



**HKU
Med** LKS Faculty of Medicine
School of Biomedical Sciences
香港大學生物醫學學院

BIMHSE Seminar - Teaching Development Grants (TDG) Project Sharing Session

Journal Database to Strengthen Vertical Integration between Basic Sciences and Clinical Medicine across Multiple Curricula

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Objectives

1. To develop a **database of journal articles (teaching resources)** that best illustrate to students the connection between **basic sciences** and **clinical medicine**.
2. To test the **effectiveness** of teaching and learning activities supported by journal-based materials in biomedical sciences courses of various undergraduate programmes.



Basic sciences are a core component of virtually all undergraduate programmes for healthcare professionals.

Academic **journals** are valuable sources of scholarly information.

Potential benefits of applying **journal-based teaching materials** in education of **basic sciences**:

- *Deepen students' understanding of course content*
 - *Move students beyond memorisation-driven learning*
 - *Instill a lasting curiosity*
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- Kassirer JP (1992) Learning medicine. Too many books, too few journals. ***N Engl J Med*** 21;326:1427-1428.
 - Beresford WA (1997) Journal articles for first-year students. ***Acad Med*** 72:934-935.

Problem: Too many journal articles

As the medical literature is huge, it is **very time-consuming** for teachers to identify the **most appropriate and relevant journal articles** that contain useful & meaningful content for enrichment of their teaching materials.

Online databases such as *PubMed* only provide basic searching function (mainly based on keywords).

They do NOT allow the identification of **journal articles** that best fit the teaching purpose of illustrating the **connection** between **basic sciences** & **clinical medicine** related to specific teaching topics.



Solution: To develop a database of suitable journal articles

Careful screening & classification of journal articles must be done manually to achieve a high level of specificity.

Results generated from multiple searches are organised.

Selection process:

- Journal articles which provide representative information with a good balance between biomedical sciences & clinical relevance (from research studies with significant clinical value) are chosen.
- Journal articles that do not meet the requirement (e.g. those focusing too much on technical aspects, purely reporting clinical cases, or discussing too many issues rather than specific teaching topics) are eliminated.



Solution: To develop a database of suitable journal articles

The selected **journal articles** facilitate **vertical integration** (i.e. integration across time), an educational approach in which the time spent on **basic sciences** gradually decreases as the amount of **clinical practice** gradually increases.

Vertical integration fosters increasing levels of clinical responsibility within undergraduate training and support students to develop abilities in solving medical problems, managing unfamiliar situations, prioritising tasks & collaborating with others.

- Wijnen-Meijer M *et al.* (2020) Vertical integration in medical education: the broader perspective. **BMC Med Educ** 20:509.

Access to **learning resources** (e.g. **journal articles**) of appropriately identified subject material and **support measures for teachers** are exactly the key elements that facilitate the implementation of **vertical integration**.

- O'Regan A *et al.* (2013) Towards vertical integration in general practice education: literature review and discussion paper. **Ir J Med Sci** 182:319-324.



Covers major topics in curricula of programmes offered by HKUMed

6,000 journal articles in **10 Excel files** (10 biological systems):

Nervous System	Digestive System
Endocrine System	Muscular System
Cardiovascular System	Skeletal System
Respiratory System	Reproductive System
Renal System	Immune System

Excel files can be conveniently downloaded by HKU teaching staff (via Portal login).

Database – *main themes → topics → sub-topics*

- **10 Excel files**
 - Each Excel file contains **8 main themes**
 - Each main theme contains ~ **5 topics**
 - Each topic contains ~ **3 sub-topics**
 - Each sub-topic contains **5 journal articles**
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To help students understand:

- **How is biomedical science knowledge generated through scientific research?**
- **How are biomedical discoveries translated into clinical applications?**

Database – *main themes → topics → sub-topics*

Journal Database

Nervous System			
Theme 1: Neurotransmission			
	Topic 1	Membrane Potential	Resting Membrane Potential Graded Potential / Postsynaptic Potential Action Potential
	Topic 2	Synapse	Electrical Synapse / Chemical Synapse Excitatory Synapse / Inhibitory Synapse Synaptic Proteins
	Topic 3	Neurotransmitters & Receptors	Acetylcholine Amino Acid Neurotransmitters Monoamine Neurotransmitters
	Topic 4	Myelination	Myelin Sheath Saltatory Conduction Oligodendrocytes / Schwann Cells
	Topic 5	Neural Plasticity	Long-term Potentiation Long-term Depression Neurogenesis / Neurotrophic Factors
Theme 2: Brain & Spinal Cord			
	Topic 1	Cerebrum	Cerebral Cortex / Lobes Cerebral Lateralization Hippocampus
	Topic 2	Diencephalon	Thalamus Hypothalamus Epithalamus
	Topic 3	Cerebellum	Vestibulocerebellum Spinocerebellum Cerebrocerebellum
	Topic 4	Brainstem	Medulla / Pons / Midbrain Reticular Formation Cranial Nerves
	Topic 5	Spinal Cord	Dorsal Horn / Ventral Horn Central Canal Spinal Nerves
Theme 3: Meninges & Cerebrospinal Fluid			
	Topic 1	Dura Mater	Periosteal Layer Meningeal Layer Falx Cerebri
	Topic 2	Arachnoid Mater	Arachnoid Granulations Arachnoid Trabeculae Superior Sagittal Sinus
	Topic 3	Pia Mater	Cranial Pia Mater Spinal Pia Mater Subpial Space
	Topic 4	Subarachnoid Space	Cerebellomedullary Cistern Pontine Cistern / Cerebellopontine Cistern Interpeduncular Cistern
	Topic 5	Cerebrospinal Fluid	Choroid Plexus Cerebral Ventricular System Intracranial Pressure
Theme 4: Somatic & Autonomic Nervous System			
	Topic 1	Somatic Nervous System	Somatic Sensory System Somatic Motor System Voluntary Movement
	Topic 2	Somatic Reflexes	Stretch Reflex / Golgi Tendon Reflex Flexor Reflex / Crossed Extensor Reflex Babinski Reflex
	Topic 3	Autonomic Nervous System	Sympathetic Nervous System Parasympathetic Nervous System Fight-or-flight Response
	Topic 4	Autonomic Reflexes	Pupillary Light Reflex Defecation / Micturition Reflex Chemoreceptor / Baroreceptor Reflex
	Topic 5	Enteric Nervous System	Myenteric Plexus Submucosal Plexus

		Gut-brain Axis
Theme 5: Sensory Function		
Topic 1	Vision	Eyes Visual Pathway Visual Processing
Topic 2	Audition	Ears Auditory Pathway Auditory Processing
Topic 3	Vestibular Sensation	Otolith Organs & Semicircular Canals Vestibular Pathway Vestibular Processing
Topic 4	Gustation & Olfaction	Tongue & Nose Gustatory & Olfactory Pathways Gustatory & Olfactory Processing
Topic 5	Somatosensation	Mechanoreception & Thermoception Proprioception Nociception / Pain
Theme 6: Motor Control		
Topic 1	Motor Processing	Premotor Cortex Supplementary Motor Area Primary Motor Cortex
Topic 2	Descending Pathways	Corticospinal Tract Corticobulbar Tract Extra-pyramidal Tracts
Topic 3	Basal Ganglia	Caudate Nucleus Lentiform Nucleus Substantia Nigra
Topic 4	Cerebellum	Vestibulocerebellum Spinocerebellum Cerebrocerebellum
Topic 5	Eye Movements	Saccades & Smooth Pursuit Vergence Optokinetic Reflex
Theme 7: Limbic System & Higher Cortical Functions		
Topic 1	Memory	Short-term Memory & Long-term Memory Memory Encoding / Storage Memory Consolidation / Retrieval
Topic 2	Emotion	Papez Circuit Facial Expression Amygdala & Fear
Topic 3	Reward Circuitry	Medial Forebrain Bundle Ventral Tegmental Area Nucleus Accumbens
Topic 4	Language	Broca's Area Wernicke's Area Angular Gyrus
Topic 5	Higher Cortical Functions	Attention Imagination Planning & Judgement
Special Theme: Neurological Disorders		
Topic 1	Neurodegenerative Diseases	Alzheimer's Disease Parkinson's Disease Huntington's Disease
Topic 2	Brain Tumours	Meningioma / Schwannoma Astrocytoma / Oligodendroglioma Ependymoma / Medulloblastoma
Topic 3	Stroke	Ischaemic Stroke Intracerebral Haemorrhage Subarachnoid Haemorrhage
Topic 4	Synaptic Disorders	Autism Depression Schizophrenia
Topic 5	CNS Infections / Inflammatory Diseases	Encephalitis Meningitis Myelitis

Nervous System

Database – *main themes → topics → sub-topics*

Journal Database

Endocrine System			
Theme 1: Basic Concepts of Endocrine System			
	Topic 1	Structural Classification of Hormones	Amino Acid Derivatives Peptide & Protein Hormones Steroid Hormones
	Topic 2	Hormone Regulation	Negative Feedback on Hormone Secretion Positive Feedback on Hormone Secretion Hormone Receptor Regulation
	Topic 3	Hormone Synthesis	Hormone Synthesis Pathway Steroidogenesis Hormone Secretory Granules
	Topic 4	Hormone Receptors & Signaling	G-Protein-Coupled Receptors Steroid Hormone Receptors Signal Amplification
	Topic 5	Rhythms of Hormone Secretion	Pulsatile Secretion Diurnal Secretion Cyclic Secretion
Theme 2: Hypothalamus & Pituitary Gland			
	Topic 1	Hypothalamus	Hypothalamus-Pituitary Axis Arcuate / Paraventricular / Supraoptic Nucleus Hypothalamic Releasing / Inhibiting Hormones
	Topic 2	Regions of Anterior Pituitary	Pars Distalis Pars Tuberalis Pars Intermedia
	Topic 3	Anterior Pituitary Hormones	Adrenocorticotropic Hormone Thyroid-Stimulating Hormone Growth Hormone Prolactin Luteinizing Hormone Follicle-Stimulating Hormone Melanocyte-Stimulating Hormone
	Topic 4	Posterior Pituitary Hormones	Antidiuretic Hormone Oxytocin
	Theme 3: Thyroid Gland		
	Topic 1	Thyroid Gland & Thyroid Follicles	Thyroid Lobes & Isthmus Thyroid Follicular Cells & Follicular Lumen Thyroid Parafollicular Cells & Calcitonin
	Topic 2	Thyroid Hormones	Thyroxine & Triiodothyronine Thyroid Hormone Receptor Thyroid Hormone Replacement Therapy
	Topic 3	Thyroid Hormone Metabolites	Thyroid Hormone Deiodination Thyronamine 3-Iodothyronamine
	Topic 4	Thyroglobulin	Thyroglobulin Structure Thyroglobulin Secretion Thyroglobulin Antibodies
	Topic 5	Basal Metabolic Rate	Oxygen Consumption Thermogenesis Na ⁺ -K ⁺ -ATPase Activity
Theme 4: Parathyroid Glands			
	Topic 1	Parathyroid Glands	Parathyroid Chief Cells Parathyroid Oxyphil Cells Third & Fourth Pharyngeal Pouch
	Topic 2	Parathyroid Hormone	Structure of Parathyroid Hormone Parathyroid Hormone Receptor Parathyroid Hormone Signaling
	Topic 3	Actions of Parathyroid Hormone	Expression of RANKL Regulation of 1-alpha-hydroxylase Regulation of TRPV5
	Topic 4	Parathyroid Hormone-related Protein	Structure of PTHrP Expression of PTHrP Hypercalcemia of Malignancy
	Topic 5	Calcium & Phosphate Metabolism	Bone Resorption Calcium Reabsorption

