

# A brief review of the pediatric anatomical and physiological differences and their influence in the recognition of shock

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*Shock is a condition in which the dysfunction of the circulatory system results in inadequate delivery of oxygen and nutrients to meet tissue metabolic demands and the adequate removal of wastes* (Emergency Nursing Association, 2004; Hazinski, 1999). Infants can progress to this state very rapidly, but give us warning signs indicating that this is the direction they are headed. Shock, whether caused by low or maldistributed flow, affects end organ perfusion. This is where we need to be confident in our assessment.

The pediatric anatomy and physiology consist of an immature neurological system (e.g. limited ability to regulate temperature), greater ratios (e.g. body surface area to volume and mass), smaller diameters (e.g. nasal passages), shorter lengths (e.g. cardiac fibres), and an increased metabolic rate (higher cardiac output, with twice the oxygen consumption) resulting in a higher oxygen demand (Emergency Nursing Association, 2004; Mecham, 2006; Smith, 1988) when compared to adults, all of which impede their ability to cope with serious illnesses or injury. They can compensate extremely well, but deteriorate quickly when their compensatory mechanisms fail.

Initially, they will try to increase their oxygen intake by increasing their respiratory rate. They may demonstrate signs of increased work of breathing to try to overcome some of their anatomical immaturities. Nasal flaring (an early sign) is an attempt to decrease airway resistance and increase surface area. Indrawing (moderate to severe respiratory distress sign) is an attempt to use immature accessory muscles to further expand their chest diameter, which is maximally expanded at baseline, due to their horizontal rib orientation (Emergency Nursing Association, 2004). They will increase their heart rate and shunt blood from less important to more important end organs in an attempt to increase delivery. An assessment of their skin

may demonstrate cool fingers and toes (mild to moderate) to cold extremities (severe), pale to mottled to grey color, and delayed capillary refill time, first peripherally and then centrally. Their peripheral pulses may be weak to absent as compared to central, as the shock progresses (Emergency Nursing Association, 2004; Hazinski, 1999; Mecham, 2006; Smith, 1988). Early on, their blood pressure may remain within normal limits, as compensatory mechanisms are working. A low blood pressure is an ominous sign indicating *uncompensated shock* (Hazinski, 2002; Mecham, 2006; Smith, 1988). Along with this, they will demonstrate a decreasing level of consciousness.

As the shock progresses there will be renal and hepatic involvement resulting in multiorgan dysfunction, and, ultimately, death.

Every day, every time we interact with our pediatric patients, we are subconsciously making quantitative and qualitative evaluations as to whether or not the child “looks good or looks bad”. Although we may not be able to articulate our findings, we know it when it is there, and we know it when it is not. 

## References

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