Rules of 100

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One of the patients you take report on today is a patient admitted with a SAH and has gone on to brain death. The family wishes their loved one to be an organ donor. If you have never had the opportunity to manage an organ donor, you may have questions as to what lies ahead. The transplant coordinator quells your fears and tells you to just think in terms of "**Rules of 100**." What does that mean and what basis does it have in physiology?

Brain death is defined as the irreversible destruction of all neurological tissue of the cerebral cortex and brain stem above the first cervical vertebrae. This results in the cessation of any central regulatory control. Patients can no longer maintain adequate body temperature, blood pressure, and no longer have hormonal controls that, among other things, regulate water balance. Patients that are brain dead also have an increased risk of neurogenic pulmonary edema.

Management principles in organ donor care, therefore focus on correcting problems brought about by treatment directed at keeping cerebral perfusion pressures down, and secondly at preventing complications due to brain death itself. "**Rules of 100**" broadly address these problems.

Temperature of around 100° – Due to the lack of thermoregulatory control, patients that are brain dead cannot maintain a normal body temperature. During herniation, the temperature can go as high as 106° – 107°. Once the herniation is complete, the temperature drops quickly. Preventing the lowered body temperature not only acts to prevent acidosis and D.I.C., but aids in the optimization of other pharmacologic therapy. Most organ donors therefore will require heating blankets and may even require warming of blood and other I.V. fluids as well as warmers added to the ventilator.

Systolic Blood Pressure of 100 mm Hg – Nearly 100% of organ donors, at some time during the donation, will require pressure support with the use of inotropics and other vasopressors. Dopamine is

the first choice, preferably at renal doses. Dobutamine is a second line drug, and can improve cardiac function if there are hypokinetic areas of the heart due to dysfunction caused by brain death itself. This latter finding is poorly understood but is thought to be a sequelae of the depletion of T-3. Neosynephrine, in very low doses can be advantageous in elevating SVR, which is frequently below normal due to the massive vasodilation secondary in brain death. Bringing the SVR up can augment the dopamine/dobutamine. Leveophed and epinephrine are always last line agents due to the severe vasoconstricting effect on internal organ vessels and resultant decrease in blood flow.

P02 of greater than 100 – Optimizing pulmonary function depends on ensuring an adequate hemoglobin for oxygen carrying capacity (Hgb 10/Hct 30) and preventing iatrogenic pulmonary edema due to very aggressive fluid resuscitation. The patient should be maintained on the lowest Fi02 that will maintain a p02 of 100 or greater. Even without aggressive fluid resuscitation, organ donors are at risk of going into neurogenic pulmonary edema due to poor vascular tone and "leaky capillaries" associated with brain death.

Urine output of 100 cc/hr – Patients that have been fluid restricted or have had hypotensive periods are at risk for impaired renal function. It is important to prevent renal failure and correct damage caused by the attempts to preserve brain function as soon as possible after brain death is declared. Oliguria for long periods of time can be indicative of damage to the kidneys. Low urine output due to prolonged hypovolemia can result in acute tubular necrosis when the kidneys are transplanted. If BUN/Creatine are high at the onset of donor management, aggressive fluid resuscitation and normalization of blood pressure can bring down the increased values. This is the goal of management.

Diabetes insipidus is a condition occurring in many donors and is the result of destruction of the hypothalamus. No longer is ADH secreted in response to decrease plasma volume or increased osmotic pressure. Patients excrete large volumes of dilute urine, sometimes as much as 1000 cc/hr. This can be

controlled with a very dilute pitressin drip (10 u/1L D_5W – begin at 0.1 u/hr and titrate to desired effect) to bring urine output down to the desired level over 2 cc/kg/hr.

Pulse of around 100 – In the volume depleted patient, hypotension and tachycardia go hand-in hand. In most cases, when you normalize the blood pressure and replete the volume, the pulse decreases close to normal. This is another soft sign to tell if your volume replacement efforts are working.

Although the "**Rules of 100**" are brief, they nevertheless cover many management issues and can guide the ICU nurse in the proper care of an organ donor.