		Calcitriol
Theme 5: Adrenal Glands		
Topic 1	Adrenal Cortex	Zona Glomerulosa Zona Fasciculata Zona Reticularis
Topic 2	Mineralocorticoids	Aldosterone Mineralocorticoid Receptor Renin-angiotensin-aldosterone System
Topic 3	Glucocorticoids	Cortisol Glucocorticoid Receptor Glucocorticoid Response Elements
Topic 4	Androgens	Testosterone Dihydrotestosterone Androstenedione
Topic 5	Catecholamines	Epinephrine Norepinephrine Chromaffin Cells
Theme 6: Pancreas		
Topic 1	Islets of Langerhans	Alpha Cells Beta Cells Delta Cells
Topic 2	Glucagon	Preproglucagon / Proglucagon Glucagon Receptor Glucagon-like Peptide-1
Topic 3	Insulin	Preproinsulin / Proinsulin C-peptide Insulin Receptor & Insulin Resistance
Topic 4	Somatostatin	Preprosomatostatin / Prosomatostatin Somatostatin Receptor Somatostatin Analogues
Topic 5	Glucose Metabolism	Glycolysis Gluconeogenesis Glycogenolysis & Glycogenesis
Theme 7: Pineal Gland & Secondary Endocrine Functions		
Topic 1	Pineal Gland	Melatonin Suprachiasmatic Nucleus Circadian Rhythm
Topic 2	Digestive Hormones	Gastrin Secretin Cholecystokinin
Topic 3	Adipose Tissues (Leptin)	Leptin Leptin Receptor Neuropeptide Y
Topic 4	Kidney (Erythropoietin)	Erythropoietin Erythropoietin Receptor Erythropoietin Stimulating Agents
Topic 5	Heart (Natriuretic Peptides)	Atrial Natriuretic Peptide Brain Natriuretic Peptide C-type Natriuretic Peptide
Special Theme: Endocrine Disorders		
Topic 1	Pituitary Disorders	Pituitary Tumors Hyperprolactinemia Acromegaly & Gigantism
Topic 2	Thyroid Disorders	Hyperthyroidism & Graves' Disease Hypothyroidism Thyroiditis
Topic 3	Parathyroid Disorders	Hyperparathyroidism Hypoparathyroidism Parathyroid Cancer
Topic 4	Adrenal Disorders	Addison's Disease Cushing's Syndrome Congenital Adrenal Hyperplasia
Topic 5	Diabetes Mellitus	Type 1 Diabetes Type 2 Diabetes Gestational Diabetes

Endocrine System

Database – *main themes → topics → sub-topics*

Journal Database

Cardiovascular System

Theme 1: Structure of the Heart

Topic 1	Heart Wall	Epicardium Myocardium Endocardium
Topic 2	Chambers & Septa of the Heart	Atria Ventricles Interatrial / Interventricular Septum
Topic 3	Pericardium & Pericardial Sinuses	Pericardial Cavity Pericardial Fluid Pericardial Sinus
Topic 4	Heart Valves	Mitral Valve & Tricuspid Valve Aortic Valve & Pulmonary Valve Papillary Muscles & Chordae Tendineae
Topic 5	Coronary Circulation	Coronary Arteries Coronary Veins Aortic Sinuses & Coronary Sinus

Theme 2: Cardiac Cycle

Topic 1	Events in Cardiac Cycle	Atrial Systole Isovolumetric Contraction Ventricular Ejection Isovolumetric Relaxation Ventricular Filling Diastole
Topic 2	Heart Sounds & Additional Sounds	First Heart Sound Second Heart Sound Third Heart Sound Fourth Heart Sound Murmurs Systolic Clicks Carotid Bruit
Topic 3	Jugular Venous Waveform	Jugular Venous Pressure Right Atrial Pressure

Theme 3: Electrocardiogram (ECG)

Topic 1	Conduction System of the Heart	Sinoatrial Node Atrioventricular Node Bundle of His Interventricular Septum Bundle Branches Purkinje Fibres
Topic 2	ECG Trace	P Wave PR Interval QRS Complex ST Segment T Wave U Wave
Topic 3	ECG Leads	Limb Leads Chest Leads

Theme 4: Blood Vessels

Topic 1	Arteries	Aorta Elastic Arteries Muscular Arteries Arterioles
Topic 2	Veins	Superior Vena Cava Inferior Vena Cava Veins Venules Venous Sinuses
Topic 3	Capillaries	Continuous & Fenestrated Capillaries Sinusoids
Topic 4	Tunics	Tunica Adventitia Tunica Media Internal Elastic Lamina Tunica Intima / Endothelium

Theme 5: Blood Flow & Haemodynamics

Topic 1	Types of Blood Flow	Laminar Blood Flow Turbulent Blood Flow
Topic 2	Control of Blood Flow	Active Hyperemia Reactive Hyperemia Blood Flow Autoregulation Vascular Smooth Muscle Metarteriole & Precapillary Sphincter Poiseuille's Law / Blood Viscosity
Topic 3	Vasoconstriction & Vasodilation	Vasoconstriction Vasospasm Endothelin Vasodilation Bradykinin Prostacyclin Vascular Nitric Oxide / Nitrovasodilators

Theme 6: Cardiac Output & Blood Pressure

Topic 1	Blood Pressure	Systolic Pressure Diastolic Pressure Mean Arterial Pressure Arterial Pulse Pressure
Topic 2	Factors Affecting Blood Pressure	Heart Rate Stroke Volume Total Peripheral Resistance
Topic 3	Control of Cardiac Output	Frank-Starling Law Preload End-Diastolic Volume Afterload End-Systolic Volume Heart Contractility Venous Return Respiratory Pump Muscle Pump

Theme 7: Haematology

Topic 1	Blood Groups & Blood Transfusion	ABO Blood Group System Rh Blood Group System Blood Transfusion
Topic 2	Haematopoiesis	Erythropoiesis Myelopoiesis Lymphopoiesis
Topic 3	Bone Marrow	Bone Marrow Stroma Haematopoietic Stem Cells Haematopoietic Growth Factors
Topic 4	Red Blood Cell Metabolism	Iron Metabolism Heme Synthesis & Haemoglobin
Topic 5	Blood Clotting & Fibrinolysis	Extrinsic / Intrinsic / Common Pathways Coagulation Factors & Anticoagulants Platelet & Antiplatelet Drugs Fibrinolysis

Special Theme: Cardiovascular Diseases & Blood Disorders

Topic 1	Acute Coronary Syndrome	ST Elevation Myocardial Infarction Non-ST Elevation Myocardial Infarction Unstable Angina
Topic 2	Arrhythmia & Conduction Abnormalities	Atrial Arrhythmia / Ventricular Arrhythmia Heart Block Cardiac Arrest
Topic 3	Valvular Heart Diseases	Aortic Stenosis Aortic Regurgitation Rheumatic Heart Disease
Topic 4	Circulation-related Problems	Circulatory Shock Hypertension Atherosclerosis
Topic 5	Blood Disorders	Anaemia / Thalassemia Haemophilia / Thrombocytopenia Leukemia / Lymphoma / Myeloma

Cardiovascular System

Database – *main themes → topics → sub-topics*

Journal Database

Respiratory System		
Theme 1: Upper Respiratory Tract		
Topic 1	Nose / Nasal Cavity	Nasal Conchae Nasal Vestibule
Topic 2	Paranasal Sinuses	Maxillary Sinuses Sphenoidal Sinuses Frontal Sinuses Ethmoid Sinuses / Ethmoid Cells
Topic 3	Pharynx	Nasopharynx Oropharynx Laryngopharynx
Topic 4	Larynx	Epiglottis Vocal Cords / Vocal Folds / Glottis Thyroid Cartilage Cricoid Cartilage Arytenoid Cartilages Intrinsic & Extrinsic Laryngeal Muscles
Theme 2: Lower Respiratory Tract		
Topic 1	Trachea	Cervical Trachea / Thoracic Trachea Tracheal Bifurcation Tracheal Cartilage
Topic 2	Bronchi & Bronchioles	Left Main Bronchus / Right Main Bronchus Right Intermediate Bronchus Lobar Bronchi / Segmental Bronchi Bronchioles
Topic 3	Lungs	Left Lung / Right Lung Right Middle Lobe Superior Lobe & Inferior Lobe Lung Apex / Lung Base Hilum of the Lung Alveoli / Alveolar Dead Space Visceral Pleura / Parietal Pleura Pleural Cavity
Topic 4	Pleura	
Theme 3: Breathing Mechanics		
Topic 1	Elastic Properties	Lung Compliance / Elastance Chest Wall Compliance / Elastance
Topic 2	Fundamental Pressures	Atmospheric Pressure Intrapulmonary Pressure / Alveolar Pressure Intrapleural Pressure
Topic 3	Distending Pressures	Transpulmonary Pressure Trans thoracic Pressure & Transrespiratory Pressure
Topic 4	Lung Volumes & Capacities	Tidal Volume Total Lung Capacity Vital Capacity Residual Volume Inspiratory Reserve Volume / Inspiratory Capacity Expiratory Reserve Volume / Functional Residual Capacity FEV1/FVC Ratio Spirometry / Spirogram
Theme 4: Inspiration/Expiration & Airflow		
Topic 1	Inspiratory Muscles	External Intercostal Muscles Diaphragm Sternocleidomastoid / Scalene Muscles
Topic 2	Expiratory Muscles	Internal Intercostal Muscles Abdominal Muscles
Topic 3	Nerves Innervating Respiratory Muscles	Intercostal Nerves Phrenic Nerves
Topic 4	Lung Recoil Pressure	Pulmonary Elastin / Pulmonary Interstitium Pulmonary Surface Tension / Surfactant
Topic 5	Factors Affecting Airflow	Airway Resistance Bronchomotor Tone / Airway Smooth Muscles Bronchoconstriction Bronchodilation / Bronchodilator Drugs Airway Mucus Secretion / Mucolytic Drugs

