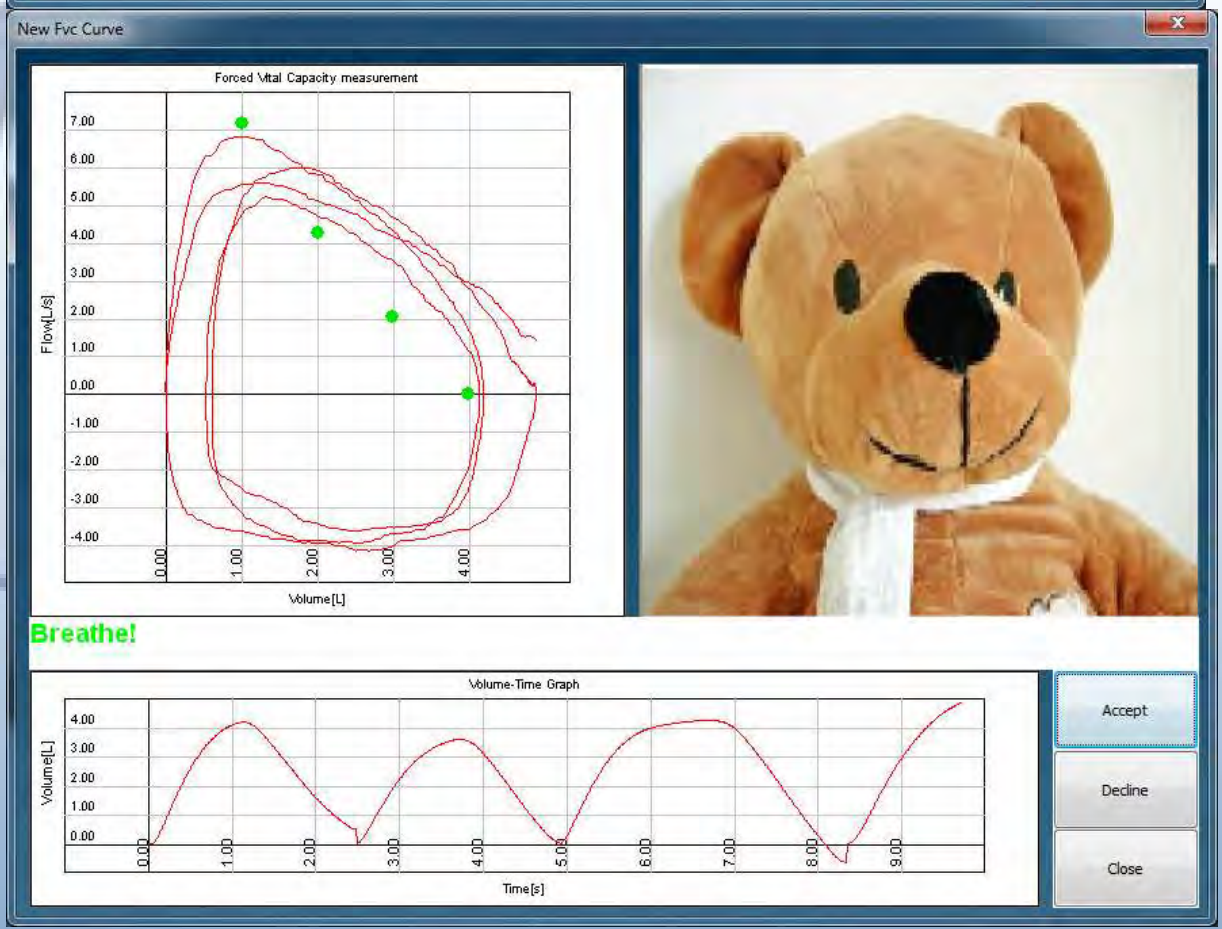
Best curve is selected automatically while curves are recorded. Adding a new curve to the curve list runs algorithm of selecting the best curve, which is highlighted - row of the best curve has black background in the grid. The best curve has the biggest FVC value. The automatic curve selection can be overridden by the user using popup context menu on the grid. Three menu items are there:

- Select a curve under the mouse as best
- Select best curve automatically -> dropping user selection

Best curve is saved to database and on the result/report pages the best curve will represent the session. Be careful, best curve cannot be changed on result page.

By selecting the New Curve button, the User will find the following screen:


New Fvc Curve
Forced Vital Capacity measurement
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Flow[L/s]
0.00
1.00
2.00
3.00
Volume[L]
Zero flow calibration
Volume-Time Graph
Volume[L]
0.00
0.00
10.00
20.00
30.00
40.00
50.00
Time[s]
Accept
Decline
Close


New Fvc Curve
Forced Vital Capacity measurement
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
Flow[L/s]
0.00
1.00
2.00
3.00
4.00
Volume[L]
Breathe!
Volume-Time Graph
Volume[L]
4.00
3.00
2.00
1.00
0.00
0.00
1.00
2.00
3.00
4.00
5.00
6.00
7.00
8.00
9.00
Time[s]
Accept
Decline
Close

The patient could continuously blow several curves and the program will select the best trial which will be saved to the parameter table in the previous page (if it meets the essential requirements).

This screen has the following sections:

- *FVC diagram with predicted points* on the top left corner of the screen. On the x axis is the volume of the air exhaled out by the patient given in Liters and on the y axis the air flow given in Liter/second. The predicted values (FEF25, FEF50, FEF75 and FVC) are marked with light green dots.
- *Volume - Time diagram*: on the bottom of the screen. On the x axis is the time of the exhalation and inhalation given in seconds and on the y axis is the volume of the air given in Liters.

- *Infobar:* in middle of the screen, above the V-T diagram. It represent the state of the zero flow correction. If the zero flow correction is turned off, the infobar shows the "Breathe!" sign.

- For young patients (the age can be set in settings page - Show incentive below age) there is an incentive animation. A nice picture about teddy bear is showing up behind a curtain. The volume controls how much the curtain opens - how much portion of teddy bear's image is visible. Teddy bear is full visible if the young patient can blow out 90% of his/her predicted FEV1 value. Blowing in closes the curtain. On Settings page Show incentive below age controls the upper age below incentive is shown

Function buttons on the screen are:

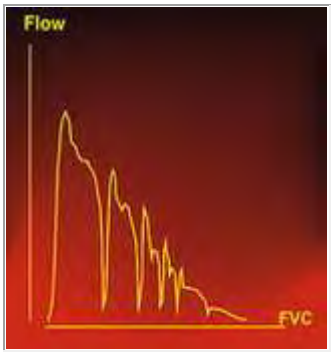
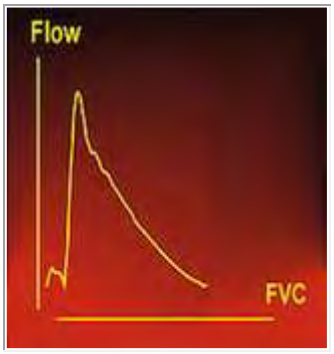
- Accept - accepting the session, the best curve is saved to a table in the previous screen.

- Decline - not accepting and restarting the measurement. **WARNING: decline deletes all curves in the screen**. All data will be lost.

- Close - same as decline but closes the New FVC Curve window. **WARNING: close deletes all curves in the screen**. All data will be lost.

Quality control

The following table shows the potential issues that can occur during the measurement:

	The patient was coughing.
	The patient wasn't fully forcing the expiration.
	The expiration was stopped prematurely.

FVC Session result screen

The screen is reachable by clicking on the Accept button on the FVC Procedure Screen or from the menu (**View** -> **FVC Result Page**). The screen shows the best measurement result details.

The screen has the following sections:

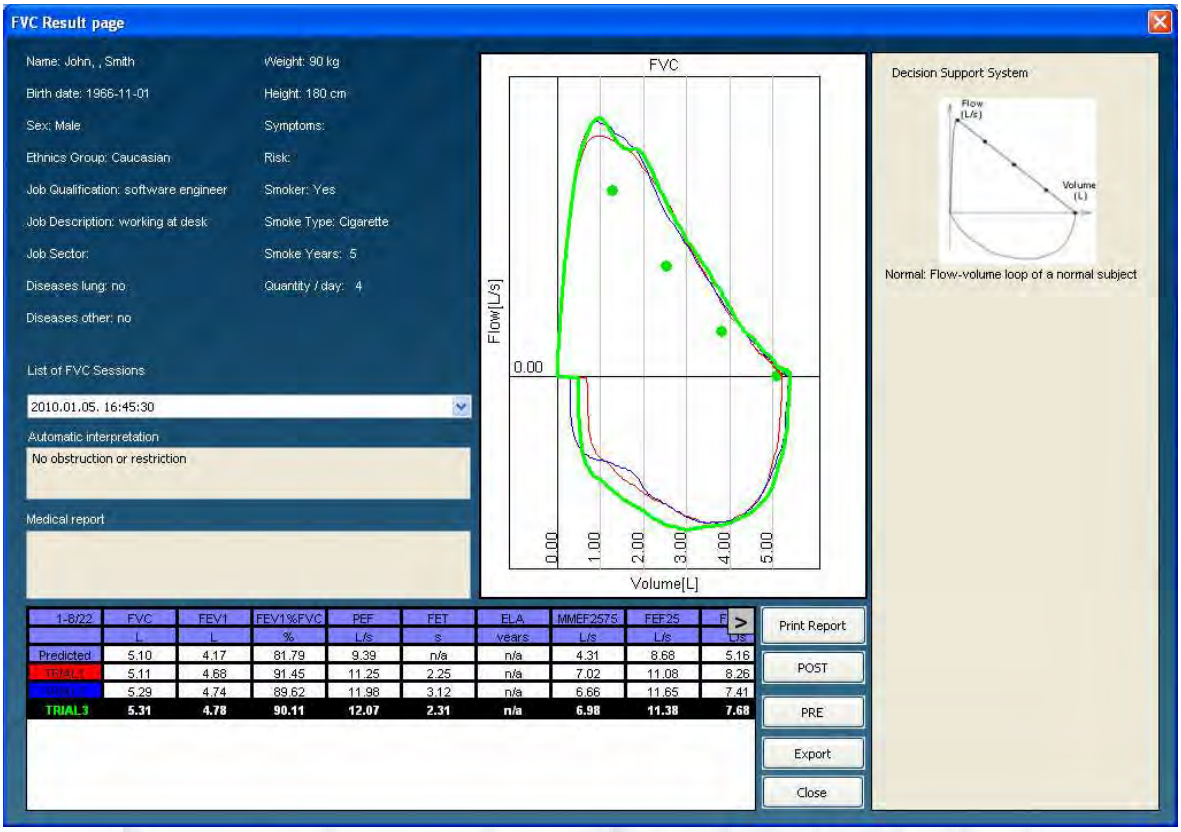
- Patient details (patient card)
  - name
  - birth date
  - sex
  - ethnic group
  - job qualification
  - job description
  - job sector
  - disease lung
  - disease other

- Visit details (visit card)
  - weight
  - height
  - symptom
  - risk
  - smoker
  - smoke type
  - smoke years
  - smoke quantity per day
- Post-FVC drug information (if applicable)
- Best FVC curve with relevant predicted parameter points, see section **FVC Procedure Screen - FVC diagram**
- Decision support system. The Decision support system displays some FVC curves and its medical description, which are most similar to the current best curve. The support system displays images based on the computer interpretation generated on the previous FVC Session page. The main purpose of this module is to support the user in evaluating the results. See more details below.
- FVC parameter table with the result values of the best curve, predicted values and the result value's deviation from the predicted values in percentage.
- List of FVC sessions combo box: the result page is able to list the patient's all previous sessions (older sessions can be loaded to the result page - on the report page these will be showed and printed on demand). Using hotkeys Up and Down keys the list scrolls up and down and the result page is refreshed immediately with the data of the selected session.
- Automatic interpretation text generated by the application, see section **FVC Procedure Screen - Computer interpretation**
- Medical report: detailed user evaluation of the measurement, it can be entered and saved to the database (this feature will be implemented in future).

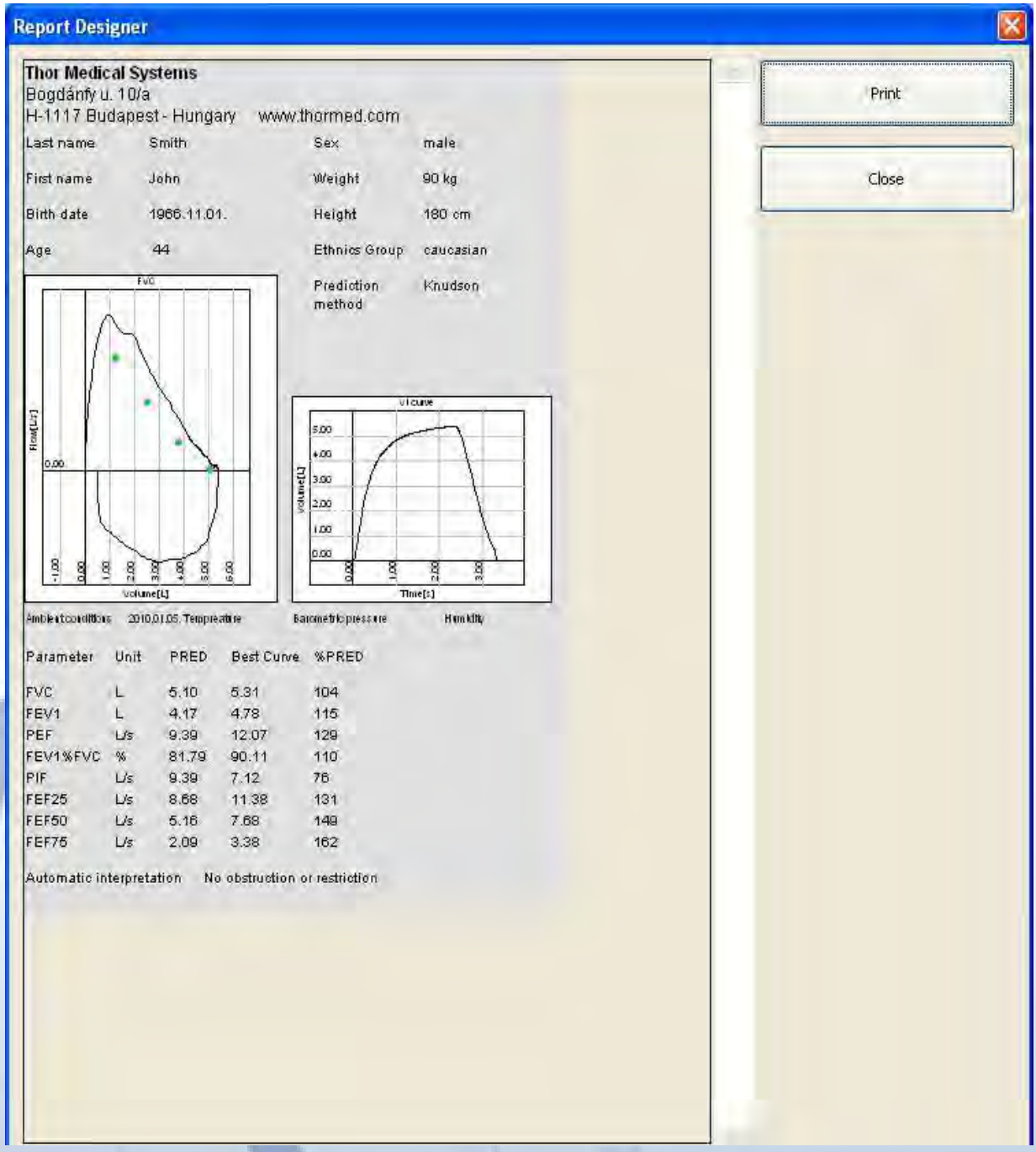
The content of the page especially of the grid and diagram is different a bit for normal, post and pre FVC types.

