

Reaching Consensus for Core Concepts of Human Bioscience that support study of Pathophysiology & Introductory Pharmacology: A modified Delphi Study.

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Background

There is evidence of a progression slump for nursing students moving from level 1 human bioscience to level 2 pathophysiology and pharmacology courses. Surface learning techniques are reinforced for those entering directly to level 2 with recognised prior learning due to an increased cognitive load associated with foundational science revision. In order to develop a website of revision resources that targeted key areas necessary for the study of pathophysiology and pharmacology, we set out to identify necessary core concepts that assist students with foundational knowledge and help them self-identify revision needs.

Aim

Develop a checklist of core concepts for nursing student self-determination of revision needs.

Method

A modified Delphi consensus process was undertaken utilising two face-to-face meetings and email communication between team members. The team consisted of seven tertiary academics with a combined experience of more than 70 years teaching pre-registration nursing students. The team included four Registered Nurses and five scientists (all held PhDs). The consensus process began with a draft tool created for a pilot program undertaken in 2014 (Logan & Cox, 2015).

Results

A detailed checklist of 101 human bioscience core concepts was finalised after five rounds of communication. A further nine concepts relating to transition of understandings from normal biology to aberrant function and drug intervention were added.

Conclusion

The tool highlights level 1 human bioscience key core concepts necessary for successful study of level 2 pathophysiology and pharmacology. It alerts students with advanced standing, who are 1st year university students enrolled directly to 2nd year subjects, to the discipline language they may have forgotten and enables self-determination of revision needs. It will be utilised on the *BioScienceEssentials2BRN* website (<http://bioscienceessentials2brn.com>) dedicated to facilitating the Enrolled Nurse's transition from vocational to university study.



References Logan, P.A. & Cox, J. (2015). When level 2 is the 1st year at university: Evaluation of a preparation program for direct entry to pathophysiology and pharmacology. *STARS Melbourne 2015 Conference*. Melbourne 1-4th July, 2015. www.unistars.org/papers/STARS2015/04C.pdf