		Peak Expiratory Flow Rate
Theme 5: Pulmonary Gas Exchange & Transport		
Topic 1	Pulmonary Gas Diffusion	Alveolar-Capillary Membrane / Respiratory Membrane Partial Pressure of Oxygen Partial Pressure of Carbon Dioxide Diffusing Capacity Of The Lung For Carbon Monoxide (DLCO)
Topic 2	Pulmonary Circulation	Pulmonary Artery Pulmonary Vein Pulmonary Arterioles / Pulmonary Venules Pulmonary Capillaries
Topic 3	Transport of Oxygen	Haemoglobin Saturation Oxygen-Haemoglobin Dissociation Curve Bohr Effect 2,3-Bisphosphoglycerate Cellular Respiration
Topic 4	Transport of Carbon Dioxide	Carbon Dioxide Dissociation Curve Haldane Effect
Theme 6: Control of Breathing		
Topic 1	Respiratory Rate/Depth & Breathing Pattern	Respiratory Rate Tachypnea / Hyperpnea Apneustic / Ataxic / Agonal Breathing
Topic 2	Respiratory Centres	Pneumotaxic Centre Apneustic Centre Inspiratory Centre / Dorsal Respiratory Group Expiratory Centre / Ventral Respiratory Group Pre-Bötzinger Complex & Botzinger Complex
Topic 3	Peripheral & Central Chemoreceptors	Carotid Bodies Aortic Bodies Central Chemoreceptors
Topic 4	Reflexes Related to Respiration	Hering-Breuer Reflex Cough Reflex / Irritant Receptors Juxtacapillary Receptors (J receptors) Metaboreflex
Theme 7: Hypoxaemia & Hypercapnia		
Topic 1	Respiratory Failure	Type I (Hypoxaemic) Respiratory Failure Type II (Hypercapnic) Respiratory Failure Arterial Blood Gas Analysis Alveolar-arterial Oxygen Gradient (A-a Gradient)
Topic 2	Causes of Hypoxaemia and/or Hypercapnia	Pulmonary Shunt / Atelectasis Cardiac Shunt Ventilation-Perfusion Mismatch (V/Q Mismatch) Diffusion Impairment / Pulmonary Edema Alveolar Hypoventilation
Topic 3	Management of Respiratory Failure	Oxygen Therapy Tracheostomy Invasive Mechanical Ventilation Non-Invasive Ventilation (NIV) Extracorporeal Membrane Oxygenation (ECMO) Extracorporeal Carbon Dioxide Removal (ECCO2R)
Special Theme: Respiratory Diseases		
Topic 1	Obstructive Lung Diseases	Chronic Obstructive Pulmonary Disease (COPD) Asthma Bronchiectasis
Topic 2	Restrictive Lung Diseases	Interstitial Lung Disease Idiopathic Pulmonary Fibrosis Pulmonary Sarcoidosis Pneumoconiosis / Asbestosis
Topic 3	Pleural Diseases	Pleural Effusion / Pleuritis Pneumothorax
Topic 4	Respiratory Tract Infections & Infectious Lung Diseases	Sinusitis / Rhinitis / Pharyngitis Influenza / Coronavirus Disease 2019 Pneumonia Tuberculosis
Topic 5	Respiratory Distress Syndrome	Acute Respiratory Distress Syndrome (ARDS)
Topic 6	Lung Carcinoma	Small-cell Lung Cancer (SCLC) Non-small-cell Lung Cancer (NSCLC)

Respiratory System

Database – *main themes → topics → sub-topics*

Journal Database

Renal System		
Theme 1: Structure of the Renal System		
Topic 1	Kidney Capsule / Cortex / Medulla	Renal Capsule Renal Cortex Renal Medulla / Pyramid / Interstitium
Topic 2	Renal Corpuscle	Glomerulus Bowman's Capsule
Topic 3	Renal Tubule	Proximal Convoluted Tubule Loop of Henle Distal Convoluted Tubule
Topic 4	Juxtaglomerular Apparatus	Macula Densa Cells Juxtaglomerular Cells Glomerular Mesangial Cells
Topic 5	Renal Calyces	Renal Papilla / Minor Calyx Major Calyx / Renal Pelvis
Topic 6	Ureters / Bladder / Urethra	Ureters / Urinary Bladder Urethra
Theme 2: Renal Blood Flow		
Topic 1	Renal Circulation	Renal Artery Segmental Arteries Interlobar Arteries / Veins Arcuate Arteries / Veins Cortical Radiate (Interlobular) Arteries / Veins Afferent Arterioles Glomerular Capillaries Efferent Arterioles Peritubular Capillaries / Vasa Recta Renal Vein
Topic 2	Renal Perfusion	Renal Perfusion Pressure Renal Vasoconstriction Renal Vasodilation Renal Plasma Flow (RPF) Para-aminohippuric Acid Clearance
Theme 3: Urine Formation		
Topic 1	Glomerular Filtration	Glomerular Filtration Rate (GFR) Estimated Glomerular Filtration Rate (eGFR) Inulin Clearance Creatinine Clearance Renal Autoregulation
Topic 2	Filtration Membrane	Glomerular Endothelium Glomerular Basement Membrane Podocytes
Topic 3	Diuresis	Osmotic Diuresis Pressure Diuresis Diuretics
Topic 4	Tubular Reabsorption & Secretion	Tubular Reabsorption Sodium-glucose Co-transporter-2 (SGLT2) Sodium-glucose Co-transporter-2 Inhibitors Tubular Secretion
Theme 4: Micturition		
Topic 1	Neural Control of Micturition	Micturition Reflex Pontine / Sacral Micturition Centre Pelvic Nerve Pudendal Nerve Hypogastric Nerve Detrusor Muscle Urethral Sphincter
Topic 2	Voiding Function	Urinary Bladder Volume Post-void Residual Urine Volume Bladder Voiding Efficiency
Topic 3	Urination Abnormalities	Urinary Incontinence Urinary Retention Overactive Bladder Oliguria / Anuria

		Polyuria
Theme 5: Acid-Base Balance		
Topic 1	Metabolic Acidosis & Alkalosis	High Anion Gap Metabolic Acidosis Normal Anion Gap Metabolic Acidosis Metabolic Alkalosis
Topic 2	Types of Metabolic Acidosis	Ketoacidosis / Diabetic Ketoacidosis Lactic Acidosis Uraemic Acidosis Renal Tubular Acidosis
Topic 3	Causes of Metabolic Alkalosis	Vomiting / Dehydration / Contraction Alkalosis Hyperaldosteronism Antacids
Topic 4	Respiratory Compensation	Compensatory Hyperventilation Compensatory Hypoventilation Henderson-Hasselbalch Equation
Topic 5	Chemical Buffer Systems	Bicarbonate / Phosphate / Protein Buffer Carbonic Anhydrase
Theme 6: Electrolyte & Fluid Regulation		
Topic 1	Electrolyte Imbalance (Metal)	Hyperkalaemia Hypokalaemia Hypernatremia Hyponatremia Hypercalcaemia Hypocalcaemia Hypermagnesaemia Hypomagnesaemia
Topic 2	Electrolyte Imbalance (Non-metal)	Hyperchloraemia Hypochloraemia Hyperphosphataemia Hypophosphataemia
Topic 3	Renal Fluid Retention	Hypoalbuminaemia Fluid Retention / Water Retention Renal Sodium Retention
Theme 7: Urinalysis		
Topic 1	Urine Tests	Dipstick Test Twenty-four-hour Urine Test Urinary Microalbumin Test Urine Albumin-to-creatinine Ratio (uACR) Urine Specific Gravity Urine Culture
Topic 2	Proteinuria	Albuminuria / Microalbuminuria Haemoglobinuria / Myoglobinuria Bence Jones Protein
Topic 3	Blood or Small Molecules in Urine	Haematuria / Eosinophiluria Glycosuria Ketonaemia Aminoaciduria Bilirubinuria / Hyperuricaemia Chyluria / Crystalluria
Special Theme: Renal Diseases		
Topic 1	General Syndromes	Chronic Kidney Disease Acute Kidney Injury Nephrotic Syndrome / Nephritic Syndrome
Topic 2	Glomerular Diseases	IgA Nephropathy / Membranous Nephropathy Diabetic Nephropathy Minimal Change Disease Focal Segmental Glomerulosclerosis Membranoproliferative Glomerulonephritis Lupus Nephritis
Topic 3	Tubulointerstitial Diseases	Tubulointerstitial Nephritis Acute Tubular Necrosis
Topic 4	Obstructive Uropathy & Hydronephrosis	Nephrolithiasis (Kidney Stone Disease) Hydronephrosis
Topic 5	Tumours of the Renal System	Kidney Cancer / Bladder Cancer Ureteral Cancer / Urethral Cancer

Renal System

Database – *main themes → topics → sub-topics*

Journal Database

Digestive System				
Theme 1: Mouth / Pharynx / Esophagus				
	Topic 1	Teeth	Deciduous Teeth / Permanent Teeth Incisors Canines Premolars Molars Alveolar Bone	
	Topic 2	Palate	Hard Palate Soft Palate / Uvula	
	Topic 3	Salivary Glands	Parotid Glands Submandibular Glands Sublingual Glands Salivary Amylase	
	Topic 4	Pharynx & Esophagus	Pharyngeal Muscles Esophageal Peristalsis Swallowing / Deglutition	
	Theme 2: Stomach			
	Topic 1	Structure of Stomach	Greater Curvature / Lesser Curvature Gastric Cardia / Gastric Fundus	
	Topic 2	Pylorus	Pyloric Sphincter / Pyloric Orifice Pyloric Antrum / Pyloric Canal	
	Topic 3	Gastric Mucosa	Chief Cells / Peptic Cells Parietal Cells / Oxynitic Cells G Cells / Gastrin Mucous Cells Enterochromaffin-like Cells	
	Topic 4	Gastric Secretions	Gastric Acid Pepsinogen Pepsin Gastric Lipase Intrinsic Factor Cephalic Phase / Gastric Phase / Intestinal Phase	
	Theme 3: Pancreas			
		Topic 1	Structure of Pancreas	Pancreatic Head Pancreatic Neck Pancreatic Tail Main Pancreatic Duct Accessory Pancreatic Duct
		Topic 2	Pancreatic Exocrine Cells	Pancreatic Acinar Cells Pancreatic Ductal Cells
Topic 3		Pancreatic Secretions	Pancreatic Amylase Pancreatic Lipase Pancreatic Nuclease Trypsinogen Trypsin Chymotrypsinogen Chymotrypsin Zymogen Granule	
Theme 4: Liver & Gallbladder				
Topic 1		Lobes of Liver	Left Lobe / Right Lobe Caudate Lobe / Quadrate Lobe	
Topic 2		Ligaments	Falciform Ligament Round Ligament / Coronary Ligament	
Topic 3		Hepatic Lobule & Blood Flow	Liver Lobule / Portal Triad Liver Sinusoid Liver Sinusoidal Endothelial Cells / Kupffer Cells Enterohepatic Circulation / Hepatic Portal Vein	
Topic 4		Bile	Bile Salts / Cholic Acid Bilirubin	
Topic 5		Bile Storage & Release	Gallbladder Cystic Duct Hepatic Duct Bile Duct	