Function buttons on the screen are:

- Print button, the report can be printed out if a printer is connected to the system.
- Close button: closes the screen.
- Post (available only if a POST measurement can be done)
- Pre (available only if a PRE measurement can be done)
- Export button: export data from selected session to Microsoft Excel

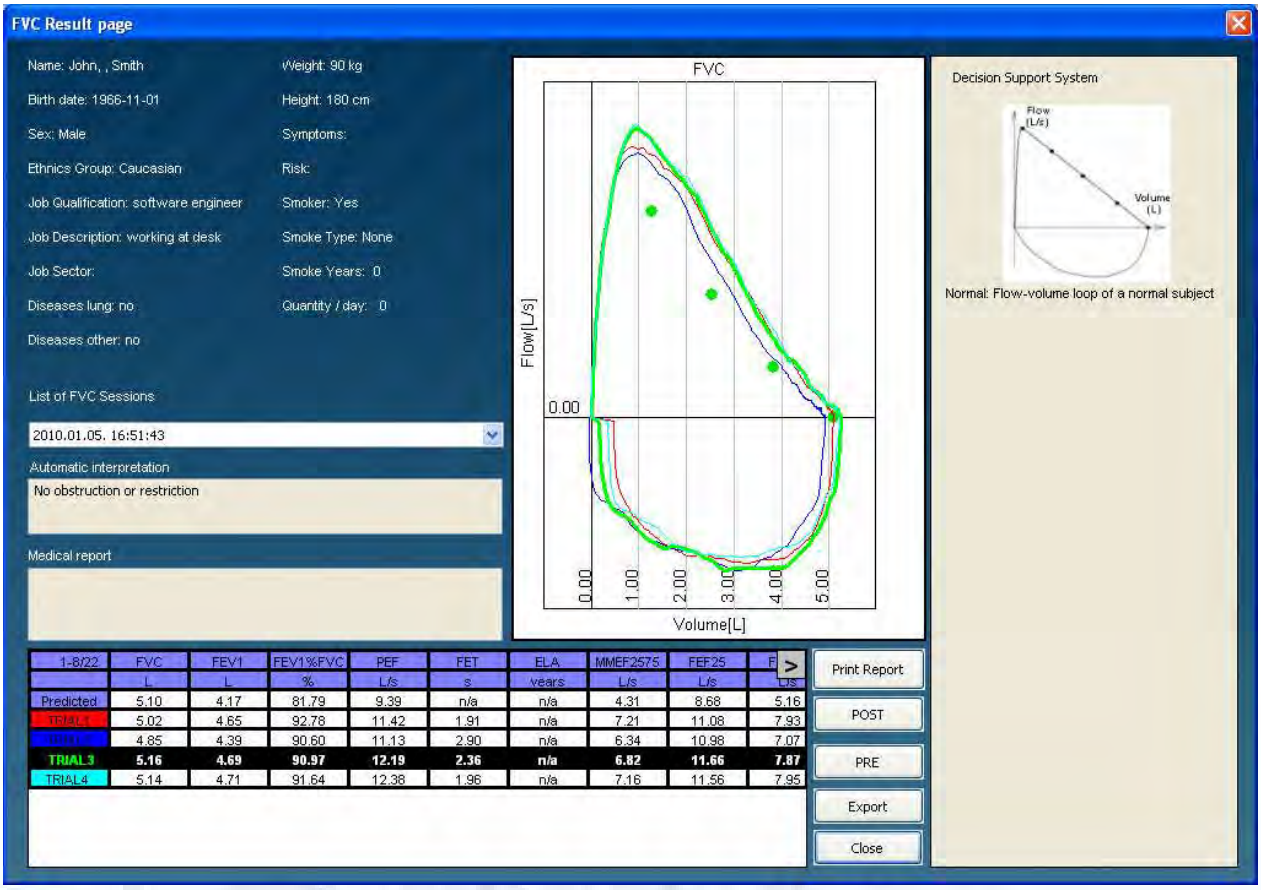

FVC Result page
Name: John, , Smith
Weight: 90 kg
Birth date: 1966-11-01
Height: 180 cm
Sex: Male
Symptoms:
Ethnics Group: Caucasian
Risk:
Job Qualification: software engineer
Smoker: Yes
Job Description: working at desk
Smoke Type: Cigarette
Job Sector:
Smoke Years: 5
Diseases lung: no
Quantity / day: 4
Diseases other: no
List of FVC Sessions
2010.01.05. 16:45:30
Automatic interpretation
No obstruction or restriction
Medical report
FVC
Flow[L/s]
0.00
0.00
1.00
2.00
3.00
4.00
5.00
Volume[L]
Decision Support System
Flow (L/s)
Volume (L)
Normal: Flow-volume loop of a normal subject
1-8/22
FVC
FEV1
FEV1%FVC
PEF
FET
ELA
MMEF2575
FEF25
L
L
%
L/s
s
years
L/s
L/s
Predicted
5.10
4.17
81.79
9.39
n/a
n/a
4.31
8.68
5.16
TRIAL2
5.11
4.68
91.45
11.25
2.25
n/a
7.02
11.08
8.26
TRIAL3
5.29
4.74
89.62
11.98
3.12
n/a
6.66
11.65
7.41
TRIAL3
5.31
4.78
90.11
12.07
2.31
n/a
6.98
11.38
7.68
Print Report
POST
PRE
Export
Close

Clicking on Print report button the Report page comes up. The FVC report page is like this:

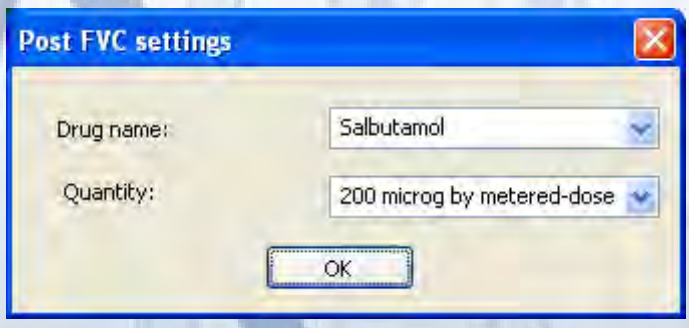


POST FVC session

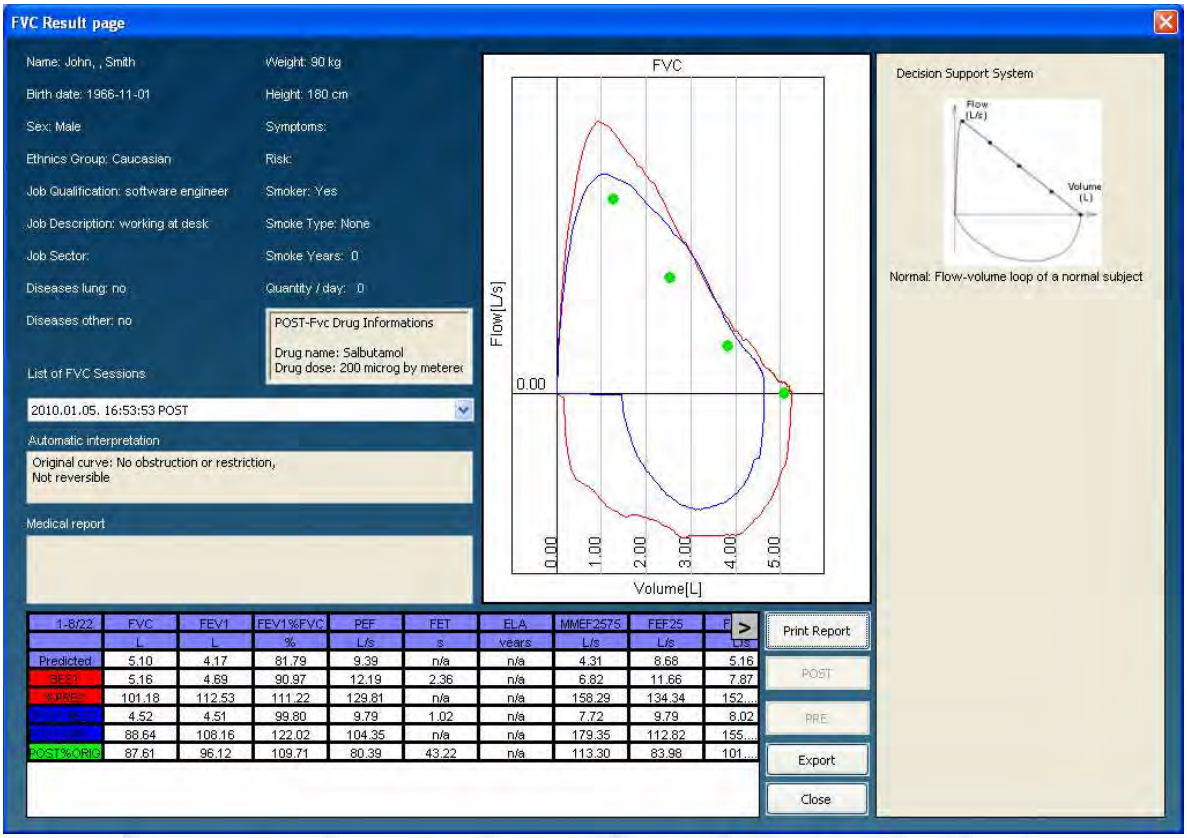
POST FVC session is available after normal FVC session on FVC result page if the normal FVC session was done within 24 hours and there is no related POST or PRE session already attached to it. POST FVC session can be started from FVC result page by clicking the POST button. POST FVC session and normal FVC build a pair.



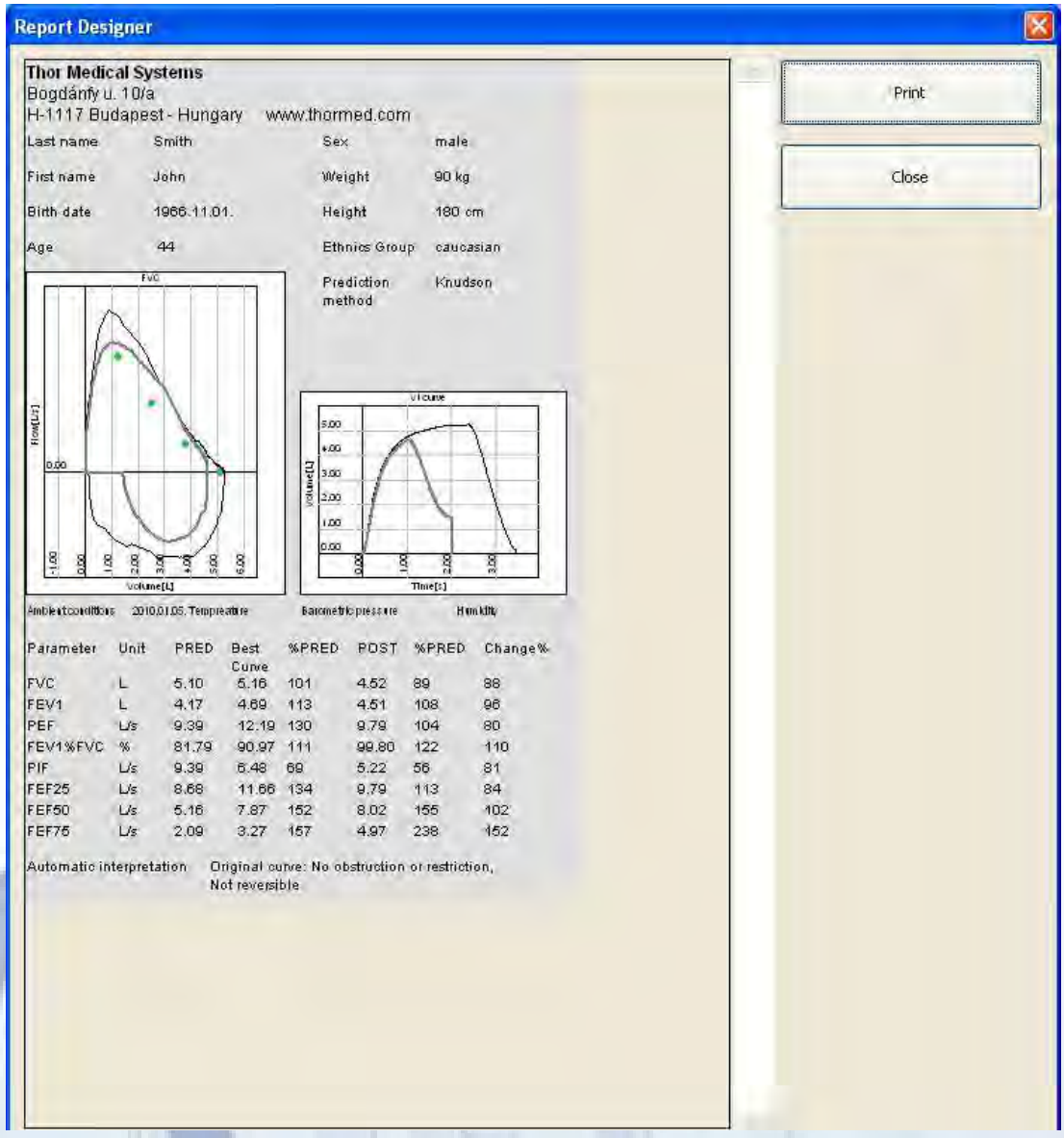
You can administer the bronchodilator drug in the popup window:



On POST FVC result page you can compare NORMAL and POST FVC data. Grid shows the best normal curve and best post curve. Automatic interpretation evaluates the normal curve and tells whether the problem is reversible (percentage of reversibility).

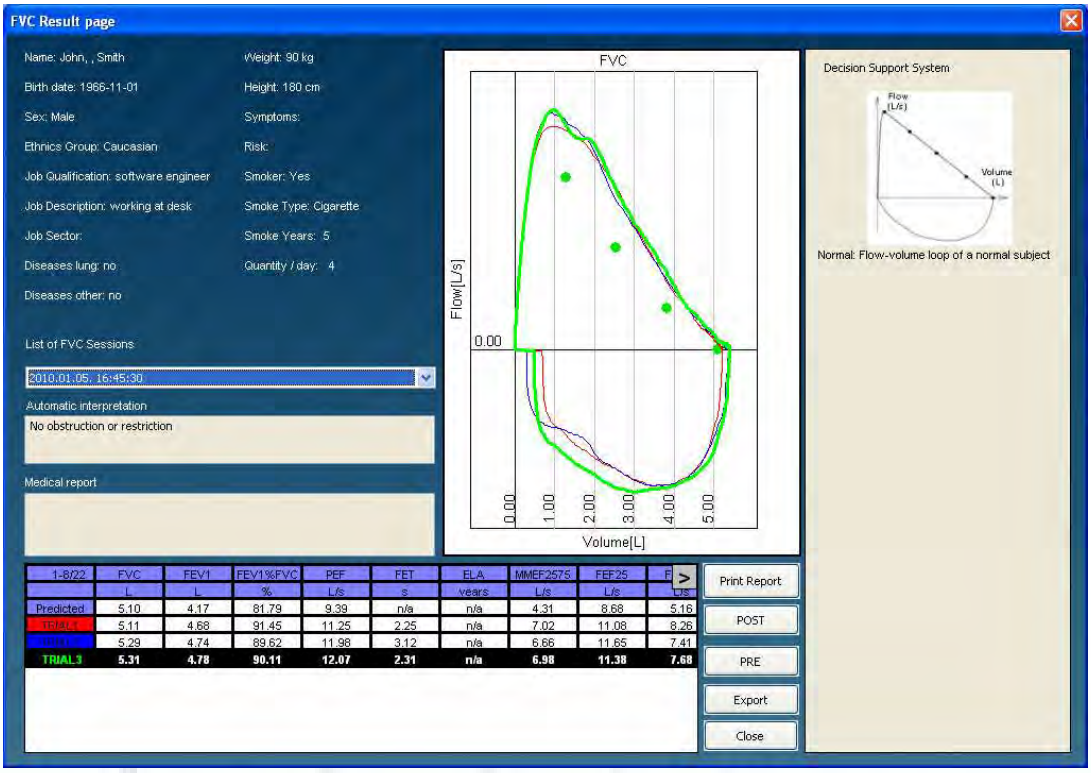


The report template is as follows:

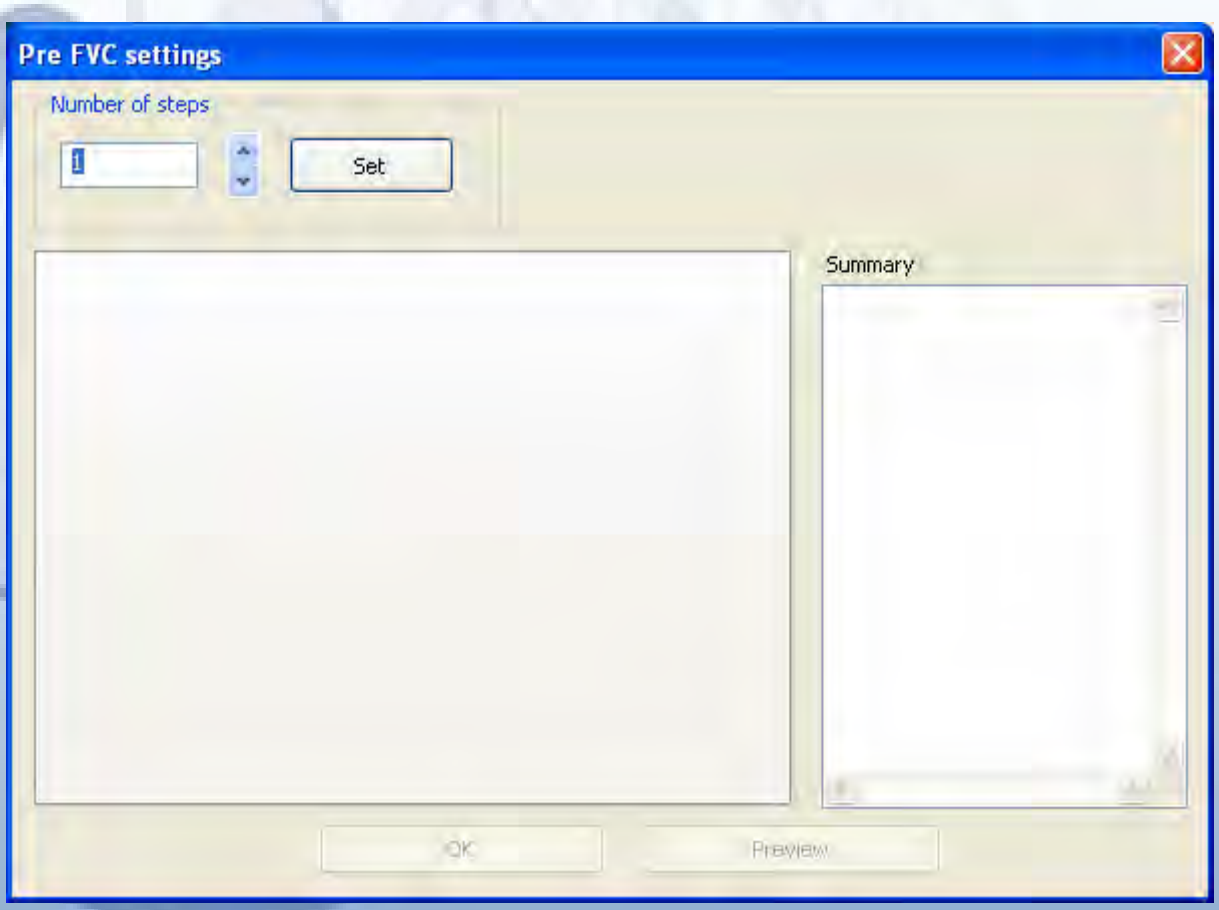


PRE FVC session

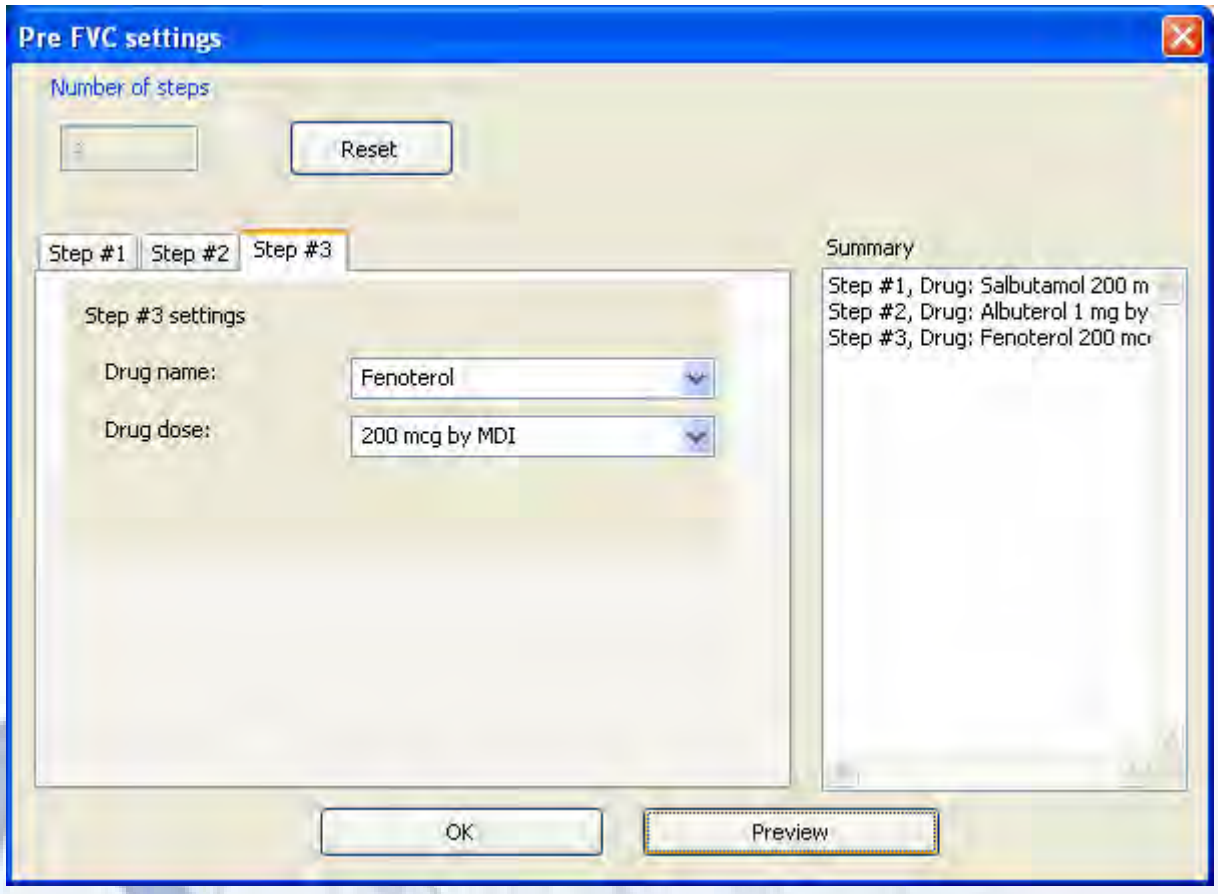
PRE FVC session is available after normal FVC session on FVC result page if the normal FVC session was done within 24 hours and there is no related POST or PRE session already attached to it. PRE FVC session can be started from FVC result page by clicking the PRE button. PRE FVC session and normal FVC build a pair.



