GLOSSARY

Ablation: the removal of material from the surface of an object by vaporization, chipping, or other erosive processes.

Abnormal cerebral venous drainage: Blood is drained from the brain through a network of veins and venous sinuses ('lakes'). Much of the blood eventually drains into the jugular veins. Blockage of a jugular vein, for example because of thrombosis after previous cannulation, results in blood finding alternative pathways.

Acetylcholine: is a chemical neurotransmitter in both the peripheral nervous system (PNS) and central nervous system (CNS), that is it facilitates the passage of the electrical potential across the gap between contiguous nerve fibres.

Aciclovir: an antiviral drug with specific activity against Herpes virus. Because of its relative freedom from side effects it may be used in treating unexplained neurological ('brain') disease in case the virus is responsible.

Acute tubular necrosis: the kidney consists of about a million microscopic units, each consisting of a glomerulus – a tuft of tiny blood vessels and a tubule – a hollow tube carrying the fluid filtered from blood which will go to make up urine. An event causing disruption and death of the cells lining the tubules and which leads to kidney failure has been termed acute tubular necrosis although the term is now regarded as archaic.

Adalat: a tablet form of the drug, nifedipine, manufactured by Bayer. It is used in the treatment of high blood pressure and in the prevention of angina.

Adhesion: the abnormal union of two normally separate tissues.

Adenosine: a nucleoside comprising a molecule of adenine attached to a ribose sugar molecule. Adenosine plays an important role in biochemical processes, such as energy transfer.

Agglutination: adherence together of small bodies in a fluid.

Agonist: a chemical that binds to a receptor of a cell and triggers a response by that cell. Agonists often mimic the action of a naturally occurring substance.

Albumin: a protein that can be dissolved in water which is present throughout all body tissues (egg-white is mostly albumin). Albumin in the

blood is important in maintaining oncotic pressure. Albumin preparations can be given intravenously to boost blood volume when it is dangerously low.

Amnesia: a condition in which memory is lost.

Anaemia: a decrease in haemoglobin, the red pigment in blood which carries oxygen to tissues and takes away carbon dioxide. It is recognised by testing blood.

Angiography: a medical imaging technique using an intravenous dye to visualize the inside, or lumen, of arteries, veins and the heart chambers.

Anoxia: a total decrease in the level of oxygen, an extreme form of hypoxia or "low oxygen".

Antecubital fossa: the triangular cavity at the front of the elbow that contains a tendon of the biceps muscle, the median nerve, and the brachial artery.

Antidiuretic hormone (ADH): also known as vasopressin, it is a chemical (hormone) produced by the hypothalamus at the base of the brain. One of its effects is to inhibit the production of urine by stimulating the kidney tubules to reabsorb some of the water otherwise destined to be passed as urine.

Anti-rejection therapy: the use of certain drugs after a transplantation to prevent the body rejecting the transplanted organ.

Anuria: complete failure to produce urine, generally due to kidney failure. Production of an abnormally low volume of urine is termed **oliguria**.

Aorta: the largest artery in the body – arising out of the left ventricle of the heart, arching leftwards and backwards though the chest to lie alongside the backbone. It exits the chest through a gap in the diaphragm muscle and continues along the spine until it splits into the two common iliac arteries at the level of the umbilicus. Through its branches it provides arterial blood to all the organs of the body.

Apoptosis: the process of genetically programmed cell death. Biochemical events lead to characteristic cell changes, including cell shrinkage, fragmentation and death producing cell fragments called apoptotic bodies that other cells are able to engulf and quickly remove before the contents of the cell can spill out onto surrounding cells and cause damage.

Appendectomy: the surgical removal of the appendix. This procedure is normally performed as an emergency procedure, when the patient is suffering from acute appendicitis (inflammation of the appendix).

Arachidonic acid: a polyunsaturated fatty acid that is present in the membranes of the body's cells, and is abundant in the brain, muscles, liver.

Artefact: a false object or test result. Thus, faulty preparation of a specimen to be looked at through a microscope may contain foreign bodies which can mislead the observer into thinking they are part of the tissue being looked at.

Arterial anastomosis: the joining (stitching) together, surgically, of two arteries (or one artery that has been severed).

Arterial blood pressure: heart muscle, as it contracts ('beats') exerts pressure on the blood flowing through arteries, thus enabling blood to reach the extremities of the body. It is conventionally described using two figures – such as 120/70 - where 120 is the pressure at the height of contraction of the heart ventricles (systolic pressure) and 70 the pressure at the moment of greatest relaxation (diastolic pressure). Both high and low pressures may have important effects on the body's functioning.

Arterial line: a hollow tube (**cannula** or **catheter**) passed through the skin into an artery in order to sample blood, measure pressure and/or deliver injectable material.

Atracurium: a muscle relaxant of short to intermediate duration used in anaesthesia for surgery or intensive care. It allows easy passage of a tube through the larynx (endotracheal intubation) to artificially ventilate ('breathe') a patient and relaxes stomach muscles and diaphragm, allowing surgeons to operate within the abdominal cavity.

Atrophy: the partial or complete wasting away of a part of the body.

Atropine: a drug, prepared originally from the plant Belladonna, which relaxes certain muscles not under conscious control, particularly those of the intestines, bladder, stomach etc. It also reduces the production of saliva and sweat. It used to be used as premedication an hour or so before an anaesthetic but is now rarely used for this purpose. It increases heart rate so may be used to oppose the action of certain other anaesthetic drugs (e.g. neostigmine) which have the opposite effect.

Astrocyte: characteristic star-shaped glial cells in the brain and spinal cord, which perform many functions including the repair of the brain and spinal cord.

Aquaporins: proteins embedded in the cell membrane which regulate the flow of water.

Aqueous solutions: these contain material dissolved in water.

Arginine Vasopressin: a synthetic form of **ADH**, used in the treatment of diabetes insipidus – a condition where the patient does not produce his or her own ADH.

Artefactual: of or relating to an error in perception or information introduced by the involved equipment or techniques.

Augmentin: a brand (made by GlaxoSmith Kline) of the antibiotic co-amoxiclav. It combines amoxicillin, a derivative of penicillin but which can kill a much wider range of bacteria and clavulinic acid, which enhances its effectiveness. It can be given by injection or by mouth.

Axon: a long, slender projection of a nerve cell, or neuron, that conducts electrical impulses away from the neuron's cell body or soma.

Azathioprine: a drug prescribed to transplant recipients to suppress the body's attempts to reject the transplanted tissue. It is one of a group of drugs called immunosuppressants.

Basal cistern: a wide cavity where the arachnoid extends across between the two temporal lobes.

Basal Ganglia: a group of cell collections (nuclei) in the brain. They are situated at the base of the forebrain and are strongly connected with the cerebral cortex, thalamus and other brain areas. The basal ganglia are associated with a variety of functions, including voluntary motor control and procedural learning relating to routine behaviours or "habits".

Baxter's solution: Baxter is a pharmaceutical company which manufactures, amongst other things, fluids for intravenous use and for dialysis. There is no specific 'solution' but the term may be loosely used to describe solutions used in peritoneal dialysis.

Bergman glia: see Glial.

Bilateral fundal haemorrhages: bilateral means 'on both sides of the body.' Fundal haemorrhage means that blood can be seen through an instrument (ophthalmoscope) around that part of the back of the eye where the nerves and blood vessels enter. It is a sign of trauma or of damage to the blood vessels by lack of oxygen or a catastrophic fall in blood pressure.

Bilateral reimplanatation of ureters: see above for 'bilateral'. Ureters are muscular tubes, one on each side of the body, which carry urine from the

kidney to the bladder. When a kidney is transplanted, its ureter has to be sewn into the recipient's bladder – reimplantation.

Blood gas analyser: a machine used to measure the partial pressures of oxygen and carbon dioxide in a blood sample (broadly equivalent to the amount of the gases present). This provides a guide to how well a patient is moving these gases between the outside world, their lungs and their blood. It also measures the acidity of blood (pH), calculates to what extent the body is trying to compensate for abnormal acidity (base excess). Most such machines can also measure the concentrations of electrolytes (chemicals such as sodium) and haemoglobin in the blood. It is often used as a 'near-patient' device as well as being situated in laboratories.

Blood Groups: the four main groups are O, A, B and AB

Bolus: a single dose given relatively rapidly (over a few seconds) usually referring to intravenous use.

Bone profile: A blood test looking at chemicals – calcium, phosphate – and an enzyme alkaline phosphatase. It provides information about the quality of bones, important in renal failure where this can be a serious problem because of loss of calcium.