		Sphincter of Oddi
Theme 5: Small Intestine		
Topic 1	Portions of Small Intestine	Duodenum
		Jejunum
		Ileum
Topic 2	Intestinal Secretory Cells / Enteroendocrine Cells	S Cells / I Cells / K Cells
		Intestinal Crypt Cells / Intestinal Goblet Cells
		Paneth Cells
		Tuft Cells
		Brunner's Glands
Topic 3	Duodenal Hormones	Secretin
		Cholecystokinin
		Glucose-dependent Insulinotropic Polypeptide
		Motilin
Topic 4	Brush Border Enzymes	Maltase-glucoamylase
		Sucrase-isomaltase
		Aminopeptidase / Carboxypeptidase
Theme 6: Large Intestine & Gut Microbiota		
Topic 1	Structure of Large Intestine	Caecum
		Appendix
		Ascending Colon
		Transverse Colon
		Descending Colon
		Sigmoid Colon
		Rectum
		Anal Canal
Topic 2	Defecation	Internal Anal Sphincter
		External Anal Sphincter
		Anus
Topic 3	Gut Microbiota	Intestinal Microflora
		Microbiota-gut-brain Axis
		Gut Dysbiosis
		Fecal Microbiota Transplantation
Theme 7: Transport Mechanisms for Nutrient Absorption		
Topic 1	Absorptive Tissue & Cells	Intestinal Villi
		Enterocytes
		Colonocytes
Topic 2	Fat Absorption	Lacteal
		Chylomicron
		Cholesterol Transporter
Topic 3	Sodium Absorption	Sodium-glucose Cotransporter-1 (SGLT1)
		Sodium-hydrogen Exchanger 3 (NHE3)
		Epithelial Sodium Channel (ENaC)
Topic 4	Sugar Absorption	Glucose Transporter 2 (GLUT2)
		Fructose Transporter (GLUT5)
Topic 5	Amino Acid & Peptide Absorption	Amino Acid Transporters
		Peptide Transporter 1
Topic 6	Water & Chloride Absorption	Cl/HCO ₃ ⁻ Exchanger
		Aquaporin
Special Theme: Digestive Diseases		
Topic 1	Inflammatory Diseases / Infections	Gastroenteritis
		Pancreatitis
		Celiac Disease
		Cholera
Topic 2	Functional Gastrointestinal Disorders	Irritable Bowel Syndrome
		Functional Nausea / Functional Vomiting
Topic 3	GERD & Peptic Ulcer	Gastroesophageal Reflux Disease
		Peptic Ulcer
Topic 4	Liver & Gallbladder Diseases	Non-alcoholic Fatty Liver Disease
		Hepatic Cirrhosis
		Gallstones
Topic 5	Malignancy	Gastric Cancer
		Colorectal Cancer
		Pancreatic Cancer
		Hepatic Cancer / Bile Duct Cancer

Digestive System

Database – *main themes → topics → sub-topics*

Journal Database

Muscular System		
Theme 1: Muscle Proteins		
Topic 1	Contractile Proteins	Actin Myosin
Topic 2	Regulatory Proteins	Troponin Tropomyosin Tropomodulin
Topic 3	Structural Proteins	Titin Nebulin Alpha-actinin Myomesin M-protein Obscurin Dystrophin Desmin Ankyrin Sarcoglycans / Dystroglycans
Theme 2: Structure of Skeletal Muscle		
Topic 1	Muscular Levels of Organisation	Epimysium Perimysium Endomysium Muscle Fascicle Myofibril Myofilament
Topic 2	Structure of Skeletal Muscle Fibres	Sarcomere Sarcolemma Sarcoplasm Motor End-plate Transverse Tubules
Topic 3	Types of Muscle Fibres	Slow-twitch (Type I) Muscle Fibres Fast-twitch (Type II) Muscle Fibres
Topic 4	Stretch Receptor	Muscle Spindle Intrafusal Muscle Fibres
Theme 3: Contraction of Skeletal Muscle		
Topic 1	Types of Contraction	Isometric Contraction Concentric Contraction Eccentric Contraction
Topic 2	Motor Unit	Motor Unit Recruitment Muscle Twitch Tetanic Contraction Muscle Fatigue
Topic 3	Neuromuscular Transmission	Neuromuscular Junction Acetylcholine Receptor Acetylcholinesterase Acetylcholinesterase Inhibitor
Topic 4	Calcium Release	Excitation-contraction Coupling Sarcoplasmic Reticulum Dihydropyridine Receptor Ryanodine Receptor
Theme 4: Smooth Muscle		
Topic 1	Structure of Smooth Muscle	Smooth Muscle Actin Smooth Muscle Myosin Caveolae
Topic 2	Contraction of Smooth Muscle	Calmodulin Caldesmon Calponin Myosin Light-chain Kinase Myosin Light-chain Phosphatase
Topic 3	Types of Smooth Muscle	Vascular Smooth Muscle Bronchial Smooth Muscle Esophageal Smooth Muscle Gastric Smooth Muscle Intestinal Smooth Muscle Gallbladder Smooth Muscle

		Urinary Bladder Smooth Muscle
Theme 5: Back Muscles & Appendicular Muscles		
Topic 1	Erector Spinae / Transversospinales / Splenius	Longissimus / Spinalis / Iliocostalis Semispinalis / Multifidus / Splenius
Topic 2	Pectoral Girdle Movements	Pectoralis Minor / Serratus Anterior Trapezius / Levator Scapulae Rhomboid Major / Rhomboid Minor
Topic 3	Arm & Forearm Movements	Pectoralis Major / Latissimus Dorsi Deltoid / Teres Major / Coracobrachialis Biceps Brachii / Brachialis Triceps Brachii / Anconeus
Topic 4	Intrinsic Hand Muscles	Thenar Muscles / Hypothenar Muscles Lumbrical Muscles / Interosseous Muscles
Topic 5	Thigh & Leg Movements	Gluteus Maximus / Medius / Minimus Psoas Major / Iliacus Sartorius / Rectus Femoris Quadriceps Femoris / Hamstrings
Theme 6: Muscles of Head & Face		
Topic 1	Face & Scalp	Masticatory Muscles Zygomaticus Major / Depressor Anguli Oris Frontalis / Occipitalis / Auricularis
Topic 2	Eye & Orbit	Lateral Rectus / Medial Rectus Superior Rectus / Inferior Rectus Superior Oblique / Inferior Oblique Levator Palpebrae Superioris Orbicularis Oculi
Topic 3	Middle Ear	Ciliary Muscle Tensor Tympani Stapedius
Topic 4	Soft Palate	Tensor Veli Palatini / Levator Veli Palatini Palatopharyngeus / Palatoglossus / Musculus Uvulae
Topic 5	Tongue	Genioglossus Hyoglossus / Styloglossus / Palatoglossus
Theme 7: Electromyography (EMG)		
Topic 1	Types of EMG Recording	Surface EMG Needle EMG Single-Fibre EMG
Topic 2	EMG Recording System & Analysis	EMG Electrodes EMG Signal Decomposition / Processing EMG Analysis
Topic 3	Muscle Action Potential	Compound Muscle Action Potential (CMAP) Motor Unit Action Potential (MUAP)
Topic 4	Nerve Conduction Study	Nerve Conduction Velocity Repetitive Nerve Stimulation
Topic 5	Electromyogram	Fibrillation Fasciculation Myotonia Neuromyotonia Myokymia
Special Theme: Muscle Disorders		
Topic 1	Myopathy	Muscular Dystrophy Muscle Atrophy Amyotrophy / Amyotrophic Lateral Sclerosis
Topic 2	Muscle Damage & Inflammation	Rhabdomyolysis Myositis Myalgia Muscle Strain
Topic 3	Neuromuscular Junction Disorders	Myasthenia Gravis Lambert-Eaton Syndrome
Topic 4	Abnormal Muscle Tone	Hypotonia Hypertonia Spasticity Rigidity
Topic 5	Tendinopathy & Bursopathy	Tendinitis Bursitis

Muscular System

Database – *main themes → topics → sub-topics*

Journal Database

Skeletal System			
Theme 1: Bone / Cartilage / Tendon / Ligament			
Topic 1	Bone Cells	Osteocyte	
		Osteoblast	
		Osteoclast	
Topic 2	Structure of Bone	Osteon	
		Periosteum / Endosteum	
Topic 3	Types of Bone	Compact Bone (Cortical Bone)	
		Cancellous Bone (Trabecular Bone)	
		Long Bone / Short Bone	
		Flat Bone / Irregular Bone	
		Sesamoid Bone	
Topic 4	Types of Cartilage	Hyaline Cartilage	
		Elastic Cartilage	
		Fibrocartilage	
Topic 5	Tendon & Ligament	Tendon	
		Ligament	
Theme 2: Bone Development & Growth			
Topic 1	Osteogenesis	Endochondral Ossification	
		Intramembranous Ossification	
Topic 2	Epiphyseal Plate	Resting Zone / Proliferative Zone	
		Hypertrophic / Calcified Cartilage / Ossification Zone	
Topic 3	Bone Regions	Epiphysis	
		Metaphysis	
		Diaphysis	
Topic 4	Bone Modeling & Remodeling	Bone Modeling	
		Bone Remodeling	
		Bone Resorption	
		Bone Mineralization	
		Bone Matrix	
		Bone Metabolism	
		Bone Homeostasis	
		Bone Adaptation	
Theme 3: Vertebral Column & Thorax			
Topic 1	Vertebral Column / Vertebrae	Cervical Vertebrae	
		Thoracic Vertebrae	
		Lumbar Vertebrae	
		Sacral Vertebrae / Sacrum	
		Coccygeal Vertebrae / Coccyx	
		Spinous Process	
		Articular Process	
		Transverse Process	
		Intervertebral Disc	
		Intervertebral Foramen	
Topic 2	Atlantoaxial & Atlanto-occipital Joints	Atlantoaxial Joint	
		Atlanto-occipital Joint	
Topic 3	Thorax	Sternum	
		Rib Cage	
		Ribs	
Theme 4: Upper Limb & Shoulder Bones			
Topic 1	Pectoral Girdle	Clavicle	
		Scapula	
Topic 2	Arm	Humerus	
		Ulna	
		Radius	
Topic 3	Hand	Scaphoid	
		Lunate	
		Triquetrum	
		Pisiform	
		Trapezium	
		Trapezoid	
		Capitate	
		Hamate	
		Metacarpals	

Phalanges		
Theme 5: Lower Limb & Hip Bones		
Topic 1	Pelvic Girdle	Ilium
		Ischium
		Pubis
		Pelvic Inlet / Pelvic Outlet
Topic 2	Leg	Femur
		Patella
		Tibia
		Fibula
Topic 3	Foot	Talus
		Calcaneus
		Navicular / Accessory Navicular
		Cuneiform
		Cuboid
		Metatarsals
		Phalanges
Theme 6: Limb Joints / Ligaments		
Topic 1	Pectoral Girdle	Glenohumeral Joint (Shoulder Joint)
		Acromioclavicular Joint / Sternoclavicular Joint
Topic 2	Upper Limb	Elbow Joint
		Distal Radioulnar Joint
		Radiocarpal Joint (Wrist Joint)
		Ulnar / Radial Collateral Ligament
Topic 3	Pelvic Girdle	Pubic Symphysis
		Sacroiliac Joint
		Hip Joint / Acetabulum
Topic 4	Lower Limb	Patellofemoral Joint / Tibiofemoral Joint
		Proximal Tibiofibular Joint / Distal Tibiofibular Syndesmosis
		Talocrural Joint
		Anterior / Posterior Cruciate Ligament
		Medial / Lateral Collateral Ligament
		Patellar Tendon
Theme 7: Skull & Face		
Topic 1	Facial Bones & Ear Bones	Maxilla
		Nasal Bone / Vomer
		Zygomatic Bone / Zygomatic Arch
		Inferior Nasal Concha / Palatine Bone / Lacrimal Bone
		Mandible / Temporomandibular Joint
		Auditory Ossicles
Topic 2	Neurocranium	Frontal Bone
		Occipital Bone
		Parietal Bones
		Temporal Bones
		Sphenoid Bone / Ethmoid Bone
		Styloid Process / Mastoid Process / Zygomatic Process
Topic 3	Sutures & Foramina	Sagittal Suture / Coronal Suture / Lambdoid Suture
		Foramen Magnum / Foramen Ovale
		Mastoid Foramen / Stylomastoid Foramen
Special Theme: Skeletal Disorders		
Topic 1	Collagen-related Diseases	Osteogenesis Imperfecta
		Ehlers-Danlos Syndrome
		Achondrogenesis / Hypochondrogenesis
		Spondyloepiphyseal Dysplasia Congenita
		Kniest Dysplasia / Stickler Syndrome
Topic 2	Osteoporosis & Fracture	Osteoporosis
		Osteopenia
		Bone Fracture
Topic 3	Arthritis & Inflammation	Osteoarthritis
		Rheumatoid Arthritis
		Gout
		Osteomyelitis
		Periostitis
		Chondritis
Topic 4	Bone Tumours	Osteosarcoma
		Osteochondroma