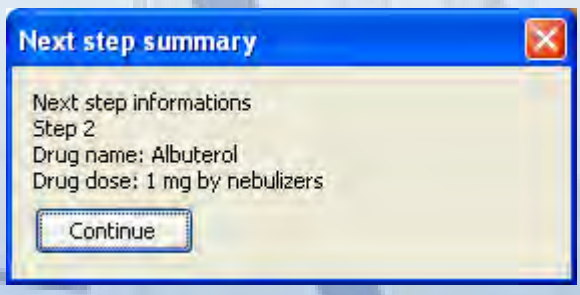
You can administer the number of steps (at least 1, at most 10) and each drug doses for the steps in the popup window:



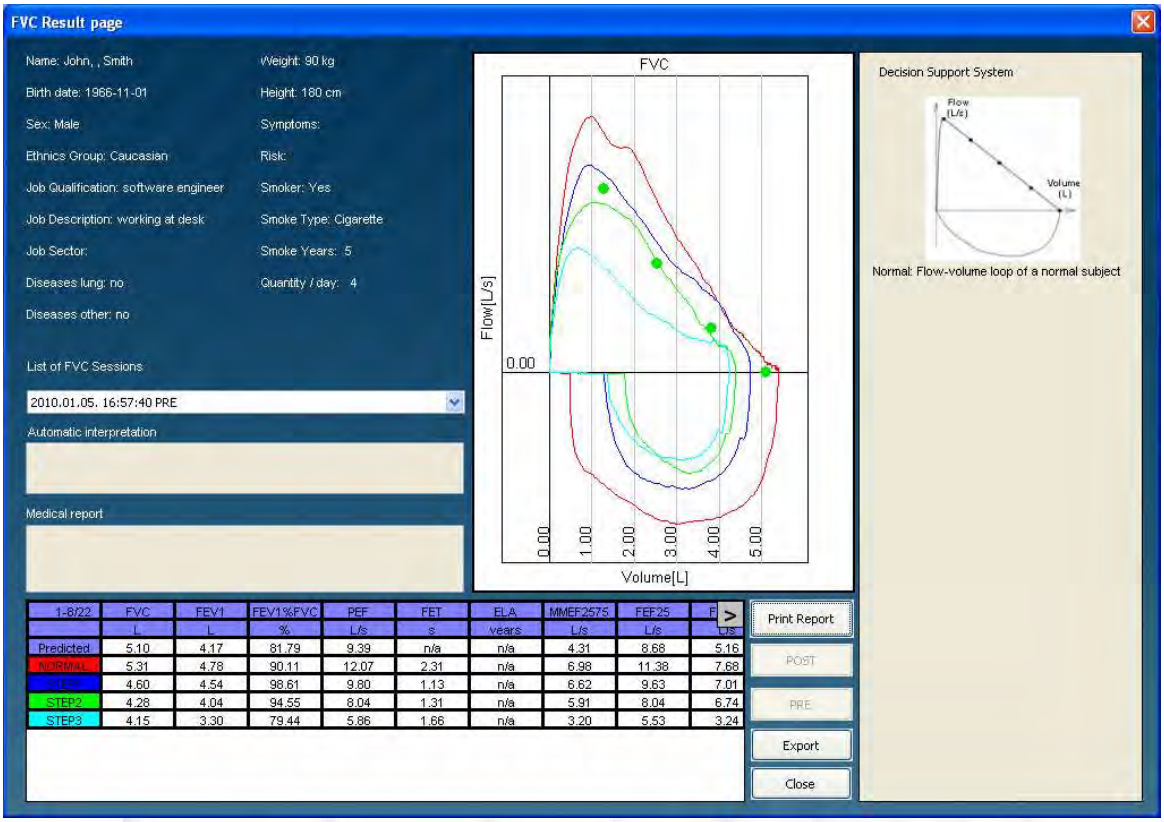
In "Number of steps" section, number can be manually entered or set by clicking on '^' button. When the number is correct, by pressing "Set" button can be proceeded and the drugs can be set by clicking on the tab of a step. By pressing the "preview" button, the whole procedure can be seen in the "summary" window. When finished, by pressing "OK" button can be proceeded.



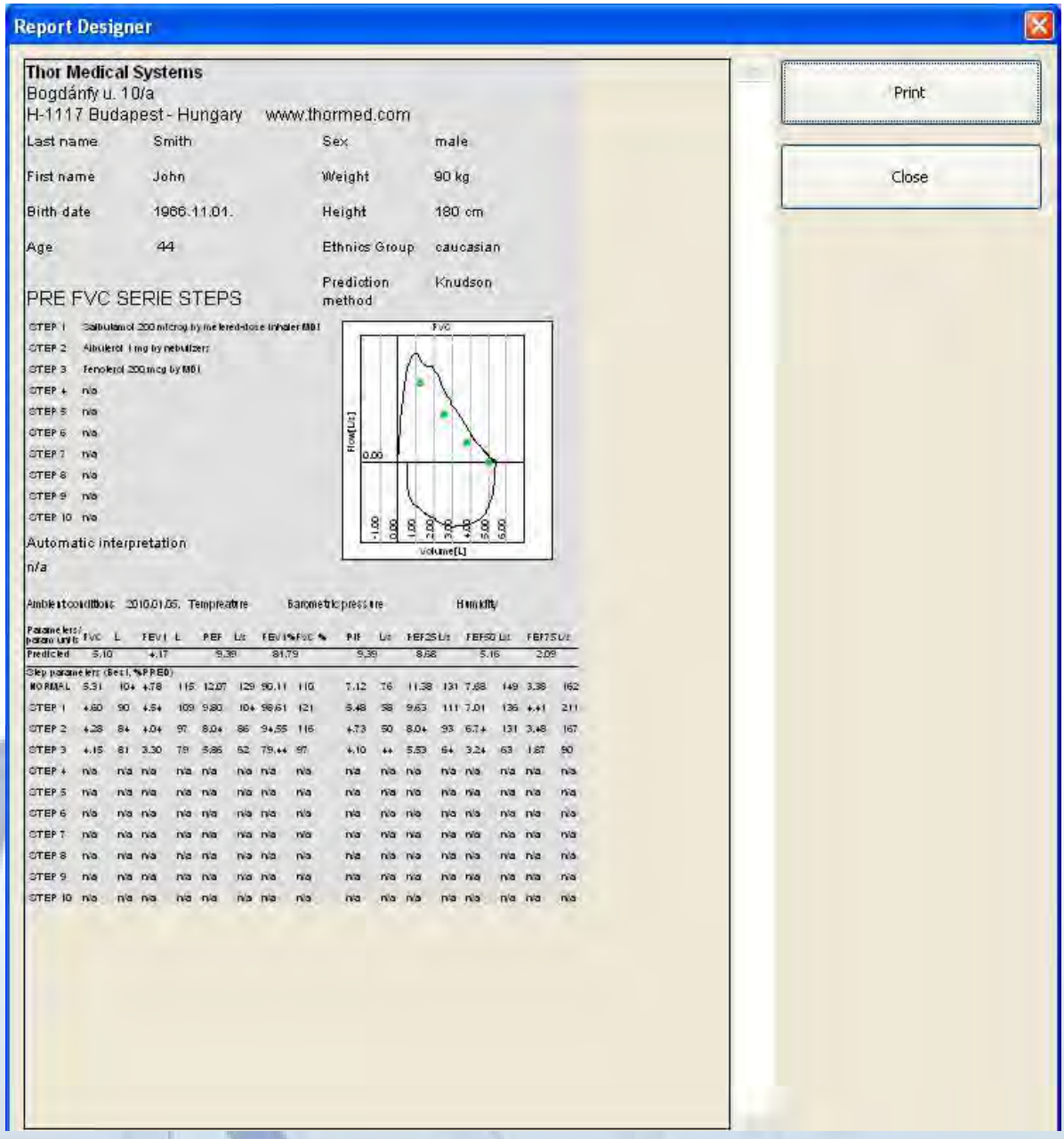
After the drug doses are set, measurements will be begun. At the end of the step, the "Next step information" will be seen. By clicking on continue button can be proceeded.



On Result page every single steps can be seen.

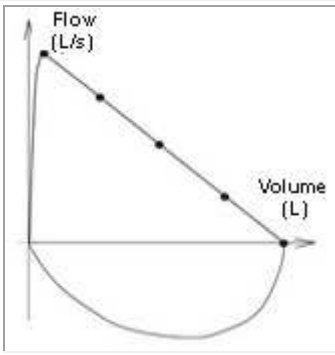
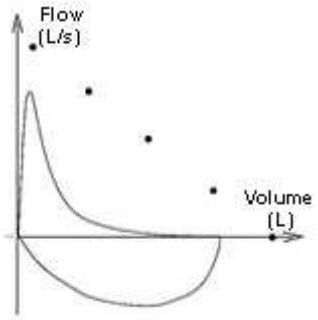
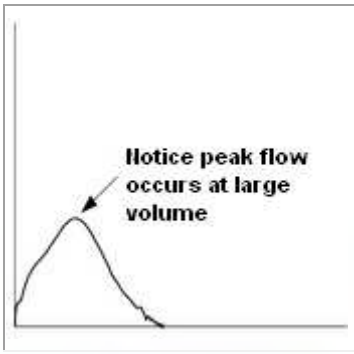
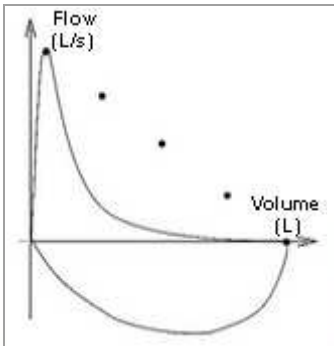
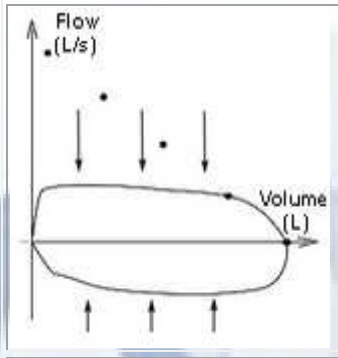
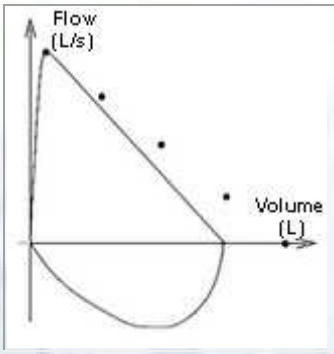
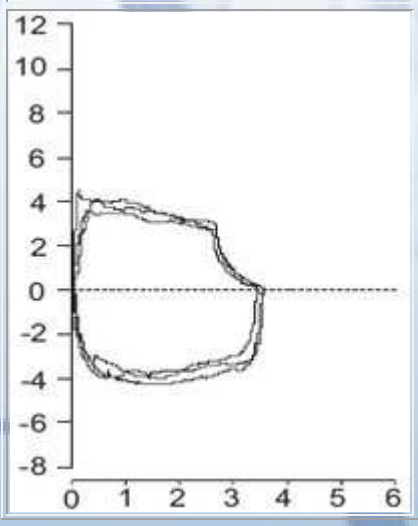
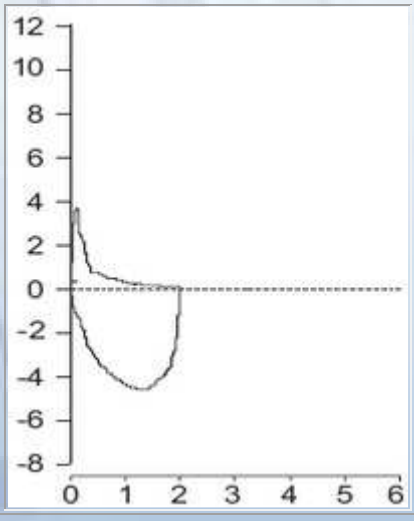

FVC Result page
Name: John, , Smith
Weight: 90 kg
Birth date: 1966-11-01
Height: 180 cm
Sex: Male
Symptoms:
Ethnics Group: Caucasian
Risk:
Job Qualification: software engineer
Smoker: Yes
Job Description: working at desk
Smoke Type: Cigarette
Job Sector:
Smoke Years: 5
Diseases lung: no
Quantity / day: 4
Diseases other: no
List of FVC Sessions
2010.01.05. 16:57:40 PRE
Automatic interpretation
Medical report
FVC
Flow[L/s]
0.00
0.00
1.00
2.00
3.00
4.00
5.00
Volume[L]
Decision Support System
Flow (L/s)
Volume (L)
Normal: Flow-volume loop of a normal subject
1-8/22
FVC
FEV1
FEV1%FVC
PEF
FET
ELA
MMEF2575
FEF25
L
L
%
L/s
s
years
L/s
L/s
Predicted
5.10
4.17
81.79
9.39
n/a
n/a
4.31
8.68
5.16
NORMAL
5.31
4.78
90.11
12.07
2.31
n/a
6.98
11.38
7.68
STEP1
4.60
4.54
98.61
9.80
1.13
n/a
6.62
9.63
7.01
STEP2
4.28
4.04
94.55
8.04
1.31
n/a
5.91
8.04
6.74
STEP3
4.15
3.30
79.44
5.86
1.66
n/a
3.20
5.53
3.24
Print Report
POST
PRE
Export
Close

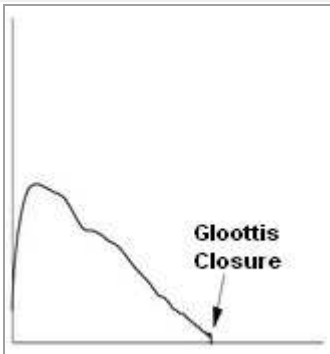
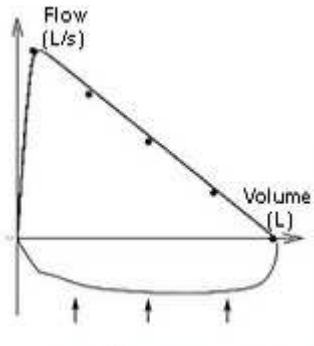
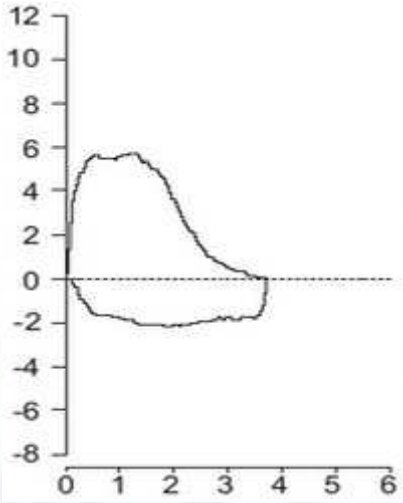
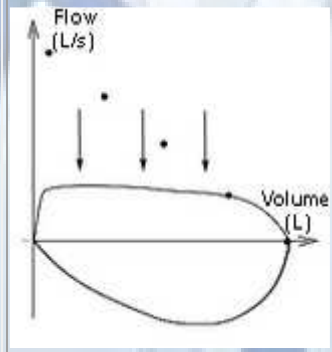
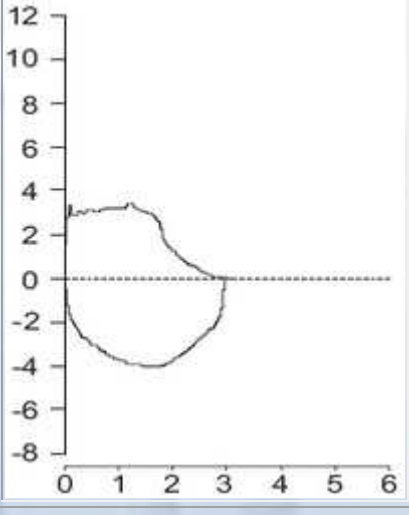
The report template is as follows:



Decision Support System

The following table shows the different kind of FVC curves and medical descriptions.

