MedVision

USER MANUAL

Simulator for endoscopy

Contents

Introduction

Simulator for endoscopy is a training complex consisted of software, endoscopic instruments imitators, computing unit and visualization system.

Figure 1. Simulator

Training complex (Simulator for endoscopy) is designed for studying of basics and specifics o f g astroenterology. A ll interventions are being performed in virtual but realistic anatomic environment, with use of real endoscopic instruments imitators as well as imitators and other surgical equipment. It eliminates any risk to the health and life of the real patient unlike in many classic training programs.

Please note: all endoscopic instruments and medical equipment used in the simulator are only imitations of the real ones and can not be used outside simulator's environment.

1 Safety precautions

Always check condition of simulator body, connection wires, instruments and monitors brackets before work. Look for twisted wires, breaks or cracks, loose fastening of bracket etc. In case of any damage or serious defects - all work should be postponed until repair is completed.

Following things are **forbidden:**
- Exert a force upon the instrument;
- Dismantle the simulator parts during exercise performing;
- Turn off simulator power during exercise performing;
- Dismantle the instrument handle;
- Force opening of simulator body.

It's also forbidden to use simulator in a rooms with high humidity conditions, there condensation may form on the electronic and mechanical components. Vapors of acids, alkalies and other aggressive substances also should not be present in the air. Air condition must meet the sanitary standards: maximum single amount of dust in the air space no more than - 0.5 mg/m^3, average - 0.15 mg/m^3.

Always retract the instruments imitators from the port (located in the bronchoscope handle) after exercise completion. **Do not leave the instrument in the trocar imitator, always hold it.** Leaving instrument leads to the disruption of feedback function (if one is present) and can cause a traumatic situation for the user as well.

Other dangers

Collisions with the simulator's body can lead to its falling. Do not hold or hang on the monitor bracket or lay/sit onto simulator body. Power cords, cables and wires should not be placed in the passages, it's can cause stumbling and falling as well. If simulator falls onto you, please, call for help and wait for it to arrive, before trying to free yourself. After being freed make sure to visit your doctor even if there are no visible signs of injury.

Please note: all instruments and medical equipment used in the simulator are only imitations of the real ones and can not be used outside simulator's environment. Do not insert or put any of the endoscopic instruments imitators into the cavity of the human body or anywhere else!

2 Startup and Shutdown

2.1 Simulator startup

Startup algorithm is shown below:

- Turn on tumbler switch (0/1) on the surge protector (if used);
- Connect simulator body to the surge protector/power outlet;
- Press start up button on the side panel of the simulator to turn its on;
- If needed, turn on tumbler switch (0/1) on the back of the computer.

Simulator software will launch automatically. Otherwise you can launch the program from desktop shortcut as well.

2.2 Simulator shutdown

Shutdown algorithm is shown below:

- Retract instruments from the laparoscopic ports (trocars);
- Press ON/OFF button on the side panel of the simulator to turns its off;
- Turn off surge protector tumbler switch (0/1) (if used).

3 Authentication

Authentication menu (Figure 3.1) is available immediately after medical simulator program loading. In the menu the you can select between «Select the existing user» or «Create a new one».

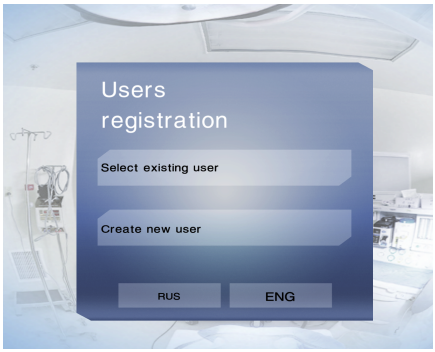

Figure 3.1. Authentication menu

3.1 Existing user selection

Press «Select existing user» button in the menu (Figure 3.1) .

Each user (cadet) affiliate to a study group, which she/he selects when registering. User name is displayed only in his group. All study groups are listed on the left(Figure 3.2) of the screen. Choose group by clicking its name and choose user name in the middle. Then type the password in the password field and press «Accept».