Skeletal System

Database – *main themes → topics → sub-topics*

Journal Database

Reproductive System			
Theme 1: Male Reproductive System			
	Topic 1	Testes	Seminiferous Tubules Sertoli Cells Leydig Cells
	Topic 2	Male Duct System	Rete Testis Epididymis Vas Deferens (Ductus Deferens) Ejaculatory Duct
	Topic 3	Male Accessory Glands	Seminal Vesicles Prostate Gland Bulbourethral Glands
	Topic 4	Inguinal Canal & Spermatic Cord	Inguinal Canal Spermatic Cord
	Topic 5	Male External Genitalia	Penis Corpora Cavernosa / Corpus Spongiosum Scrotum
Theme 2: Male Reproductive Function			
	Topic 1	Spermatogenesis	Spermatogonia Primary / Secondary Spermatocytes Spermatids Spermiogenesis Spermatozoa Semen
	Topic 2	Erection & Ejaculation	Penile Erection Ejaculation Sperm Capacitation
	Topic 3	Reproductive Hormones & ABP	Gonadotropin-Releasing Hormone (in male) Follicle-Stimulating Hormone (in male) Luteinizing Hormone (in male) Testosterone Androgen-binding Protein Anti-Müllerian Hormone (in male)
Theme 3: Female Reproductive System			
	Topic 1	Ovaries & Oviducts	Ovaries Corpus Luteum Oviducts (Fallopian Tubes) Theca Cells Granulosa Cells
	Topic 2	Uterus	Uterine Wall Endometrium Myometrium Cervix
	Topic 3	Vagina	Vaginal Epithelium Hymen
	Topic 4	Female External Genitalia	Vulva Labia Majora / Labia Minora Mons Pubis Clitoris
Theme 4: Female Reproductive Function			
	Topic 1	Oogenesis	Primordial Follicles Primary Follicles / Secondary Follicles Tertiary Follicles (Graafian Follicles) First Polar Body / Second Polar Body
	Topic 2	Ovarian Cycle	Follicular Phase Ovulation Luteal Phase
	Topic 3	Uterine Cycle	Menstruation Proliferative Phase Secretory Phase
	Topic 4	Reproductive Hormones	Gonadotropin-Releasing Hormone (in female) Follicle-Stimulating Hormone (in female) Luteinizing Hormone (in female) Oestrogen

		Progesterone
Theme 5: Fertilisation & Blastulation		
Topic 1	Fertilisation	Corona Radiata Zona Pellucida Acrosomal Membrane / Acrosome Reaction Perivitelline Space / Vitelline Layer Cortical Reactions / Cortical Granules Polyspermic Block / Polyspermic In Vitro Fertilisation Intracytoplasmic Sperm Injection Intrauterine Insemination
Topic 2	Assisted Reproductive Technology	Zygote Morula Blastocyst Inner Cell Mass Trophoblast Blastocoel
Topic 3	Cleavage & Blastulation	
Theme 6: Embryonic & Fetal Development		
Topic 1	Developmental Processes	Implantation Gastrulation Neurulation Placentation / Placenta Organogenesis
Topic 2	Germ Layers	Ectoderm Mesoderm Endoderm
Topic 3	Extraembryonic Membranes	Amnion / Amniotic Fluid Allantois Yolk Sac Chorion / Chorionic Villi
Topic 4	Placental Development	Cytotrophoblast / Syncytiotrophoblast Human Chorionic Gonadotropin Human Placental Lactogen
Theme 7: Pregnancy / Parturition / Lactation		
Topic 1	Pregnancy Trimesters	First Trimester Second Trimester Third Trimester
Topic 2	Fetal Circulation	Umbilical Artery / Umbilical Vein Vitelline Artery / Vitelline Vein
Topic 3	Parturition	Stages of Labour Cervical Dilation Induction of Labour Caesarean Delivery / Caesarean Section
Topic 4	Lactation	Mammogenesis / Lactogenesis Lactiferous Duct / Mammary Alveoli Breastfeeding Nipple / Areola Milk Ejection Reflex Colostrum
Special Theme: Reproductive Disorders		
Topic 1	Infertility	Male Infertility Female Infertility
Topic 2	Congenital Defect & Trauma	Cryptorchidism Testicular Torsion / Inguinal Hernia
Topic 3	Menstrual Disorders & Endometriosis	Amenorrhea / Dysmenorrhea Premenstrual Syndrome Endometriosis
Topic 4	Malignancy	Testicular Cancer / Prostate Cancer Ovarian Cancer / Breast Cancer Cervical Cancer / Endometrial Cancer
Topic 5	Inflammation & Infection / Sexually Transmitted Diseases	Orchitis / Epididymitis / Prostatitis Oophoritis / Salpingitis Vaginitis / Vaginal Candidiasis Chlamydia / Gonorrhea / Syphilis Trichomoniasis

Reproductive System

Database – *main themes → topics → sub-topics*

Journal Database

Immune System			
Theme 1: Non-specific Immunity (Innate Immunity)			
Topic 1	First Line of Defense	Skin	
		Mucosal Surface / Mucus	
		Mucociliary Clearance	
		Lacrimal Gland / Tear / Saliva	
		Lysozyme	
Topic 2	Second Line of Defense	Phagocytosis	
		Inflammation	
		Fever / Pyrexia / Pyrogen	
		Antimicrobial Peptides	
Topic 3	Complement System	Classical Complement Pathway	
		Lectin Pathway	
		Alternative Pathway	
		Membrane Attack Complex	
Topic 4	Pattern Recognition Receptor	Toll-like Receptor / Mannose Receptor	
		NOD-like Receptor / RIG-I-like Receptor	
Theme 2: Specific Immunity (Adaptive Immunity)			
Topic 1	Humoral Immunity (Antibody-mediated Immunity)	B Cell	
		Plasma Cell	
		Memory B Cell	
		Antibody	
Topic 2	Cellular Immunity (Cell-mediated Immunity)	Cytotoxic T Cell	
		Helper T Cell	
		Regulatory T Cell	
		Memory T Cell	
		Major Histocompatibility Complex	
		Minor Histocompatibility Antigen	
		Class I MHC Protein / Class II MHC Protein	
		Human Leukocyte Antigen / HLA Typing	
Topic 3	Antigen-Presenting Cells	Professional Antigen-Presenting Cells	
		Macrophage	
		Dendritic Cell	
Theme 3: Antibodies			
Topic 1	Antibody Molecules	Immunoglobulin Light Chain	
		Immunoglobulin Heavy Chain	
		Fab Fragment / Fc Fragment	
Topic 2	Antibody Isotypes (Classes)	IgA	
		IgD	
		IgE	
		IgG	
		IgM	
		Immunoglobulin Class Switching	
Topic 3	Actions of Antibodies	Neutralization	
		Opsonization	
		Agglutination / Precipitation	
		Complement Activation / Complement Fixation	
Topic 4	Antibody Production	Monoclonal Antibody	
		Polyclonal Antibody	
Theme 4: Immune Response			
Topic 1	Primary & Secondary Immune Response	Primary Immune Response	
		Secondary Immune Response	
		Booster Vaccination / Booster Dose	
Topic 2	Phases of Specific Immune Response	Antigen Recognition	
		T Cell Activation	
		T-cell Receptor	
		B Cell Activation	
		B-cell Receptor	
		Clonal Expansion	
Topic 3	Formation of Immune Complex (Antigen-Antibody Complex)	Immune Complex	
		Epitope / Antigenic Determinant	
Topic 4	Signalling Processes	Cytokines	
		Interleukins	
		Interferons	

		Co-stimulation
Theme 5: Lymphoid Organs & Tissues		
Topic 1	Primary Lymphoid Organs	Bone Marrow
		Thymus
Topic 2	Secondary Lymphoid Organs & Tissues	Spleen
		Lymph Nodes
		Lymphatic Vessels
		Mucosa-associated Lymphoid Tissue
		Tonsils / Adenoids
		Gut-associated Lymphoid Tissue
		Peyer's Patches
		Bronchus-associated Lymphoid Tissue
		Nasal-associated Lymphoid Tissue
Topic 3	Immune Tolerance	Central Tolerance
		Peripheral Tolerance
		Cross-reactivity
		Clonal Selection / Clonal Deletion / Clonal Anergy
Theme 6: Myelopoiesis & Lymphopoiesis		
Topic 1	Granulopoiesis & Granulocyte	Granulopoiesis
		Myeloblast
		Promyelocyte / Myelocyte / Metamyelocyte
		Neutrophil
		Eosinophil
		Basophil
		Mast Cell
Topic 2	Monocytopoiesis & Monocyte	Monocytopoiesis
		Monoblast / Promonocyte
		Monocyte
Topic 3	Lymphopoiesis & Lymphocyte	Lymphopoiesis
		Lymphocyte
		Natural Killer Cell (NK Cell)
Topic 4	Cluster of Differentiation	CD4+/CD8+ Ratio
		CD45
Theme 7: Immunotherapy & Vaccines		
Topic 1	Immunotherapy	Immune Checkpoint Inhibitors
		Monoclonal Antibody Therapy
		Adoptive Cell Transfer
		Cancer Vaccine
		Interleukin-2 Immunotherapy
		Photoimmunotherapy
Topic 2	Immunosuppression & Immunomodulation	Immunosuppression / Immunosuppressive Drug
		Immunomodulation / Immunomodulator
Topic 3	Vaccines	Live Attenuated Vaccine
		Inactivated Vaccine
		Subunit Vaccine
		Conjugate Vaccine
		mRNA Vaccine
		DNA Vaccine
		Vaccine Adjuvant
Special Theme: Immune Disorders		
Topic 1	Hypersensitivity Reactions (HR)	Type I HR (Immediate Hypersensitivity) / Anaphylaxis
		Type II HR (ADCC) / Immune Thrombocytopenia
		Type III HR (Immune Complex Disease) / Serum Sickness
		Type IV HR (Delayed Hypersensitivity) / Poison Ivy Dermatitis
		Allergy / Antihistamine
Topic 2	Autoimmune Diseases	Systemic Lupus Erythematosus / Coeliac Disease
		Multiple Sclerosis / Guillain-Barré Syndrome
Topic 3	Immunodeficiency	B Cell Deficiency / T Cell Deficiency
		Acquired Immunodeficiency Syndrome (AIDS)
Topic 4	Transplant Rejection	Hyperacute Rejection / Acute Rejection
		Chronic Rejection
Topic 5	Hematological Malignancies	Non-Hodgkin Lymphoma / Hodgkin Lymphoma
		Acute Lymphoblastic Leukaemia / Chronic Lymphocytic Leukaemia
		Acute Myeloid Leukaemia / Chronic Myeloid Leukaemia
		Myelodysplastic Syndromes / Myeloproliferative Neoplasm