	Normal flow, the diagram shows a flow-volume loop of a normal subject.		More than one issue occurred at the same time during the process.
	The patient wasn't fully forcing the expiration.		The patient has obstruction.
	The patient has a fixed large airway obstruction.		The patient has restriction.
	The patient has a fixed upper airway obstruction.		The patient has severe air flow limitation indicating a chronic obstructive pulmonary disease.

	The patient has a glottis closure.		The strength of the expiration wasn't stable.
	The patient has variable extra thoracic obstruction		The patient has variable extra thoracic upper obstruction.
	The patient has variable intra thoracic obstruction.		The patient has variable intra thoracic upper obstruction.

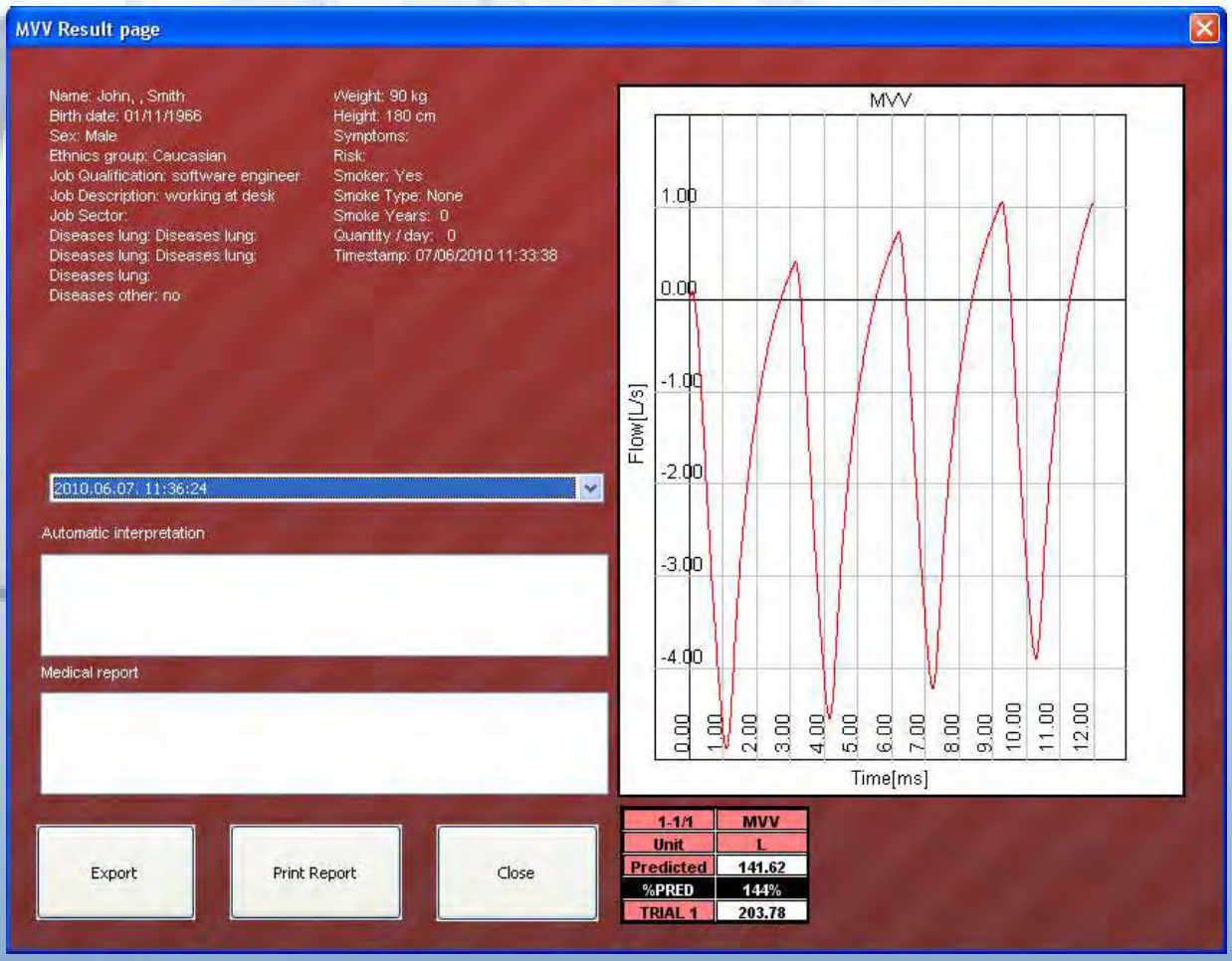
MVV Procedure

The screen is reachable by clicking on the Start Session button on the Visit Screen. To run the MVV procedure in the application the Procedure setting on the Settings screen needs to be set to 'MVV'.

In case of MVV Procedures the color for all the related screens is red.

The flow of the procedure and the displayed data is the same as in case of the FVC procedure, however there is no quality control of exam on the procedure session screen and there is no Decision Support System on the session result screen.

After pressing the Accept button, the MVV Result page will appear:

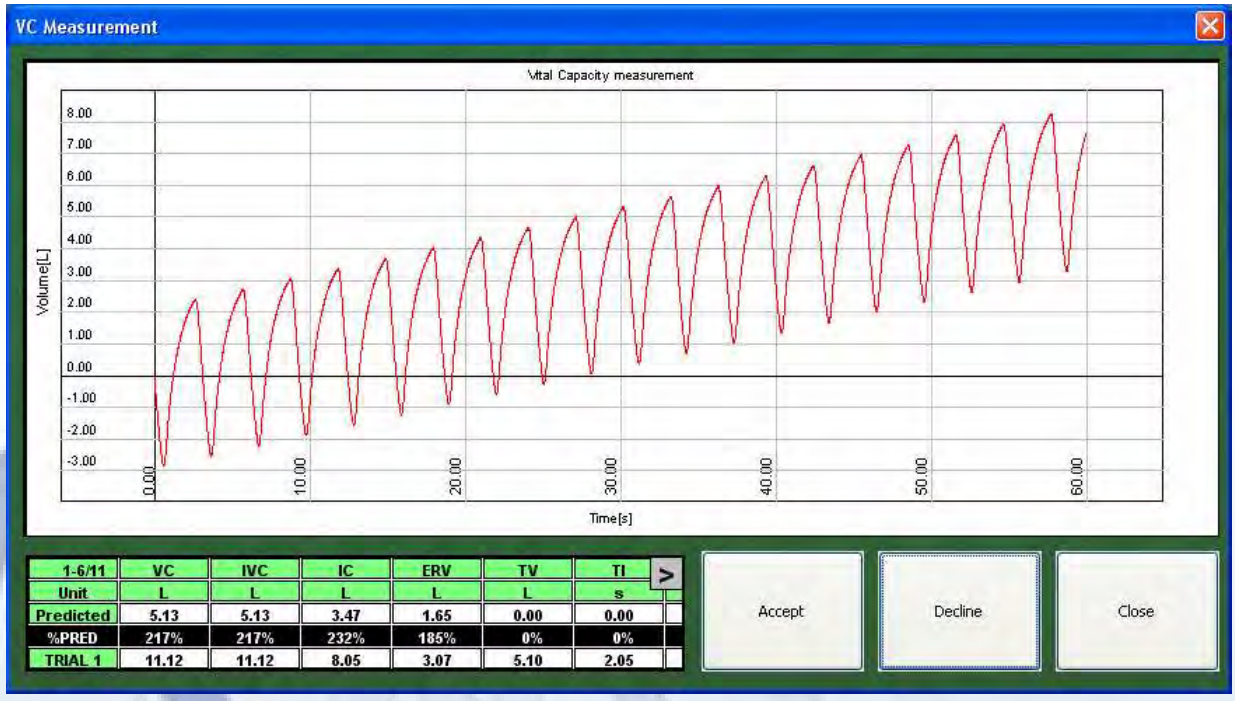


VC Procedure

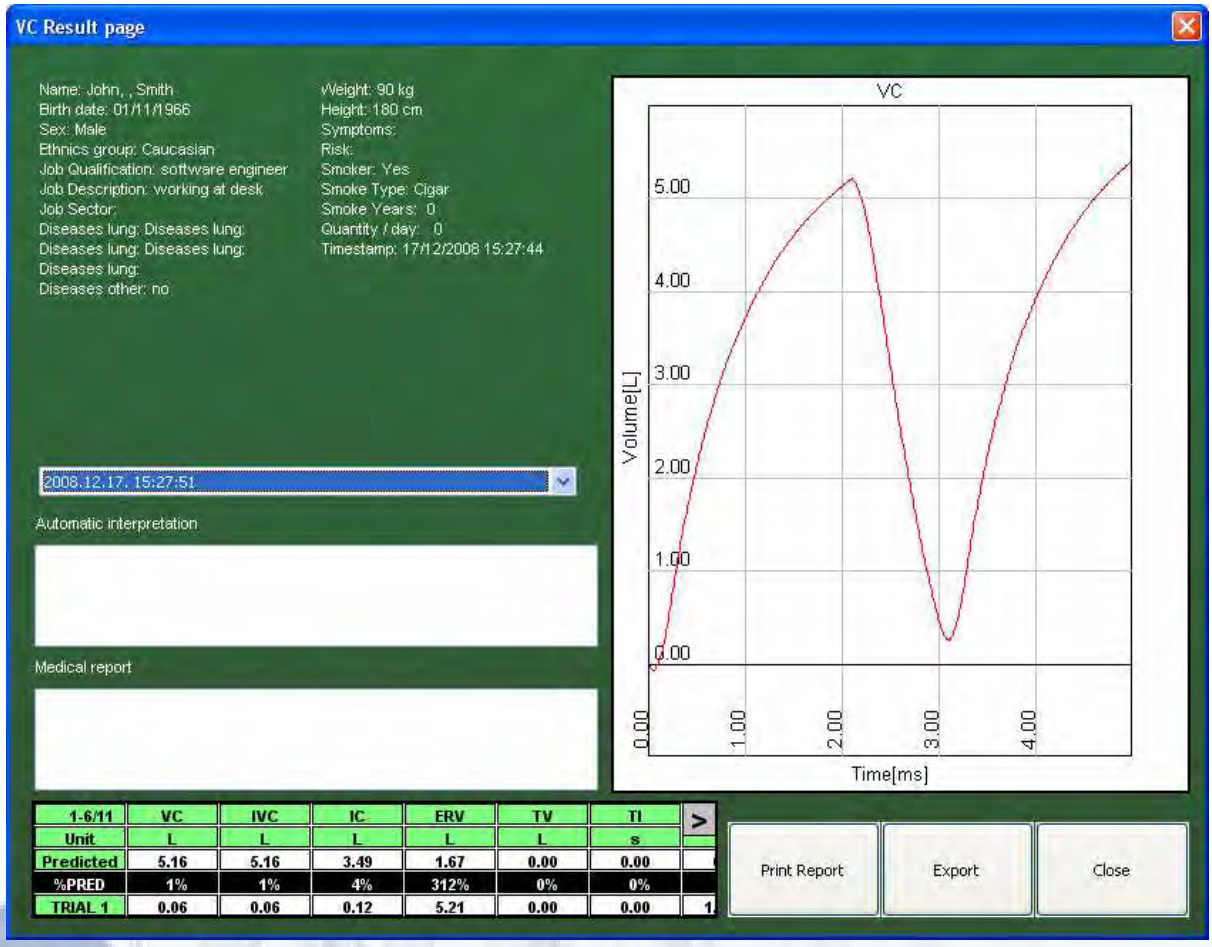
The screen is reachable by clicking on the Start Session button on the Visit Screen. To run the VC procedure in the application the Procedure setting on the Settings screen needs to be set to 'VC'.

In case of VC Procedures the color for all the related screens is green.

The flow of the procedure and the displayed data is the same as in case of the FVC procedure, however there is no quality control of exam on the procedure session screen and there is no Decision Support System on the session result screen.



After pressing the Accept button the VC result page will appear:

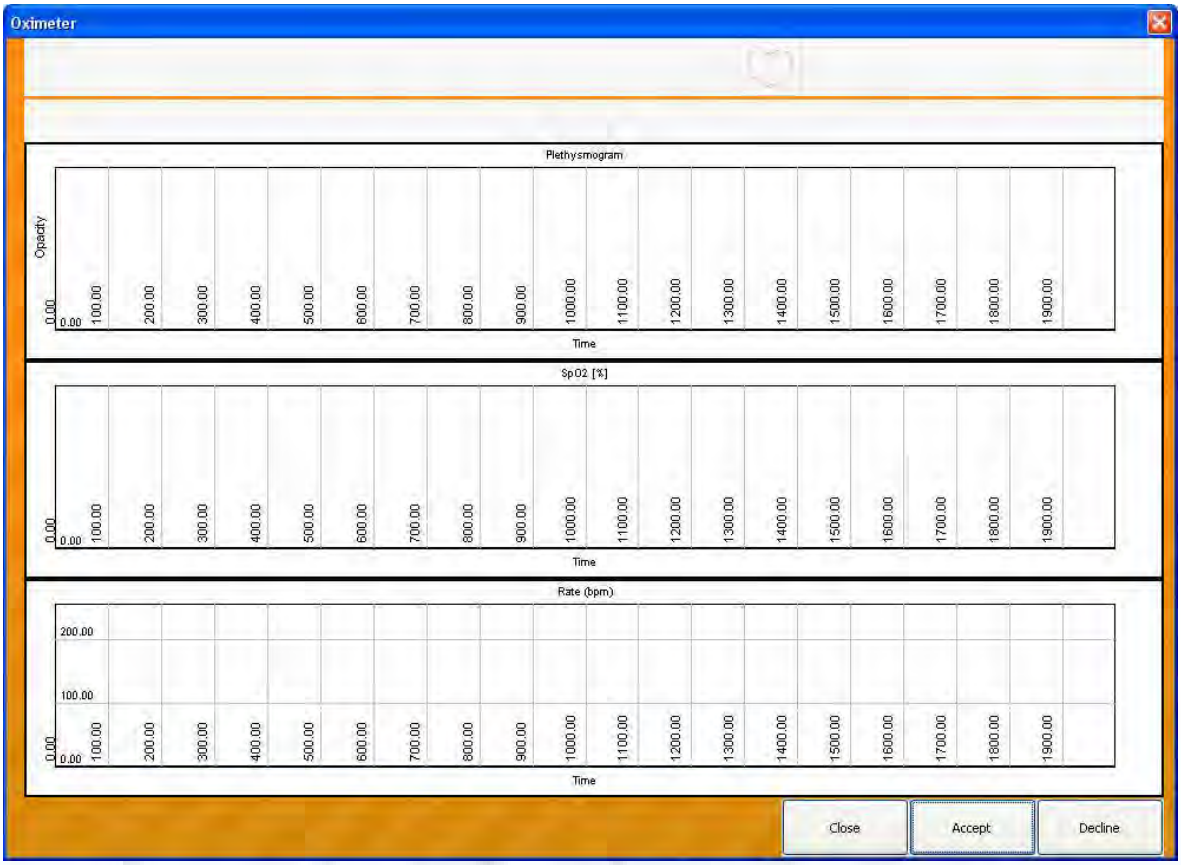


Short SpO2 Procedure

The screen is reachable by clicking on Short SpO2 button on the toolbar.

In case of SpO2 Procedures the color for all the related screens is orange.

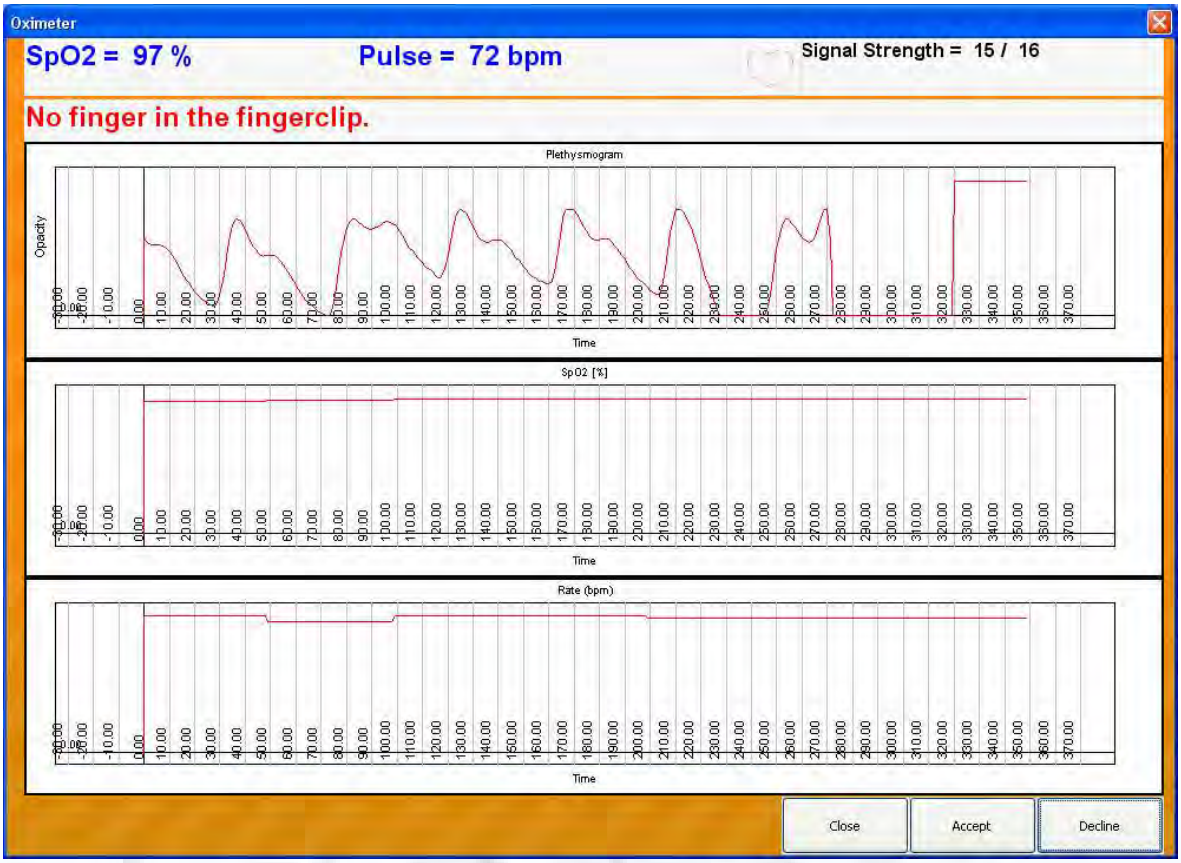
After starting the SpO2 session the following page will appear:

