

Technical Note

How Does Automated Blood Sampling Work?

Introduction

The heart of the Phlebot is a sterile, disposable blood reservoir connected to a standard bag of sterile saline. When connected to an indwelling catheter in the patient, this comprises a closed system, with no access point for microbial contaminants. The patient remains connected to the mobile Phlebot throughout the duration of intensive care, so that a blood sample can be collected immediately (“stat” sample) or intermittently according to a selectable schedule.

The sequence of steps in a common protocol are listed below and outlined on the following page. The reservoir is operated by three programmable, external valves (i.e. not in direct contact with blood or saline) and a reversible precision pump under digital control. These drawings are neither drawn to scale, nor complete in all details.

Sequence of Events in Blood Collection by the Phlebot

Step 1

The Phlebot syringe is partially filled with sterile saline by the digital pump. It then waits until instructed to take the next sample, according to either a programmed sequence or a ‘stat’ request.

Step 2

Blood is drawn through the catheter directed by the software with independent control of both time and volume (more blood is withdrawn during this step than will be collected but the excess is returned to the patient to conserve blood, a distinct advantage for conservation of blood in neonates). The blood is briefly stored in the reservoir. Note that the interface between blood and saline is very well defined, but blood near this point is never collected to avoid risk of dilution.

Step 3

Saline remaining in the collector tubing is flushed by blood from the reservoir into a sealed, disposable waste receptacle. A few additional microliters of blood directed down this line (“waste blood”) ensure that only whole, undiluted blood will be collected.

Step 4

The collector tube is now aligned with a sample collection vial, sealed by a permeable septum. The programmed volume of blood is now delivered to the bottom of the vial.

Step 5

The syringe is instructed to withdraw saline from the bag and then reverses direction to cycle the blood remaining in the reservoir and catheter back to the patient. Additional saline is delivered to flush the catheter line again and also replace the volume of blood collected with an equivalent volume of sterile saline. The collector tube is then realigned with the waste position.

Step 6.

The Phlebot completes the cycle by flushing the collector line with fresh saline and then returns to Step 1 to await further instructions.



