Republic of Iraq
Ministry of Higher Education and Scientific Research
University of Basrah
Al-Zahraa College of Medicine

Module Summary:
Clinical Problem Solving 1

Updated: Sep. 2023

Introduction

You are here to become a doctor, which is a very long task involving the assimilation of a huge amount of material. Most people find the process challenging as it requires a change of approach from previous study. In the early years in particular the challenge is mainly the enormous breadth of material which has to be covered, and seeing the relevance to the ultimate task of working with patients. If you can see early how you are going to use material, however, it becomes very much easier to cope with, because you can place your learning in context. The issue, however is that there is no single context in which any given piece of information is used. Medicine is all about **transferring ideas between contexts**, so that the same basic understanding will permit a wide range of different activities. We have introduced this module to help you with these challenges. We will also use the opportunity to help you audit you more general skills such as literacy and numeracy, to identify any issues you will need to address in order to prosper on the medical course.

Module Aims

The purpose of this module is to help you begin to think like a doctor, to develop the skills to retain a large amount of information, and to focus that information upon the solution of patients' problems.

Learning Outcomes

By the end of the module, you should be able to:

- explain how clinical problem solving is learned during medical education.
- construct 'concept maps' related to clinical presentations or conditions, which enable you to link information and ideas into multiple contexts
- identify for yourself the important questions which may be asked about any clinical presentation or condition
- establish an intellectual process that enables you to identify and catalogue as the medical course progresses information relevant to individual clinical presentations or conditions.
- build mental structures which allow you to collect information systematically from patients by taking a history from them, conducting a focused examination and initiating appropriate investigations
- audit effectively your skills in literacy, numeracy, and information handling, to identify and remedy any deficiencies.

Structure of the Module

The module does not focus on factual content. Its purpose is to enable you to move from ways of thinking which have served you well at A level or a first degree, but which are no longer appropriate for learning medicine. The module therefore focuses on processes and skills. It may take time, but you will eventually realize how important these processes are and how they will both help you to do well in assessments in the course and become a good, thoughtful doctor.

The module runs on a series of two-week cycles, unlike the others in semester one. Each cycle is focused on a single clinical condition, which we have chosen carefully because of its relationship with the material you will be learning in the concurrent core modules. This provides some, but not all, of the raw material you need to engage in the module. You will also need to seek out some information for yourself, and identify other information, which you know you will study later in the course, but it is clearly relevant to the topic in hand.

In the first week you will be introduced to the topic for the fortnight, and taken through some of the processes you will need to engage with. You will then work in your groups to build a concept map relating to the chosen condition, to identify topics which are relevant, and design a plan of work to address a set of questions provided to you in the workbook. Between the first week and the session of the following week you will complete those tasks and bring them to a second session where you will be asked to present your findings. Later in the module, you will then be asked to use the work you have done to **set** questions in the format of the assessments which you will take at the end of

each semester in phase 1, and in major summative assessments in phase 2. Each two week cycle also addresses one of a set of key generic skills, with exercises which allow you to audit those skills and prompts to develop them further.

The idea is that you come to see how a huge variety of questions may be linked to a simple clinical presentation, understand how assessments operate at Leicester and practise setting, answering and marking those questions, and ensure that you gave the generic skills to prosper on the course. In this way you will change the way in which you think, and no doubt, in the course of the exercise think up for yourselves many of the questions which we may ask you in one form or another in the assessments, so they will be easy to pass.

Assessment

No module in phase 1 is separately assessed. The assessment of all material is by Integrated End of Semester Assessments (ESA's) each of which covers all material to date in the course. If you persist in thinking as you have done before you will regard this module as irrelevant to those assessments as it has limited content. You may still pass the first semester, but all experience shows that you will eventually collapse under the strain of the cumulative content of the course and fail later. If you recognise the relevance of the module to assessment, you will handle that accumulating material and you will pass, and pass well. The choice is yours.

Resources

Much of the content linked to the module is presented in either concurrent or later modules in the course, and the workbooks and reading prescribed for those modules is your major resource. You will need to search out some topics, in order first to learn the skills of doing so and second to learn how to filter information from multiple sources. The library will provide you with guidance as to how this should be done.