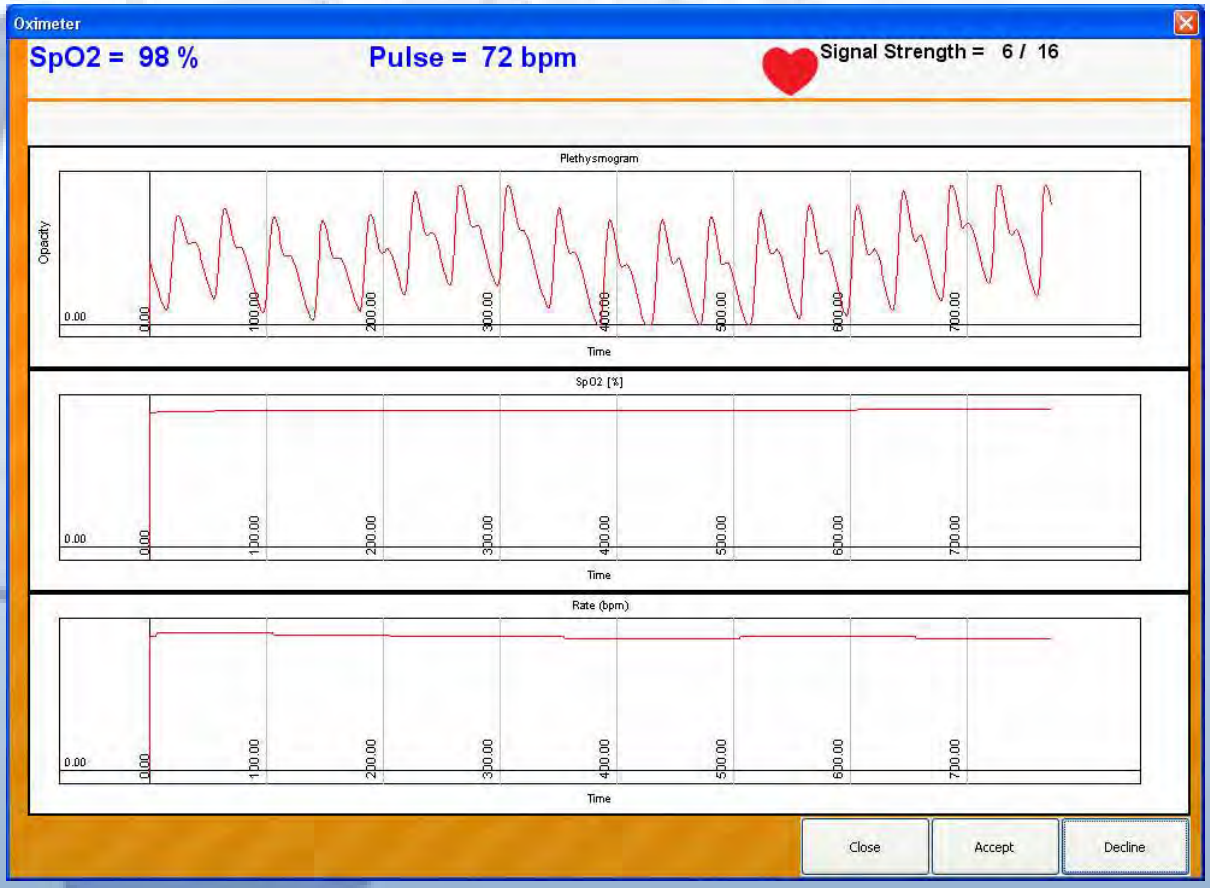


This page have the following sections:

Diagrams: Plethystmogram, SpO2 - Time and Rate(bpm) - Time diagrams

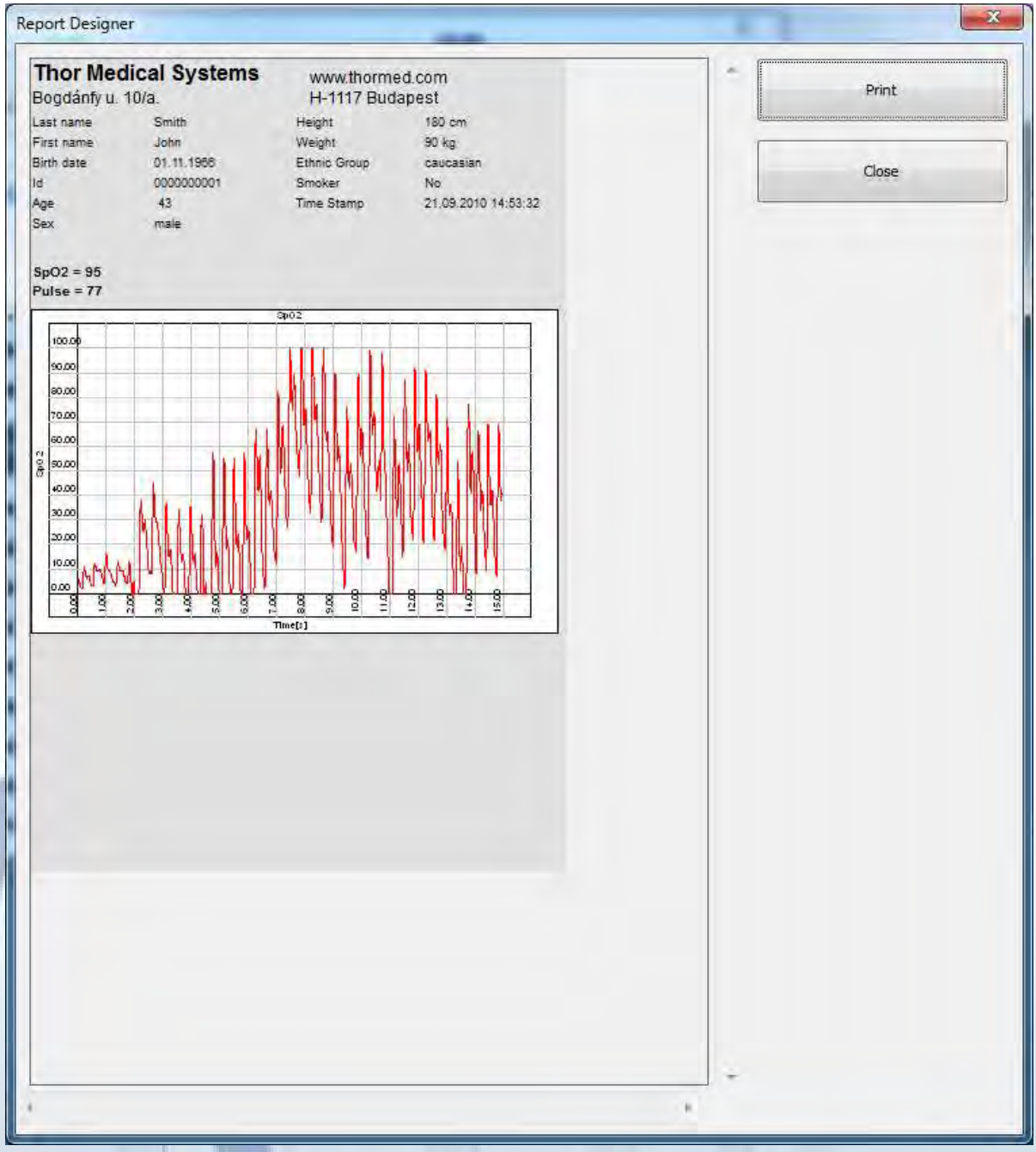
Infobar: information about finger clip is displayed here (ex: No finger in the fingerclip, Searching for pulse...)





After pressing the Accept button, the SpO2 result page will appear:

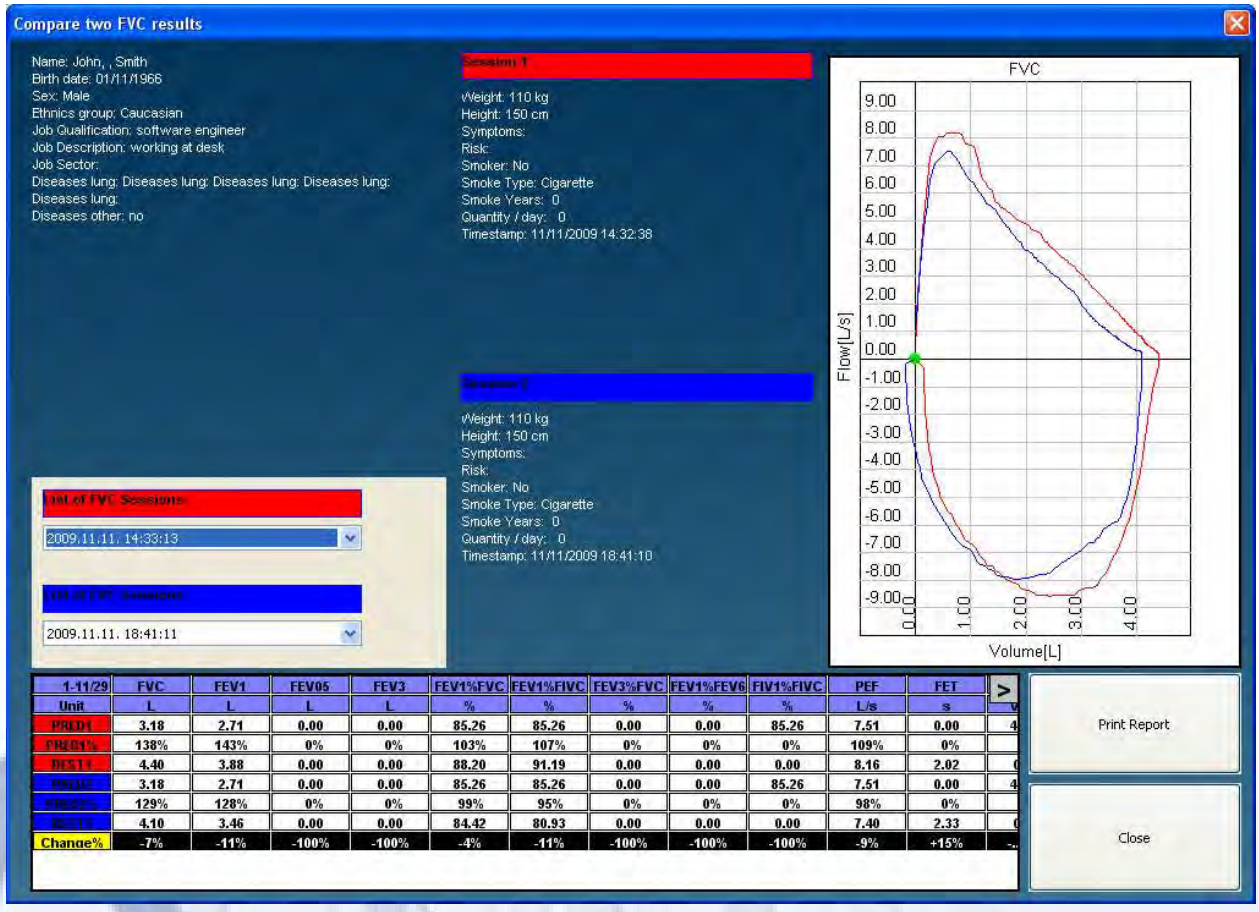
The result of the SpO2 measurement is printable with the Print Report button:



Comparing Two Fvc Sessions

Two normal Fvc curves of the same patient can be compared on Compare Two Fvc Sessions page. A list of all sessions of the patients is given into the two combo boxes simultaneously. On the page there is a patient card with relevant patient data, two visit cards, a diagram for two Fvc curves and a spreadsheet for parameters of the curves, their relation to the predicted values and to each other. Predicted values are calculated using prediction method set in the configuration. Each predicted value set calculated so that the age is the age of the patient at time the session was recorded. On the dialog there are two sessions selected with different patient age, so the predicted value sets are different too. Another patient can be selected on the patient page. To change the patient in this dialog the dialog should be closed and reopened.

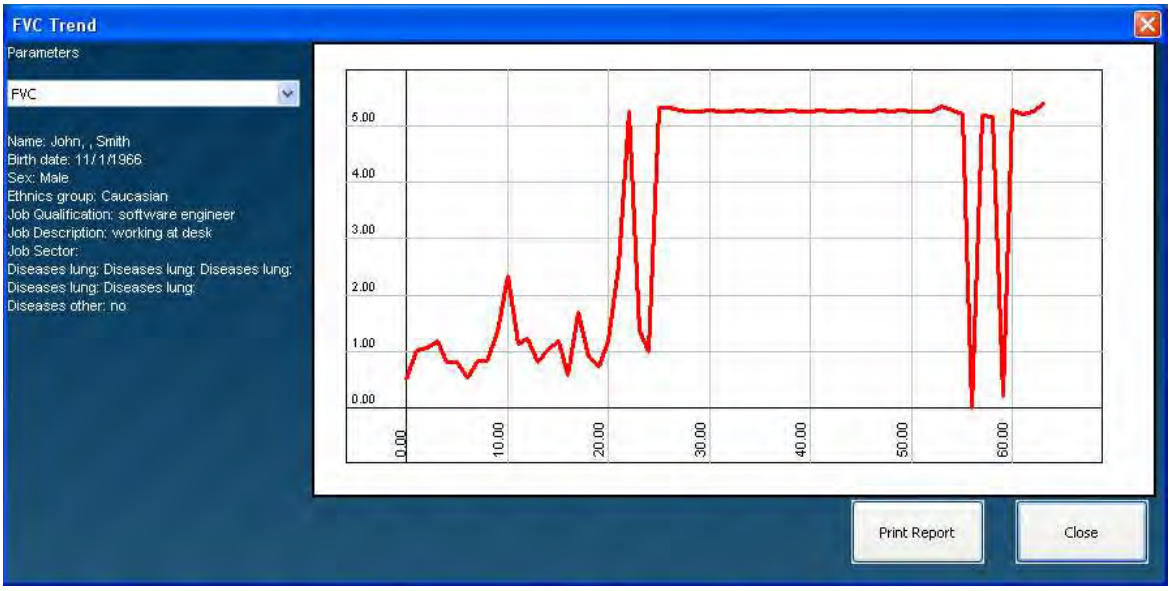
Hotkey are available and the same as another result page. LEFT and RIGHT buttons scroll the columns of the spreadsheet while UP and DOWN keys scroll thorough the active session list combo box.



1-11/29	FVC	FEV1	FEV05	FEV3	FEV1%FVC	FEV1%FIVC	FEV3%FVC	FEV1%FEV6	FIV1%FIVC	PEF	FET	>
Unit	L	L	L	L	%	%	%	%	%	L/s	s	
PRED1	3.18	2.71	0.00	0.00	85.26	85.26	0.00	0.00	85.26	7.51	0.00	4
PRED1%	138%	143%	0%	0%	103%	107%	0%	0%	0%	109%	0%	
BEST1	4.40	3.88	0.00	0.00	88.20	91.19	0.00	0.00	0.00	8.16	2.02	0
PRED2	3.18	2.71	0.00	0.00	85.26	85.26	0.00	0.00	85.26	7.51	0.00	4
PRED2%	129%	128%	0%	0%	99%	95%	0%	0%	0%	98%	0%	
BEST2	4.10	3.46	0.00	0.00	84.42	80.93	0.00	0.00	0.00	7.40	2.33	0
Change%	-7%	-11%	-100%	-100%	-4%	-11%	-100%	-100%	-100%	-9%	+15%	--

FVC Trend

This screen shows the evolution of parameters of curves of the selected patient. On the page there is a patient card with relevant data and a diagram which has on X-axis the number of sessions from first to last and on Y-axis the best values of each session. Available hotkeys are: LEFT, RIGHT and UP, DOWN buttons to scroll thorough the parameters (FVC, FEV1, PEF, FET ...).