Immune System

Database – Excel Files

	A	B	C	D	E	F	G
	Topic	Sub-topic	Title of Journal Article	Journal	Year	PubMed Weblink	
1							
2	General Syndromes	Chronic Kidney Disease	Empagliflozin in patients with chronic kidney disease	New England Journal of Medicine	2023	https://pubmed.ncbi.nlm.nih.gov/36331190/	
3		Chronic Kidney Disease	Mitochondrial pathophysiology on chronic kidney disease	International Journal of Molecular Sciences	2022	https://pubmed.ncbi.nlm.nih.gov/35163697/	
4		Chronic Kidney Disease	An intermediate-effect size variant in UMOD confers risk for chronic kidney disease	PNAS	2022	https://pubmed.ncbi.nlm.nih.gov/35947615/	
5		Chronic Kidney Disease	Fibrosis in chronic kidney disease: Pathogenesis and consequences	International Journal of Molecular Sciences	2021	https://pubmed.ncbi.nlm.nih.gov/33401711/	
6		Chronic Kidney Disease	Genomic integration of ERRγ-HNF1β regulates renal bioenergetics and prevents chronic kidney disease	PNAS	2018	https://pubmed.ncbi.nlm.nih.gov/29735694/	
7		Acute Kidney Injury	Acute kidney injury: Medical causes and pathogenesis	Journal of Clinical Medicine	2023	https://pubmed.ncbi.nlm.nih.gov/36615175/	
8		Acute Kidney Injury	Comparison of two delayed strategies for renal replacement therapy initiation for severe acute kidney injury (AKIKI 2): a multicentre, open-label, randomised, controlled trial	Lancet	2021	https://pubmed.ncbi.nlm.nih.gov/33812488/	
9		Acute Kidney Injury	A clinically applicable approach to continuous prediction of future acute kidney injury	Nature	2019	https://pubmed.ncbi.nlm.nih.gov/31367026/	
10		Acute Kidney Injury	Acute kidney injury from sepsis: current concepts, epidemiology, pathophysiology, prevention and treatment	Kidney International	2019	https://pubmed.ncbi.nlm.nih.gov/31443997/	
11		Acute Kidney Injury	Management of patients at risk of acute kidney injury	Lancet	2017	https://pubmed.ncbi.nlm.nih.gov/28561005/	
12		Nephrotic Syndrome / Nephritic Syndrome	Nephrotic syndrome: pathophysiology and consequences	Journal of Nephrology	2023	https://pubmed.ncbi.nlm.nih.gov/37466816/	
13		Nephrotic Syndrome / Nephritic Syndrome	Nephritic syndrome	Primary Care	2020	https://pubmed.ncbi.nlm.nih.gov/33121632/	
14		Nephrotic Syndrome / Nephritic Syndrome	Idiopathic nephrotic syndrome in children	Lancet	2018	https://pubmed.ncbi.nlm.nih.gov/29910038/	
15		Nephrotic Syndrome / Nephritic Syndrome	Activation of the IL-2 receptor in podocytes: A potential mechanism for podocyte injury in idiopathic nephrotic syndrome?	PLoS One	2016	https://pubmed.ncbi.nlm.nih.gov/27389192/	
16		Nephrotic Syndrome / Nephritic Syndrome	Analysis of the expression of HMGB-1, CXCL16, miRNA-30a, and TGF-β1 in primary nephritic syndrome patients and its significance	Genetics and Molecular Research	2015	https://pubmed.ncbi.nlm.nih.gov/26345917/	
17	Glomerular Diseases	IgA Nephropathy / Membranous Nephropathy	Efficacy and safety of a targeted-release formulation of budesonide in patients with primary IgA nephropathy (NefIgArd): 2-year results from a randomised phase 3 trial	Lancet	2023	https://pubmed.ncbi.nlm.nih.gov/37591292/	
18		IgA Nephropathy / Membranous Nephropathy	Elevated levels of IL-6 in IgA nephropathy patients are induced by an epigenetically driven mechanism modulated by viral and bacterial RNA	European Journal of Internal Medicine	2023	https://pubmed.ncbi.nlm.nih.gov/37550110/	
19		IgA Nephropathy / Membranous Nephropathy	Membranous nephropathy: Systems biology-based novel mechanism and traditional Chinese medicine therapy	Frontiers in Pharmacology	2022	https://pubmed.ncbi.nlm.nih.gov/36176440/	
20		IgA Nephropathy / Membranous Nephropathy	Molecular pathogenesis of membranous nephropathy	Annual Review of Pathology	2020	https://pubmed.ncbi.nlm.nih.gov/31622560/	
21		IgA Nephropathy / Membranous Nephropathy	New developments in the genetics, pathogenesis, and therapy of IgA nephropathy	Kidney International	2015	https://pubmed.ncbi.nlm.nih.gov/26376134/	
22		Diabetic Nephropathy	GSDMD-mediated pyroptosis: a critical mechanism of diabetic nephropathy	Expert Reviews in Molecular Medicine	2021	https://pubmed.ncbi.nlm.nih.gov/34955116/	
23		Diabetic Nephropathy	Complement activation in patients with diabetic nephropathy	Diabetes & Metabolism	2019	https://pubmed.ncbi.nlm.nih.gov/29729954/	
24		Diabetic Nephropathy	Novel insights into the pathophysiology and clinical aspects of diabetic nephropathy	Reviews in Endocrine and Metabolic Disorders	2017	https://pubmed.ncbi.nlm.nih.gov/28289965/	
25		Diabetic Nephropathy	High Elmo1 expression aggravates and low Elmo1 expression prevents diabetic nephropathy	PNAS	2016	https://pubmed.ncbi.nlm.nih.gov/26858454/	
26		Diabetic Nephropathy	Activated protein C ameliorates diabetic nephropathy by epigenetically inhibiting the redox enzyme p66Shc	PNAS	2013	https://pubmed.ncbi.nlm.nih.gov/23267072/	
27		Minimal Change Disease	Interventions for minimal change disease in adults with nephrotic syndrome	Cochrane Database of Systematic Reviews	2022	https://pubmed.ncbi.nlm.nih.gov/35230699/	
28		Minimal Change Disease	Minimal change disease is associated with endothelial glycocalyx degradation and endothelial activation	Kidney International Reports	2021	https://pubmed.ncbi.nlm.nih.gov/35497798/	
29		Minimal Change Disease	Molecular mechanisms of proteinuria in minimal change disease	Frontiers of Medicine	2021	https://pubmed.ncbi.nlm.nih.gov/35004732/	
30		Minimal Change Disease	Randomized, controlled trial of tacrolimus and prednisolone monotherapy for adults with de novo minimal change disease: A multicenter, randomized, controlled trial	Clinical Journal of the American Society of Nephrology	2020	https://pubmed.ncbi.nlm.nih.gov/31953303/	
31		Minimal Change Disease	Acute kidney injury complicating nephrotic syndrome of minimal change disease	Kidney International	2018	https://pubmed.ncbi.nlm.nih.gov/29980292/	
32		Focal Segmental Glomerulosclerosis	Btg2 promotes focal segmental glomerulosclerosis via smad3-dependent podocyte-mesenchymal transition	Advanced Science	2023	https://pubmed.ncbi.nlm.nih.gov/37749872/	
33		Focal Segmental Glomerulosclerosis	Clinical, pathological, and genetic characteristics in patients with focal segmental glomerulosclerosis	Kidney360	2022	https://pubmed.ncbi.nlm.nih.gov/36176665/	
34		Focal Segmental Glomerulosclerosis	Focal segmental glomerulosclerosis: State-of-the-art and clinical perspective	Nephron	2020	https://pubmed.ncbi.nlm.nih.gov/32721952/	
35		Focal Segmental Glomerulosclerosis	Causes and pathogenesis of focal segmental glomerulosclerosis	Nature Reviews Nephrology	2015	https://pubmed.ncbi.nlm.nih.gov/25447132/	
36		Focal Segmental Glomerulosclerosis	Pathogenesis and treatment of focal segmental glomerulosclerosis: the role of animal models	BMJ Nephrology	2012	https://pubmed.ncbi.nlm.nih.gov/22547002/	

Structure of the Renal System	Renal Blood Flow	Urine Formation	Micturition	Acid-Base Balance	Electrolyte
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Principal Investigator

Abstract

Keyword(s)

Status

Deliverables

- a. Nervous system
- b. Endocrine system
- c. Cardiovascular system
- d. Respiratory system
- e. Renal system
- f. Digestive system
- g. Muscular system
- h. Skeletal system
- i. Reproductive system
- j. Immune system
- k. User Guide

- Questionnaire
- Interview script

4. Educational journal article

- a. Nervous system
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- h. Skeletal system
- i. Reproductive system
- j. Immune system
- k. User Guide

- a. Questionnaire
- b. Interview script

4. Educational journal article

Teaching Materials

MBBS

Pupillary Light Reflex - Clinical & Scientific Relevance

nature COMMUNICATIONS

ARTICLE

DOI: 10.1038/s41467-018-03985-4 OPEN

Enhanced pupillary light reflex in infancy is associated with autism diagnosis in toddlerhood

Pär Nyström¹, Teodora Gliga², Elisabeth Nilsson Joba³, Gustaf Gredebäck¹, Tony Charman⁴, Mark H. Johnson^{2,4}, Sven Bötte^{5,6} & Terje Falck-Ytter^{1,5,6,7}

Physiol. Res. 66 (Suppl. 2): S277-S284, 2017

Pupillary Light Reflex is Altered in Adolescent Depression

A. MESTANIKOVA^{1,2}, I. ONDREJKA¹, M. MESTANIK^{1,2}, D. CESNEKOVA¹, Z. VISNOVOVA^{1,2}, I. BUJNAKOVA^{1,2}, M. OPFA¹, A. CALKOVSKA^{1,2}, I. TOSHAJZEKOVA^{1,2}

¹Department of Physiology, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava, Martin, Slovakia, ²Biomedical Center Martin, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava, Martin, Slovakia, ³Psychiatric Clinic, Jessenius Faculty of Medicine in Martin, Comenius University in Bratislava, University Hospital Martin, Martin, Slovakia

diagnostics

Review

Eyeing up the Future of the Pupillary Light Reflex in Neurodiagnostics

Charlotte A. Hall and Robert P. Chilcott *

Research Centre for Topical Drug Delivery and Toxicology, University of Hertfordshire, Hatfield SP10 2CH, UK

* Correspondence: toe.publications@herts.ac.uk; Tel.: +44-(0)7718696629

Received: 22 February 2018; Accepted: 12 March 2018; Published: 13 March 2018

Volume 51 • Number 4 • August

Pupillary Light Reflex Variability as a Predictor of Clinical Outcomes in Subarachnoid Hemorrhage

Stefany Ortega-Perez, Beoluwa Shoyombo, Venkatesh Aiyagari, Folefat Atem, Michelle Hill, Sonja E. Stutzman, DaiWai M. Olson

Myasthenia Gravis

2015

Review

Myasthenia gravis and related disorders: Pathology and molecular pathogenesis^{1,2}

James C. Ha, David P. Richman *

Department of Neurology, University of California, Davis, United States

ARTICLE INFO

Article history:
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ABSTRACT

Disorders affecting the presynaptic, synaptic, and postsynaptic portions of the neuromuscular junction arise from various mechanisms in children and adults, including acquired autoimmune or toxic processes as well as genetic mutations. Disorders include autoimmune myasthenia gravis associated with acetylcholine receptor, muscle

ABSTRACT

Disorders affecting the presynaptic, synaptic, and postsynaptic portions of the neuromuscular junction arise from various mechanisms in children and adults, including acquired autoimmune or toxic processes as well as genetic mutations. Disorders include autoimmune myasthenia gravis associated with acetylcholine receptor, muscle specific kinase or Lrp4 antibodies, Lambert–Eaton myasthenic syndrome, nerve terminal hyperexcitability syndromes, Guillain Barré syndrome, botulism, organophosphate poisoning and a number of congenital myasthenic syndromes. This review focuses on the various molecular and pathophysiological mechanisms of these disorders, characterization of which has been crucial to the development of treatment strategies specific for each pathogenic mechanism. In the future, further understanding of the underlying processes may lead to more effective and targeted therapies of these disorders. This article is part of a Special Issue entitled: Neuromuscular Diseases: Pathology and Molecular Pathogenesis.