Timetable

Week	Day	Time	Lecture	Group Session
1	Sun	09.00 – 10.00	"Introduction to the Module" Lecture	
		10.00 – 10.30		
		10.30 – 12.30		"Concept Map: Chest Pain" Group Session
2	Sun	09.00 – 10.00		"Review: Chest Pain" Group Session
		10.00 – 10.30		
		10.30 – 12.30		"Literacy Skills" Group Session
3	Sun	09.00 – 10.00	"Cystic Fibrosis (CF)" Lecture	
		10.00 – 10.30		
		10.30 – 12.30		"Concept Map: CF" Group Session
4	Sun	09.00 – 10.00		"Review: CF" Group Session
		10.00 – 10.30		
		10.30 – 12.30		"Numeracy Skills" Group Session
5	Sun	09.00 – 10.00	"Sickle Cell Disease (SCD)" Lecture	
		10.00 – 10.30		
		10.30 – 12.30		"Concept Map: SCD" Group Session
6	Sun	09.00 – 10.00		"Review: SCD" Group Session
		10.00 – 10.30		
		10.30 – 12.30		"Module Skills Assessment" Group Session
7	Sun	09.00 – 10.00	"Falls" Lecture	
		10.00 – 10.30		
		10.30 – 12.30		"Concept Map: Falls" Group Session
8	Sun	09.00 – 10.00		"Review: Falls" Group Session
		10.00 – 10.30		
		10.30 – 12.30		"Internet Research: Review" Group Session
9	sun	09.00—10.00	Tuberculosis (TB) Lecture	
		10.00 –10.30		
		10.30 –12.30		Concept Map :TB Group Session
10	sun	09.00 –10.30		"Review :TB" Group Session
		10.00—10.30		
		10.30 –12.30		"Literacy Skills"
11	Sun	09.00 – 10.00	"Tired All The Time (TATT)" Lecture	
		10.00 – 10.30		
		10.30 – 12.30		"Concept Map: TATT" Group Session
12	Sun	09.00 – 10.00		"Review: TATT" Group Session
		10.00 – 10.30		
		10.30 – 12.30		"Thinking Question Skills" Group Session

Week	Day	Time	Lecture	Group Session
13	Sun	09.00 – 10.00	"Preparing for Assessments" Lecture	
		10.00 – 10.30		
		10.30 – 12.30		"Review of Questions" Group Session
14	Sun	09.00 – 10.00	"Revision of Module" Lecture	
		10.00 – 10.30		
		10.30 – 12.30		"Revision of Module" Group Session

Session One
Introduction

Aim

The aim of this session is to introduce you to how clinical medicine is learned and to plot a course that you may follow to begin to think like a doctor.

Structure of the session

09:00 – 10:00	Lecture	Thinking like a doctor
10:30 – 12:30	Group Work	Constructing a concept map

Learning outcomes

By the end of the session you should be able to:

- describe the types of information that may be collected from a patient
- define the concept of 'clinical presentation' and 'diagnosis'
- describe how to use a 'concept map' to link relevant material to a diagnosis
- describe the process of 'encapsulation' of basic science in its application to clinical medicine
- describe the format of questions used in assessments at Leicester Medical School

Lecture Synopsis

Any medical student or doctor will tell you that the principal intellectual challenge of a medical course is **breadth**. There are few individual concepts which are difficult to understand, but there are huge numbers of ideas to assimilate and interrelate. There are thousands of doctors practising all over the world who have managed this challenging task, so it can be done, but it is not easy.

There is a huge temptation to try and divide the material into isolated, bite sized chunks, each contained within its own impregnable silo. These may easily be learned, but are only useable if applied in the precise context which generated them. This is fine if you are learning to pass A levels when the question format and content is largely predictable, so you may learn material only in the way which will subsequently be tested.

Such learning is **shallow**, **context specific** and not what is known as **'generalisable'**. That is to say it cannot be used in multiple different contexts, which is exactly what you will have to do as a doctor. Generalisable information can be used for **problem solving** which is completely different to writing answers in response to pre-determined cues, and is what being a doctor is all about.

Clinical problem solving

Clinical problem solving is a process of merging **information collected** from a **patient** with ideas and concepts in **your head** in order to make a **diagnosis** which will facilitate the construction of a **management plan** which may be implemented in collaboration with the patient.

Information collected from a patient is in three categories:

Symptoms: These are things that a patient **reports** to you, such as a pain in some part of their body, feeling breathless, feeling tired, or changes that they have noticed about themselves.

Signs: This is information you collect by **examining** a patient. Examination involves **looking** at the patient (inspection), **feeling the patient with your hands** (palpation), **listening** to some part of the patient, usually with a stethoscope (auscultation) and **tapping** a patient to elicit a sound or response (percussion).

Investigations: This is where equipment of some kind is used to image some part of a patient, measure a physiological process (breathing, hearing, heart function), or measure some biochemical variable in a body fluid.

The symptoms a patient reports are collected by talking with the patient, which is known as **'taking a history'**. You will learn a structured approach to this specialised communication skill as the course progresses.

You will need to identify a **'presenting complaint'** often known as a 'presentation', which is a mixture of symptoms and signs which defines the starting point for problem solving.

For example, a patient may have 'central crushing chest pain' or 'acute epigastric pain'.

You will then collect the **'history of the presenting complaint'** which will tell you what events preceded this clinical event, plus a variety of other information about the patient's previous medical history, social circumstances and what the patient already believes about the condition, what they are concerned about and what they expect you to do about it.

You will be problem solving as information is collected, so that you may focus on relevant questions in the history, examine the patient appropriately and order the right investigations. This involves matching the evolving patient story to structures in your head which enable you to identify what is wrong with the patient.