Boyd's equation: a rapid method of calculating body surface area if you know a person's height and weight, by reading it off from a chart. Surface area is often used to calculate drug doses, especially in children.

Brachiocephalic vein: a vein which supplies blood to the right arm, head and neck.

Brain stem death test: now that people can be kept alive artificially by mechanical ventilation and with drugs to enhance heart function, it may be difficult to determine precisely when death occurs. The brain stem is that part of the brain which controls such automatic activity as breathing and heart rate, so if it is damaged beyond repair, and artificial ventilation is withdrawn there is no chance whatsoever of survival. Thus, when deciding when to advise a family that artificial means should stop, a series of tests are done by two doctors, at some hours apart, that include checking various responses which would be present if the brainstem is still functioning. They must be sure that the coma is not caused by drugs or any correctable biochemical abnormality. The responses checked include reaction to a painful stimulus, lack of eye movements with fixed, dilated pupils; no gag or cough reflex and no resumption of breathing after stopping artificial ventilation for up to 8 minutes.

British National Formulary: a publication of the British Medical Association and Royal Pharmaceutical Society of Great Britain, now in its 62nd edition, which lists all drugs available for use with the licensed reasons for using them (indications), side-effects, prohibitions on using them in a particular person (contraindications), dosages, routes of administration (by mouth or by injection etc) and whether they are over-the-counter or prescription only.

Broviac line: an intravenous catheter most often used for the administration of chemotherapy or other medications, as well as for the withdrawal of blood for analysis. Some types of Broviac lines are used mainly for the purpose of apheresis or dialysis. Broviac lines may remain in place for extended periods and are used when long-term intravenous access is needed.

Cannula: A short, narrow hollow tube which can be inserted into a blood vessel (and left there for a time) through which to take samples or deliver medication. If a cannula becomes dislodged, such that fluid being run into it enters the tissue outside a blood vessel, it is termed 'tissuing' and has to be removed and replaced.

Carina: the point of division of the main airway.

Carotid Artery: one of two pairedarteries (right and left) that supply the head and neck with oxygenated blood.

Catecholamines: molecules that have a nucleus consisting of benzene with two hydroxyl side groups, and a side-chain amine. They include dopamine, as well as the "fight-or-flight" hormone adrenaline released by the adrenal glands in response to stress.

Catheter: longer hollow tubes than cannulas which are inserted into the body: they include cardiac catheters (passed along a vein into the heart to make measurements and assist in performing certain X-rays) **suprapubic catheters** (inserted through the skin and muscle just above the pubic bone into the bladder to drain urine), **urethral catheters** (passed into the urethra – the tube which carries urine from the bladder to the outside), **ureteric catheters** (passed from the bladder up the ureters to inject material which shows up on X-rays or scans and to sample urine from the kidney.

Central venous line: a **cannula** or **catheter** passed into a large vein, often in the neck, and threaded up into the vena cava, the major vein draining into the heart. It is used when the alternative might be multiple cannula insertions, for example in a child with leukaemia who needs numerous samples taken for testing and drugs and transfusions over many months. The line can also be used to judge heart and circulation function by measuring pressures (see below). Very premature newborn babies may need a central line through

which to provide nourishment before they can take milk adequately by mouth.

Central venous pressure (CVP): measured through a **central venous line.** This is a measure of the pressure of blood in one of the main veins draining into the heart (superior or inferior **vena cava**) so represents the pressure inside the right atrium, the chamber of the heart which receives venous blood back from the body. It offers a guide to the amount of blood returning to the heart and the ability of the heart to pump that blood out into the arterial system. It is affected by various events, including whether or not the circulation needs more fluid in it for the heart to pump blood effectively or the opposite, whether the circulation is overloaded, so putting a strain on the heart. As such knowing the CVP is of value to anaesthetists and intensive care doctors in adjusting intravenous fluid replacement.

Cerebellar tonsil: a rounded lobule on the undersurface of each cerebellar hemisphere.

Cerebellum: that part of the brain involved with balance and co-ordination.

Cerebral autoregulation: an adaptive mechanism that plays an important role in maintaining an appropriate blood pressure within vessels supplying brain tissue.

Cerebral oedema: an excess of fluid within and surrounding brain cells. It has many causes, including head trauma, infections such as meningitis, a prolonged epileptic fit, and starvation of the brain's oxygen supply. It can result also from hyponatraemia and diabetic ketoacidosis. Since the brain is inside the rigid box of the skull, any increase in its volume by the presence of oedema leads to increased pressure on the brain. The effect is that pressure within the brain increases. This, in turn, restricts the amount of venous blood able to drain from the brain, which tends to increases oedema still more. The result is the patient becomes comatose (unconscious). Eventually, parts of the brain, particularly the brainstem are pushed down through the foramen magnum, the hole in the base of the skull which accommodates the upper part of the spinal cord. This impairs blood supply to the brainstem which may fail leading to loss of control over the heart, blood pressure and breathing. Sudden death may result.

Cerebral palsy: an umbrella term encompassing a group of non-progressive, non-contagious motor conditions that cause physical disability in human development, chiefly in the various areas of body movement.

Cerebral perfusion pressure (**CPP):** the net pressure gradient causing blood flow to the brain (brain perfusion).

Cerebrospinal fluid (**CSF**): a clear, colorless, bodily fluid, that occupies the subarachnoid space and the ventricular system around and inside the brain and spinal cord. In essence, the brain "floats" in it.

Cervical cord: that part of the spinal cord situated in the neck.

Chemoreceptor: a sensory receptor that converts a chemical signal into an electrical action potential. In more general terms, chemoreceptors detect certain chemical stimuli in the environment.

Chiari malformation: a malformation of the brain. It consists of a downward displacement of the cerebellar tonsils through the foramen magnum (the opening at the base of the skull).

Cingulate gyrus: a part of the brain situated in the medial aspect of the cerebral cortex usually considered part of the limbic lobe, separate from the adjacent frontal and parietal lobes.

Circle of Willis: a circle of arteries that supply blood to the brain. It is named after Thomas Willis (1621–1675), an English physician.

Circulating nurse ('runner'): a nurse, working in an operating theatre who is not 'scrubbed up' and can therefore handle non-sterile material, unlike the operating surgeons and their **scrub nurse**. The circulating nurse has many tasks, including fetching sutures, collecting and weighing discarded swabs to assess blood loss, placing them on a rack for counting and checking at the end of the operation. The circulating nurse is available to connect up replacement fluid or blood packs to drips and to fetch extra equipment or instruments at the request of the scrub nurse. The circulating nurse can also assess or measure the amount of blood or other fluids draining from **catheters** etc.

Circulatory Arrest: an alternative phrase for 'cardiac arrest'.

Cirrhosis: a consequence of chronic liver disease characterized by replacement of liver tissue by fibrosis, scar tissue and regenerative nodules (lumps that occur as a result of a process in which damaged tissue is regenerated), leading to loss of liver function.

Coagulation screen: a standard set of tests of blood, performed in a haematology laboratory, which show if a person has any abnormality of the blood clotting system.

Cockcroft-Gault formula: a method of calculating creatinine clearance (see below) from knowledge of the blood creatinine level and the person's age, height and weight.

Cold ischaemic time: ischaemia means a deficient blood supply which, in turn, results in a lack of oxygen and nutrients to the tissue in question. Ischaemia, if it continues, can lead to damage to cells which may be permanent or even cell death ('necrosis'). If a tissue is kept cold, it can stand ischaemia for much longer than if it is warm or at body temperature. When performing a transplant, therefore, strenuous attempts are made not to allow the donor organ to 'warm up'. For the surgeon to judge if the organ, such as a kidney, is likely to survive ('viability') he or she needs to know the cold ischaemia time – calculated from the time it is removed form the donor until placed in the recipient and the arteries anastomosed (see above) and that any warm ischaemia time has been a bare minimum.

Colloid: a substance microscopically dispersed evenly throughout another substance.

Common iliac artery: the **aorta**, the main artery arising from the heart and travelling through the chest into the lower part of the body splits into left and right common iliac arteries when it reaches the lower back.

Common iliac vein: the left and right common iliac veins lie on either side of the pelvis, formed from the junction of the internal and external iliac veins. They meet in the lower back, at the level of the fifth lumbar vertebra, to form the inferior **vena cava**, the main vein returning blood from the legs and lower trunk to the heart.

Complete mixing: a concept quoted by Dr. Malcolm Coulthard, one of the experts reporting to the Inquiry about intravenous fluid administration. He defines it at page 11 of his report dated 4th December 2010 as follows: "the theoretical situation where all of the sodium and water infused as N/5 saline is completely mixed with the body's entire fluid volume." He contrasts it with 'zero mixing' which he defines, also at page 11 of that report, as "the concentration that would theoretically be achieved if the N/5 saline was mixed evenly into the [blood] plasma water but that none of it was redistributed from there into the rest of the water in the body."

