Application Note 034

Innovating Together

Occlusion Test for the Multi-Flo

What is occlusion?

An infusion pump is an electronic device used to control the administration of intravenous fluids to deliver measured amounts at careful and regulated rates. They often incorporate mechanism or structure that mediated active transport across a biological membrane. Occlusion is the interruption or ineffective therapy of infusion due to a blockage, momentary closure or obstruction of the passageway or blood vessel.

How do infusion pumps manage occlusion

Infusion pumps use a pumping action to infuse fluids, medication or nutrients into the patient and are suitable for intravenous, subcutaneous, enteral and epidural infusions. They provide accurate and controllable flow over a predetermined period of time or on demand.

Occlusion sensors can detect both upstream and downstream restrictions and the downstream occlusion sensor sensitivity can be adjusted to suit the needs of the patient/hospital through the pump configurations. Dynamic monitoring systems provide the ability to monitor downstream pressure or resistance allowing for rapid detection of full or partial blockages.

To prevent nuisance alarms and interruptions to therapy the initial occlusion pressure needs to be set above the systems normal running pressure e.g. to deliver simple electrolytes into an adult intravenously through a 16 G, 9 cm cannula at 100ml/h the pressures due to resistances are:

	Pressure (mmHg)
Max adult venous pressure	30
Filter	10
Cannula	100
Administration set	1
Total	141

Therefore to administrate this infusion the occlusion alarm pressure should be set above 141 mmHg. However, configuring the alarm to the lowest feasible occlusion pressure minimises the time to alarm and the possibility of post occlusion bolus.

Occlusion alarms are used to indicate when the pump is unable to sustain the set flow rate and therefore pressure in the line beings to increase. This is typically due to a partial or complete block in the delivery tubing e.g. kinks in the tube, clamp or tab closed; or in the cannula e.g. clotted off or a change in position.

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To reduce the time to alarm:

- Use highest flow rate clinically acceptable for the infusion
- Use smaller syringe size
- Only use recommended syringes by the pump manufacturer to minimise stiction and normal variability in the driving force of the pump
- Use largest cannula practicable possible and configure the occlusion alarm at lower level
- Use a current generation syringe pump which has a "back off" or "Auto rewind" feature

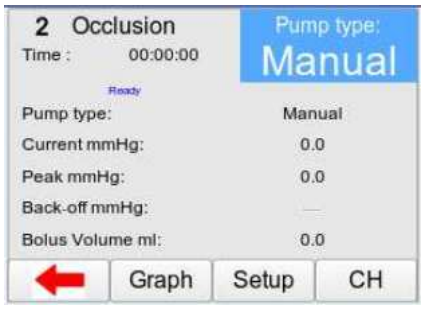
Hazards and complication which arise because of occlusion include, interruptions to the therapy which can be a huge problem with critical, fast acting drugs e.g. inotropes and pumps continue to attempt to deliver fluid under the preset pressure in the line is reached which stops the pump and sets off the alarm. The compliance and flexibility of the tubing allows it to expand under increased pressure which can cause extra fluid to be released and delivered to the patient as a bolus when the occlusion is released.

What is the difference between auto rewind and normal stop/alarm function on infusion pumps?

To counteract the effects of occlusion including post occlusion bolus, modern pumps often have a "back off" or auto rewind facility, which briefly runs the pump in reverse when occlusion is sensed to reduce the pressure in the tubing.

How do you test occlusion on the Multi-Flo?

The Multi-Flo occlusion test simulates an obstruction in the infusion and monitors the variation in pressure due to the blockage. Most infusion devices have the ability to detect this obstruction and provide an occlusion alarm and the occlusion test can test this alarm feature. Some infusions devices have an auto rewind function at occlusion alarm and the Multi-Flo can detect that to display the maximum occlusion pressure at which auto rewind occurs. In infusion devices that do not have auto rewind (normal stop/alarm pumps) the user must press the Green button when the occlusion alarm sounds which will stop the test, record and display the maximum occlusion pressure observed, Figure 1.



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