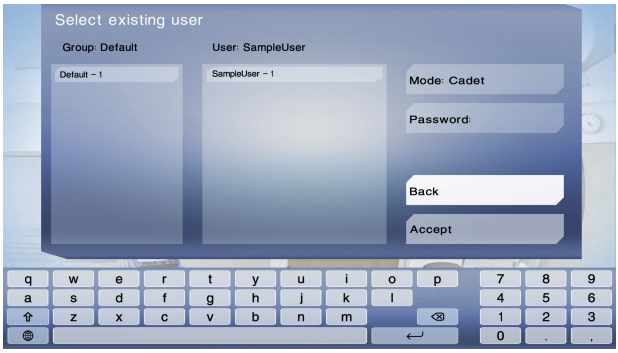

Figure 3.2. Authentication process

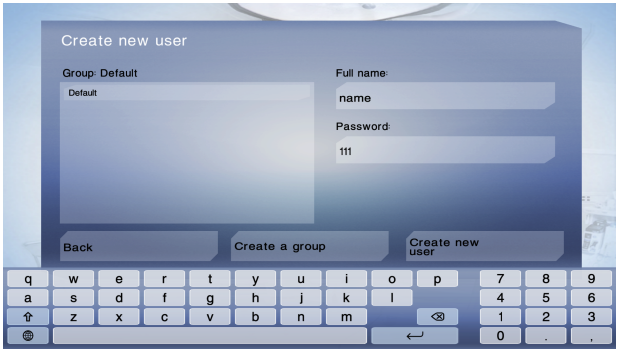

Figure 3.3. User registration form

3.2 New user registration

Press «Create user» button in the menu(Figure 3.1) . New user can be added to existing group or to a new one. In second case you'll need

to create any group first (see «New group creation» section for more details).

To add a new user into one of already existing groups follow the instruction below:

- Choose group name from the list on the left (Figure 3.3) ;
- Type user full name in the «Full name» field;
- Type password in the «Password» field;
- Press «Create new user» button;

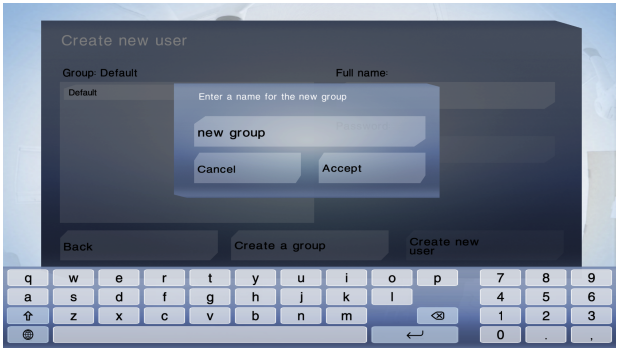

Figure 3.4. New group creation

3.3 New group creation

In order to create a new study group click «Create a group» button in the registration menu. Type name of the group in the new window (Figure 3.4) and press «Accept».

4 Exercises

Before starting the exercise:

- Always retract the all instruments imitators from the port (located in the brochoscope handle);

To access the exercise click the «Gastroenterology» button in the main menu (Figure 4.1) and choose study section. List of the available exercises will display on the screen. Choose exercise by clicking its name. Exercise description will display on the right of the window. Press «Next» to proceed toward the exercise window. Each exercises have three levels of complexity: easy, normal and hard. Click the «Complexity» button to set the required level. In order to start the exercise press «Start exercise» button.

Figure 4.1. «Gastroenterology» section

4.1 Exercise modules list

4.1.1 Basic skills in gastroscopy

This module includes basic exercises focused on instrument handling and anatomy knowledge of studying the anatomy of the upper gastrointestinal tract. Exercises being performed in both virtual non-anatomical and anatomical environment.

4.1.2 Diagnostic gastroscopy

This module includes exercises focused on developing of practical skills for safe inspection of the upper gastrointestinal tract. (such as taking tissue samples, early diseases diagnostic etc). Module includes variety of anatomy cases based on real patient records that helps gain a better understanding of human anatomy differences.