Concomitant: happening at the same time as something else, especially because one thing is related to or causes the other.

Congenital nephrotic syndrome: a generic term for several conditions characterised by abnormally functioning glomeruli – the million or so filtering bodies in the kidneys and which are present at (and before) birth.

Congenital obstructive uropathy: any condition present at birth in which drainage of urine from the kidney is obstructed at a point between the kidney pelvis (into which all the kidney tubules drain) and the bladder and urethra.

The result is that back pressure from the obstruction to flow of the urine causes damage to kidney tissues.

Coning/coned: (more correctly 'transforaminal herniation') a shorthand term used to describe the downward displacement of the brain stem into the foramen magnum, the large hole in the base of the skull where the brain joins the spinal cord. The cause is raised intracranial pressure and the result can be sudden death or coma leading to eventual brain death.

Consultant paediatric anaesthetist: a consultant who regularly anaesthetises children.

Contractile Proteins: the proteins responsible for the contraction of muscle tissue.

Cortex: the outermost or superficial layer of an organ.

Cranial: adjective relating to the cranium or skull.

Creatinine: a breakdown product of protein which can be measured in blood and urine. The higher the blood creatinine (and the lower the urinary creatinine) the less well the kidney is functioning. By calculating what proportion of creatinine filtered by the kidney is eradicated, the 'creatinine clearance' is calculated, which approximates to the glomerular filtration rate – a measure of kidney function.

Cross-matching: a method of comparing a person's blood or tissue with that of a potential donor to make sure they are compatible. If they are not, then the recipient is likely to produce antibodies to the transfused blood or transplanted organ which may destroy it.

CT scan: an imaging technique relying on a computerised analysis of multiple x-rays, taken at different levels, which are reconstructed to show a two- or three-dimensional image of the organ concerned.

Cyclase: an enzyme, almost always a lyase, that catalyses a chemical reaction to form a compound.

Cycles of dialysis: in **peritoneal dialysis**, fluid is run into the peritoneal cavity (the 'inside of the abdomen') left for a time and then run out again. While within the peritoneum, the chemistry of the person's blood gradually equalises with that of the dialysis fluid. The process is repeated several times over a number of hours, each 'in and out' being referred to as a cycle.

Cystatin C: a protein, measured in a blood sample, which provides an accurate assessment of kidney function.

Cytomegalovirus (CMV) titre: CMV is a common virus but one which rarely causes disease in healthy people. It is, however, potentially dangerous for people whose immune system is not working well, either from disease or the use of immunosuppressive drugs, as in those who have received transplants. To determine if a person (donor or recipient) has been infected with the virus, in the past one can measure the concentration of antibody to the virus that the person has produced – called CMV titre.

Cytoscopy: An examination of the inside of the bladder and urethra, the tube that carries urine from the bladder to the outside of the body.

Decerebrate movement: the cerebrum is the part of the brain which, amongst other things, controls all voluntary activity. If the cerebrum is not functioning adequately as a result of disease, toxin, seizures etc. the person may show characteristic muscle spasms which throw them intermittently or continuously into an abnormal posture.

Dehydration: a deficiency of fluid in the body caused by insufficient intake, excessive output (of urine, faeces, sweat etc) or both. Minor degrees of dehydration are common in illness and may be of no consequence. As the person becomes more dehydrated, however, especially if combined with abnormality of the blood chemistry (high or low sodium, potassium, acidity etc) then various body functions may deteriorate.

Dentate nucleus: located within the deep white matter of each cerebellar hemisphere, it is the largest single structure linking the cerebellum to the rest of the brain.

Dextrose: an alternative term for 'glucose'.

Dialysate; fluid used for peritoneal dialysis (see **Cycles**).

Diastole: the period of time when the heart fills with blood after systole (contraction).

Diffuse Oedema: Oedema is an abnormal accumulation of fluid within the body. It can be localised, for example present only in organs such as lungs or brain or it can involve the whole body – when it is termed generalised or diffuse.

Dilutional hyponatraemia: see hyponatraemia

Dioralyte: a proprietary powder (made by Rhone-Poulenc) containing glucose and salts in concentrations which, when dissolved in water, represent the best way of restoring by mouth fluid lost as a result, say, of diarrhoea or dehydration generally.

Dopamine: used in resuscitation and intensive care, this drug is always given by intravenous infusion. It is a heart stimulant which increases the force produced by heart muscle when it contracts. In low doses it may also increase the blood supply to vital organs by dilating blood vessels.

Double or triple lumen line: A **cannula** or **catheter** with two or three separate channels. This allows separate routes of sampling, measurements and drug delivery.

Dura mater, or **dura**: the outermost of the three layers of the meninges surrounding the brain and spinal cord.

Dynamic trace: an indication that the real time wave form is influenced by heart and respiratory function. If a trace is flat or not influenced by heart or respiratory function it suggests either that the catheter lumen is obstructed or that the catheter tip is not being directly influenced by pressure within a central vein.

Dysplasia: a term used in pathology to refer to an abnormality of development of tissues or an entire organ. This generally consists of an expansion of immature cells, with a corresponding decrease in the number and location of mature cells.

Dysplastic kidneys: dysplastic means abnormally formed. The term is used to describe kidneys which contain within them tissue that should not be present, such as muscle and cartilage; fluid filled spaces – cysts – are common. The condition arises before birth and the kidneys are often very small and function poorly.

Electrolytes: a term used to describe the elements of the common salts in blood, such as sodium, potassium, chloride and bicarbonate.

Embolus: any detached, traveling intravascular mass (solid, liquid, or gaseous) carried by circulation, which is capable of clogging arterial capillary beds (create an arterial occlusion) at a site distant from its point of origin.

Endonucleases: enzymes that cleave the bond within a polynucleotide chain.

Endoscopy: an examination inside the body for medical reasons using an endoscope, an instrument used to examine the interior of a hollow organ or

cavity of the body. Unlike most other medical imaging devices, endoscopes are inserted directly into the organ.

Endothelium: the thin layer of cells that line the interior surface of blood vessels and lymphatic vessels, forming an interface between circulating blood and lymph in the lumen and the rest of the vessel wall.

Endotracheal tube: a catheter that is inserted into the trachea in order for the primary purpose of establishing and maintaining a patent airway and to ensure the adequate exchange of oxygen and carbon dioxide.

Enteral Feeding: to give a patient a liquid, low residue food through a naso- or oro-gastric feeding tube.

Eosinophilic: refers to the staining of certain tissues or cells, after they have been washed with eosin, a dye.

Epidural: a form of regional analgesia involving injection of drugs through a catheter placed into the epidural space.

Epileptogenic: capable of producing epileptic seizures.

Excitotoxicity: the pathological process by which nerve cells are damaged and killed by excessive stimulation by neurotransmitters such as glutamate and similar substances.

Expiration: the movement of air out of the bronchial tubes, through the airways, to the external environment during breathing.

External iliac artery: each of the two common iliac arteries (see above) divide in two to form the external iliac arteries which run from the lower back to the groin where they continue as femoral arteries.

Extracellular fluid: the body contains fluid conventionally divided into two areas, or compartments. Fluid inside cells is termed intracellular, and that outside is extracellular. The latter is divided into intravascular – inside blood vessels and interstitial – the remainder.

Extraperitoneal procedure: the peritoneum is a membrane which envelopes the inner surface of the abdomen. Lying within it (the peritoneal cavity) are the intestines, liver, spleen and other organs. An extraperitoneal procedure is an operation in which the peritoneal cavity is not entered.

Fibrinogen: a soluble plasma glycoprotein, synthesised by the liver, that is converted into fibrin during blood coagulation.

Fixed, dilated pupils: the pupils of the eyes contract and dilate in response to the brightness of light and the distance to which the person is looking. Severe damage to the **brain stem** leads to the pupils not reacting to these stimuli and remaining large in diameter.

Fixing of the brain: the process by which the brain is fixed in a solution of formalin for up to two weeks in order to make it easier for the neuropathologist to examine.

Fluoroscopy: an imaging technique commonly used by physicians to obtain real-time moving x-ray images of the internal structures of a patient through the use of a radiological instrument termed a fluoroscope.

Foley catheter: a flexible tube that is passed through the urethra and into the bladder.

Foramen magnum: a large hole in the base of the skull. It is the point at which the **brainstem** merges into the upper part of the spinal cord.