These structures are commonly called 'illness scripts' and they are the means by which expert clinicians make diagnoses very quickly indeed. The process is one of recognition, but it is not simple pattern recognition, rather a process of exploring options very swiftly and deciding between them – a so called hypothetico-deductive approach.

The process is strongly analogous to the recognition of objects in the world, skills we all learn unconsciously at a very early age. The hypothetico-deductive approach involves the testing of ideas, by asking **'what if'** questions. The basis of these questions in medicine is a deep understanding of how the body is put together, how it works and it what ways it can go wrong.

This deep understanding needs to be in the form of what computer buffs among you will understand as a 'relational database'. That is to say any piece of data may be accessed by a huge variety of routes and is linked to potentially many different presentations or diseases.

Your task is to build these links. A useful tool for the purpose is the **concept-map**. Many of you will have used these before, and may have called them spider-diagrams.

The clinical presentational or condition is placed in a central box and related ideas in nearby boxes linked by lines. Each of these boxes identifies relevant information, but does not necessarily contain it. It is simply a flag that indicates this information is relevant and in what way. Information may be defined in a number of levels of detail by connecting boxes to others, so that over the whole diagram the picture is complete.

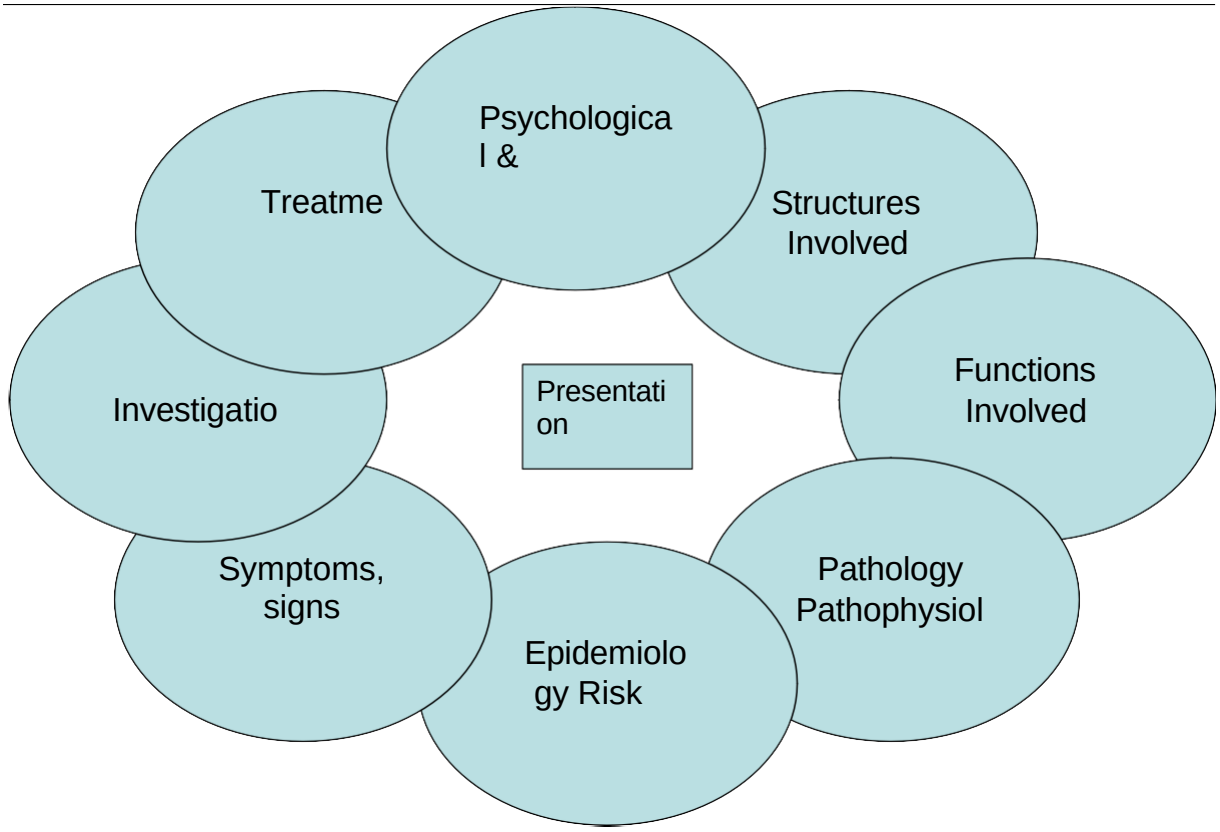
The same concepts will recur in many different concept-maps, and over time you will begin to see that relatively few big ideas explain a great deal of what you need to know. These then provide you a means of handling the mass of information, and make it shrink overnight. The aim of our assessment scheme is to reward those of you who develop the cognitive (i.e. mental) structures which will help you problem solve.

All questions in assessments from semester 1 to finals are related to a clinical presentation or condition, and all open with a **case scenario** which relates in a succinct form, aspects of a patient's presenting complaint. This is then followed by a series of questions related to that scenario. These questions are chosen by sampling from the 'concept-maps' that we have as examiners, which determine what is relevant to that presentation or condition.