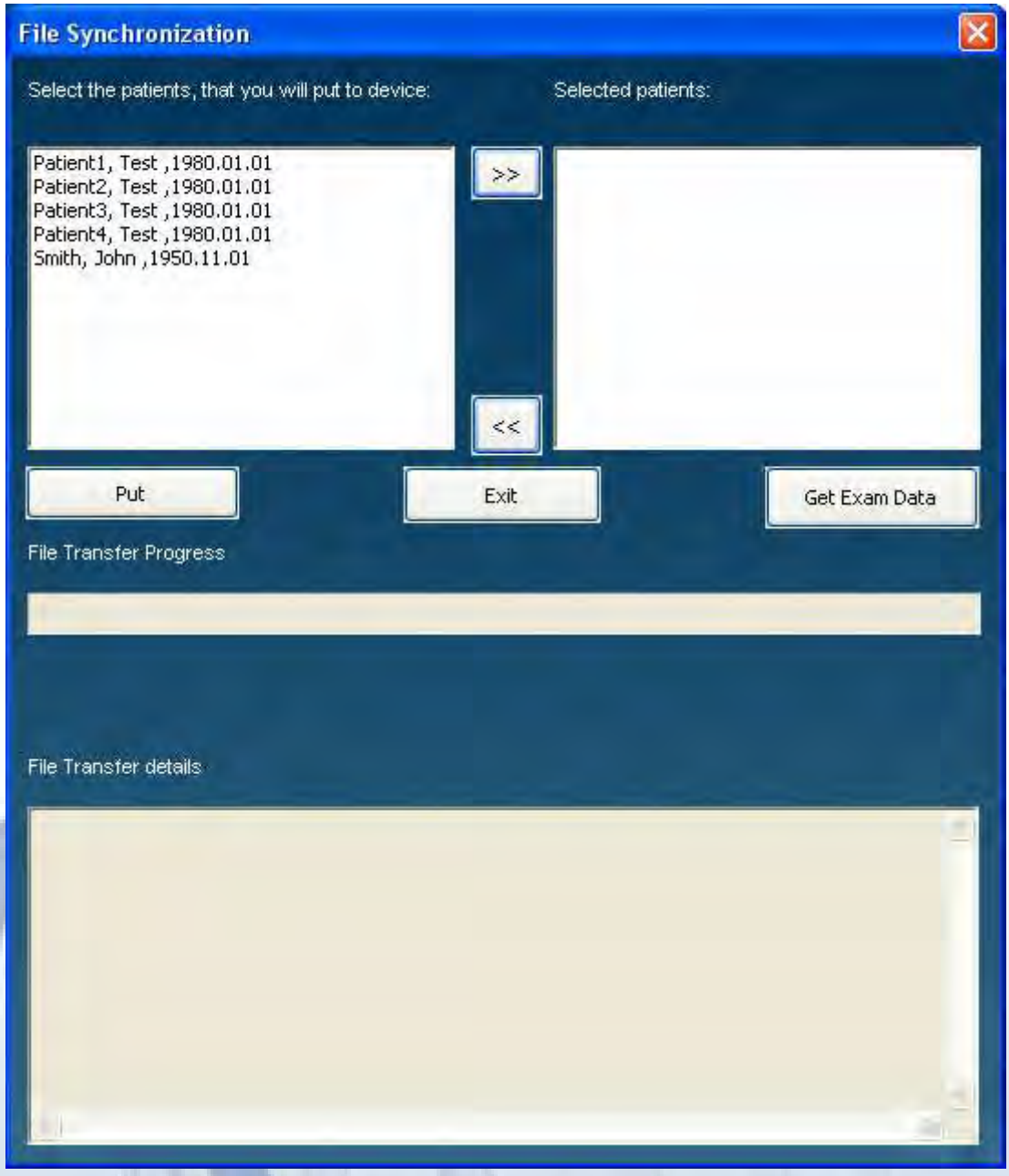


File synchronization between PC software and standalone handheld spirometer device

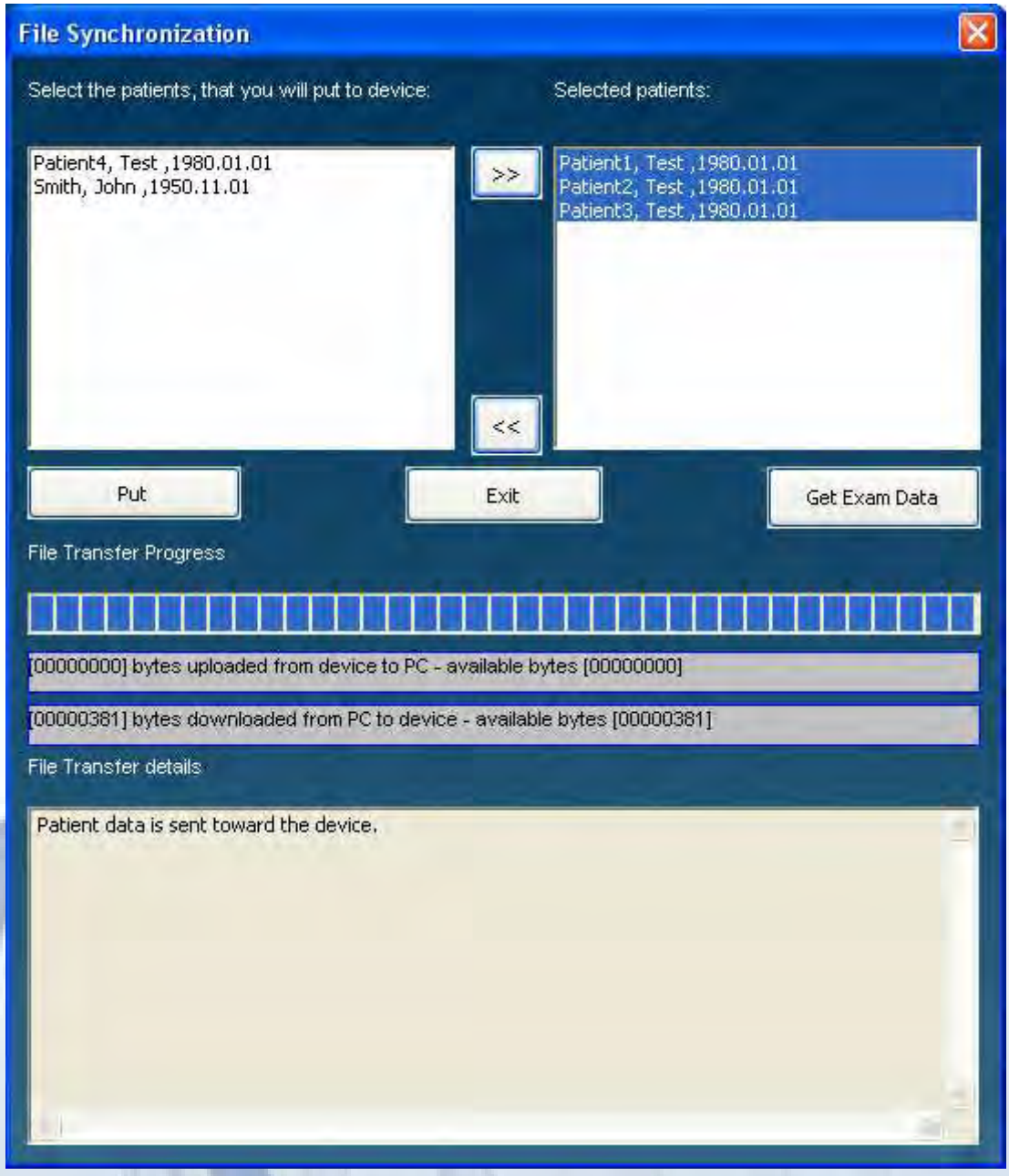
Either the portable spirometer device or the PC software has an own-managed database. The file synchronization option establishes the contact between these 2 different database structures. Patient data and measurement results can be easily downloaded from the portable device to the PC, and patient data can also be sent from the PC to the portable device, so measurements can performed using both of those methods.

To begin the synchronization the portable spirometer device has to be in PC synchronization mode, the File Synchronization window in PC software has to be opened. The portable spirometer device and the PC will be connected to each other using the USB cable.

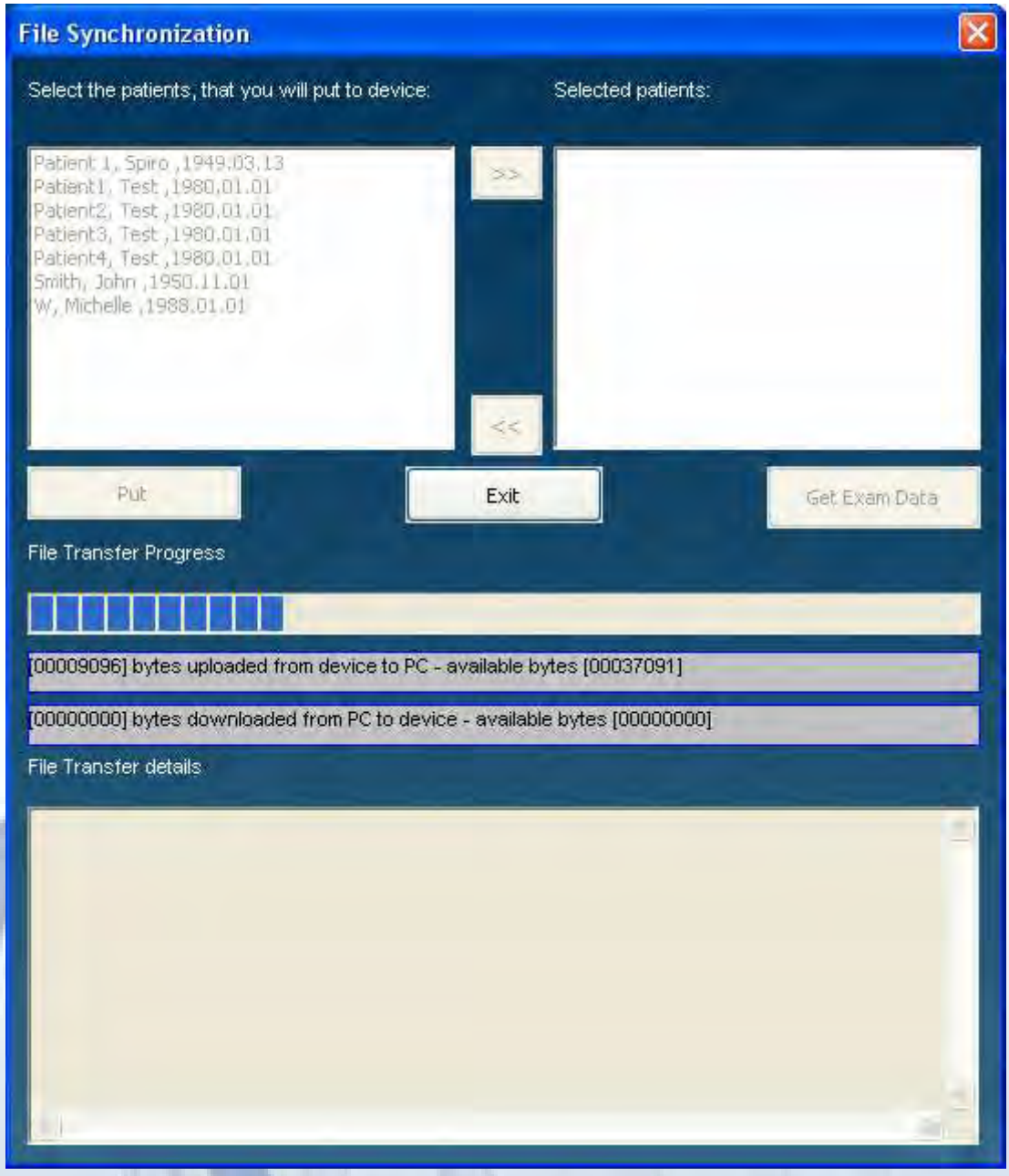
File synchronization steps:
1. Patients are to be created in PC software.
2. Portable spirometer device will be used in synchronization mode (from settings menu).
3. File synchronization window has to be opened in PC software (from file menu).



4. Patients data to be send have to be chosen. In the left sided list of the window (all available patients) selecting the patients to be send and by hitting the ">>" button can the patient names moved to the right sided list, patients from the right sided list can be removed by hitting the "<<" button. Patients in the right sided list will be chosen to be sent.



5. "Put" button has to be pushed.
6. The process can be seen on the progress bar.
7. Synchronization mode must be terminated on portable spirometer device.
8. Measurements can be performed now with portable spirometer device.
9. After measurements are finished, result can be sent to the PC by entering the Synchronization mode again.
10. In PC software "Get exam data" button have to be hit.
11. The process can also be seen on the progress bar.



12. File synchronization report can be seen below.

IN DEVICE DATABASE AVAILABLE: 2 patients, 15 visits, 10 Fvc sessions, 2 Post Fvc sessions, 1 Mvv sessions, 2 Vc sessions;
IMPORTED: 2 patients, 15 visits, 10 Fvc sessions, 2 Post Fvc sessions, 1 Mvv sessions, 2 Vc sessions

DETAILS:

Patient name: [B B B], Ssn id: [348729] processing successfully. New pateint created!
Visit time stamp: 2010.07.08 13:21:03 processing successfully. New visit added with Id: 1865 .
Post Fvc session time stamp: 2010.07.08 13:21:28 processing successfully. It contains 1

curves.
Visit time stamp: 2010.07.08 13:21:42 processing successfully. New visit added with Id: 1866 .
Fvc session time stamp: 2010.07.08 13:21:42 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.16 17:32:20 processing successfully. New visit added with Id: 1867 .
Fvc session time stamp: 2010.07.16 17:32:20 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.16 17:43:37 processing successfully. New visit added with Id: 1868 .
Fvc session time stamp: 2010.07.16 17:43:37 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.08 13:22:02 processing successfully. New visit added with Id: 1869 .
Vc session time stamp: 2010.07.08 13:22:02 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.08 13:50:02 processing successfully. New visit added with Id: 1870 .
Vc session time stamp: 2010.07.08 13:50:02 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.08 14:06:09 processing successfully. New visit added with Id: 1871 .
Mvv session time stamp: 2010.07.08 14:06:09 processing successfully. It contains 1 curves.

Patient name: [B B C], Ssn id: [68943] processing successfully. New pateint created!
Visit time stamp: 2010.07.08 11:32:21 processing successfully. New visit added with Id: 1872 .
Post Fvc session time stamp: 2010.07.08 11:32:52 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.07 15:02:36 processing successfully. New visit added with Id: 1873 .
Fvc session time stamp: 2010.07.07 15:02:36 processing successfully. It contains 2 curves.
Visit time stamp: 2010.07.07 17:47:52 processing successfully. New visit added with Id: 1874 .
Fvc session time stamp: 2010.07.07 17:47:52 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.07 17:58:33 processing successfully. New visit added with Id: 1875 .
Fvc session time stamp: 2010.07.07 17:58:33 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.07 18:00:34 processing successfully. New visit added with Id: 1876 .
Fvc session time stamp: 2010.07.07 18:00:34 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.07 18:08:32 processing successfully. New visit added with Id: 1877 .
Fvc session time stamp: 2010.07.07 18:08:32 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.07 18:11:09 processing successfully. New visit added with Id: 1878 .
Fvc session time stamp: 2010.07.07 18:11:09 processing successfully. It contains 1 curves.
Visit time stamp: 2010.07.07 19:04:09 processing successfully. New visit added with Id: 1879 .
Fvc session time stamp: 2010.07.07 19:04:09 processing successfully. It contains 1 curves.

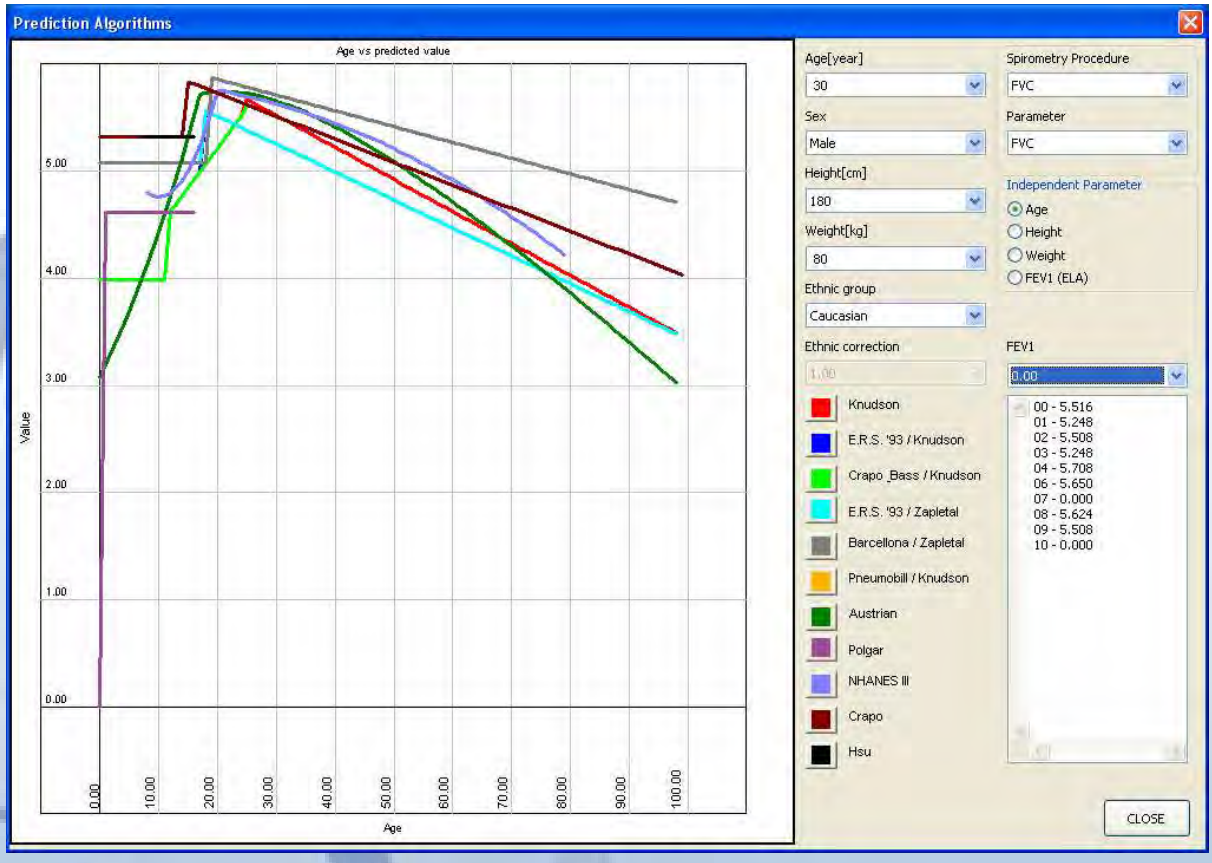
Predictions page

By clicking on "Show predicted value chart" menu item from Tools menu the predictions dialog window can be opened. This window can be used to examine the different prediction algorithms and the predicted parameters and see them on a diagram.

On the right side of the window, many adjustable parameters can be seen. Some parameters are used for define a person with a specified gender, age, height and weight, so the predicted values for this currently defined person can be seen in the right-bottom corner.

The first 2 settings are used for the diagram, so the spirometry procedure (FVC,VC or MVV) and the parameters (in connection with the current procedure) can be set, so the predicted values will be seen for the currently set parameters. Every single prediction method has a different color on the diagram, which colors can be seen at the middle-right side of the window.

The X-axis value of the diagram can be set by hitting the "age","height" or "weight" radio button in the "Independent parameter" section. The Y-value of the diagram shows the chosen parameter which belongs to the X-values.

