Here’s your challenge: Fluid in your body is constantly in motion in an attempt to maintain balance, or homeostasis. Many types of illness can upset this balance by creating fluid excess or deficit in the intravascular or interstitial compartments.

Goal: Your body’s goal is to prevent the accumulation of fluid in these compartments.

How is this achieved? Your body has to ensure that fluid leaving circulation and the amount of fluid returning to circulation is equal.
Now we’ll return to the soaker hose. Click the arrow over each image to see how increasing or decreasing water pressure, obstructing the flow of water, or expanding the size of the holes in the hose, affects the flow of water.

You’re thinking, great, now I know how to water my lawn…but what does that have to do with nursing? Let’s shift gears for a moment and compare the soaker hose to a capillary. Both are long, narrow, flexible tubes with hollow centers. Both are semi-permeable. Both have clearly defined ends where fluid enters and exits. Just as you controlled the flow of water in this exercise, your body controls the continuous movement of water, nutrients and waste products between the capillary and the interstitial space.

This movement is regulated by two pressures, and two processes. We’ll talk about the pressures first, then describe the processes.

Key Factors:
Hydrostatic pressure pushes water out of, or into, the capillaries.
Oncotic pressure pulls water out of, or into, the capillaries.
Because of the differing pressures, the process “begins” at the arterial end of the capillary and ends at the venous end.
Think back to the garden hose and what happened to the flow of water when you adjusted the faucet. Now, replace the faucet with the heart, and the hose with a capillary. What would you expect to happen in the capillaries if you ran up a flight of stairs? If you meditated or relaxed? If you suffered an injury, such as a bite, burn or cut? If something in your body prevented the normal flow of blood and nutrients?

Remember how the flow of water increased when you turned the faucet on high? Running up stairs, exercising or doing anything that increases your activity level causes your heart to pump harder and faster. This increases hydrostatic pressure in the capillaries.

When we adjusted the faucet so less water flowed, more remained inside the hose. Some studies show that meditation and other deep breathing relaxation exercises may slow the beating of the heart. As a result cardiac force, and subsequently hydrostatic pressure, decreases.
Twisting the hose caused obstruction, increasing the flow of water at one end, and preventing it from moving to the other. Likewise, a blood clot or other form of obstruction in the body creates additional hydrostatic pressure at one end of the capillary and significantly reduced flow in the other.

Increasing the size of the holes in the hose allowed more water to leave. In your body forms of trauma, such as those experienced during injury or illness, damage capillaries and initiate the inflammatory process. This causes the endothelial cells that line the capillary wall to contract, creating spaces through which fluid and proteins, such as albumin, leak into the interstitial space.

**Arterial End**

Capillary filtration is the **process** that unloads materials for the tissues at the arterial end of the capillary. Just like the part of the hose that is closest to the faucet, hydrostatic pressure is highest at this end of the capillary. Capillary hydrostatic pressure, caused by the pumping of the heart, **pushes** fluid out of the capillary into the interstitial space.
Arterial End
In addition, as the number of Na molecules increase in the interstitial space, interstitial osmotic pressure *pulls* fluid from the capillary to dilute these particles.

Venous End
Due to the loss of fluid at the arterial end, hydrostatic pressure falls as it reaches this end of the capillary. Reabsorption is the *process* that picks up materials for transport at the venous end of the capillary. Capillary oncotic pressure, caused by the presence of plasma proteins (especially albumin) and Na, is now greater (due to loss of fluid) and *pulls* water out of the interstitial space and back into the capillary.

Venous End
In addition, interstitial fluid hydrostatic pressure which is now greater due to the increased fluid present, *pushes* water from the interstitial space into the capillary.
Venous End

Key Points:
At the venous end, capillary hydrostatic pressure < capillary osmotic pressure and fluid moves from the interstitial space back into the capillary (termed reabsorption)
Net movement favors water and solutes being passed back into the capillary where they are less concentrated.

Summary
As blood circulates, two types of pressure cause fluids (primarily) and solutes (sometimes) to move between the capillaries and the interstitial space. When hydrostatic pressure is higher inside the capillary than in the interstitial compartment that surrounds it, this pressure pushes fluids out of the capillary. When oncotic pressure is higher in the capillaries than in the interstitial compartment, oncotic pressure pulls fluid back into the capillary. Since large solutes cannot pass through capillary walls, the solute buildup induces osmosis. Small amounts of extra fluid that leave the capillary move into the lymphatic vessels and are eventually recirculated by the heart.
The difference in pressure at opposing ends of the capillary is known as the pressure gradient.