If you understand and have similar concept maps then the questions we may ask are entirely predictable. You can therefore work out for yourself the best way of revising for such exams.

In sumHuda, if you are to be a good doctor you must learn to think like a doctor from day one, which for virtually all of you is **not** how you are thinking now. The quicker you change, the more successful you will be.

The following diagram suggests a broad structure for your concept maps:



Group Work

Consider the presentation **'Crushing Central Chest Pain'**

This might be presented as such:

Ali, aged 53, has enjoyed his life consuming with relish his wife's excellent cooking. He is a little portly as a result and a few years ago he was diagnosed as diabetic, though he is reasonably well controlled with oral drugs. He also has higher blood pressure than he should, but has been resistant to suggestions that he should exercise and lose some weight. After a stressful day at the office he develops sudden onset chest pain which is severe, and feels like a band crushing his chest. He is pale and has vomited. You are the first to see him when he arrives at A&E. You suspect a myocardial infarction.

Your task is to construct an outline concept map of the **topics** you will need to know about to confirm your suspicions and subsequently manage Ali with the aim of keeping him alive.

The essence of Ali's condition is this:

Ali has atherosclerosis of his coronary arteries – the blood vessels which carry blood to the muscle of his heart. Atherosclerosis is a thickening of the inner layer of the blood vessels, due to changes in cells stimulated by the accumulation of oxidised LDL cholesterol within them. This builds up over time and is exacerbated by high blood cholesterol (affected by diet) and damage caused by smoking and high blood pressure.

This thickening protrudes into the lumen (hole down the middle) of the blood vessels and makes it harder for blood to flow to the heart muscle, which must have a high blood flow to maintain its constant activity. So long as the atherosclerosis is stable, the effect is to limit blood flow to the heart muscle in exercise, which may lead to pain called angina. Angina comes on with exercise and is normally relieved by rest.

The surface of the atherosclerosis may however eventually become roughened and attract blood clots. These may suddenly detach with some of the atherosclerosis and flow down the artery to block a branch completely, so that the part of the heart muscle supplied by that branch dies. This is a ***myocardial infarction****. Myocardial infarction normally leads to acute severe central chest pain which is crushing in character and may radiate to the neck and arm because of the way in which the nerves to the heart are organised. A myocardial infarction will seriously disrupt the flow of electrical*

*impulses across the heart that produces the heartbeat, and these electrical disturbances may be detected with a test known as the **electrocardiogram**. The dying cells also release enzymes into the blood stream which may be detected by a blood test. The objective of immediate management is to prevent more clots forming (usually by using a drug like aspirin) and to dissolve those that have formed (usually using a drug like streptokinase). The patient will need strong pain relief and oxygen to help to get oxygen to his damaged heart and the rest of his body. A heart with dying muscle will not function correctly, and there may be severe consequences for the circulation.*

The above description contains most everything you need to construct your concept map, though you may wish to consult a textbook to check the odd thing. Remember the concept map does not contain detailed information itself, just the **topics which are relevant**. We know you have not studied them at medical school, but this does not stop you thinking about what they should be from the above description, and in any case many of you will know quite a lot about them already.

Your concept map:

Session Two
Chest Pain 2 and Literacy Skills

Aim

The aim of this session is to follow up on the work in session one about how clinical medicine is learned and to allow you to audit your skills in literacy

Structure of the session

09:00 – 10:00	Group Work	Review of concept maps
10:30 – 12:30	Assessment and Group Work	Literacy skills

Learning outcomes

By the end of the session you should be able to:

- describe the types of information that may be collected from a patient
- define the concept of 'clinical presentation' and 'diagnosis'
- describe how to use a 'concept map' to link relevant material to a diagnosis
- describe the process of 'encapsulation' of basic science in its application to clinical medicine
- describe the format of questions used in assessments at Leicester Medical School
- identify your strengths and weaknesses in literacy and produce an action plan to address weaknesses

Group work: concept maps

The Clinical educators will ask you to present your concept maps and discuss how you created them, and how they may be used.

Literacy skills

This part of the session has two components. First you will take an unseen test which will examine your literacy skills. We will collect this for marking. Second, there are a number of exercises for you to complete to illustrate the importance of literacy in medical practice.

Individual Assessment

N.B.: You will need a pencil and an eraser for this assessment.

You will be given a GP's referral letter to read. The letter contains spelling errors and grammatical errors which include punctuation errors. You should work on your own, without referring to your peers, to correct these mistakes using a pencil. Your corrections should render the letter fully grammatical. Your corrected letter will be collected and marked.

Group work

Once all the members of your group have handed in their individually corrected letters you should attempt the following tasks as a group. The examples chosen are real, many produced by medical students.

Task: punctuation matters

Punctuate the following so that it makes full grammatical sense. Other than changing lower case letters to upper case letters, you should only insert punctuation. You should not delete, insert or move letters or words.