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I rank my confidence in my understanding of the topic area as				
Overarching learning category	Place a tick in the box that most closely indicates how confident you feel with your knowledge of these topics	Not very confident	5 point Likert scale	Super confident
Homeostasis	Anatomical terminology	<input type="checkbox"/>		<input type="checkbox"/>
	The body's normal response to physical stressors and stress	<input type="checkbox"/>		<input type="checkbox"/>
	Regulation by negative feedback loop	<input type="checkbox"/>		<input type="checkbox"/>
Cells	Regulation by positive feedback loop	<input type="checkbox"/>		<input type="checkbox"/>
	Cell membrane structure	<input type="checkbox"/>		<input type="checkbox"/>
	Passive diffusion	<input type="checkbox"/>		<input type="checkbox"/>
	Facilitated diffusion	<input type="checkbox"/>		<input type="checkbox"/>
	Active transport & Na ⁺ /K ⁺ Pump	<input type="checkbox"/>		<input type="checkbox"/>
	Osmosis	<input type="checkbox"/>		<input type="checkbox"/>
Tissues	The role of mitochondria	<input type="checkbox"/>		<input type="checkbox"/>
	The basic structure of DNA and RNA	<input type="checkbox"/>		<input type="checkbox"/>
	Mitosis	<input type="checkbox"/>		<input type="checkbox"/>
	The role of ribosomes	<input type="checkbox"/>		<input type="checkbox"/>
Reproductive system	Gene transcription and translation for protein synthesis	<input type="checkbox"/>		<input type="checkbox"/>
	Structure of the 4 types of tissues: (epithelial, connective, muscular and nervous tissue)	<input type="checkbox"/>		<input type="checkbox"/>
	Male anatomy	<input type="checkbox"/>		<input type="checkbox"/>
	Female anatomy	<input type="checkbox"/>		<input type="checkbox"/>
	Development of sperm	<input type="checkbox"/>		<input type="checkbox"/>
Chemistry	Ovarian cycle	<input type="checkbox"/>		<input type="checkbox"/>
	Pregnancy and birth	<input type="checkbox"/>		<input type="checkbox"/>
	Fetal development	<input type="checkbox"/>		<input type="checkbox"/>
	Meiosis	<input type="checkbox"/>		<input type="checkbox"/>
	Inheritance of traits (recessive, dominant, co-dominance)	<input type="checkbox"/>		<input type="checkbox"/>
	Atoms and molecules	<input type="checkbox"/>		<input type="checkbox"/>
	Ions and electrolytes	<input type="checkbox"/>		<input type="checkbox"/>
	Action of enzymes (catalysts)	<input type="checkbox"/>		<input type="checkbox"/>
	Acids, bases and the pH scale	<input type="checkbox"/>		<input type="checkbox"/>
	The role of chemical buffers in the body	<input type="checkbox"/>		<input type="checkbox"/>
Urinary system	The 3 types of carbohydrates	<input type="checkbox"/>		<input type="checkbox"/>
	Fatty acids, triglycerides, phospholipids and cholesterol	<input type="checkbox"/>		<input type="checkbox"/>
	The lock and key model of ligands and receptors	<input type="checkbox"/>		<input type="checkbox"/>
	The role of receptor agonists and antagonists	<input type="checkbox"/>		<input type="checkbox"/>
Fluids, electrolytes, acids & bases	The concept of free and bound molecules	<input type="checkbox"/>		<input type="checkbox"/>
	The role of ATP in body function	<input type="checkbox"/>		<input type="checkbox"/>
	How nutrients are used to make ATP	<input type="checkbox"/>		<input type="checkbox"/>
The Nervous system	Nephron function – filtration, reabsorption and secretion	<input type="checkbox"/>		<input type="checkbox"/>
	Transport, storage and excretion of urine	<input type="checkbox"/>		<input type="checkbox"/>
	Fluid compartments within the body	<input type="checkbox"/>		<input type="checkbox"/>
	Role of Electrolytes – Na ⁺ , K ⁺ , HCO ₃ ⁻ , Cl ⁻ , Ca ²⁺ , Fe ²⁺	<input type="checkbox"/>		<input type="checkbox"/>
	The role of hormones in fluid and electrolyte balance	<input type="checkbox"/>		<input type="checkbox"/>
	How the kidneys contribute to acid base balance	<input type="checkbox"/>		<input type="checkbox"/>
	How the lungs contribute to acid base balance	<input type="checkbox"/>		<input type="checkbox"/>
	Nerves and Nerve signal transmission	<input type="checkbox"/>		<input type="checkbox"/>
	The action potential	<input type="checkbox"/>		<input type="checkbox"/>
	The role of neurotransmitters	<input type="checkbox"/>		<input type="checkbox"/>
Endocrine system	The somatosensory cortex	<input type="checkbox"/>		<input type="checkbox"/>
	The frontal lobe functions	<input type="checkbox"/>		<input type="checkbox"/>
	The temporal lobe functions	<input type="checkbox"/>		<input type="checkbox"/>
	The occipital lobe functions	<input type="checkbox"/>		<input type="checkbox"/>
	The parietal lobe functions	<input type="checkbox"/>		<input type="checkbox"/>
Musculo-skeletal system	The roles of the brainstem and midbrain structures and nerve centres	<input type="checkbox"/>		<input type="checkbox"/>
	The limbic system functions and its structures	<input type="checkbox"/>		<input type="checkbox"/>
	Peripheral nervous system	<input type="checkbox"/>		<input type="checkbox"/>
	Autonomic nervous system	<input type="checkbox"/>		<input type="checkbox"/>
Cardiovascular system	Pain perception	<input type="checkbox"/>		<input type="checkbox"/>