Fractional excretion rate: This is calculated as the proportion of sodium passing through the kidney that is actually filtered into the urine. It is worked out from the results of measuring blood and urinary sodium and applying a formula. It is useful in evaluating acute kidney failure to discover if a reduced blood circulation might be responsible and it also provides information on the ability of renal tubules to reabsorb water filtered into them from the blood.

Free Radicals: where radicals are atoms, molecules, or ions with unpaired electrons or an open shell configuration, free radicals may have positive, negative, or zero charge. With some exceptions, the unpaired electrons cause radicals to be highly chemically reactive.

Free water: this is a term used to describe the theoretical proportion of water in blood or urine which can be recognised or calculated as containing no dissolved solutes. Thus, the kidney produces urine which can be thought of as a mixture of water containing dissolved salts (solute) and 'pure' water. Similarly if one receives an intravenous infusion which contains water, glucose and salt it is possible to calculate what proportion of it will be recognised by the kidney as being water only. The amount of 'free water' in the blood is normally very closely controlled, mainly by various hormones that affect kidney function. If a person's blood contains an excess of free water, a normal kidney will excrete it as urine; if they have a deficiency of free water, perhaps through dehydration, a healthy person will produce **antidiuretic hormone** which cuts down the amount of free water lost in the urine.

Frontal white matter: the brain and spinal cord (central nervous system) contain cells (termed 'grey matter') and nerve fibres ('white matter'). Thus the term means nerve fibres within the frontal lobe of the brain.

Full blood picture: blood consists of plasma, which contains proteins such as **albumin** and solutes such as **electrolytes**. Blood also contains red cells carrying oxygen and carbon dioxide, white cells responsible for combating infection (e.g. by producing antibodies to bacteria) and platelets, involved in the clotting system. A sample of blood can be tested by the laboratory to determine the proportions of all these components – a full blood count or picture.

Fundoplication: Suture of the fundus of the stomach completely or partially around the gastroesophageal junction to treat gastroesophageal reflux disease; can be performed by open abdominal or thoracic operation, or a laparoscopic approach.

Ganglion: a biological tissue mass, most commonly a mass of nerve cell bodies.

Gastroesophageal reflux disease: chronic symptoms or mucosal damage caused by stomach acid coming up from the stomach into the esophagus. A typical symptom is heartburn.

Gastrointestinal losses: Loss of fluid and **electrolytes** from the gut, usually by the production of faeces but, in abnormal circumstances by vomiting and/or diarrhoea. This has to be taken into account when prescribing fluids for a child.

Gastrostomy tube and button: some children are not able to take adequate nourishment by mouth so have a plastic tube inserted through the wall of the abdomen into their stomach through which they are fed. The tube ends at a flat disc sewn onto the abdomen (the button) to which a feeding tube can be attached.

Gentamycin: an antibiotic, given by intravenous or intramuscular injection, used for significant infection with certain bacteria, such as pseudomonas and klebsiella.

Glial: non-neuronal cells that provide support and protection for neurons in the brain, and for neurons in other parts of the nervous system such as in the autonomous nervous system.

Gliosis: the proliferation of astrocytes in damaged areas of the central nervous system, usually resulting in scarring.

Glomerular filtration rate (GFR): Every minute the kidneys filter about 1300 mls of blood (in an adult) and every day about 180 litres of water pass in and out of the kidney tubules. The rate at which the kidneys filter out fluid free from fats, protein or cells is termed the GFR and is a measure of the adequacy of kidney function.

Glomerulus: one of 2 million filtering units in the kidney in which blood in very thin walled capillaries comes into contact with the smallest component of the tubules which conduct the flow of urine.

Glutamate: alternative word for glutamic acid which is a non-essential amino acid. The carboxylate anions and salts of glutamic acid are known as glutamates. In neuroscience, glutamate is an important neurotransmitter that plays a key role in learning and memory.

Glycopyrrolate: an **atropine**-like drug used by anaesthetists to increase heart rate, commonly to oppose the action of certain other anaesthetic drugs (e.g. **neostigmine**) which have the opposite effect.

Glycolysis: the metabolic pathway that converts glucose into pyruvate (an organic acid).

Gyrus: a ridge on the cerebral cortex. It is generally surrounded by one or more sulci.

Haematocrit: a measure of the proportion of blood which is solid (that is consisting of blood cells) and liquid (plasma) determined by spinning a small blood sample in a centrifuge. It is useful in determining the severity of **anaemia.** It is also used as a crude measure of hydration.

Haematoma: a localized collection of blood outside the blood vessels, usually in liquid form within the tissue. This distinguishes it from an ecchymosis, which is the spread of blood under the skin in a thin layer, commonly called a bruise.

Haemoglobin: the red pigment in blood which carries oxygen to tissues and takes away carbon dioxide.

Haemorrhage: the escape of blood from any of the blood vessels, normally in response to trauma.

Hagen–Poiseuille equation: a physical law that gives the pressure drop in a fluid flowing through a long cylindrical pipe. The assumptions of the equation are that the flow is laminar viscous and incompressible and the flow is through a constant circular cross-section that is substantially longer than its diameter.

Hand ventilated: artificial ventilation produced by a doctor or nurse squeezing a rubber bag connected to a mask or tube delivering air and/or oxygen to a patient. It is usually done while awaiting connection of the patient's breathing circuit to a mechanical ventilator.

Hartmann's solution: an intravenous solution containing sodium chloride (salt), sodium lactate, potassium and calcium chloride. The sodium concentration is similar to that of the blood.

Hepatocyte: a cell of the main tissue of the liver.

Herniation and compression of the brain stem: see **coning**.

Heterogeneous: relating to lack of uniformity or within a substance. Its opposite is homogeneous, where there is uniformity in composition or character.

Hindbrain: that part of the brain which includes the medulla, pons, and cerebellum.

Hippocampus: a major component of the brain, it belongs to the limbic system and plays important roles in the consolidation of information from short-term memory to long-term memory and spatial navigation.

Histological slides: refers to thin slices of tissue applied to a microscopic slide, usually around 5 to 10 micrometres thick, which are viewed under a microscope.

Histopathology: refers to the microscopic examination of tissue in order to study the manifestations of disease.

Homeostasis: the property of a system that regulates its internal environment and tends to maintain a stable, constant condition of properties like temperature or pH. It can be either an open or closed system.

Human leucocyte antigen (HLA): these are complex antigens (that is protein capable of inciting an immune reaction) found in most tissues of the body. They are situated on a particular chromosome at four sites (called A, B, C and D) and there are numerous variants at each of these (coded 1, 2, 3 etc). The number of combinations is thus very high so the chances of unrelated people having a similar HLA profile is very low. Incompatibility between donor and recipient HLA can cause rejection.

Human Plasma Protein Fraction (HPPF): A mixture of **albumin,** other proteins and saline, largely equivalent to blood (from a donor) from which the

cells have been removed. It can be used in the emergency treatment of bleeding until blood becomes available.

Hydrolysis: a chemical reaction during which molecules of water (H_2O) are split into hydrogen cations (H^+, conventionally referred to as protons) and hydroxide anions (OH^-) in the process of a chemical mechanism.

Hypercapnia: also known as hypercarbia, is a condition where there is too much carbon dioxide (CO_2) dissolved in the blood. Carbon dioxide is a gaseous product of the body's metabolism and is normally expelled through the lungs.

Hypercarbia: see Hypercapnia above.

Hyperkalemia: refers to the condition in which the concentration of the electrolyte potassium (K^+) in the blood is elevated.

Hypernatraemic: (from the Latin *natrium*, meaning sodium and *haem* – blood) this refers to a concentration of sodium in the blood that is higher than normal. It is caused either by excessive salt intake or by water loss in excess of that of salt.

Hypertension: raised blood pressure.

Hypertonic infusion: delivery of an intravenous fluid which has a higher **osmotic pressure** than blood. **Osmotic pressure** develops when there are more molecules on one side of a semi-permeable membrane, such as a cell wall, than the other. The result is that water tends to flow through the membrane into the more concentrated solution until the concentrations are equal on both sides of the membrane.

Hypoglycemia: the medical term for a state produced by a lower than normal level of blood glucose.

Hyponatraemia: see also **hypernatraemia**. This is when the blood level of sodium is lower than normal either because of an excess excretion of sodium over intake or, more commonly, by an excess of water intake over output (referred to as 'dilutional hyponatraemia'). Mildly reduced sodium levels do not cause problems but a rapid fall of sodium or very low levels can cause major disruption of body cells, unless countered by excreting **free water** (see above) through the kidneys or the introduction of extra sodium in the form of a hypertonic saline infusion.