- my fiance Mona is a bit useless and doesnt seem to be able to cope without me as I said to him yesterday a woman without her man is nothing

- dear dr Khalid our tutor group needs a tutor who knows what student life is all about you are clever insightful and helpful tutors who are not like you admit to being slow and useless you have ruined us for other tutors we long for you we have no feelings whatsoever when were apart we can be forever happy will you let our group be yours Group 25

Task: tautological repetition

The following quote is attributed to William of Ockham, a fourteenth century Franciscan theologian, "Entia non sunt multiplicanda praeter necessitatem." It means, 'Entities should not be multiplied beyond necessity'. Ockham was referring to philosophy but you would be well advised to follow his exhortation (which could be interpreted, 'words should not be used unnecessarily') in all your future medical writing, including your 10,000 word People and Disease dissertation. One way to avoid using too many words is to avoid tautology. Tautology is the use of words which merely repeat something already stated, as in 'reverse back'.

Cross out redundant words, as you rewrite the following sentences, so that meaning and grammatical correctness are maintained.

- The Fire and Police services in the Leicestershire area both share the same aim, which still continues, to minimise down the number of lives lost in vehicular traffic accidents.

- Up until the present, all past records about victims of the previous accident show that live survivors had been quickly transported, with haste, to safe havens comprising of emergency tents and school buildings.

- Future prospects for new initiatives depended on the resulting outcome of planned talks which have been cancelled.

- Results and findings from research work which tested out methods of raising up new antibodies further enhance and increase our knowledge and understanding of illness and disease.

- Doctors are exiting out of the association and forming an utterly unique forum at this moment in time in order to free up personnel to make future plans.

Task: writing correctly

A student tells her personal tutor about the incident below. Retell the following incident using formal, grammatically correct prose.

- “We’re on the ward round and Waleed’s Give me my stethoscope back and the patient’s like No go away and he’s like please Mr Mustafa I really need it and Noor’s walking round the bed to get it from his other hand when this consultant? comes up and he’s looking for his patient? and Trace trips over the drip stand and it’s falling over and pulls? the cannula out and the patient’s like screaming? and the consultant’s face is white as his shirt”

Session Three
Cystic Fibrosis (1)

Aim

The aim of this session is that you should use the example of cystic fibrosis to explore how to build conceptual structures which will help you to diagnose and manage that and related conditions.

Structure of the session

09:00 – 10:00	Lecture	Cystic fibrosis
10:30 – 12:30	Group Work	Constructing a concept map and preliminary questions

Learning outcomes

By the end of this cycle you will be able to:

- identify and map in a logical way the topics relevant to the understanding, diagnosis and management of cystic fibrosis
- identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map

Lecture Synopsis

This lecture will introduce cystic fibrosis, and construct for you a part of the concept map you may use.

Cystic Fibrosis

Cystic fibrosis is a genetic disease. It is an autosomal recessive condition, which means that people with one copy of the defective gene may act as carriers, and only those with two copies are affected. Around 1:25 people are carriers, and about 1:2500 are affected. The defective gene codes for a membrane protein in epithelial cells which is involved in the transport of chloride ions. The channel is crucial for normal movement of ions into and out of epithelial cells. As a result secretions from epithelial cells become greatly thickened (more viscous), which affects the function of many organs as epithelial cells are found on all surfaces of the body that are outside or lining tubes which open to the outside.

The lungs are particularly affected, and become very prone to infections because of the abnormal accumulation of secretions. Recurrent infections progressively damage the airways in the lungs, which in the past often led to an early death. Many other organs are affected, including sweat glands in the skin which secrete sweat with exceptionally high sodium content, the cells lining the intestines, cells in the pancreas and cells lining the reproductive tract, especially in men.

Cystic fibrosis is diagnosed in children by measuring sodium in sweat, though genetic tests have often indicated that both parents are carriers, in which case a child has a 1:4 chance of being affected and a 1:2 chance of being a carrier. There is some hope that the defective gene might be replaced in individuals as using modern molecular biology techniques.

Management of cystic fibrosis involves reducing the risk of respiratory infection and managing the adverse effect of the condition upon other organ systems, such as the intestines, pancreas and reproductive tract. Sophisticated antimicrobial therapy combined with physiotherapy and other treatment is essential to preserve lung function as long as possible.

To understand and explain this condition you must draw together information about genetics, molecular biology, the cell biology of membrane transport processes, the structure of effective organs, such as lungs, intestine, pancreas and male reproductive tract, how the function of these organs may be affected, how the lungs may become infected and with what, how the antimicrobial

drugs used to manage the condition work against which organisms, how the lives the wellbeing of individuals are affected when carriers of sufferers of the disease, and the public health and health service implications of such a common condition.

As the lecture progresses we will begin to construct the concept map that you will use for the remaining tasks.

Your concept map:

Group work: concept map

By the end of this lecture you should be able to complete your concept map in the space above. Spend the first part of the group work on this task.

Your next task is to consider the following list of questions . For each question: **First** locate the question on your concept map. There are some phrases in italics to help you. Which box does it fit into? Why? **Second**, write a **brief** answer to that question. In some cases you may already know it, or it may come from the lecture. In others you may have to seek out information from textbooks or other sources.