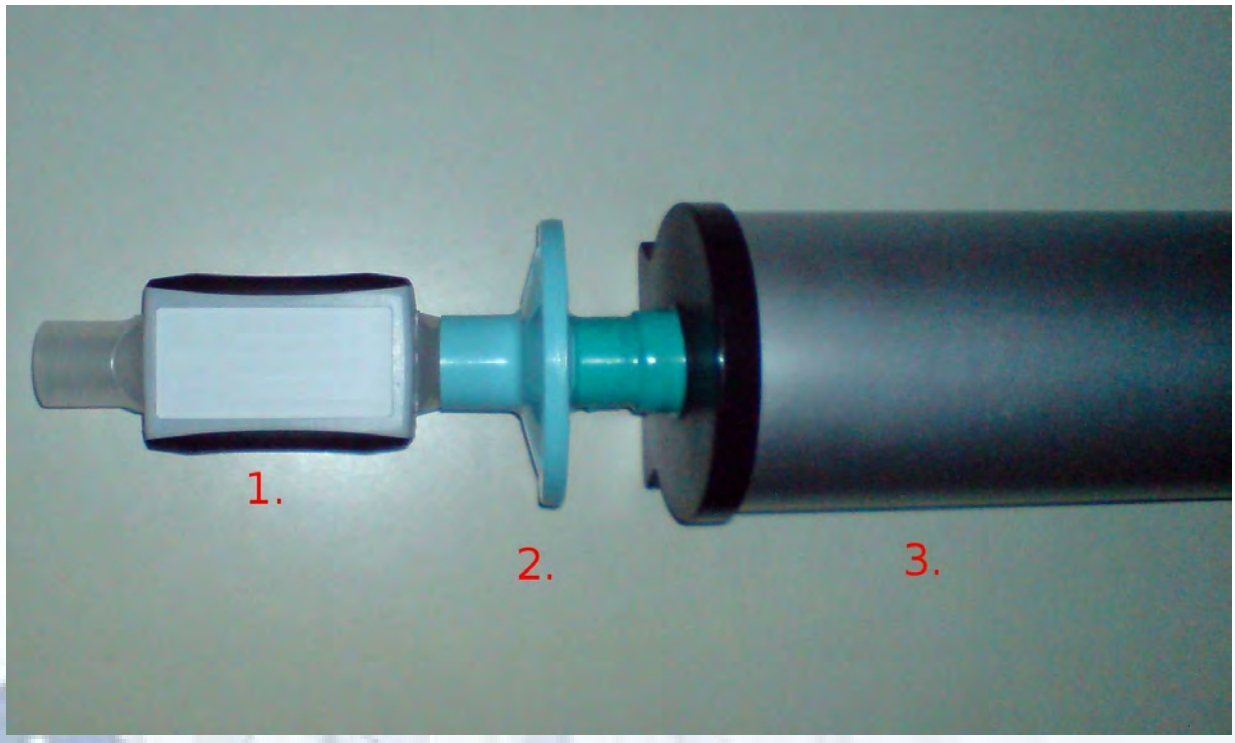


Checking Calibration with 1 or 3 Liter syringe

By clicking on "Calibration Check" menu item from Tools menu the Calibration checking window can be opened. Calibration check can be done with a 1 or 3 Liter volume calibration syringe. **Make sure that the flowmeter is connected to the PC using USB cable. Connect the flowmeter to the syringe using bacterial filter so that air does not leak through the connections.** Bacterial filter is necessary at connection to avoid the interference between the flowmeter and the syringe.

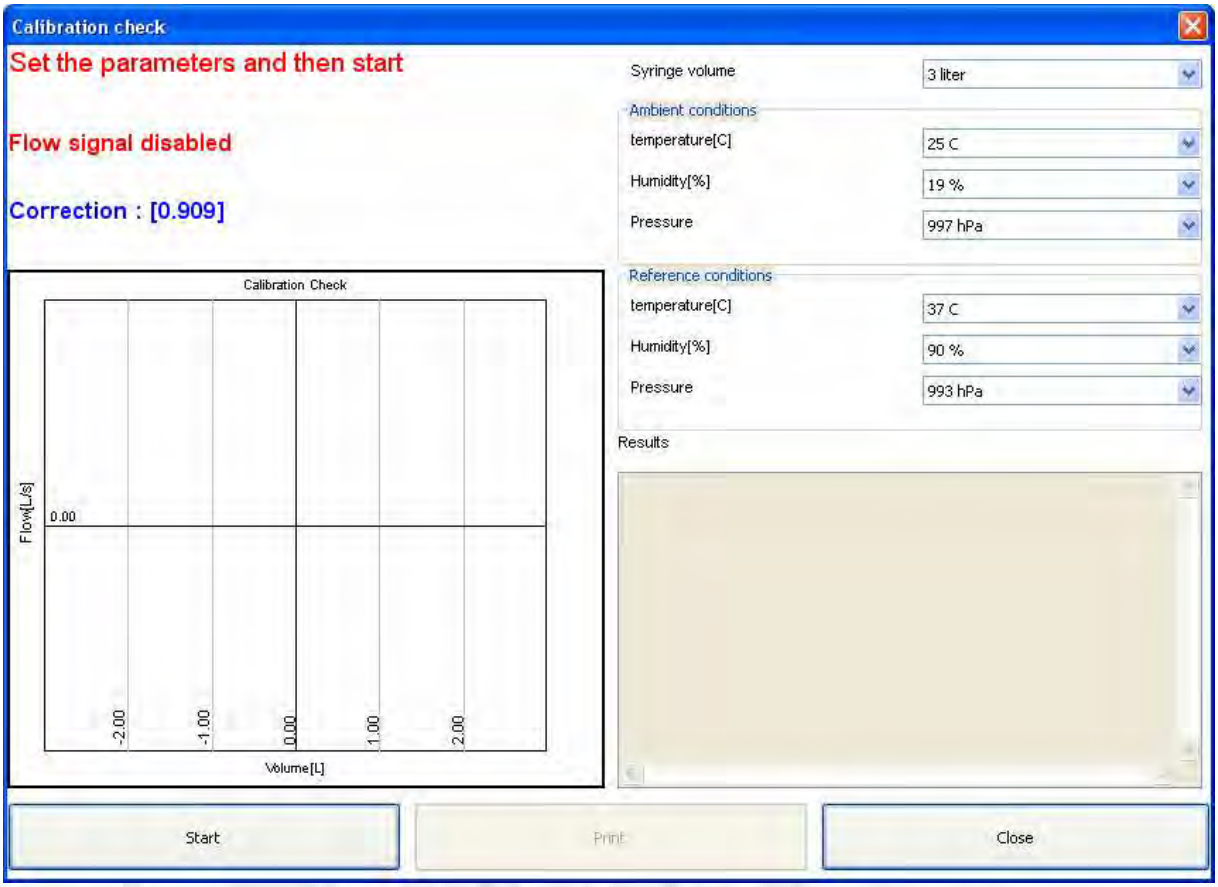
Recomended to measure more than one curve because the measured values will be mean values

Before starting the calibration check, please make sure that the flowmeter device is connected to the calibration syringe as shown below :



1. PC based Spirometer
2. Bacterial Filter
3. Calibration syringe

After starting the calibration check the following window will popup:



Please follow the instructions printed in red at the upper left corner of the applications window:

- Before starting the calibration set the ambient parameters of the room where the measurement will be carrying out (temperature, humidity and pressure), set the reference conditions which can be found on a paper in the box of the device (T_{int} , H_{int} , P_{out}) and set the syringe volume (1 or 3 liter).

- **Please make sure you use a bacterial filter between the calibration synringe and WaveFront Handheld Spirometer / PC based Spirometer**

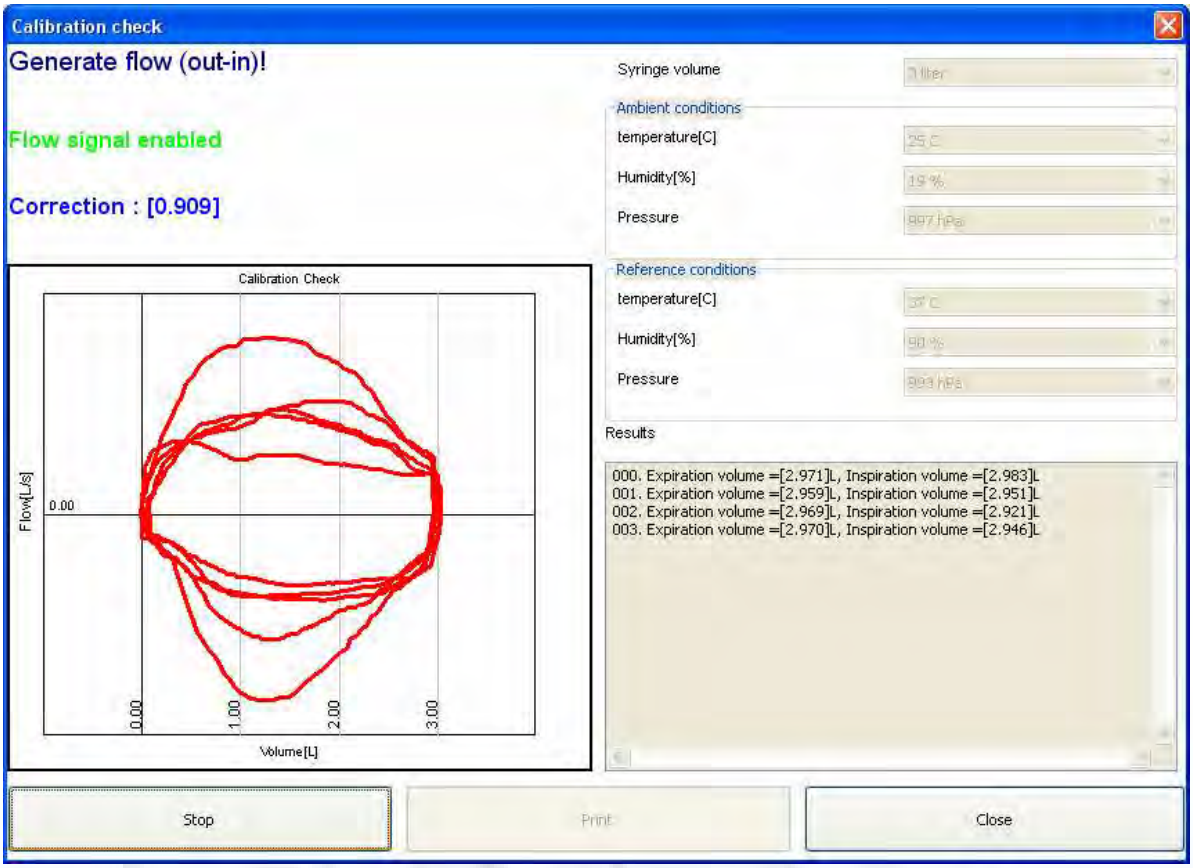
- Click on Start button to check the calibration.

- Do not generate flow in the flowmeter tube - the program sets the zero point to the calibration.

- Blow out and blow in with the calibration syringe one or more times (one cycle -out and in - is required!).

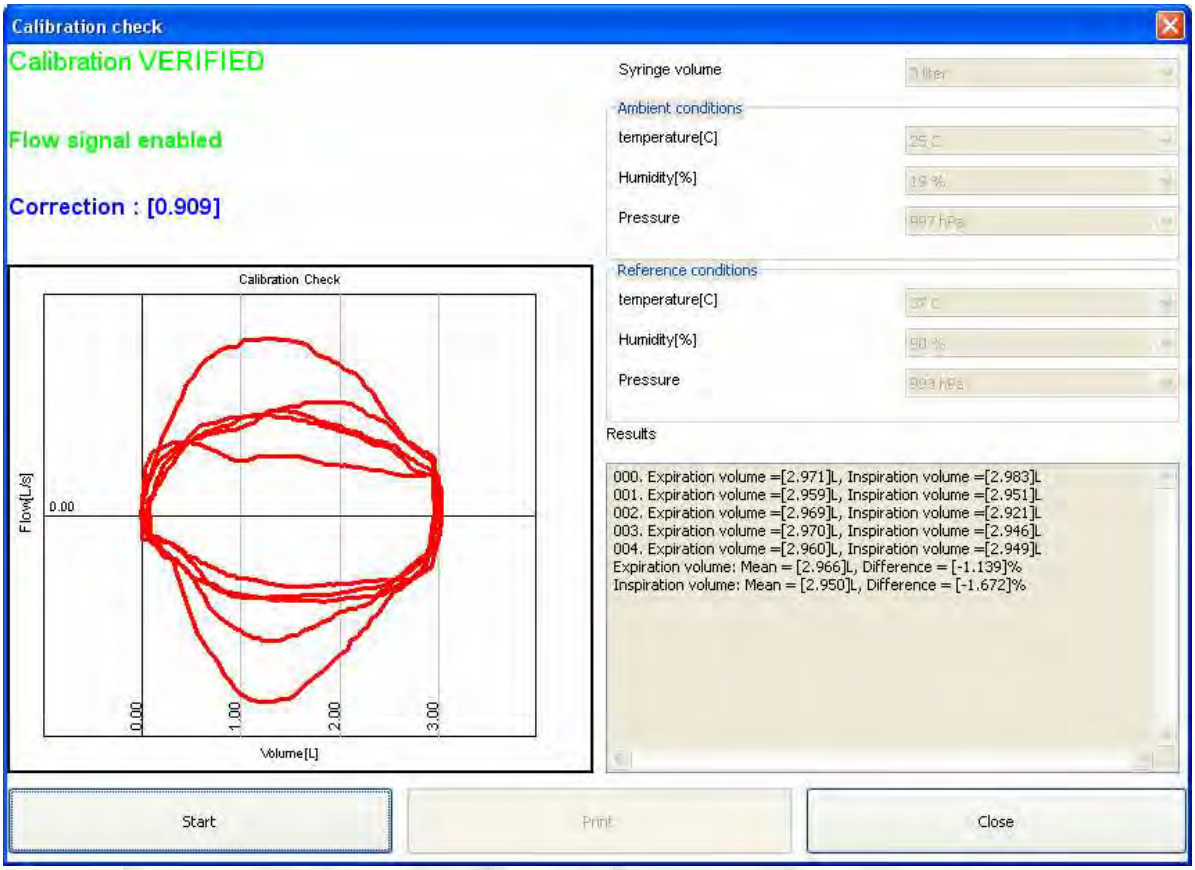
- Wait 3 seconds

After pressing the Start button, the calibration begins:



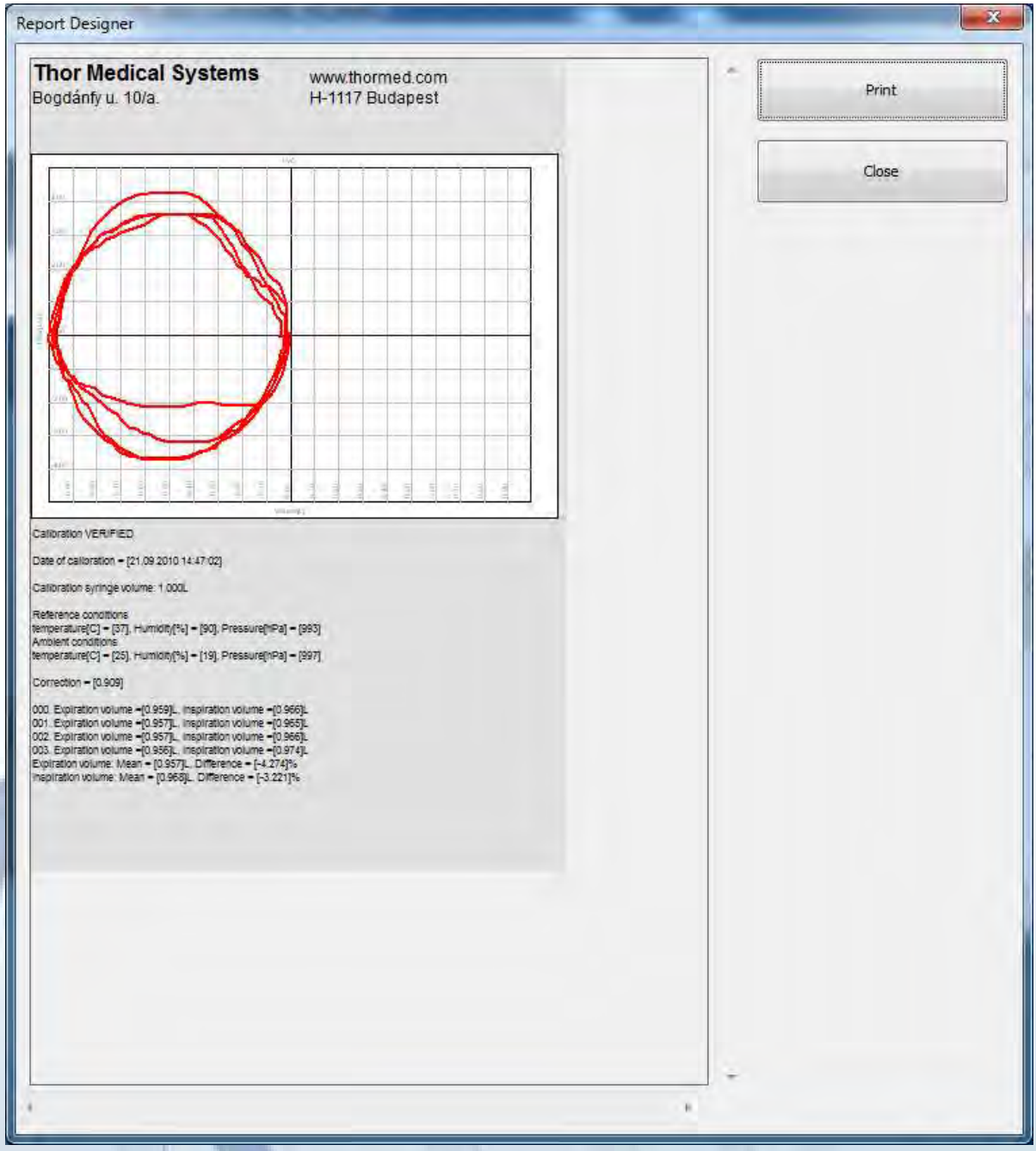
When the calibration test in progress, it can be interrupted with the Stop button and the current measurement will be evaluated.

After these steps the program evaluates the informations and prints the result of the calibration (successful or failed) to the upper left corner of the screen and prints the details to the Results message box in the lower right corner of the screen.



The calibration check can be performed again by clicking the Start button and repeating instructions above or the window can be closed by pressing **X** in the upper right corner of the screen or with the Close button.