4.1.3 Operative gastroscopy

The module «Operative gastroscopy» is focused to develop skills in complex and urgent clinical situations, such as polyps removal, stenting, bleeding coagulation etc. To complete the exercises in the module successfully you have to perform all the intervention stages in a sequential and precise way, trying to avoid errors (intervention stages violation, excessive coagulation, massive vessels damage, damages of the tissue, etc). All complications should be arrested timely in a correct manner. Module includes variety of anatomy cases based on real patient records that helps gain a better understanding of human anatomy differences.

4.1.4 Bleeding in upper gastrointestinal tract

This module focused to develop skills in complex and urgent clinical situations in complex and urgent clinical situations, such as excessive internal bleeding, surgical complications etc. To complete the exercises in the module successfully you have to perform all the intervention stages in a sequential and precise way, trying to avoid errors (intervention stages violation, excessive coagulation, massive vessels damage, damages of the tissue, etc). All complications should be arrested timely in a correct manner. Module includes variety of anatomy cases based on real patient records that helps gain a better understanding of human anatomy differences.

4.1.5 Diagnostic colonoscopy

This module includes exercises focused on developing of practical skills for safe colonoscopy procedure, safe and painless inspection of colon (such as taking tissue samples, early cancer diagnostic etc). Module includes variety of anatomy cases based on real patient records that helps gain a better understanding of human anatomy differences.

4.1.6 Therapeutic colonoscopy

This module includes exercises focused on developing of practical skills for safe performance of the colonoscopy procedures, such as internal bleeding coagulation, early diverticula diagnoses, detection of an obstruction in the intestine etc. To complete the exercises in the module successfully you have to perform all the intervention stages in a

sequential and precise way, trying to avoid errors (intervention stages violation, excessive coagulation, massive vessels damage, damages of the tissue, etc). All complications should be arrested timely in a correct manner. Module includes variety of anatomy cases (from simple anatomy to a rare abnormalities) based on real patient records that helps gain a better understanding of human anatomy differences.

4.1.7 Sigmoidoscopy

This module includes exercises focused on developing of practical skills for safe performance of the sigmoidoscopy procedures, such as internal bleeding coagulation, polyps removal, detection of an obstruction in the intestine etc. To complete the exercises in the module successfully you have to perform all the intervention stages in a sequential and precise way, trying to avoid errors (intervention stages violation, excessive coagulation, massive vessels damage, damages of the tissue, etc). All complications should be arrested timely in a correct manner. Module includes variety of anatomy cases (from simple anatomy to a rare abnormalities) based on real patient records that helps gain a better understanding of human anatomy differences.

4.2 Imitators of the endoscopic instruments

Imitators of many endoscopic instruments are being used imitated in the simulator:

- Bipolar grasper;
- Coagulator;
- Sphere electrode;
- Needle electrode;
- Endoscope camera (endocamera) etc.

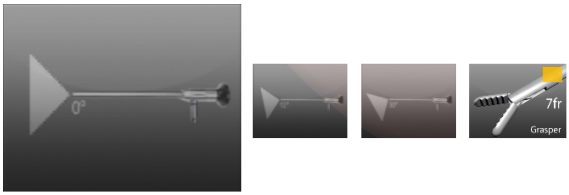

Figure 4.2. Instruments icons

Instruments imitators are inserted in the special port located in the brochoscope handle. In order to change instrument type in the program:

- Retract instrument in the port;
- Press middle button on the endoscope - list of all available instruments will appear on the service screen (Figure 4.2) ;
- Choose between instruments by pressing key on the 2 key pedal (either of them) or pressing buttons on the endoscope instrument;
- Once you choose instrument (its icon is a bigger one in the row) - start inserting instrument in the port until you can see it through the endoscopic camera mounted at the distal end of the bronchoscope tip;

4.3 Service monitor

Service monitor is active during exercise. Lower panel of the monitor screen reserved for control panel which becomes active during exercise performance. Functions change from exercise to exercise and depending on its type, some are unavailable during basic trainings, some are not supposed for this exercise (for example, video courses or step-by-step instruction). Main functions are «Virtual tips», «Video course» and «Navigation». The middle of the screen reserved for 3D anatomical atlas model and x-ray picture for this clinical case.