Cystic fibrosis is characterised by repeated chest infections due to thick mucus that the person finds difficult to clear.

- What type of epithelium lines the upper respiratory tract?

- Name the unicellular glands within this epithelium which secrete mucus.

Your school friend remarks that the student with cystic fibrosis seems to be off sick a lot.

- What non-pharmacological treatments are commonly used for patients with cystic fibrosis?

- What pharmacological agents are commonly used to combat lung infections in cystic fibrosis?

Your school friend notices that the fingernails of the student with cystic fibrosis look "sort of swollen".

- What is the medical term for this appearance of the fingernails?

Your school friend asks why the student with cystic fibrosis has to take pills to help him with his diet.

- What are these pills likely to be?

Your school friend heard a rumour that males with cystic fibrosis cannot have children because they are impotent.

- How does cystic fibrosis affect the fertility of males?

- What is the inheritance pattern for cystic fibrosis?

Your school friend is now worried that their newborn niece may have cystic fibrosis.

- What tests can be used to detect cystic fibrosis in the newborn?

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Session Four
Cystic Fibrosis (2) and Numeracy Skills

Aim

The aim of this session is that you should use the example of cystic fibrosis to explore how to build conceptual structures which will help you to diagnose and manage that and related conditions, and audit your numeracy skills relevant to medical practice.

Structure of the session

09:00 – 10:00	Group Work	Review of concept maps and secondary questions
10:30 – 12:30	Assessment and Group Work	Numeracy skills

Learning outcomes

By the end of this cycle you will be able to:

- identify a map in the logical way the topics relevant to the understanding, diagnosis and management of cystic fibrosis
- identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map
- audit your numeracy skills related to medicine and devise an action plan to address deficiencies

Group work: concept map

Review and compare concept maps. Does your concept map enable you to answer the following secondary questions? If not, consider how your concept map could be developed to lead you to consider the following secondary questions and other potential secondary questions.

- Why is the mucus excessively thick in a patient with cystic fibrosis?

- How is the transfer of water linked to sodium ion transport across the cell membrane?

- How is sodium ion transport linked to chloride ion transport?

- Why is there reduced chloride ion transport?

- Name the key protein that is deficient.

- Where, in the cell, is the key protein normally located?

- What are the common pathogens causing respiratory infections in patients with cystic fibrosis?

- The student with cystic fibrosis uses a DNase aerosol spray. What is the origin of the target DNA?

- How does this DNA contribute to the chest symptoms in cystic fibrosis?

- What other conditions or diseases are associated with this appearance of the fingernails?

- Suggest a possible mechanism for this appearance of the fingernails.

- What is not being absorbed correctly in his small intestine?

- Which key enzyme is not secreted into the lumen of his small intestine?

- Which major gland is compromised and how?

- In what way is what is happening in his small intestine similar to what is happening in his chest?

- Are males with cystic fibrosis impotent?

- How common is the carrier status?

- What types of people are unlikely to be a carrier?

- How common is the disease in the population?

- How could the frequency of the disease in the population be calculated from the frequency of the carrier status? What assumptions are you making?

- What is the effect in the sweat glands of the lack of function of the key protein? How is use made of the effect?

- Since cystic fibrosis is an inherited disease, does your school friend have the right to know the result of the test on their newborn niece? Why?

Numeracy skills

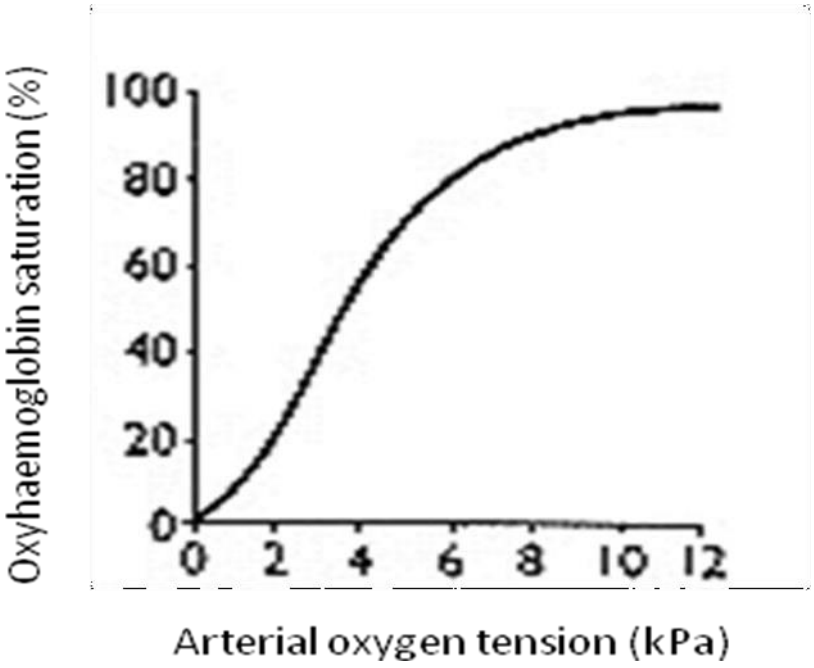
Assessment

N.B. – calculations and answers should be to 3 significant figures.