LKS Faculty of Medicine

BBiomedSc

Supplementary Reading Materials (BBMS1001)

Journal Articles Related to Lectures

The following scientific and medical journal articles can facilitate your understanding of how biomedical science knowledge is generated through scientific research and how biomedical discoveries are translated into clinical applications.

The journal articles may also broaden your knowledge of the lecture topics, pique your curiosity to discover about medical sciences and clinical problems, enhance your ability in raising research questions, and increase your exposure to a variety of research topics.

Lecture Topics	Recommended Journal Articles
Muscle contraction I	A chloride channel blocker prevents the suppression by inorganic phosphate of the cytosolic calcium signals that control muscle contraction (2021) https://pubmed.ncbi.nlm.nih.gov/32991741/ Muscle disease caused by mutations in the skeletal muscle alpha-actin gene (ACTA1) (2003) https://pubmed.ncbi.nlm.nih.gov/1291789/
Muscle contraction II	Signal transduction and regulation in smooth muscle (1994) https://pubmed.ncbi.nlm.nih.gov/7969467/ Mechanisms of vascular smooth muscle contraction and the basis for pharmacologic treatment of smooth muscle disorders (2016) https://pubmed.ncbi.nlm.nih.gov/27037223/

Autism

202

Pharmacological Management of Core Symptoms and Comorbidities of Autism Spectrum Disorder in Children and Adolescents: A Systematic Review

Jennal Maniram¹, Saira BS Karrim², Frasia Oosthuizen³, Ebenezer Wiawe^{1,2}

¹School of Health Sciences, University of KwaZulu-Natal, Durban, South Africa; ²Clinical Pharmacy Services Unit, Directorate of Pharmacy, Ho Teaching Hospital, Ho, Ghana

Purpose: The pharmacological management of Autism Spectrum Disorder (ASD) in children remains a challenge due to limited effective management options and the absence of approved drugs to manage the core symptoms. This review aims to describe and highlight effective pharmacological management options employed in managing the core symptoms and comorbidities of ASD from eligible studies over the past decade.

Methods: A search of databases; PubMed, Scopus, Science Direct, and PsychInfo for pharmacotherapeutic options for ASD was conducted in this systematic review. Duplicate studies were removed by utilizing the EndNote citation manager. The studies were subsequently screened independently by two authors. Eligible studies from 01 January 2012 to 01 January 2022 were included based on established eligibility criteria. A narrative synthesis was used for data analysis.

Results: The systematic review provided a comprehensive list of effective management options for ASD comorbidities and core symptoms from 33 included studies. The management options for ASD comorbidities; insomnia, hyperactivity, irritability and aggression, gastrointestinal disturbances, and subclinical epileptiform discharges, were reviewed. Risperidone, aripiprazole, methylphenidate, guanfacine, levetiracetam, and atomoxetine are examples of effective pharmacological drugs against ASD comorbidities. Additionally, this review identified various drugs that improve the core symptoms of ASD and include but are not limited to, bumetanide, buspirone, intranasal oxytocin, intranasal vasopressin, and prednisolone.

Conclusion: This review has successfully summarized the pharmacological advancements made in the past decade to manage ASD. Although there is still no pharmacological cure for ASD core symptoms or additional drugs that have obtained regulatory approval for use in ASD, the availability of promising pharmacological agents are under evaluation and study.

Clinical Relevance

Control of Posture & Movement

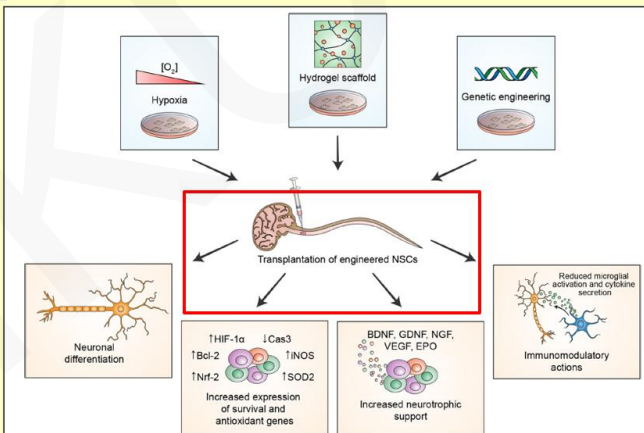


Fig. 1 Engineering strategies to increase stem cell engraftment and survival within the host tissue include hypoxic and pharmacological models. In addition to that, engineered cells appear able to increase expression of anti-apoptotic (THF-1α, Bcl-2), antioxidant (Iinos, SOD2, catalase, Nrf2), and trophic (VEGF, EPOR) genes. Remarkably, they can also promote the secretion of neurotrophic factors (GDNF, BDNF, VEGF, NGF, NT-3) and reduce cytokine production and microglial activation.

increasing endogenous neuroblasts proliferation and migration and reducing infarct size and reperfusion-induced injury in experimental models. In addition to that, engineered cells appear able to increase expression of anti-apoptotic (THF-1α, Bcl-2), antioxidant (Iinos, SOD2, catalase, Nrf2), and trophic (VEGF, EPOR) genes. Remarkably, they can also promote the secretion of neurotrophic factors (GDNF, BDNF, VEGF, NGF, NT-3) and reduce cytokine production and microglial activation.

Supplementary Reading Materials (BMSN3605 & BMSN2102)

Lectures - Dr C.W. Ma

Journal Articles Related to Lectures

The following scientific and medical journal articles can facilitate your understanding of how biomedical science knowledge is generated through scientific research and how biomedical discoveries are translated into clinical applications.

The journal articles may also broaden your knowledge of the lecture topics, pique your curiosity to discover about medical sciences and clinical problems, enhance your ability in raising research questions, and increase your exposure to a variety of research topics.

Lecture Topics	Recommended Journal Articles
Synaptic & neuromuscular transmission	Increased levels of the synaptic proteins PSD-95, SNAP-25, and neuromodulin in the cerebrospinal fluid of patients with Alzheimer's disease (2022) https://pubmed.ncbi.nlm.nih.gov/35461266/ Electrical and chemical synapses between relay neurons in developing thalamus (2010) https://pubmed.ncbi.nlm.nih.gov/20457735/ Change in plasma levels of amino acid neurotransmitters and its correlation with clinical heterogeneity in early Parkinson's disease patients (2015) https://pubmed.ncbi.nlm.nih.gov/23981689/ Clinical neurophysiology of neuromuscular junction disease (2019) https://pubmed.ncbi.nlm.nih.gov/31307607/
Excitation & muscle contraction	A chloride channel blocker prevents the suppression by inorganic phosphate of the cytosolic calcium signals that control muscle contraction (2021) https://pubmed.ncbi.nlm.nih.gov/32991741/ Muscle disease caused by mutations in the skeletal muscle alpha-actin gene (ACTA1) (2003) https://pubmed.ncbi.nlm.nih.gov/1291789/ Signal transduction and regulation in smooth muscle (1994) https://pubmed.ncbi.nlm.nih.gov/7969467/ Mechanisms of vascular smooth muscle contraction and the basis for pharmacologic treatment of smooth muscle disorders (2016) https://pubmed.ncbi.nlm.nih.gov/27037223/
Reflex physiology	Dendritic spine dysgenesis contributes to hyperreflexia after spinal cord injury (2015) https://pubmed.ncbi.nlm.nih.gov/25505110/ Functional analysis of human intrafusal fiber innervation by human γ-motoneurons (2017) https://pubmed.ncbi.nlm.nih.gov/29272416/

BNurs /
BChinMed

BPharm

BEng(BME)

Objectives

1. To develop a **database of journal articles (teaching resources)** that best illustrate to students the connection between basic sciences and clinical medicine.
2. To test the **effectiveness** of teaching and learning activities supported by journal-based materials in biomedical sciences courses of various undergraduate programmes.

Students' Learning Motivation

Learning motivation is positively related to academic performance (according to previous studies).

Students completed a questionnaire for evaluating their learning motivation before & after learning activities with journal-based teaching materials.



Students' Learning Motivation

International Journal of Science Education
Vol 27, No. 6, 16 May 2005, pp. 639–654

RESEARCH REPORT

The development of a questionnaire to measure students' motivation towards science learning

Hsiao-Lin Tuan^{a,*}, Chi-Chin Chin^b and Shyang-Horng Shieh^c

^aNational Changhua University of Education, Taiwan, ^bDepartment of Science Education, National Taichung Teachers College, Taiwan, ^cKong-Kwang Elementary School, Taiwan

Specifically designed to measure:
students' motivation towards science learning (SMTSL)

Tuan HL et al. (2005) Int J Sci Educ 27:639-654

Widely adopted in educational studies
(including those in medical education)

SMTSL Questionnaire

- **35 statements** (6 domains of motivation)
- Students indicated the extent to which they **agreed or disagreed** (along 5-point Likert scale)
- **Maximum SMTSL score = 175**

Increases in the scores for these domains imply that students:

1. **SE**, self-efficacy
2. **ALS**, active learning strategies
3. **SLV**, science learning value
4. **PG**, performance goal
5. **AG**, achievement goal
6. **LES**, learning environment stimulation

- (1) believe more strongly in their ability to perform well in learning sciences,
- (2) take a more active role in constructing knowledge based on previous understanding,
- (3) perceive better the importance of learning biomedical sciences (e.g. to acquire problem-solving skills and stimulate their own thinking),
- (4) have less intention to treat competition with other students and getting attention from the teacher as the goals of learning sciences,
- (5) feel more satisfied with their achievement in learning sciences
- (6) respond more towards stimulations in the learning environment

35 statements (6 domains of motivation)

Students' Learning Motivation

SMTSL Domain (factor)		Medical students MBBS <i>MBBS II MSS</i> <i>Musculo-skeletal System</i> (51)	Nursing students BNurs <i>BMSN1601</i> <i>Foundation of Life Sciences</i> (62)	Nursing students BNurs <i>BMSN3605</i> <i>Life Sciences III</i> (83)	Pharmacy students BPharm <i>BPHM3145</i> <i>Pharmacy in Body System Series</i> (9)	Chinese Medicine students BChinMed <i>BMSC2102</i> <i>Life Science II</i> (8)	Biomedical Sciences students BBiomedSc <i>BBMS1001</i> <i>Introduction to Human Anatomy & Physiology</i> (39)	Biomedical Engineering students BEng(BME) <i>BMED3301</i> <i>Life Sciences III (Physiology)</i> (4)
SE	Pre Post	24 *** 26	22 *** 24	20 *** 22	23 ns 24	17 ns 21	22 *** 24	25 ns 28
ALS	Pre Post	31 *** 33	29 *** 32	27 *** 31	27 *** 32	28 ns 31	30 *** 34	30 ns 33
SLV	Pre Post	19 *** 21	17 *** 19	16 *** 18	18 * 21	17 ns 18	19 *** 21	21 ns 22
PG	Pre Post	13 ns 13	13 ** 12	14 *** 13	15 ns 15	14 ns 13	13 ns 12	16 ns 15
AG	Pre Post	20 ** 21	18 ** 19	17 *** 18	17 * 19	17 ns 19	19 *** 21	18 ns 19
LES	Pre Post	20 *** 21	17 *** 19	17 *** 19	19 ns 21	19 ns 20	19 *** 22	19 ns 21
Total	Pre Post	128 *** 135	116 *** 126	111 *** 121	119 ** 131	111 * 122	122 *** 135	128 ns 138

In all courses:

Journal-based learning enhanced motivation

Motivation scores for nearly all domains ↑

Effects are statistically significant for all large classes

SE, self-efficacy; ALS, active learning strategies; SLV, science learning value; PG, performance goal; AG, achievement goal; LES, learning environment stimulation. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, paired t-test.