Hypothermia: a core body temperature of less than 35 degree Celsius.

Hypovolaemia: this means reduction in the volume of circulating blood. Initially the body compensates by increasing the heart rate to pump more blood round and by small blood vessels such as those in the skin contracting to divert flow to major vessels and vital organs. Ultimately, this 'compensation' cannot be maintained and the patient goes into shock, whereby insufficient blood is being pumped, blood pressure falls and vital organs are starved of blood (and therefore oxygen).

Hypoxia: a reduction in the amount of oxygen available in the body as a whole, such that normal vital organ function is affected adversely, typically in reference to the brain.

Hypoxic damage: damage caused to any organ by the effect of hypoxia (see above).

ICU: Intensive Care Unit.

Iliac fossa: the internal concavity of the iliac bone, the bone forming the largest boundary of the pelvis. It contains within it organs such as the ilium, caecum and appendix. When examining a patient's abdomen, it is arbitrarily divided into three parts on each side, the lowest being termed the right and left iliac fossae. The right iliac fossa is the commonest site of pain and tenderness in acute appendicitis.

Infarcted: tissue that has died through failure of its blood (and therefore oxygen) supply.

Infusion: the intravenous or subcutaneous injection of one of a variety of solutions used in the treatment of **dehydration** and/or **electrolyte** imbalance or as a vehicle for drugs, such as antibiotics.

Inspiration: the movement of air from the external environment, through the air ways, and into the alveoli of the lungs.

Ion: an atom or molecule in which the total number of electrons is not equal to the total number of protons, giving it a net positive or negative electrical charge.

Ischaemia: see **Cold ischaemic time**.

Ischaemic-hypoxic damage: usually used in reference to brain injury resulting from reduction in blood flow (ischaemia) and lack of oxygen (hypoxia). It is usually caused by cardiac arrest or profound hypotension. The clinical pattern and outcome depend on the severity of the initial insult, the

effectiveness of immediate resuscitation and transfer, and the post-resuscitation management on the intensive care unit.

Insensible losses: fluid lost as sweat, in the breath and in normal stools, so not easily measurable in the way that urine and vomitus can be. When calculating how much fluid a person needs, the insensible losses have to be taken into account.

Interstitial fluid: see **extracellular fluid**.

Intracellular fluid: see **extracellular fluid**.

Intracranial pressure (**ICP**): the pressure inside the skull and thus in the brain tissue and cerebrospinal fluid (CSF).

Intraperitoneal space: see **extraperitoneal**.

Intrauterine: of or related to the uterus.

Intravascular: of or relating to the blood vessels.

Intubated: the presence of a tube (endotracheal or ET tube) through the mouth or nose and into the larynx in order to provide a stable and secure airway when resuscitating or artificially ventilating a patient.

Ipsilateral Cranial Nerve: the cranial nerve which is on the same side as another structure.

Isotonic solution: one with broadly the same osmolar pressure (and so the same sodium concentration) as blood plasma.

Jugular venous pressure: (JVP) the indirectly observed venous pressure wave seen in the external jugular veins in the neck. It can be useful in the diagnosis of actual or potential right heart failure.

Lactic acidosis: a physiological condition characterized by low pH in body tissues and blood (acidosis) accompanied by the buildup of lactate.

Laparotomy: the act of opening the abdomen when performing an operation.

Leukoaraiosis: a term for nonspecific changes in the cerebral white matter that can be detected with high frequency by CT and MRI in aged individuals.

Ligation: the creation of a ligature- a suture typically tied around a vessel to seal it off.

Lumbar: a term used to denote the region of the back lying lateral to the lumbar vertebrae.

Lumbar epidural: placement of a **cannula** into the epidural space – that is a space near but outside the spinal cord – through which local anaesthetic and analgesic 'pain-killing') drugs can be delivered to produce anaesthesia of the lower part of the body without necessarily having to render the patient unconscious.

Lumen line: a line inserted into the inside space of a tubular structure, such as an artery or intestine.

Lymph nodes: swellings which occur at various points in the lymphatic system through which lymph (a watery fluid derived from blood and absorbed food material) drains.

Macrophages: cells whose role is to engulf and then digest cellular debris and pathogens, either as stationary or as mobile cells.

Macroscopic: the length scale on which objects are of a size which is measurable and observable by the naked eye.

Maintenance rate: for a patient on intravenous fluids who is not **dehydrated** and who is not undergoing abnormal losses of body fluid, the maintenance rate is that which covers ongoing losses (from urine etc) and **insensible losses**. It is calculated by reference to weight or body surface area.

Major Surgery: a). A surgical operation within or upon the contents of the abdominal, pelvic, cranial, or thoracic cavities b). A procedure which, given the locality, condition of patient, level of difficulty, or length of time to perform, constitutes a hazard to life or function of an organ or tissue c). any surgical procedure that involves anaesthesia or respiratory assistance.

Mannitol: an osmotic diuretic – that is a solution of very high molecular weight which is designed to provoke rapid excretion of **free water** through the kidney when given intravenously. It is part of the emergency treatment of **cerebral oedema** and **raised intracranial pressure**.

Mean Arterial Pressure (MAP): a term used in medicine to describe an average **arterial blood pressure** in an individual during a single cardiac cycle. Thus, if blood pressure is 120/70, MAP is 95.

Mediastinum ('mediastinal"): is a non-delineated group of structures in the thorax, surrounded by loose connective tissue.

Medulla oblongata: the lower half of the brainstem.

Medullary Cystic (kidney disease): a dominantly inherited kidney disorder characterized by cysts in both kidneys and tubulointerstitial sclerosis leading to end-stage renal disease.

Membrane pump: an alternative term for a diaphragm pump- which may be used as artificial hearts.

Meninges: the three membranes that envelop the brain and spinal cord.

Mesenchyme: is a type of undifferentiated loose connective tissue. The term mesenchyme essentially refers to the morphology of embryonic cells.

Metabolic coupling: the transfer between tissue cells in contact, of low molecular weight metabolites such as amino acids.

Metabolic regulation: the process which allows organisms to respond to signals and interact actively with their environments.

Metabolism: the set of chemical reactions that happen in living organisms to sustain life. These processes allow growth and reproduction.

Microglia: a type of cell that is the resident of the brain and spinal cord, and thus acts as the first and main form of active immune defense in the central nervous system.

Microscopic: the scale of size or length used to describe objects smaller than those that can easily be seen by the naked eye and which require a lens or microscope to see them clearly.

Microvascular: of or relating to the small blood vessels.

Mitochondrion (plural mitochondria): a membrane-enclosed organelle found in most eukaryotic cells. Mitochondria are sometimes described as "cellular power plants" because they generate most of the cell's supply of adenosine triphosphate (ATP), used as a source of chemical energy.

Monro-Kellie principle: this hypothesis states that the cranial compartment is incompressible, and the volume inside the cranium is a fixed volume. The cranium and its constituents (blood, CSF, and brain tissue) create a state of volume equilibrium, such that any increase in volume of one of the cranial constituents must be compensated by a decrease in volume of another.

Morbidity and mortality meetings: in most hospital departments there are regular meetings of medical, nursing and other clinical staff to discuss

patients who have died (mortality) or suffered a serious adverse event (morbidity). The aim is to determine what went wrong, whether it was preventable and what can be done in future to prevent such disasters. Traditionally these meetings were informal and minutes were not kept with the responsible consultant being expected to take any needed action. More recently and in some hospitals, meetings of this type have become more organised and formal with published accounts of what is to be done.

Multivariate: of or relating to a number of different variations.

Myelin: an electrically insulating material that forms a layer, the **myelin sheath**, usually around only the axon of a neuron. It is essential for the proper functioning of the nervous system.

Myelinolysis: a neurological disease caused by severe damage of the myelin sheath (a substance made up of protein and phospholipids that surround the axons of some neurones) of nerve cells in the brainstem.

Myogenic: of or giving rise to the formation of muscle tissue.

Na+ and K+ electrodes: the parts of a piece of laboratory apparatus which measure concentrations of sodium (Na+) and potassium (K+).

Nail bed stimuli: pressing on the nail bed (the junction of a nail and skin) provokes pain. The person's response depends upon their brain function so the test may be used as a guide to the severity of coma.

Necrosis: the premature death of cells and living tissue, caused by factors external to the cell or tissue, such as infection, toxins, or trauma.

Neonate: refers to an infant in the first 28 days after birth.

Neostigmine: a drug used by anaesthetists to reverse the action of certain muscle relaxants (e.g. **atracurium**). It acts within a minute of being injected intravenously and lasts 20-30 minutes so is used at the end of an operation to enhance recovery.

