

USCOM in the Surgical Ward – Clinical Case Study 1



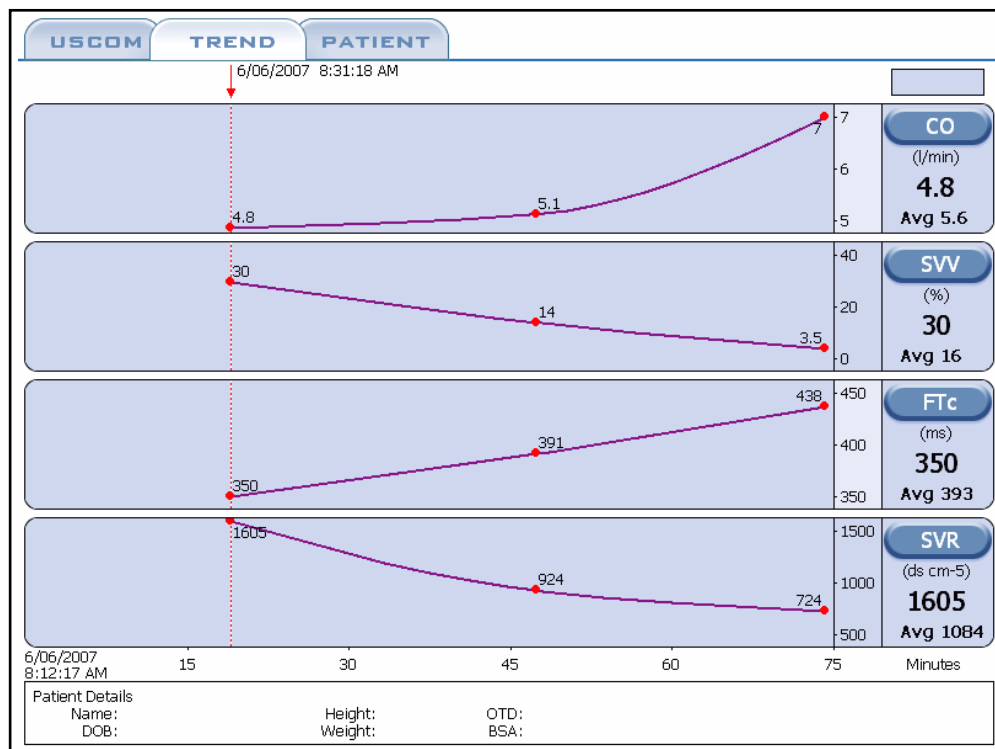
The measure of life.

Post Operative Hypotension and Stroke Volume Optimisation.

There are a large number of haemodynamic problems that may arise in inpatients, from the point of view of diagnosis, from guiding their therapy, and also for explaining unexpected eventualities.

Perhaps one of the commonest problems that we see is the hypotensive postoperative patient. Here the differential diagnosis lies between bleeding and other causes of hypovolaemia, and a coronary event or even pulmonary embolus that has led to the low blood pressure.

In the patient who is simply becoming dehydrated, the BP may be normal although the pulse tends to be increased. We will see a raised SVR and a low FTc with an elevated SVV. BP may be maintained simply by the degree of vasoconstriction present and cardiac output by the increase in heart rate as shown in the trend display here.



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This shows the effect of giving 1 L of normal saline over about 45 minutes. The CO increases from 4.8 to 7 litres, the SVV falls from 30% to just 3.5%, the FTc increases steadily from the moderately low value of 350 ms to an entirely normal 438 ms.

But what happened to the peripheral circulation?

Well the saline must have done the trick as the SVR fell by more than 50%! We now have a nicely vasodilated patient with a higher CO and better peripheral perfusion, exactly what we wanted, and achieved in under an hour with no guesswork.

