

## Assessment Blueprint for Metabolic Medicine for Chemical Pathology Trainees

Curriculum area	Competence	MRCPath exam	Mini-CEX	DOPS	MSF	CBd
<b>Laboratory Training</b>						
<b>1. Objective - to develop competence and limitations of relevant complex laboratory investigations</b>						
<b>Competency Level 1</b>						
K	Gain knowledge of laboratory practice including Health & Safety and COSSH.	X				
	Gain knowledge of biological and analytical variability	X				
	Knowledge of specimen collection, handling, transport and sample storage.	X				
	Knowledge of common pre-analytical biological factors.	X				
	Knowledge of Quality Assurance	X				
S	Assess risks inherent in a laboratory			X		
	Ability to calculate critical difference between two results			X		
	Assess unstable analytes and why specific handling is required			X		
	Assess patient's physiological status prior to testing			X		
	Assess what is appropriate analytical performance and concepts of precision and accuracy			X		
A	Maintain safe environment for other laboratory staff				X	
	Recognise that slight changes in result do not indicate significant differences				X	X
	Recognise importance of working with the laboratory				X	
	Recognise importance of correctly timed samples				X	X
	Recognise issues in rare tests with inter-laboratory comparability				X	X

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<b>1. Objective - to develop competence and limitations of relevant complex laboratory investigations</b>						
<b>Competency Level 2</b>						
K	Spectrometry: visible, UV, reflectance, bichromatic, derivative, linear diode array, infra red	X				
	Turbidimetry, nephelometry, densitometry, fluorimetry.	X				
	Nuclear magnetic resonance	X				
	Mass spectrometry	X				
	Flame emission spectrometry	X				
	Atomic absorption	X				
S	Experience of the application of some of these methods.			X		
<b>Competency Level 3</b>						
K	POCT, especially Extra Laboratory Glucose Monitoring	X				
	Knowledge of POCT requirements	X				
	More complex metabolic tests	X				
S	Understand the limitations of methods in use within hospital. Ability to train other healthcare professionals in their use.				X	X
	Ability to interpret complex metabolic results while understanding the limitations of the methods.					X
A	Recognise limitations and risks from POCT				X	X
	Appreciate the issues and interest that non-laboratory staff take to POCT testing				X	

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<b>2A. Objective: To assess and treat adult patients with obesity in Outpatient setting.</b>						
<b>Competency Level 1</b>						
K	Diagnosis of obesity.	X	X			X
	Investigation and classification	X	X			X
	Knowledge of risk factors	X	X			X
	Basic dietary and lifestyle advice and know when to refer to dietician	X	X			
S	Calculate BMI.		X			
	Measure skinfold thickness, bioimpedance		X			
	Clinically assess complications and appropriate investigations		X			
	Practical experience of giving basic dietary advice		X			
A	Understand analytical and practical limitations of techniques					X
	Re-assess risk factors over time to improve life expectation and decrease morbidity					X
<b>Competency Level 2</b>						
K	Knowledge of suitable drug therapies.	X	X			
	Knowledge of role of surgical treatment	X	X			
	Knowledge of complications of obesity; Diabetes Mellitus, +/- Hypertension, +/- Hyperlipidaemia	X	X			
S	Experience of supporting obese patients and initiating drug therapies.		X			X
	Experience of treating complications		X			X
A	Working as part of multi-disciplinary team to address obesity.				X	
	Show a willingness to provide explanation to patients as to rationale for investigations and treatments				X	
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## Assessment Blueprint for Metabolic Medicine for Chemical Pathology Trainees

area		exam	CEX			
<b>2B. Objective: Competent to assess and manage patients with malnutrition and prescribe nutritional support by enteral and IV routes on a short-term or long-term basis</b>						
<b>Level 1</b>						
K	Assessment and management of nutritional support for protein-energy efficient status.	X				
	Principles of parenteral and enteral feeding	X				
	Markers of nutritional status	X				
	Effects of starting TPN	X				
S	Prescribe nutritional support and care of patients with standard and long-term nutritional support.		X			X
	Appropriate use and care of equipment			X		
	Ability to confirm sitting of nasogastric and nasojejunal tubes			X		
	Maintenance of central vein cannulas			X		
	Prescribing and review of short and long term monitoring		X			X
A	Maximise the use of enteral route, whenever possible.				X	
	Treat each patient as an individual				X	
	Appreciate the effects of chronic disease states on patients and their relatives				X	