Nephrogenic diabetes insipidus: a condition in which the kidney is unable to respond to the hormone **vasopressin (ADH)**. Patients with this condition cannot retain water so are in grave danger of **dehydration**. It is usually congenital, that is present from birth and is characterised by excessive passage of urine (**polyuria**) and thirst (polydipsia) leading to episodes of **hypernatraemia**, dehydration, fever, constipation and vomiting.

Nephrology: the branch of medicine concerned with the study and management of kidney disease.

Nephrons: a term applied to the 2 million individual microscopic filtering units of the kidneys which consist of **glomeruli** and tubules.

Nephrostomy: an artificial opening created between the kidney and the skin which allows for the drainage of urine directly from the upper part of the urinary system (renal pelvis).

Neuromuscular blockade: the process by which an anesthetist delivers drugs which induce temporary muscle paralysis. Always given along with drugs used to induce sleep and pain prevention.

Neuron: an electrically excitable cell that processes and transmits information by electrical and chemical signaling.

Neuropathology: the study of disease of nervous system tissue, usually in the form of either small surgical biopsies or whole autopsy brains.

Neuropathy: usually refers to peripheral neuropathy, which denotes damage to nerves of the peripheral nervous system.

Neuropeptides: any of several types of molecules found in brain tissue, composed of short chains of amino acids including endorphins, vasopressin, and others. They are often localized in synapses and are classified as putative neurotransmitters, although some are also hormones.

Non-pulsatile: the term 'pulsatile' indicates a state of rhythmic pulsation, eg. the heart beating, which will affect the pressure in blood vessels leaving or entering the heart (this is termed pulsatile pressure). A non-pulsatile wave form implies that the expected variations are not being transmitted from the heart, suggesting the catheter may be misplaced or the vessel in which it is situated is blocked.

Norepinephrine: also called noradrenaline, this is a molecule with multiple roles including as a hormone and a neurotransmitter. Areas of the body that produce or are affected by norepinephrine are described as noradrenergic.

Normotensive: of or relating to normal values of blood pressure.

Nuclei: the control centres of a cell, which contains the cell's chromosomal DNA.

Nucleolysis: the process by which the nucleus of a displaced intervertebral disk is dissolved by disease.

Nutrison: a nutritional supplement containing protein, carbohydrates, fats, vitamins and minerals which provides 750 kilocalories per 500 mls. It is prescribed as the only source of nourishment or as a supplement for children with various conditions when they cannot take in or properly absorb sufficient food and drink in the normal way.

Obstructive Uropathy: a condition in which the flow of urine is blocked, causing it to back up and injure one or both kidneys.

Occipital horn syndrome: a deficiency in copper excretion that causes deformations in the skeleton**.**

Occipital lobe: the visual processing centres situated at the back of the cerebral hemispheres of the brain, containing most of the anatomical region of the visual cortex.

Oedematous: excessive accumulation of serous fluid in the intercellular spaces of tissue.

Oliguria: a significant reduction from normal in the volume of urine passed.

Orchidopexy: a surgery to move an undescended testicle into the scrotum and permanently fix it there.

Organelle: a specialized part of a cell that has a specific function, and is usually separately enclosed within its own lipid bilayer. The name organelle comes from the idea that these structures are to cells what an organ is to the body.

Osmolality: the concentration of an osmotically active solution, described as milliosmoles per litre (mOsmol/L).

Osmosis: the passage of water molecules through a semi-permeable membrane (such as a cell wall). This occurs when one fluid contains fewer molecules of dissolved solids) than the other; this osmotic pressure provokes water to move to the more 'concentrated' area until the two solutions have an equal concentration of dissolved solids.

Osmotic Disequilibrium Syndrome: where the osmotic equilibrium (i.e the normal circumstance where the osmotic pressure of plasma is essentially the same as that of intracellular fluid, meaning that there is a minimum flux of

water either into or out of a cell) normally present between two fluid compartments is no longer present.

Osmotic Fluid Shift: movement of water across a semipermeable membrane which has the result of tending to equalise the osmotic pressure across the membrane.

Osmotic myelinolysis: a neurological disease caused by severe damage of the myelin sheath of nerve cells in the brainstem.

Osmotic oedema: oedema caused through osmosis.

Otic: of or relating to, or located near to, the ear.

Oxidative: alternative term for redox- which describes all chemical reactions in which atoms have their oxidation state changed. This can be either a simple redox process, such as the oxidation of carbon to yield carbon dioxide (CO_2) in the human body through a series of complex electron transfer processes.

Oxygen saturation: oxygen is carried in the blood bound to haemoglobin, the red blood cell pigment. If all the available haemoglobin is attached to oxygen then that represents 100% saturation. If, for some reason, the patient is deprived of oxygen or if unoxygenated (venous) blood is mixing with arterial blood, then the saturation will fall. It is easily measured non-invasively with a device attached to a finger or toe which provides a reading on a screen. Saturation is normally above 95% and offers a guide to clinical staff as to the adequacy of a patient's oxygenation.

Paediatrician: a medical specialist skilled in the care of children's health and diseases.

Paravertebral plexus: a network of nerves which create a nerve trunk travelling along the length of the vertebral column.

Parenchymal: is a term used to describe a bulk of a substance.

Pathogenesis: the mechanism by which a disease is caused.

Pathology: the precise study and diagnosis of disease.

Pathophysiology: the physiological processes associated with disease or injury.

PCO2: an abbreviation for the partial pressure of carbon dioxide. It is commonly measured in blood to determine the adequacy of respiration.

Peduncle: a stem, through which a mass of tissue is attached to a body, for example cerebral peduncles.

Peptides: short polymers of amino acid monomers linked by peptide bonds. They are distinguished from proteins on the basis of size, typically containing less than 50 monomer units.

Perfusion: the transfer of fluid through a tissue, for example blood through a kidney.

Perinatal: the period from immediately before to after birth.

Peripheral perfusion: this refers to the amount of blood circulating in small arteries, arterioles and capillaries. If the circulation is put under stress, say by **hypovolaemia** or by heart failure resulting in insufficient blood being pumped, these small blood vessels close down. The result is hopefully to preserve blood supply to vital organs such as the brain, kidneys, heart muscle etc.

Perisylvian Syndrome: an extremely rare neurological disorder that may be apparent at birth (congenital), infancy, or later during childhood. It is characterized by partial paralysis of muscles on both sides (diplegia) of the face, tongue, jaws, and throat (pseudobulbar palsy); difficulties in speaking (dysarthria), chewing (mastication), and swallowing (dysphagia); and/or sudden episodes of uncontrolled electrical activity in the brain (epilepsy).

Peritoneal dialysis: dialysis is a process whereby surplus fluid and waste products in the blood can be removed from someone whose kidneys are unable to perform this task. There are two methods – haemodialysis, in which the person's blood is filtered and peritoneal dialysis, which uses the opportunity provided by the peritoneum as a semipermeable membrane (see

Peritoneal dialysis catheter: a plastic tube inserted through skin and muscle into the peritoneal cavity and stitched in place. **Dialysis** takes place through this **catheter**.

Peritoneal dialysis cycler PAC-X: A machine manufactured by Baxter Laboratories in the 1980s which automatically performs the cycles of **peritoneal dialysis** (PD), that is the input of fluid, the period of time that it remains in the peritoneal cavity and then the removal of the fluid. It allows patients on PD to have their treatment overnight so as to interfere as little as possible with daytime activities.

Perivascular: referring to the periphery of the circulatory system, and typically the blood vessels.

pH: a measure of the acidity or basicity of an aqueous solution. Pure water is said to be neutral, with a pH close to 7.0 at 25 °C (77 °F). Solutions with a pH less than 7 are said to be acidic and solutions with a pH greater than 7 are basic or alkaline. Blood pH measurements are important in medicine as a guide to how well cells are functioning.

Phenotype: An individual's characteristics as determined by the interaction between his genotype- his quota of genes- and the environment.

Phonology: the discipline of linguistics concerned with speaking.

Phosphorylases: enzymes that catalyze the addition of a phosphate group from an inorganic phosphate.

Pial: of or relating to the pia mater, often referred to as simply the pia, the delicate innermost layer of the meninges, the membranes surrounding the brain and spinal cord.