You will be given a Numeracy Skills Question Sheet. Answer the questions and indicate your degree of confidence for each answer. You should work on your own, without referring to your peers. You should then work in groups to answer the following questions:

Section A: Tables and Graphs

The following graph shows an oxygen dissociation curve:



- A patient attends the Emergency Department with an asthma attack and an oxyhaemoglobin saturation of 90%. What is his arterial oxygen tension (in kPa)?

Are you confident in your answer? **Yes / No**

- Despite being given oxygen, his oxyhaemoglobin saturation drops to 70%. What is his arterial oxygen tension now (in kPa)?

Are you confident in your answer? **Yes / No**

The number of people from various ethnic groups in the East Midlands in the 2001 Census was:

	Counties	Cities	TOTAL
White	3,301,050	599,330	3,900,380
Pakistani	5,038	22,791	27,829
Bangladeshi	4,254	2,669	6,923
Black-Caribbean	9,777	16,907	26,684
Black-African	4,014	5,151	9,165
Chinese	8,912	3,998	12,910
Other	70,512	117,771	188,283
TOTAL	3,403,557	768,617	4,172,174

- Where are more Chinese to be found: in the counties or in the cities?

Are you confident in your answer? **Yes / No**

- Which has the higher proportion of Chinese: the counties or the cities?

Are you confident in your answer? **Yes / No**

Section B: Equations

A patient has a blood glucose concentration of 5 $mM.l^{-1}$
[The molecular weight of glucose is 180]

- What is the concentration of glucose in his blood (in grams per litre)?
  [mass (gram) ÷ molecular weight = molarity (M) x volume (litre)]

Are you confident in your answer? **Yes / No**

An assay of hexokinase from red blood cells showed that the enzyme gave a rate of reaction (v0) of 0.95 μM per second when it was measured in the presence of 1 $mM.l^{-1}$ glucose [S].

- Given that the Vmax for the enzyme is 1 μM per second, what is the Km of hexokinase for glucose?
  Michaelis-Menten equation: $v0 = (Vmax \times [S]) \div (Km + [S])$

Are you confident in your answer? **Yes / No**

Section C: Percentages

You read in a report that eating raw garlic every day reduces the numbers of sexually transmitted infections by 25%. In a population of 100000 people who eat no garlic there were 4000 sexually transmitted infections in 2009. During 2010 a random 20% of the same population are now eating raw garlic every day.

- How many sexually transmitted infections do you predict for 2010? Show your working.

Are you confident in your answer? **Yes / No**

Your patient needs to breathe a gas mixture with 40% oxygen by volume. You need to supplement air, which has 21% oxygen by volume with pure (100%) oxygen to create the right gas to administer.

- What volume(in l) of pure oxygen has to be added to what volume of air in each minute to deliver 8 $l.min^{-1}$ of 40% oxygen to your patient? Show your working.

Are you confident in your answer? **Yes / No**

Section D: Multiplication and Division

A 64 kg man has taken an overdose of paracetamol and requires an intravenous infusion of N-acetylcysteine at an initial dose of 150 $mg.kg^{-1}$ over 15 minutes in 200 ml of 5% glucose solution.

- How much N-acetylcysteine (in grams) does the man require over 15 minutes?

Are you confident in your answer? **Yes / No**

- N-acetylcysteine comes in 10 ml ampoules at a concentration of 200 $mg.ml^{-1}$. How many ampoules need to be opened?

Are you confident in your answer? **Yes / No**

- What is the concentration of N-acetylcysteine (in $mg.ml^{-1}$) when the dose is added to 200 ml of 5% glucose solution?

Are you confident in your answer? **Yes / No**

- What is the drip rate that needs to be set on the infusion controller to infuse the 5% glucose solution with the N-acetylcysteine over 15 minutes?
  [Assume that the infusion controller has a drop factor of 20 drops per ml and only accepts drops/minute settings in whole numbers]

Are you confident in your answer? **Yes / No**

A 64 kg man requires intravenous lidocaine.
[Maximum safe dose for lidocaine is 3 $mg.kg^{-1}$]

a. Would it be safe to administer a 10 ml vial of 2% solution of lidocaine to this man?
[1% solution = 1 gram in 100 ml]

Are you confident in your answer? **Yes / No**

Section E: Units and Scales

In a routine assay to assess liver function, the activity of Mohammadine transaminase (ALT) was shown to be 20 Units per litre of serum.
[One Unit is the amount of enzyme that produces 1 micromole of product per minute under standard conditions]

- How many nanomoles of product would be produced by 0.1 ml of this serum in one minute?

Are you confident in your answer? **Yes / No**

Section F: Ratios and Logarithms

Assume that a foetus is delivered safely and is a boy. The mother already has 4 children, all of whom are boys.