So if we think the patient is dehydrated then why not give the patient a fluid challenge to see if the situation improves? Even if we were seriously concerned that the patient might already be overloaded then there is still no problem - we can just elevate the patient's legs and see if the stroke volume increases with the increased venous return. If so, then this clearly indicates the need to increase the preload, i.e. they need fluid. Should the stroke volume go down, then they are already overloaded. All we have to do is put the legs back down and no harm has been done, and now we know for certain which way to go to solve the problem. Primum non nocere – first do no harm!

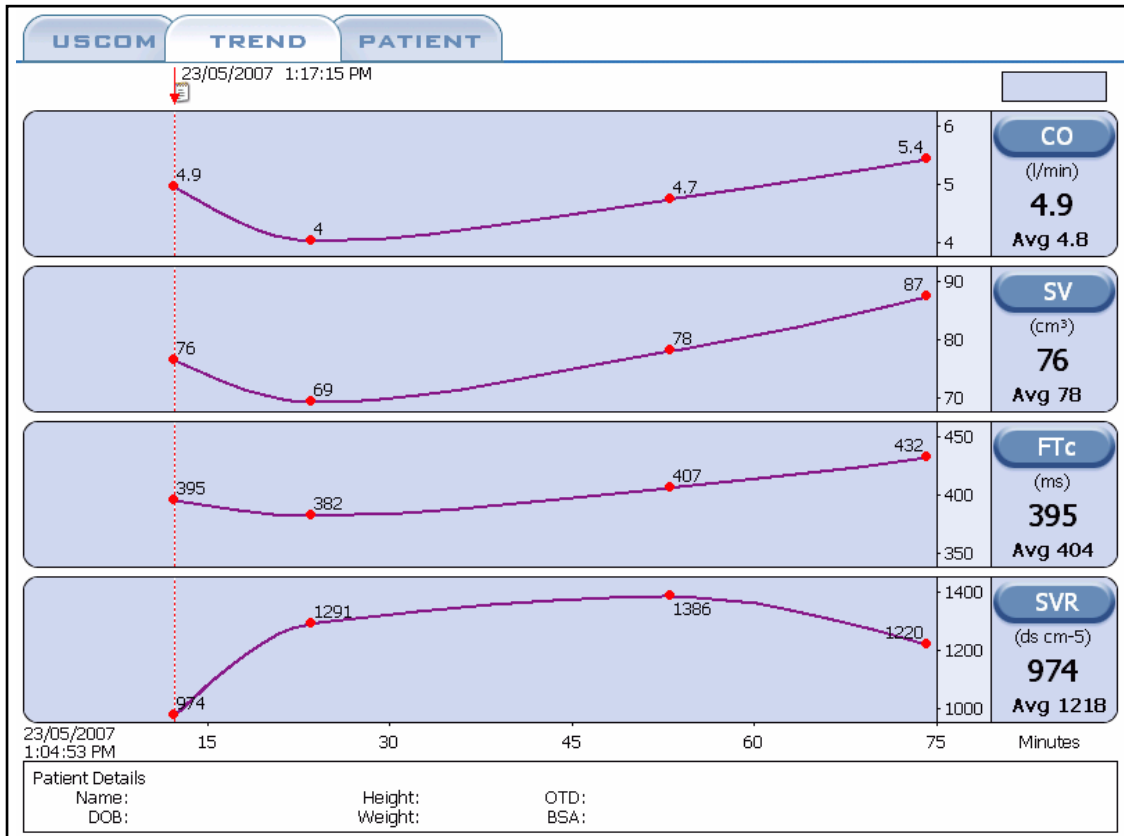


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In this trend screen we see a postoperative hip-replacement patient who has been bleeding steadily in the hour following surgery and has gradually dropped her blood pressure to around 90/45.

The SVR is increasing whilst the cardiac output and stroke volume are falling.

At around the 20 minute mark, transfusion of whole blood commences and as the FTc rises from 382 to 432, we see the stroke volume increasing from 69 to 87 ml whilst the cardiac output rises from 4 to 5.4 litres per minute. Her blood pressure gradually increased throughout this time reaching 125/65. From the trend we can see that the ideal FTc for this patient lies in the region of 425 to 450, again a fairly typical FTc in normovolaemia.