PICU: Paediatric Intensive Care Unit

Pneumothorax: each lung is coated with a membrane – pleura – which is continuous over the inner surface of the chest (thorax). As the lungs expand and contract with breathing, the two layers of the pleura slide over each other and there is no real space between them. If the lung is punctured or the chest wall wounded, say by stabbing, air enters this potential space. Because it is under pressure, the lung under it collapses and can no longer function. This is termed pneumothorax (*'air in the chest cavity'*). If blood, rather than air enters the pleural space, it is termed a haemothorax while a mixture of air and blood constitutes a haemopneumothorax. If the collection of air is large, the pneumothorax has to be drained by inserting a hollow tube into the pleural space to allow the air to flow out through a one-way valve.

Polyuria, polyuric: production of an excessive amount of urine as seen in some patients with chronic renal failure and in untreated diabetes mellitus or diabetes insipidus.

Pons in toto: The pons is a portion of the hindbrain that connects the cerebral cortex with the medulla oblongata. It also serves as a communications and coordination center between the two hemispheres of the brain. As a part of the brainstem, the pons helps in the transferring of messages between various parts of the brain and the spinal cord. The reference to 'pons in toto' (ie all of the 'pons') comes from the Report of Autopsy where it is listed as one of the areas of Adam's brain from which a block was taken to be provided to Dr. Mirakhur, Consultant Neuropathologist.

Posterior cranial fossa: part of the intracranial cavity, located between the foramen magnum and tentorium cerebelli. It contains the brainstem and cerebellum.

Posterior reversible encephalopathy syndrome: a syndrome characterised by headache, confusion, seizures and visual loss. It may occur due to a number of causes, predominantly malignant hypertension, eclampsia and some medical treatments.

Prednisone (prednisolone): a potent steroid medication given by mouth for its anti-inflammatory and/or immunosuppressive properties. The intravenous version is methylprednisolone.

Pressure reading of mm Hg: Blood pressure is conventionally measured in millimetres of mercury (Hg) because the devices used for many years to do so relied on a column of mercury being pushed up a tube by the inflation of a cuff around a person's arm (sphygmomanometer). Although mercury sphygomomanometers are no longer used the convention has remained. Similarly pressures elsewhere in the body (e.g. **CVP**) were recorded in terms of centimetres of water – because the devices originally used in measurement involved use of a water-filled column. Nowadays pressures are all measured as mmHg.

Prophylactic: any medical or public health procedure whose purpose is to prevent, rather than treat or cure a disease.

Protease: any enzyme that conducts proteolysis, that is, begins protein catabolism by hydrolysis of the peptide bonds that link amino acids together in the chain forming the protein.

Pseudolaminar necrosis: the uncontrolled death of cells in the cerebral cortexof the brain in a band-like pattern, with a relative preservation of cells immediately adjacent to the meninges. It is seen in the context of cerebral hypoxic-ischemic insults, e.g. strokes.

Pulmonary interstitial oedema: an oedema caused when the capacity of the lymphatics to drain the interstitial fluid is exceeded.

Pulmonary oedema: the presence of excessive fluid within the lung tissue, usually due to failure of the left side of the heart provoking back pressure through the pulmonary veins (the vessels which take blood from the lungs to the heart) thus forcing fluid out of blood vessels into lung tissue.

Pulsatile pressure wave: as the heart beats and the heart valves open and close and the lungs expand and contract, the pressure in blood vessels leaving or entering the heart varies. This is termed pulsatile pressure and is the basis of how (arterial) blood pressure is described using two figures (see **arterial**

blood pressure). On the venous side, because pressures are much lower, a more complex wave pattern can be seen because of the effects of breathing on blood draining into the heart, for example when using a **central venous catheter** to measure pressure. A non-pulsatile wave form implies that the expected variations are not being transmitted, suggesting the catheter may be misplaced or the vessel in which it is situated is blocked.

Purkinje cells: a class of neurons located in the cerebellar cortex.

Pyelogram: A procedure for getting x-ray pictures of the urinary tract. A radio-opaque medium is injected into a vein and when it is excreted by the kidneys, the substance can be identified in x-rays. Any abnormalities in the structure or foreign bodies such as calculi are outlined by the dye.

Pyknosis: the irreversible condensation of the nucleus of a cell undergoing necrosis

Pyrexia: fever, conventionally a body temperature persistently or intermittently greater than 37.5 degrees Centigrade.

Pyruvic acid: an organic acid which is a key intersection in several metabolic pathways- pyruvate can be made from glucose through glycolysis, converted back to carbohydrates (such as glucose) via gluconeogenesis.

Radial Artery: the artery that arises from the brachial artery at the level of the neck of the radius. It is felt in the wrist as 'the pulse.'

Radiology: a medical specialty that employs the use of imaging to both diagnose and treat disease visualized within the human body.

Raised intracranial pressure: see **cerebral oedema**

Red blood cells (erythrocytes): biconcave non-nucleated cells that contain the red pigment **haemoglobin** which carries oxygen and carbon dioxide between the lungs and body tissues.

Renal: related to the kidney.

Renal arteries: the vessels which emerge from the aorta to supply blood to the kidneys. Sometimes there is more than one such artery leading to each kidney.

Renal dysplasia: see **dysplastic kidneys**

Renal and extra renal losses: fluid leaving the body as urine is referred to as renal loss; all other losses (sweat, vapour in breath, fluid in faeces etc) are referred to as extrarenal, meaning outside the kidneys

Renal tubule: see **acute tubular necrosis.**

Reperfusion: is the tissue damage caused when blood supply returns to the tissue after a period of ischemia or lack of oxygen. The absence of oxygen and nutrients from blood during the ischemic period creates a condition in which the restoration of circulation results in inflammation and oxidative damage through the induction of oxidative stress rather than restoration of normal function.

Replacement rate (for IV fluids): when calculating how much intravenous fluid to give, it is usual to consider three aspects. Replacing abnormal losses already experienced, for example by vomiting; giving the normal amount the body requires to carry out its functions; making up for continuing abnormal losses, for example by diarrhoea: these are respectively, replacement, maintenance and continuing losses. The replacement rate is chosen by the treating doctor and may be rapid – minutes to an hour or two or slow – a day or more – depending on the nature of the patient's problem.

Respiratory pressure waves: the component of a **pulsatile pressure wave** provoked by the lungs expanding and contracting.

Reticular formation: a part of the brain that is involved in actions such as awaking/sleeping cycle, and filtering incoming stimuli to discriminate irrelevant background stimuli.

Retromandibular vein: formed by the union of the superficial temporal and maxillary veins, this vein descends in the substance of the parotid gland, beneath the facial nerve.

Right and left fundi: a fundus (pleural fundi) means a) the base of a hollow organ, that is the part furthest from its opening and b) the interior surface of the eye opposite the lens and including the retina and optic disc, the point on the retina opposite the pupil through which nerve fibres and blood vessels enter and leave the eye. It can be viewed through an ophthalmoscope.

Schwartz Formula: a method of calculating glomerular filtration rate (see above) in a child from knowledge of the blood level of creatinine and the child's height.

Sclerosis: a hardening of tissue and other anatomical features.

Scoliosis: a medical condition in which a person's spine is curved from side to side.

Scrub nurse: the nurse who is that part of an operating team, along with the surgeon and his or her assistant who have access to the instruments used and the part of the body exposed ('the operative field') so must have a primary responsibility to keep them sterile. To do so they 'scrub' their hands and arms prior to surgery, wear a sterile gown and gloves and are masked. They may not touch any unsterile area during the procedure. Other members of the team, such as the anaesthetist and assistant(s) and other nurses (see **circulating nurse**) are not gowned or gloved and so are permitted to handle non-sterile material but not sterile material.

Serology: the scientific study of blood serum and other bodily fluids. In practice, the term usually refers to the diagnostic identification of antibodies in the serum.

Sickle cell disease: describes a group of inherited blood, disorders characterized by chronic anaemia, acute episodes of limb or joint pain and various complications due to associated tissue and organ damage.

Sodium chloride 0.18%/dextrose 4%: a solution for intravenous use in patients where there are concerns about actual or potential water and sodium depletion . This solution contains 30 mmol/litre of sodium and chloride, one-fifth of the concentration in physiological solutions ('natural body fluids' such as blood etc). Other intravenous solutions include normal saline (0.9% sodium chloride in water), half normal saline (0.45% sodium chloride in 2.5% glucose) and **Hartmann's solution** which has a slightly lower sodium content than normal saline and also contains certain other common salts.

Sodium measurement (mmol/litre): the concentration of sodium in solution (that is dissolved in a liquid such as blood) is expressed as the number of milliosmoles in each litre (mOsmol/L). An osmole is a unit used to define chemicals which can contribute to **osmosis** and represents the number of osmotically active particles that, when dissolved in 22.4 L of solvent at 0 degrees Centigrade, exert an osmotic pressure of 1 atmosphere. A milliosmole is 1/1000 of an osmole.