Students' Learning Motivation

SMTSL Domain (factor)		Medical students MBBS <i>MBBS II MSS</i> <i>Musculo-skeletal System</i> (51)	Nursing students BNurs <i>BMSN1601</i> <i>Foundation of Life Sciences</i> (62)	Nursing students BNurs <i>BMSN3605</i> <i>Life Sciences III</i> (83)	Pharmacy students BPharm <i>BPHM3145</i> <i>Pharmacy in Body System Series</i> (9)	Chinese Medicine students BChinMed <i>BMSC2102</i> <i>Life Science II</i> (8)	Biomedical Sciences students BBiomedSc <i>BBMS1001</i> <i>Introduction to Human Anatomy & Physiology</i> (39)	Biomedical Engineering students BEng(BME) <i>BMED3301</i> <i>Life Sciences III (Physiology)</i> (4)
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AG	Pre Post	20 ** 21	18 ** 19	17 *** 18	17 * 19	17 ns 19	19 *** 21	18 ns 19
LES	Pre Post	20 *** 21	17 *** 19	17 *** 19	19 ns 21	19 ns 20	19 *** 22	19 ns 21
Total	Pre Post	128 *** 135	116 *** 126	111 *** 121	119 ** 131	111 * 122	122 *** 135	128 ns 138

CONCLUSION

Journal-based teaching materials enhance students' motivation to learn biomedical sciences.

Journal articles inspire students by piquing their curiosity to discover about medical sciences & clinical problems.

SE, self-efficacy; ALS, active learning strategies; SLV, science learning value; PG, performance goal; AG, achievement goal; LES, learning environment stimulation. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$, paired t-test.

Other Impacts on Student Learning

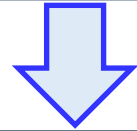
1. **Better understanding of lecture content.** The journal articles in the database (which correspond well to the curricula) will help students understand the lecture content by broadening their knowledge of the lecture topics.
2. **Clearer ideas about clinical applications of biomedical knowledge.** Since journal articles that best illustrate the **connection between basic sciences & clinical medicine** are selected, students will not only understand why the lecture materials are relevant to clinical contexts, but also appreciate the contribution of scientific research to the development of therapeutic strategies.
3. **Clearer concepts of scientific research process.** Journal articles present research work in an organised manner & provide comprehensive information of the work (e.g. background, methodologies, experimental data & discussion on the significance of findings), hence reinforcing student learning about the steps of research process (e.g. formulation of hypothesis, experimental design, data analysis/interpretation & drawing conclusions) and how to report scientific research findings.
4. **Stronger ability in generating research questions.** Journal articles describe in detail how researchers come up with clinically-related scientific research questions & find out the answers. From journal articles, students can learn to raise meaningful research questions through deeper thinking & reasoning.
5. **Exploration of research interests.** Journal articles increase students' exposure to a variety of research topics, which help them to identify their favourite research areas. This can better prepare students for pursuing research projects in the future.



Impacts on Teaching

Teachers can use to database to:

Efficiently identify suitable journal articles
with content that matches their teaching topics



Prepare teaching materials that facilitates the implementation of
vertical integration between **basic sciences** & **clinical medicine**



Create a smooth transition
through undergraduate studies for students



Database also helps teachers to:

1. **Promote undergraduate research** by using journal articles to prepare students for research projects
2. **Strengthen teaching-research nexus** by engaging students in research discussions & developing their research skills to enhance the interplay between teaching & research roles
3. **Encourage inquiry-based learning** by guiding students to actively discover knowledge as supported by journal articles that stimulate questions driven by students' interest, hence providing opportunities to engage students in knowledge creation through a student-centred approach



Experience in Preparing the TDG Proposal

3. An **abstract** of the project (in about 200 words) summarising its objectives and expected outcomes/deliverables (for posting on the University's T&L website for public access):

Academic journals are valuable sources of scholarly information. Journal-based teaching materials in the education of basic sciences deepen students' understanding, move students beyond memorisation-driven learning, and instill a lasting curiosity. However, it is very time-consuming for teachers to identify the most appropriate and relevant journal articles that contain meaningful content for enrichment of their teaching materials. Online databases provide searching function, but do not allow the identification of journal articles that best illustrate the connection between basic sciences and clinical medicine related to specific teaching topics. To achieve such a high level of specificity, screening and classification of articles must be done manually through a reliable selection process. In this project, we aim to create a database of systematically classified journal articles that cover major topics in the undergraduate curricula for medical doctors and other healthcare professionals. The database will become a useful tool for teachers to efficiently identify suitable journal articles with content that matches their teaching topics, hence promoting student learning on how biomedical science knowledge is generated through scientific research and how biomedical discoveries are translated into clinical applications. This will facilitate vertical integration, an educational approach that fosters increasing levels of clinical responsibility and supports students to develop abilities in solving medical problems. Students will have better ideas about the clinical applications of biomedical knowledge, clearer concepts of the scientific research process, stronger ability in generating research questions, higher learning motivation, and more opportunities to explore research interests. The database will also help teachers to promote undergraduate research, strengthen the teaching-research nexus, and encourage inquiry-based learning.

Abstract

Background

Objectives

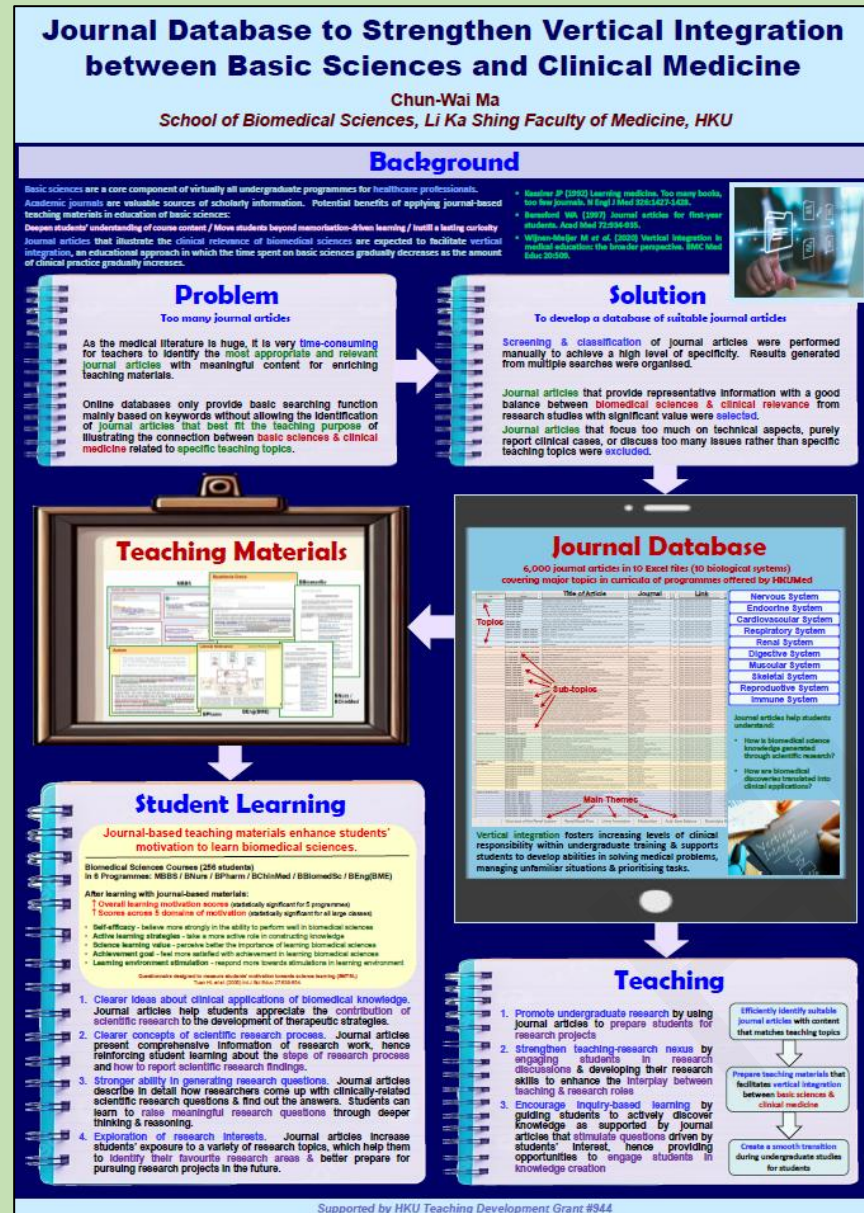
Methods

Deliverables

Benefits

Budget Justifications

Staff	
Item	Justification
Full-time <u>Research Assistant I</u>	The major <u>responsibilities</u> of the research assistant (with a background in medical sciences) are to: (1) <u>search</u> for journal articles potentially suitable to be included in the database (and perform preliminary screening and selection); (2) <u>classify</u> the journal articles (for assessment by PI and Co-Is); (3) <u>create</u> the Excel database according to the list of journal articles finalised by the PI and Co-Is; (4) distribute and collect <u>questionnaires</u> in classes; (5) input data from the questionnaires into the computer, <u>organise</u> the data, and perform statistical <u>analyses</u> of the data; (6) help in the recruitment of <u>interviewees</u> and arrangement of meetings; (7) assist with <u>manuscript</u> preparation.



Project Disseminations

7th HKU Teaching & Learning Festival 2024

THE UNIVERSITY OF HONG KONG

TaLiC

POSTER SHOWCASES

Enhancing Student Engagement and Learning in the Digital Age

20 Nov 2024 (Wed)
12:30pm to 2pm
Learning Lab
(RRS321, 3/F, Run Run Shaw Building, Main Campus, HKU)

Collaborators

- Professor Wai Ching SIN (*School of Clinical Medicine*)
- Professor Sau Ching Stanley WONG (*School of Clinical Medicine*)
- Dr Siu Ling CHAN (*School of Nursing*)
- Ms Kwok Pui Jody CHU (*Department of Pharmacology and Pharmacy*)

Research Assistant

- Mr Chun Lung NG

Teachers & Students

THANK YOU

HKUUMed