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<b>2B. Objective: Competent to assess and manage patients with malnutrition and prescribe nutritional support by enteral and IV routes on a short-term or long-term basis</b>						
<b>Level 2</b>						
<b>K</b>	Assessment of micronutrient and vitamin deficiencies and difficulties in interpretation during acute phase.	X	X			X
	Assessment in a variety of clinical scenarios, such as acute disease (e.g. stroke), chronic disease (e.g. inflammatory bowel disease) and surgery/severe trauma (e.g. ITU)	X	X			X
	Management of patients with excess fluid/electrolyte losses	X	X			X
	Complications of nutritional support and their assessment	X	X			X
<b>S</b>	Ability to clinically identify specific signs and assess risks based on underlying clinical condition.		X			X
	Exposure and experience in a number of areas		X			X
	In depth understanding of assessment and management of fluid and electrolyte balance		X			X
	Clinical and laboratory monitoring of patients RECEIVING nutritional support		X			X
<b>A</b>	Direct appropriate investigations avoiding blanket screening.		X		X	X
	Work as part of a multi-disciplinary team				X	
	Educate other healthcare workers improving understanding				X	
	Developing leadership skills for the multi-disciplinary team				X	

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<b>3A. Objective: Competent to manage patients with common inherited metabolic disorders.</b>						
<b>Level 1</b>						
K	Principles of common disorders: Biochemical consequences of a primary enzyme block in a metabolic pathway and the way in which clinical and pathological signs may be produced	X	X			X
	Understanding of the key issues in engaging “young people” during the transition from paediatric to adult services.		X			X
	Methods and monitoring of treatment	X	X			X
S	Trainees are not expected to have in-depth knowledge of all Inherited Metabolic Defects but should be aware of the major categories; presentation, investigation, mechanisms of inheritance, scope of prenatal and newborn diagnosis, principles of treatment (coenzyme supplementation, enzyme inhibition, dietary manipulation)		X			X
A	Ability to collaborate with other professionals (paediatricians, nurses, dieticians) in investigation and management of patients.				X	
	Ability to interact well with patients and relatives				X	
<b>Level 2</b>						
K	Adult impact of common IEMs especially; PKU, Galactosaemia, MCAD, MSUD, Homocysteinuria	X	X			X
S	Use of specialised dietary treatments and specific drug therapies.		X			X
	Able to counsel affected families and offer advice on prophylaxis and treatment		X			X
	Working knowledge of prenatal diagnosis and odds-ratio assessment		X			X
A	Demonstrate an understanding of the need for involving patients in decision.		X		X	X
	Ability to involve geneticists where appropriate		X		X	X

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<b>3B Objective: Competent to assess patients with inherited metabolic disorders and seek appropriate treatment regimes.</b>						
<b>Level 1</b>						
K	Understanding of the causes of hypoglycaemia, hyperammonaemia, metabolic acidosis and encephalopathy	X	X			X
S	Ability to direct appropriate investigations and interpret them.		X			X
	Understand the effect of IEM on routine biochemical tests		X			X
	Ability to start acute treatment to manage these conditions while specific diagnosis is in progress		X			X
A	Ability to support and work with others in the acute management.				X	
	Sympathetic handling of acutely ill patients				X	
<b>Level 2</b>						
K	Range of IEM affecting Intermediate metabolism e.g. urea cycle, Glycogen Storage Disorders Membrane transport e.g. Cystinuria Lysosomal metabolism e.g. Fabry Disease Peroxisomal metabolism e.g. Refsum's Disease Mitochondrial disorders Disorders of Metal Metabolism e.g. Haemochromatosis and Wilson's Disease Porphyrias	X	X			X
S	Experience of working in a metabolic laboratory and the range of tests and sources of information available		X			X
	Experience of range of treatment options available and their potential problems e.g. ERT		X			X
A	Ability to work in multi-disciplinary teams with biochemists, dieticians, pharmacists, etc				X	