Sodium thiopentone (STP): a rapid-onset short-acting drug used to induce general anaesthesia.

Sphenopalatine artery: an artery of the head.

Status epilepticus: life-threatening condition in which the brain is in a state of persistent seizure.

Stenosis: an abnormal narrowing in a blood vessel or other tubular organ or structure.

Stereomicroscope: an optical microscope, often referred to as the "light microscope", which uses visible light and a system of lenses to magnify images of small samples.

Sternomastoid: a paired muscle in the superficial layers of the anterior portion of the neck. It acts to flex and rotate the head.

STP: an abbreviation used by anaesthetists for sodium thiopentone, a drug used to induce anaesthesia intravenously. Also an acronym for Standard Temperature and Pressure.

Striatum: a subcortical part of the forebrain.

Subarachnoid: the interval in the brain between the arachnoid membrane and pia mater (the delicate innermost layer of the meninges).

Subclavian: the area beneath the clavicle (collar bone). It is most commonly used in relation to the subclavian arteries, one on each side which arises from the aorta just after it leaves the heart and supply the upper limb with blood. The subclavian veins return blood from the upper limb and drain into the internal jugular veins. The internal jugular vein is the large vein in the neck most commonly used for **central venous line** placement.

Subcutaneous: a term used to refer to any part of the body found beneath the skin.

Subpial: within the space of the brain that separates the pia from the underlying neural tissue.

Subventricular: a paired brain structure situated throughout the lateral walls of the lateral ventricles of the brain.

Sulci: depressions or fissures in the surface of an organ, especially the brain.

Superior sagittal sinus: located within the head, this is an unpaired space along the attached margin of falx cerebri. It allows blood to drain from the lateral aspects of anterior cerebral hemispheres to the confluence of sinuses.

Supraorbital: refers to the region immediately above the eye sockets.

Suprapubic: relates to the abdomen in its lower part, immediately above the pubic bones.

Suprapubic catheter: see **Catheter**

Surgical cut-down: normally when inserting a **cannula** into a blood vessel, it is simply pushed through the skin with the aid of an internal trocar (blunt needle). However, where this proves technically impossible a minor procedure is performed, under local anaesthetic to make a small incision in the skin and then to separate the underlying tissues until the vessel required is exposed. After inserting a stitch to hold the artery or vein, the **cannula** can be threaded into the vessel.

Synapse: in the nervous system a synapse is a junctional structure that permits a neuron to pass an electrical or chemical signal to another cell (neural or otherwise).

Syncytium: a multinucleate cell which can result from multiple cell fusions of uninuclear cells (i.e. cells with a single nucleus). A classic example of a syncytium is the formation of skeletal muscle. The term may also refer to cells that are interconnected by specialized membrane with gap junctions, as seen in the heart muscle cells and certain smooth muscle cells, which are synchronized electrically in an action potential.

Syndrome of inappropriate antidiuretic hormone secretion (SIADH): Antidiuretic hormone (ADH) is produced by the pituitary gland and has the effect of inhibiting urine production. It is released in response to various stimuli, such as a rise in plasma **osmolality** (for example, in **hypernatraemia**), reduction in blood volume (for example from **dehydration**) and a fall in blood pressure (for example from. **haemorrhage**). However, there are situations when it is released when these stimuli are not present and when its release may prove harmful – this is SIADH. Examples include many illnesses including damage to the brain, such as meningitis or trauma; lung diseases such as pneumonia or tuberculosis, some drugs, after surgical operations, trauma or burns and in relation to certain glandular disorders such as failure of the adrenal glands. The effect of SIADH is to retain water so that the blood **osmolality** falls and the blood sodium level may be low relative to the amount of water present, leading to **hyponatraemia**.

Syntax: the study of the principles and rules for constructing phrases and sentences in natural languages. The term *syntax* is also used to refer directly to the rules and principles that govern the sentence structure of any individual language.

Tentorium: the internal framework of supporting tissue within the skull, formed by ingrowths of the exoskeleton.

Thalamus: one of two masses of grey matter (brain cells or neurons) lying on either side of the third ventricle of the brain- important for sensory impulses.

Theatre runner: see **Circulating Nurse**.

Thoracic: relating to the chest.

Thrombosis: the formation of a blood clot within the vessels or heart.

Torsion: where a cord or vessel twists thereby cutting off blood supply to a particular area of the body.

Trachea: an alternative word for 'windpipe'.

Transducer: any part of the body which converts one form of energy into another.

Transuretero-ureterostomy: a ureterostomy is an operation in which the ureter is brought to the body surface to drain, often because of an obstruction in its lower part or in the bladder. If the operation is peformed through an endoscope passed through the urethra and bladder into the ureter it is a transureteric operation.

Trigeminal nerve (the fifth cranial nerve): contains both sensory and motor fibers. It is responsible for sensation in the face and certain motor functions such as biting, chewing, and swallowing.

Upregulation: the increase of a cellular component.

Uraemia: a term used to loosely describe the illness accompanying kidney failure (also called renal failure), demonstrable historically by a rise in blood urea, a nitrogenous waste products associated with the failure of this organ.

Urea: a crystalline substance of the chemical formula CO (NH2)2, derived from protein. It is the chief waste product discharged from the body in the urine.

Ureteric catheter: see **Catheter**

Ureteric stents: a stent is a semi rigid hollow tube which can be placed in a hollow organ, such as the ureter as a means of bypassing or preventing obstruction.

Ureters: the tubes which carry urine from the kidneys to the bladder.

Ureterostomy: the creation of a stoma (a new, artificial outlet) for a **ureter** or kidney. The procedure is performed to divert the flow of urine away from the bladder when the bladder is not functioning or has been removed.

Urethral catheter: see **Catheter**

Urethral valve: an obstructing membrane in the posterior male urethra as a result of abnormal *in utero* development.

Urinalysis: a contraction of urine analysis, this consists of a battery of tests on urine including its pH (acidity) and the presence of protein, sugar or ketones. It is often done at the bedside using a reagent strip which changes colour according to the constituents of the urine.

Uropathy: a disease of the urinary system.

Vacuolation: a small cavity in the cytoplasm of a cell, bound by a single membrane and containing water, food, or metabolic waste.

Vancomycin: an antibiotic, given intravenously to combat serious infections, especially by multiply-resistant organisms such as MRSA (multiply-resistant staphylococcus aureus). It can be used as a tablet in treating antibiotic associated colitis.

Vascular anastomosis: connecting two blood vessels (or the cut ends of one vessel) together.

Vasoconstriction: the narrowing of the blood vessels resulting from contraction of the muscular wall of the vessels, particularly the large arteries and small arterioles.

Vasodilation: refers to the widening of blood vessels resulting from relaxation of smooth muscle cells within the vessel walls, particularly in the large veins, large arteries, and smaller arterioles.

Vena cava: (pl. venae cavae): two large vessels which open into the right atrium of the heart so returning venous blood from the whole body (except the lungs). That which drains vessels from the head, neck and upper limbs is the superior vena cava while the inferior vena cava drains vessels from the trunk and lower limbs.

Ventilatory support: when a patient is unable to breathe on their own, assistance may be necessary to get sufficient air entry into their lungs, most commonly by the use of a mechanical ventilator delivering gases (such as an oxygen/air mixture) through an endotracheal tube.

Ventricles: the pumping chambers of the heart.

Vesicoureteral reflux: an abnormal movement of urine from the bladder into **ureters** or kidneys.

Vessel occlusion: tends to be a positive feedback system; an occluded vessel creates eddies in the normally laminar flow of blood currents.

Viscosity: a measure of the resistance of a fluid which is being deformed by either shear or tensile stress. In everyday terms (and for fluids only), viscosity is "thickness" or "internal friction".
White blood cells (leucocytes): cells within the blood that contain no haemoglobin and are therefore colourless. They are important in the prevention and handling of infection.

Zeroing: a monitor such as that measuring central **venous pressure (CVP)** is conventionally used such that zero represents the level of the right atrium, the chamber into which the **venae cavae** return blood. If that level changes, for example if the bed or trolley on which the patient is nursed is raised or lowered then the device has to be moved to keep the zero point where it should be – rezeroing.

Zero mixing (see **complete mixing):** Dr. Malcolm Coulthard, one of the experts reporting to the Inquiry about intravenous fluid administration defines 'zero mixing' on page 11 of his report dated 4th December 2010 as follows: "the concentration that would theoretically be achieved if the N/5 saline was mixed evenly into the [blood] plasma water but that none of it was redistributed from there into the rest of the water in the body."