



HEMOSIM

M A N U A L



v 2.9.1 · Pablo Kessler

Instructions and Pathophysiological Explanation of Modes and Therapies

This is a game based on hemodynamic shock simulation, grounded in real pathophysiology but adapted for playability and fun.

There are 3 disease modes:

- Hypertensive Cardiogenic Shock
- Hemorrhagic Shock
- Distributive (Septic) Shock

HemoSim models pathophysiology via key variables: Heart Rate, MAP (Mean Arterial Pressure), CVP (Central Venous Pressure), Cardiac Output, Blood Volume, SVR (Systemic Vascular Resistance), PCWP (Pulmonary Capillary Wedge Pressure), PAP (Pulmonary Arterial Pressure), LVSW (Left Ventricular Stroke Work), and urine output.

Below are detailed pathological and therapeutic modes, their effects on these variables, along with the roles of the defibrillator, antibiotic, and transfusion.

Pathological Modes

1. Cardiogenic Shock (Hypertensive Heart Failure):

- Pathophysiology: Simulates myocardial dysfunction reducing cardiac output.
- Effects: Decreases Cardiac Output, increases PCWP and SVR due to compensatory vasoconstriction, and elevates Heart Rate as a tachycardic response. LVSW may rise initially due to stress.

2. Hemorrhagic Shock:

- Pathophysiology: Represents acute blood volume loss, reducing intravascular volume.
- Effects: Decreases Blood Volume, PCWP, and PAP, while increasing SVR and Heart Rate due to compensatory tachycardia. Brakes the Heart Rate if it exceeds 150 bpm due to fatigue.

3. Septic Shock (Distributive):

- Pathophysiology: Simulates a distributive shock with a drop in SVR and an initial hyperdynamic phase.
- Effects: Reduces SVR, temporarily increases Output, decreases Volume and LVSW due to capillary leak, and increases Heart Rate.

Therapeutic Modes

1. Dopamine:

- Function: Inotropic and vasopressor.
- Effects: Increases Output, Heart Rate, LVSW, and MAP. At high doses (>5), it increases SVR.

2. Furosemide (Seguril):

- Function: Loop diuretic that reduces preload by eliminating fluids.
- Effects: Decreases Volume, LVSW, PCWP, PAP, and SVR. Output is minimally reduced.

3. Nitroglycerin (Solinitrina):

- Function: Vasodilator that reduces preload and afterload.
- Effects: Decreases LVSW, PCWP, SVR, Volume, and Output. Increases Heart Rate.

4. Saline (0.9%):

- Function: Volume expander that increases preload.
- Effects: Increases Volume, Output, and LVSW. Adjusts PCWP and PAP, and may decrease Heart Rate if elevated.

5. Dobutamine:

- Function: Inotrope that improves cardiac contractility and output.
- Effects: Increases Output, LVSW, and MAP. Increases Heart Rate with a brake if > 140. Reduces SVR and CVP at high doses.

6. Epinephrine (Adrenaline):

- Function: Potent vasopressor and inotrope. Strongly increases MAP, Heart Rate, and SVR. Used in arrest and critical states.

Bolus Therapies

1. **Propranolol:** ↓ Heart Rate and MAP (single dose).
2. **Amiodarone:** ↓ Heart Rate (single dose).
3. **Defibrillator:** Resets to sinus rhythm (Heart Rate = 90); 5s cooldown.
4. **Antibiotic:** Treats sepsis if the source is correct, enabling a cure if the patient is stable.
5. **Transfusion:** Restores blood volume in hemorrhage.

General Notes

- The program starts in a stable state. Selecting a mode begins the evolution.
- Therapies modify variables via formulas modulated by deltaTime.
- In hemorrhage mode, a cure is not possible without a transfusion.
- If VF/arrest occurs, defibrillation is required within 30s, or it's "game over."
- Cure or death depends on keeping variables within the ranges set by the difficulty level.
- HemoSim uses simplified formulas for comprehensibility.
- In heart failure, non-invasive ventilatory support with BIPAP can be applied to improve oxygenation and reduce preload.

New game modes and scoring (2025)**Free Mode**

- Choose a pathology (HF, hemorrhage or septic shock) or use the "Random" button.
- At the end of a case, you receive a score based on difficulty and time:
 - -10 points if the patient dies.

- +1 to +7 points if cured (faster = more points).
- You can reset the total counter with the monitor's "Reset" button.
- The "Grade" shown on screen does not apply in this mode (Exam only).

Exam Mode (10 cases)

- Press the blue "Exam" button to start 10 consecutive cases.
- Each case is scored like in Free Mode. The final Grade is the average of all 10.
- After cure or death, the cure/death screens are skipped and the next case starts automatically after a beep.
- After all 10 cases, the exam ends; you can continue in Free Mode.
- To exit early, press the red "Reset" button.

Cockpit Mode (new)

- Switch between the classic interface and the cockpit with the corresponding button on each screen.
- The cockpit shows the same data with analog instruments, an annunciator panel with warning lights, and a multi-function display (MFD) with tabs.
- Complementary tests: blood gas, complete blood count, echocardiogram, Swan-Ganz catheter and lactate are requested from the "Diagnostics" panel and take a few seconds to become available — as in real life, you cannot read what hasn't been measured.
- The Swan-Ganz catheter also unlocks three gauges: capillary pressure, cardiac output and resistance, which stay locked until requested.
- Vasoactive drug doses are adjusted by dragging the vertical levers, with the same immediate effect as the classic interface's dialogs.
- Switching interfaces mid-game does not lose progress: both share the same patient.

HemoSim. Free software.

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Disclaimer

HemoSim is an entertainment video game. It is not a medical device, a teaching or instructional tool, or a source of clinical information. The formulas are deliberately simplified, and doses, timings and patient responses were tuned to make the game work as a game. It must not be used to make clinical decisions of any kind.