- Fall in water potential- When water is lost through sweating, the water potential in the blood plasma decreases. This stimulates the hypothalamus in the brain. The pituitary gland releases more ADH into bloodstream. Cells in the walls of the collecting ducts become more permeable to water. More water is reabsorbed from the collecting duct into the blood capillaries. A smaller volume of urine produced and urine is more concentrated. Water potential of blood returns to normal.
- Rise in water potential- When a large amount of water is taken in, water potential of the blood plasma increases. Pituitary gland releases less ADH into the bloodstream. Cells in the walls of the collecting ducts become less permeable to water. Less water is reabsorbed from the collecting duct into the blood capillaries. A larger volume of urine is produced and urine is more diluted. The water potential of blood returns to normal.

The kidneys control the water and solute levels in the blood by controlling the amount of water that is reabsorbed at the nephrons. The amount of water reabsorbed affects the blood volume. As a result, the kidneys also play a vital role in the control of the blood volume and blood pressure. If blood volume increases, then the blood pressure will rise. A large increase in blood pressure can cause the blood vessels in the brain to burst, causing a stroke. To prevent this, doctors can prescribe drugs called diuretics which reduce the production of ADH. This means that a large amount of dilute urine is produced and the volume of water in the blood decreases, lowering blood pressure.

Kidney failure is caused by high blood pressure, diabetes, alcohol abuse, severe accidents that damage the kidney and complications from undergoing major surgery. Kidney failure requires transplant. A donor with two healthy kidneys may donate one kidney and survive with the remaining one. If a donor kidney is not available, dialysis can help treat it. A dialysis machine mimics the functions of a kidney. It helps to clean the patient's blood from metabolic waste products and toxins. Blood is drawn from the vein in the patient's arm and is pumped through the tubing in the dialysis machine. The tubing is bathed in a specially controlled dialysis fluid. The walls of the tubing in the dialysis machine are partially permeable. Small molecules, such as urea and other metabolic waste products, diffuse out of the tubing into the dialysis fluid. Blood cells, platelets and large molecules remain in the tubing. The filtered blood is then returned to a vein in the patient's arm.

The dialysis fluid contains the same concentration of essential substances as healthy blood to ensure that essential substances do not diffuse out of the blood and into the dialysis fluid. Furthermore, if the patient's blood lacks these essential substances, these substances will diffuse from the dialysis fluid into the blood. The dialysis fluid does not contain metabolic waste products. This sets ups a concentration gradient that allows waste products to diffuse out of the tubing into the dialysis fluid and to be removed. The tubing in the machine is narrow, long and coiled, increasing the surface area per volume ratio, ensuring efficient diffusion. The direction of the blood flow is opposite to the flow of the dialysis fluid, maintaining the concentration gradient.