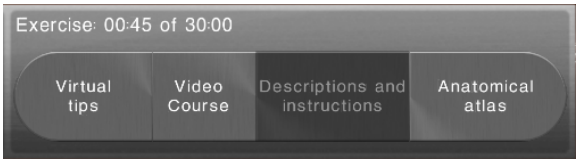

Figure 4.1. Virtual tips panel

Clicking the «Virtual tips» button will activate performance hints, such as direction for instrument movement or place of injection.

To watch the video course click the button «Video Course». Remember that video course is not present in all exercises.

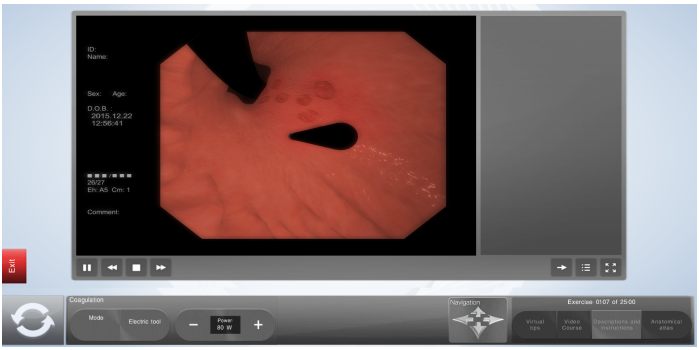

Figure 4.2. Video course player

New window will open inside the exercise. Video can be played, paused, moved forward or back.
Remember that video course is not present in all exercises.

Figure 4.3. Powered instrument

4.3.1 Powered instruments controls

Description of the control panel's function listed is given below:
- «**Mode**» indicator. Two working mode are available: «electro-dissection» and «coagulation». Working mode is set automatically and depends on

the key pressed on the 2-key pedal is pressed. Yellow key activates electro-dissection, blue one - coagulation. As long as either of two keys is pressed you will hear a loud beep sound and indicator of the active work mode will be display on the control panel;

- **«Powered instrument»** icon marks the powered instrument (if used instruments can be powered) (Figure 4.3) ;
- **«Power»** buttons. Click «+» to increase electricity power and click «-» to decrease it;

Figure 4.4. Powered instruments controls

4.4 Exercises end and exit

After all stages of the exercise is complete - «Finish» button will appear, click it to exit the exercise. In case if the button has not appeared, not all the stages were performed (final examination wasn't performed, blood weren't aspirated etc.).

Figure 4.1. Finish button

Figure 4.2. Exit button

Every exercise has a forced exit. For that press «Exit» button.

5 Training courses

Training courses are a sequence of exercises, with number of requirements including: line of performance, minimal passing score, complexity level etc.

Exercises in the course are being performed successive, in line, there is no possibility to jump ahead toward one exercise without completing previous one first. Already completed exercise can be repeated for obtaining of a better score. While one of training courses is being actively performed, section «Endosurgery» and other courses will be unavailable until chosen course is completed or canceled.

If one of courses already started, section will display its statistics if not - list of all available training courses will be shown. Administrator mode allows creating of new training courses or edit and delete already existing ones (see «Administrator» section for more details).

To start course choose it from the list and click «Start training course» button . Next menu - statistics - will display contents of the course as well as performance results.

Status icons of the exercises display at the statistic window (Figure 5.1) with the following meaning:
1 - completed exercises;
2 - repeat completed exercises;

3 - non-performed exercises;
4 - current exercise;

Figure 5.1. Exercise status icons

Numbers near status icons display progress of performing: maximum score/average score/number of tries. The following buttons are located at the bottom «Back», «Course description», «Abort the course», «Continue». Press «Back» in order to return to the previous window. Press «Course description» to see general information about chosen course.

In order to start or continue the course press «Continue». After that course exercise start window will open. Please note, you can not choose or change complexity level of the exercise and change its passing score. Press «Start exercise» to begin.

Performing of the course can be canceled by pressing «Abort the course» button in the «Training courses» menu. Press the button that confirm («Accept») or decline («Cancel») your choice in the pop-up window.