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<b>4A Objective: Competent to manage patients with hyperlipidaemia.</b>						
<b>Level 1</b>						
K	Understanding of the metabolic basis of lipid metabolism and apolipoproteins in inherited and acquired hyper- and hypo-lipoproteinaemias	X	X			X
S	Identify clinical features of genetic dyslipidaemias (xanthelasma, xanthoma-tendinous, eruptive and planar, corneal areas, lipaemia retinalis) and evidence of macro- and micro-vascular disease		X			
<b>Level 2</b>						
K	Understanding of the types of lipid disorder and their underlying aetiology.	X	X			
	Genetic counseling skills for affected families	X	X			
S	Diagnose the underlying aetiology.		X			X
	Interpretation and critical appraisal of biochemical and genetic investigations for dyslipaemia					X
	Aware of need to screen and offer support to other members of patient's family in the case of severe familial dyslipidaemia		X		X	X
	Experience of using different lipid lowering agents alone or in combination		X			X

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<b>4B Objective: Competent to assess cardiovascular risk and institute appropriate management.</b>						
<b>Level 1</b>						
K	Physiological basis for atheroma, coronary heart disease and associated risk factors and diseases including chronic kidney disease and metabolic syndrome.	X	X			X
	Primary and secondary cardiovascular disease prevention	X	X			X
	Current methods of calculating risk and their shortcomings	X	X			X
	Pharmacology of lipid lowering agents	X	X			X
S	Identify factors contributing to athero-sclerosis, including diabetes, obesity, renal disease, hypertension.		X			X
	Give appropriate basic dietetic advice and when to refer for specialist dietetic input.		X			X
	Ability to combine agents and consider role of anti-obesity and anti-diabetic/insulin resistance lowering medication		X			X
A	Ability to work in multi-disciplinary teams with biochemists, dieticians , etc		X		X	
	Appropriate safe prescribing		X		X	
<b>Level 2</b>						
K	Assess cardiovascular risk taking into account risk factors as a whole as well as those related to lipid metabolism	X	X			X
	Investigation of hypertension	X	X			X
	Complication of hypertension	X	X			X
S	Ability to interpret additional risk factors and consider them in relation to standard CV risk factors.		X			X
	Assessment of hypertension including rare underlying causes and its complications		X			X
	Role of drugs in reducing hypertension and how to combine them		X			X

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	Assessment of 24 hour BP monitoring					X
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<b>5A Objective: Competent in the metabolic management of patients with renal stones.</b>						
<b>Level 1</b>						
K	Normal renal clearance of metabolites.	X				
	Pathogenesis of renal stone formation	X				
S	Interpretative skills of renal analytes and how pathophysiological processes alter them.		X			X
	Competent to manage patients with renal stones		X			X
	Able to direct investigations and understand their limitations		X		X	X
	Ability to implement appropriate treatments to prevent recurrence of renal stones		X			X

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Curriculum area	Competence	MRCPath exam	Mini-CEX	DOPS	MSF	CbD
<b>5B Objective: Competent to diagnose and manage patients with disorders of calcium, magnesium and phosphate.</b>						
<b>Level 1</b>						
<b>K</b>	Physiological basis of calcium, magnesium, phosphate Vitamin D and PTH.	X	X			X
	Pathophysiological processes which perturb these analytes	X	X			X
	Hyper- and hypo-parathyroidism	X	X			X
<b>S</b>	Ability to assess patients looking for features which give a diagnosis and direct investigations of patients		X			X
<b>Level 2</b>						
<b>K</b>	Causes of hyper- and hypo-calcaemia: calcium sensor abnormalities.	X	X			X
	Hypo- and hyper-phosphataemia	X	X			X
	Acute management of hypercalcaemia	X	X			X
<b>S</b>	Ability to accurately investigate and diagnose calcium sensor abnormalities		X			X
	Able to direct acute management		X		X	X