	Reflexes	<input type="checkbox"/>		<input type="checkbox"/>
	The roles of the hypothalamus and pituitary gland in the endocrine system	<input type="checkbox"/>		<input type="checkbox"/>
	Growth hormone	<input type="checkbox"/>		<input type="checkbox"/>
	Thyroid hormone	<input type="checkbox"/>		<input type="checkbox"/>
	Blood glucose control	<input type="checkbox"/>		<input type="checkbox"/>
Respiratory system	The structure of the 3 types of muscle	<input type="checkbox"/>		<input type="checkbox"/>
	Skeletal muscle contraction	<input type="checkbox"/>		<input type="checkbox"/>
	Locomotion	<input type="checkbox"/>		<input type="checkbox"/>
	Calcium and bone remodelling	<input type="checkbox"/>		<input type="checkbox"/>
	Roles of the plasma and cellular components of blood	<input type="checkbox"/>		<input type="checkbox"/>
Gastrointestinal system	The structure of the different types of vessels	<input type="checkbox"/>		<input type="checkbox"/>
	The pulmonary and systemic circuits of the circulatory system	<input type="checkbox"/>		<input type="checkbox"/>
	Heart structure including the cardiac vessels, chambers and valves	<input type="checkbox"/>		<input type="checkbox"/>
	Cardiac function – muscle contraction, diastole, systole	<input type="checkbox"/>		<input type="checkbox"/>
	Heart function: pacemaker cells and the conduction of electrical signals	<input type="checkbox"/>		<input type="checkbox"/>
	Conduction system, the normal ECG and what it represents	<input type="checkbox"/>		<input type="checkbox"/>
	Effects of sympathetic and parasympathetic stimulation on cardiac muscle cells and heart rate	<input type="checkbox"/>		<input type="checkbox"/>
Lymphatic system & immunity	Haemodynamic measures: hydrostatic pressure, Blood pressure, venous return, mean arterial pressure (MAP), afterload and preload, stroke volume	<input type="checkbox"/>		<input type="checkbox"/>
	The role of partial gas pressures in gas exchange	<input type="checkbox"/>		<input type="checkbox"/>
	Pulmonary tissue structure and function	<input type="checkbox"/>		<input type="checkbox"/>
	Internal and external Respiration	<input type="checkbox"/>		<input type="checkbox"/>
Microbiology	Mechanics of pulmonary ventilation	<input type="checkbox"/>		<input type="checkbox"/>
	PCO ₂ as the driver for normal pulmonary ventilation	<input type="checkbox"/>		<input type="checkbox"/>
	Lung tissue compliance	<input type="checkbox"/>		<input type="checkbox"/>
	The roles of the lymphatic system	<input type="checkbox"/>		<input type="checkbox"/>
	The differences between innate and adaptive immunity	<input type="checkbox"/>		<input type="checkbox"/>
	The role of antibodies	<input type="checkbox"/>		<input type="checkbox"/>
Introduction to Pathophysiology	vaccines	<input type="checkbox"/>		<input type="checkbox"/>
	Inflammatory response	<input type="checkbox"/>		<input type="checkbox"/>
	The stages of wound healing	<input type="checkbox"/>		<input type="checkbox"/>
	Bile production	<input type="checkbox"/>		<input type="checkbox"/>
	Nutrient interconversion	<input type="checkbox"/>		<input type="checkbox"/>
Introduction to Pharmacology	Storage	<input type="checkbox"/>		<input type="checkbox"/>
	Protein production	<input type="checkbox"/>		<input type="checkbox"/>
	Ammonia conversion	<input type="checkbox"/>		<input type="checkbox"/>
	Steroid hormone removal	<input type="checkbox"/>		<input type="checkbox"/>
Introduction to Pathophysiology	Detoxification	<input type="checkbox"/>		<input type="checkbox"/>
	Red blood cell recycling	<input type="checkbox"/>		<input type="checkbox"/>
	Gastrointestinal tract (from mouth to anus)	<input type="checkbox"/>		<input type="checkbox"/>
Introduction to Pharmacology	Digestion and Digestive enzymes	<input type="checkbox"/>		<input type="checkbox"/>
	The differences between viruses, bacteria, fungi, moulds, protozoa and other parasites	<input type="checkbox"/>		<input type="checkbox"/>
	Normal body flora/biota	<input type="checkbox"/>		<input type="checkbox"/>
	Opportunistic infections	<input type="checkbox"/>		<input type="checkbox"/>
Introduction to Pathophysiology	Infection cycle	<input type="checkbox"/>		<input type="checkbox"/>
	Anti-microbial agents and controlling microbial growth	<input type="checkbox"/>		<input type="checkbox"/>
	Terminology: pathophysiology, pathogenesis, pathology, aetiology, morbidity, mortality, epidemiology	<input type="checkbox"/>		<input type="checkbox"/>
Introduction to Pharmacology	Response of cells to stressors: normal versus aberrant behaviour	<input type="checkbox"/>		<input type="checkbox"/>
	Inflammation	<input type="checkbox"/>		<input type="checkbox"/>
	Necrosis	<input type="checkbox"/>		<input type="checkbox"/>
	Pharmacokinetics: drug absorption, distribution, metabolism, excretion	<input type="checkbox"/>		<input type="checkbox"/>
Introduction to Pathophysiology	Bioavailability	<input type="checkbox"/>		<input type="checkbox"/>
	Biological half-life	<input type="checkbox"/>		<input type="checkbox"/>
	First pass metabolism	<input type="checkbox"/>		<input type="checkbox"/>
Introduction to Pathophysiology	Pharmacodynamics: how drugs act within the body	<input type="checkbox"/>		<input type="checkbox"/>