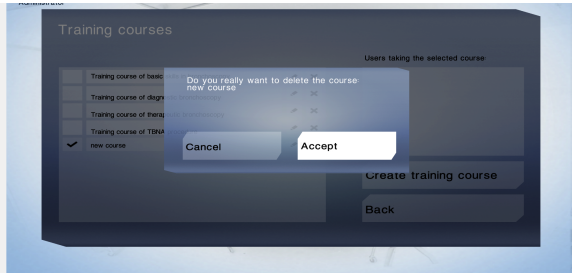

Figure 5.2. Abort the course

After completing of the exercise its statistics window will open. User can watch replay of the exercise, print its statistics, return to the main menu, view course results or continue with it.

To proceed with further with course performance press «Continue exercises of the course». If cadet's score is lower than required passing score «Retry the last exercise» button will appear instead of «Continue exercises of the course». It's not possible to continue with others exercises until pass the require score.

After completing of all exercises in the course its statistics window will open automatically.

6 Statistics

Statistic results are being formed after completion of the exercise. It is individual and tied to the user's profile. It is very important to log-in into the system using correct name and password. In any other case it may lead to the serious mistakes in the grade estimation.

To access statistics section click the button with the same name in the main menu. Statistics window also appears after completion or interruption (forced exit) of exercise (Figure 6.3) .

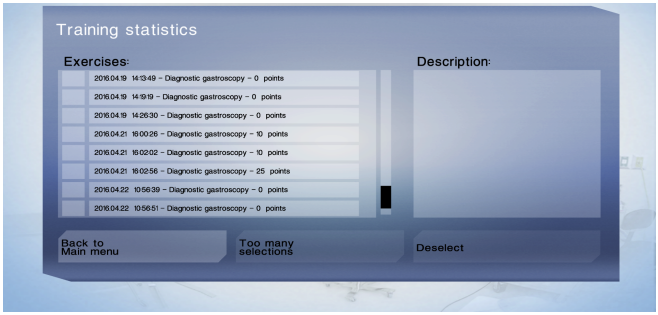

Figure 6.1. Statistics window

Statistics displays all exercises performed by a current user. Choose one by clicking its name and press «Results of the selected exercise» button.

Figure 6.2. Exercise statistics

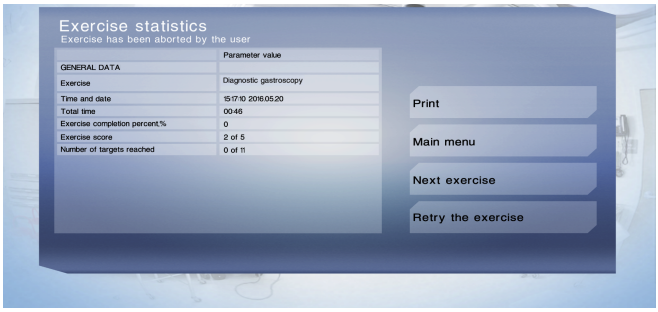

Figure 6.3. Exercise end form

In the newly open window statistics parameters will be displayed alongside with two columns of the numeric values - first actual numbers from the exercise, second - permissible numbers from the exercise settings (mainly determined by the level of complexity). Grade of the exercise is define by «Total score» (ranged from 0 to 100 points, where 100 is max).

Points are being added or took off depending on the performance quality, performance time, quantity and the character of the mistakes made. Detailing point is a precise elaboration of the final score, including points received on correct exercise performance and took off in case of mistakes.

7 Cleaning maintenance

To clean the simulator body, use a light soap solution or mild domestic cleaners. Soak a soft cloth in the selected solution and carefully wipe dirt and dust from the body of the simulator, its instruments, bracket and monitor's body etc. Please do not allow the liquid leak inside the instruments handles and body of the simulator. For cleaning monitor screen use special cleaning cloth.

Do not forget to perform regular dry and wet cleaning of the the facility housing the simulator. If heating radiators are on in the facility - make sure simulator's body do not press toward one. If you are not planning to use simulator for some time, turn off its power source.

8 Acknowledgement table

I have read and understood the manual:

Table 1. Acknowledgement table

Date	Name	Signature