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<b>5C Objective: Competent to diagnose and manage patients with a range of bone disorders.</b>						
<b>Level 1</b>						
<b>K</b>	Bone cycle.	X	X			X
	Disorders of common bone conditions including osteomalacia and rickets	X	X			X
	Osteoporosis	X	X			X
	Paget's Disease	X	X			X
	Range of therapeutic drugs which have a role in altering bone turnover	X	X			X
<b>S</b>	Ability to assess patients identifying the severity and prognosis.		X			X
	Direct and interpret range of radiological and biochemical tests to assess bone disease		X			X
	Choice of drugs and assessment of their effectiveness		X			X
<b>Level 2</b>						
<b>K</b>	The range of osteogenesis imperfecta and how it influences adult life.	X	X			X
	Renal osteodystrophy	X	X			X
	Bone turnover and different biochemical bone markers	X	X			X

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<b>6A Objective: Competent to manage patients with diabetes mellitus in an outpatient setting.</b>						
<b>Level 1</b>						
<b>K</b>	Classification of diabetes including diagnostic criteria for Diabetes, IGT, IFG	X	X			X
	Pathophysiology of diabetes: Diabetes Mellitus Type I, Diabetes Mellitus Type II	X	X			X
	Principles of treatment of diabetes and monitoring of diabetic control - Glycated haemoglobin	X	X			X
<b>S</b>	Advise on the laboratory diagnosis, investigation and management.		X			X
	Distinguish between the various causes of diabetes		X			X
	Assess comparison to DCCT measurement		X			X

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<b>6A Objective: Competent to manage patients with diabetes mellitus in an outpatient setting.</b>						
<b>Level 2</b>						
K	Basic dietary advice	X	X			X
	In depth knowledge of: Oral hypoglycaemic agents, Insulin resistance altering therapies, Types of insulin and pens	X	X			X
	Understand the role of BP control, in particular Type II Diabetes Mellitus	X	X			X
S	Advise patients on the importance particularly in Type II		X			X
	Ability to institute appropriate treatment when dietetic failure		X			X
	Ability to recognise the need for insulin treatment in diabetic patient		X			X
	Ability to institute insulin therapy and advise on insulin dose adjustment		X			X
	Provide lifestyle advice with regard to employment, driving, exercise, weight control and smoking		X			X
	Monitor and increase anti-hypertensive therapy (often by combination) to ensure adequate BP control		X			X
A	Work as part of a multi-disciplinary team.				X	
	Appropriate safe prescribing				X	X
	Treat each patient as an individual				X	
	Work empathetically with patients appreciating their social expectations and difficulties in fully complying with lifestyle changes				X	

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<b>6B</b>	<b>Objective: Competent in assessing, treating or referring complication of Diabetes Mellitus</b>					
<b>Level 1</b>						
<b>K</b>	Complications of Diabetes Mellitus and the need for regular screening.	X	X			X
	Knowledge of cardiovascular risk	X	X			X
<b>S</b>	Screen for macro- and micro-vascular complications by means of clinical examination and investigations.		X			X
	Interpret results of screening micro albuminuria, retinal photographs		X			X
	Maximise improvement in CVR by lipid lowering, and hypertensive and diabetic therapies		X			X

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<b>6B</b>	<b>Objective: Competent in assessing, treating or referring complication of Diabetes Mellitus</b>					
<b>Level 2</b>						
<b>K</b>	Pathophysiology cataract and retinal disease.	X	X			X
	Pathophysiology of nephropathy	X	X			X
	Pathophysiology of vascular disease and neurological status of the lower limb	X	X			X
<b>S</b>	Diagnose proliferative retinopathy and advance eye disease and when to refer for ophthalmological assessment.		X			X
	Advise patients about complications		X			X
	Assess proteinuria and implement anti hypertension therapy		X			X
	Recognise and manage the different types of diabetes neuropathy		X			X
	Assess vascular supply and neurological status of the lower limb		X			X
	Identify patients at risk of foot problems and advise them on how to prevent this		X			X
	Supervise care of the patient with foot problems in multi-disciplinary setting		X		X	
<b>A</b>	Work with ophthalmologists to ensure that correct group is referred				X	
	Work with others, particularly Diabetes Nurse Specialists, Podiatrists, Surgeons in avoiding and managing foot problems				X	