After the calibration check, a calibration check report page can be printed by clicking on the Print button:



GDT interface

GDT protocol 2.0 support is under construction. In current version of the application patient from GDT server can be created / selected to the spirometry software and a complex FVC/MVV/VC result GDT file is created with the best curve for the patient. In GDT mode no other patient can be selected or created.

1. 1. call <application's name>.exe with name of the gdt patient file in form of **gdtfile="LUFU_20090630_1721.txt"** and place the file in the subdirectory named GDT in the install directory of the program. File name in general format: LUFU_YYYYMMDD_HHmm.txt, where YYYY is the year in 4 digit, MM is the month on 2 digit, DD is the day on 2 digit, HH is the hour on 2 digit, mm is the minute on 2 digit. in general form "LUFU_" prefix + timestamp + ".txt" postfix. Command

line example:
<application's name>.exe gdtfile="LUFU_20090630_1721.txt"
An example of an GDT input file is the following (file is size is 155 bytes, please note the line feed and carriage return characters at end of the last line too):

```
01380006301
014810000155
0188315PRO_SPIRO
0128316CRX
0143101Aczel
0163102Katalin
017310313061955
0183000999888777
01031102
0123622172
011362364
```

2. **Important: the GDT name of the application (configurable on Settings page) has to be used in the input GDT file.**

2. After the program successfully started in GDT mode, the Patient Search page appears, where the GDT file's patient is selected (other patients can't be selected), then press the Visit start button to start the measurement.If a message appears while starting the program in GDT mode, You can find the interpretation of the message in the 5. point.

3. The result GDT file is generated automatically after a session is accepted - you receive about that a message. The name of the file is generated from the GDT input file by adding ".res" postfix, e.g. **LUFU_20090630_1721.txt.res**
Example of the content of the file:

```
01380006310
014810012522
0228315MY_MED_SYSTEM
0188316PRO_SPIRO
01092062
014921802.00
0300066Spirometry softvvare
0170067Software
01300901.18
0183000999888777
0143101Test
0163102Patient
017310313061955
0103106
0093107
01031102
0123622180
0123623090
```

0128402FVC
017620002102009
0156201040458
0128410FVC
01384204.84
0108421L
0138410FIVC
01384203.89
0108421L
0138410FEV1
01384204.02
0108421L
0178410FEV1%FVC
014842083.06
0108421%
0128410PEF
01384207.52
0128421L/s
0138410FEV6
01384200.00
0108421L
0148410FEF25
01384206.78
0128421L/s
0148410FEF50
01384204.19
0128421L/s
0148410FEF75
01384202.26
0128421L/s
0178410MMEF2550
01384205.58
0128421L/s
0178410MMEF2575
01384205.59
0128421L/s
0128410FET
01384202.61
0108421s
0138410FIV1
01384200.00
0108421L
0128410PIF
0148420-6.27
0128421L/s
0148410FIF25
0148420-1.08
0128421L/s
0148410FIF50
0148420-4.86

0128421L/s
0148410FIF75
0148420-6.09
0128421L/s
0118410EV
01384200.47
0108421L
0178410ZeroTime
01384200.00
0108421s
0178470Austrina
0098470
0208410Volume,Flow
0648417(+0.01,+1.08)(+0.03,+2.02),(+0.07,+3.31),(+0.12,+4.95),
0648417(+0.18,+6.46)(+0.25,+7.05),(+0.32,+7.25),(+0.40,+7.34),
0648417(+0.47,+7.38)(+0.55,+7.42),(+0.62,+7.49),(+0.69,+7.55),
0648417(+0.77,+7.55)(+0.85,+7.51),(+0.92,+7.51),(+1.00,+7.35),
0648417(+1.06,+7.04)(+1.13,+6.87),(+1.20,+6.78),(+1.27,+6.59),
0648417(+1.33,+6.42)(+1.40,+6.39),(+1.46,+6.36),(+1.52,+6.29),
0648417(+1.58,+6.23)(+1.65,+6.16),(+1.71,+5.91),(+1.76,+5.78),
0648417(+1.82,+5.60)(+1.87,+5.51),(+1.93,+5.47),(+1.98,+5.38),
0648417(+2.04,+5.26)(+2.09,+4.96),(+2.13,+4.89),(+2.18,+4.84),
0648417(+2.23,+4.64)(+2.27,+4.55),(+2.32,+4.42),(+2.36,+4.30),
0648417(+2.40,+4.19)(+2.44,+4.14),(+2.48,+4.09),(+2.53,+4.06),
0648417(+2.56,+3.93)(+2.60,+3.76),(+2.64,+3.70),(+2.68,+3.66),
0648417(+2.71,+3.60)(+2.75,+3.58),(+2.78,+3.57),(+2.82,+3.49),
0648417(+2.85,+3.38)(+2.89,+3.29),(+2.92,+3.28),(+2.95,+3.19),
0648417(+2.98,+3.17)(+3.01,+3.12),(+3.04,+3.08),(+3.07,+3.01),
0648417(+3.10,+2.97)(+3.13,+2.95),(+3.16,+2.85),(+3.19,+2.81),
0648417(+3.22,+2.79)(+3.25,+2.76),(+3.27,+2.70),(+3.30,+2.68),
0648417(+3.33,+2.66)(+3.35,+2.60),(+3.38,+2.56),(+3.40,+2.54),
0648417(+3.43,+2.44)(+3.45,+2.44),(+3.48,+2.41),(+3.50,+2.38),
0648417(+3.52,+2.34)(+3.55,+2.32),(+3.57,+2.26),(+3.59,+2.26),
0648417(+3.61,+2.26)(+3.64,+2.21),(+3.66,+2.19),(+3.68,+2.15),
0648417(+3.70,+2.11)(+3.72,+2.06),(+3.74,+2.01),(+3.76,+2.00),
0648417(+3.78,+1.98)(+3.80,+1.98),(+3.82,+1.92),(+3.84,+1.91),
0648417(+3.86,+1.89)(+3.88,+1.81),(+3.89,+1.77),(+3.91,+1.75),
0648417(+3.93,+1.69)(+3.94,+1.62),(+3.96,+1.55),(+3.98,+1.55),
0648417(+3.99,+1.52)(+4.00,+1.50),(+4.02,+1.48),(+4.04,+1.43),
0648417(+4.05,+1.38)(+4.06,+1.38),(+4.08,+1.37),(+4.09,+1.36),
0648417(+4.10,+1.32)(+4.12,+1.30),(+4.13,+1.28),(+4.14,+1.25),
0648417(+4.15,+1.23)(+4.17,+1.22),(+4.18,+1.19),(+4.19,+1.16),
0648417(+4.20,+1.16)(+4.21,+1.15),(+4.22,+1.10),(+4.23,+1.09),
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0648417(+4.42,+0.69)(+4.42,+0.69),(+4.43,+0.69),(+4.44,+0.68),
0648417(+4.44,+0.66)(+4.45,+0.65),(+4.46,+0.63),(+4.46,+0.62),

0648417(+4.47,+0.62)(+4.47,+0.61),(+4.48,+0.60),(+4.49,+0.59),
0648417(+4.49,+0.59)(+4.50,+0.59),(+4.50,+0.59),(+4.51,+0.58),
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0648417(+4.84,+0.06)(+4.84,+0.05),(+4.84,-0.22),(+4.83,-0.51),
0648417(+4.82,-1.01)(+4.81,-1.20),(+4.79,-1.74),(+4.77,-2.24),
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0648417(+4.60,-4.01)(+4.55,-4.34),(+4.51,-4.54),(+4.46,-4.84),
0648417(+4.41,-5.02)(+4.36,-5.12),(+4.30,-5.30),(+4.25,-5.44),
0648417(+4.19,-5.61)(+4.14,-5.76),(+4.08,-5.87),(+4.02,-5.93),
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0148421l,l/s
0208410Time,Volume
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0648417(+1.76,+4.62)(+1.77,+4.63),(+1.78,+4.63),(+1.79,+4.64),
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0648417(+2.64,+4.82)(+2.65,+4.81),(+2.66,+4.79),(+2.67,+4.77),
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0648417(+2.72,+4.60)(+2.73,+4.55),(+2.74,+4.51),(+2.75,+4.46),
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0648417(+2.80,+4.19)(+2.81,+4.14),(+2.82,+4.08),(+2.83,+4.02),
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0648417(+2.92,+3.46)(+2.93,+3.40),(+2.94,+3.34),(+2.95,+3.28),
0648417(+2.96,+3.21)(+2.97,+3.15),(+2.98,+3.09),(+2.99,+3.03),
0648417(+3.00,+2.97)(+3.01,+2.91),(+3.02,+2.85),(+3.03,+2.79),
0648417(+3.04,+2.73)(+3.05,+2.67),(+3.06,+2.62),(+3.07,+2.56),
0648417(+3.08,+2.51)(+3.09,+2.45),(+3.10,+2.40),(+3.11,+2.34),
0648417(+3.12,+2.29)(+3.13,+2.24),(+3.14,+2.19),(+3.15,+2.13),
0648417(+3.16,+2.09)(+3.17,+2.04),(+3.18,+1.99),(+3.19,+1.94),
0648417(+3.20,+1.89)(+3.21,+1.85),(+3.22,+1.80),(+3.23,+1.76),
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0648417(+3.28,+1.56)(+3.29,+1.52),(+3.30,+1.49),(+3.31,+1.45),
0648417(+3.32,+1.41)(+3.33,+1.38),(+3.34,+1.35),(+3.35,+1.31),
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0648417(+3.52,+0.97)(+3.53,+0.96),(+3.54,+0.96),(+3.55,+0.95),
0128421s,l

3. **Interpretation of the GDT messages:**
   - GDT name and name in spirometry database are different. Would you like to update patient?: this message is displayed if the GDT file contains a patient whose SSN ID is already in the database, but in the database another name belogs to this SSN ID. If You select Yes, the patient edit page will appear where the patient with the

given SSN ID can be edited. If You select No, the patient's data will be loaded from the software's database.
- **GDT patient found in spirometry database, however, the patient is inactive:** this message is displayed, when the GDT file contains a patient who has already been in the database previously, but this patient has been deleted. Measurement can not be started with this patient.
- **GDT file not found:** there is no GDT file in the GDT subdirectory
- **Patient of the GDT result file not found in spirometry database:** patient of the GDT result file not found in the software's database.

About

This module is reachable from the main menu of the application by clicking on the About menu item. Here the user can see some details about the software, like the name, version number, copyright, website address of the product. By clicking on the OK button the screen closes.

Help

The user manual/help is reachable from the main menu of the application by clicking on the Help menu item. The user manual will open in the default browser.

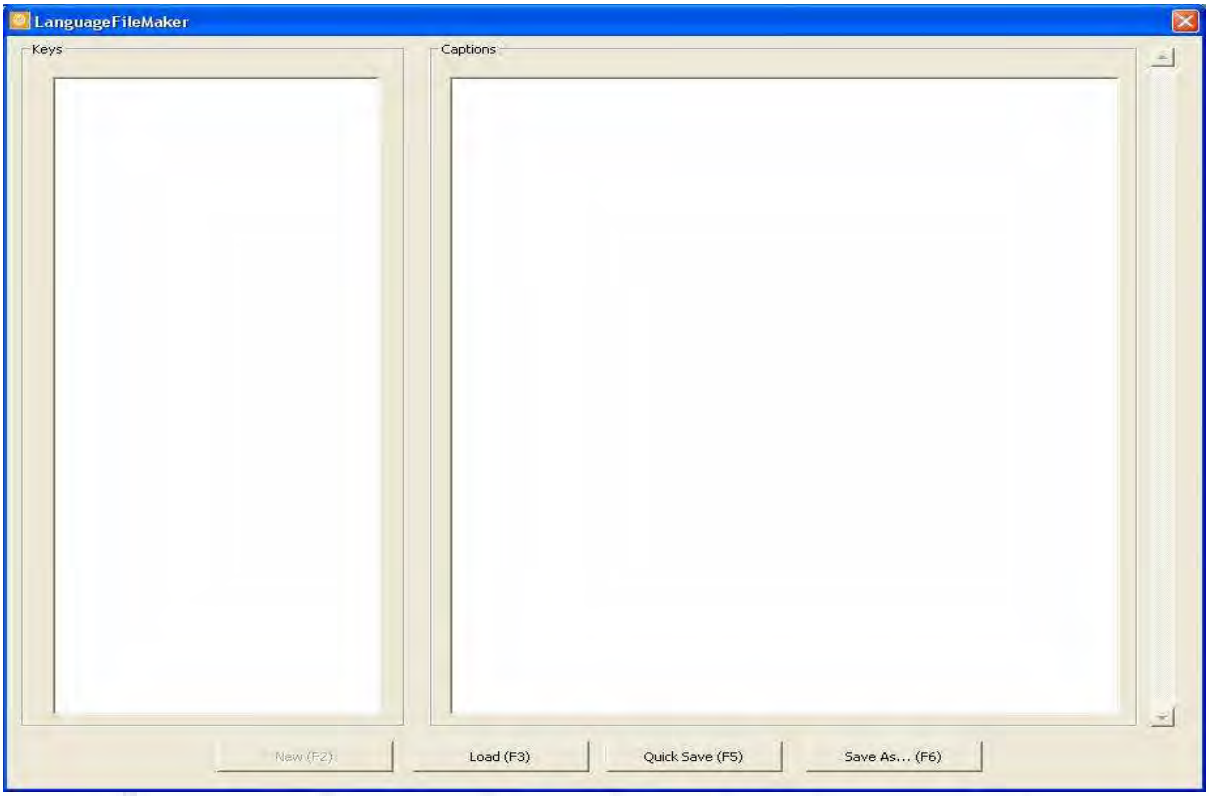
Application language, editing the langugae files

Application supports multilingualism. New language can be added by the user too. There are some languages supported by the application by default. There are 3 (optionally 4) different parts of application which should be translated to have full language support:

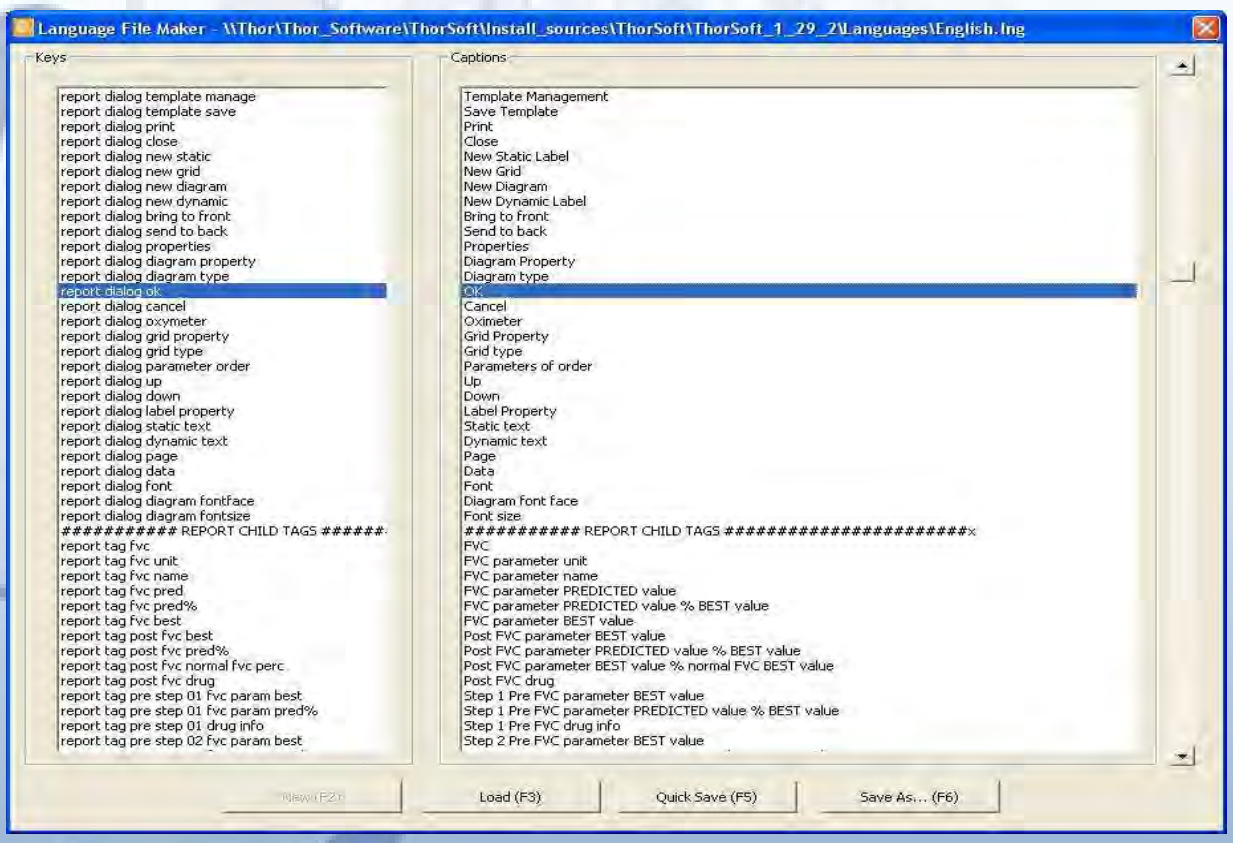
- text appearing in application (located in **language** subdirectory - *.lng files)
- application help (located in **Help** subdirectory)
- report templates
- voice (optional) (located in **sound** subdirectory)

The beginning of the language file contains 3 special lines. "LANGUAGE_NAME English" causes text "English" to appear in language combo box. "HELP_DIRECTORY english" says that help file can be found in "help\english" directory. "SOUND_DIRECTORY english" says that voice files are located in "sound\english" directory. By selecting "Englih" as language the Help and Voice files are loaded from the mentioned subdirectories. However English is the default language of the application. If the user selects let's say French language and help or voices are not available for that language then English versions are used. All files should preserve their original (English) name.

The language files with the program called LanguageFileMaker.exe can be edited. After starting this application, the following window appears. Use the Load button to load the language file which will be edited. By default, the language files for spirometry application folder will open, if the edited file is somewhere else, you can browse there.



If you succesfully loaded the language file, you will find the following window:



The language keys are on the left side of the window and the corresponding captions are on the right side of the window, which apper in the spirometry application. Each captions can be

edited by double click on them and type the text you want to display in the window. When you finished the translation or modifications press Quick Save or Save as ... button to save your work. Warning! The Quick Save button override the opened language file.