- What is the probability of a mother with 5 children having 5 sons?

Are you confident in your answer? **Yes / No**

Session five
Sickle Cell Disease (1)

Aim

The aim of this session is that you should use the example of sickle cell disease to explore how to build conceptual structures which will help you to diagnose and manage that and related conditions.

Structure of the session

09:00 – 10:00	Lecture	Sickle cell disease
10:30 – 12:30	Group Work	Constructing a concept map and preliminary questions

Learning outcomes

By the end of this cycle you will be able to:

- identify a map in the logical way the topics relevant to the understanding, diagnosis and management of sickle cell disease
- identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map

Lecture synopsis

Sickle cell disease is an autosomal genetic disorder affecting the pigment which carries oxygen in the blood – **haemoglobin**. Changes in the structure of haemoglobin affect the structure of red cells in ways which may produce **anaemia**, which is relative lack of haemoglobin, and periodic **'sickle cell crises'**, which can be very painful and debilitating.

Haemoglobin is made up of four subunits each containing a protein surrounding haem, which contains iron and is capable of binding molecular oxygen (i.e. the reaction is oxygenation, not oxidation). The capacity to bind oxygen varies dramatically over a small range of oxygen levels, so that oxygen is picked up readily in the lungs, but given up easily in the tissues, i.e. the reaction is highly reversible.

The reversibility of the reaction depends critically on the overall structure of the haemoglobin molecule, especially the relationships between the four subunits – its **quaternary** structure. This may exist in two forms – 'tense' when oxygen binds relatively poorly, and 'relaxed' when oxygen binds easily. The transition between these states is influenced by a number of factors, most significantly the level of oxygen to which the molecule is exposed. When oxygen levels are low the molecule is in the tense form, so binding the first oxygen is difficult, but as oxygen levels rise the molecule moves to the relaxed form, so that oxygen binds progressively more easily, rapidly reaching saturation. As oxygen levels fall again and oxygen is given up the molecule moves to the tense form driving the oxygen off vigorously to supply the needs of the tissues. The transition to the tense form is also facilitated by the more acid conditions prevailing in the tissues of the body.

In normal adult haemoglobin there are two alpha subunits and two beta subunits. In Sickle cell disease there is a single amino acid change in the beta chains, where a valine replaces a glutamine. This produces a form of haemoglobin known as HbS. This is due to a single nucleotide change in the DNA coding for the beta-chain, where thymine replaces adenine. This tiny change affects the whole

structure of the molecule so that when in the tense form haemoglobin molecules tend to stick together ('polymerise'). This polymerisation distorts the structure of the red blood cells that contain the haemoglobin, producing a characteristic 'sickle' shape, hence the name of the condition.

Haemoglobin molecules enter the tense form when they lose oxygen, so over repeated oxygenation/de-oxygenation cycles the red cells are distorted and released from distortion. The membranes of the cells can only take so much of this repeated stress, and eventually become stiff, so that the cells remain distorted.

This cell damage cause red cells to last less long in the circulation, so that they disappear faster than they can be replaced from the bone marrow. This leads to **anaemia** – low haemoglobin in blood. In practice most sufferers of sickle cell disease are not much affected by their anaemia, as they have adapted to it, and HbS gives up oxygen more readily in the tissues, which helps to keep up oxygen supply.

The cell distortion, however generates another problem. Oxygen exchange with the tissues occurs in vessels known as capillaries, which are tiny. Their walls are a single layer of epithelial cells, and the lumen (hole down the middle) is smaller than the normal diameter of a red cell. In order to pass through most capillaries therefore red cells must distort. Sickled cells do not readily distort, so cannot easily pass though capillaries. This may lead to occlusion of small blood vessels, depriving tissues of oxygen which causes local damage and, often severe pain. This tends not to occur all the time, but episodically when some other event such as an infection, dehydration, cold, acid blood, or low oxygen in the lungs increases the polymerisation and rate of sickling, leading to a **Sickle cell crisis**.

The blockage of blood vessels in a sickle crisis may affect many different tissues, but those most commonly affected are bone, producing severe pain, structures in the chest, producing pleuritic pain and breathlessness, the brain, where there may be partial paralysis and fits and the kidney, which may cause serious disturbances of body chemistry.

The genetic change producing sickle cell disease occurs most commonly in people of African origin, and it appears that having a single copy of the gene helps to protect against malaria, a disease caused by a parasite which invades red blood cells during part of its life. This may explain why the trait has persisted and is so common, as those with it are less likely to die from malaria, and therefore more likely to pass the gene on to offspring.

The management of sickle cell disease involves a partnership between the patient and doctor. The patient learns how to reduce factors which may precipitate a crisis, and to recognise the onset of a crisis early. Crises are managed with pain relief and oxygen treatment to increase the oxygenation of haemoglobin, and so reduce polymerisation.

New born babies have a different form of haemoglobin HbF, so do not immediately demonstrate the effects of sickle cells disease. Some therapies act to stimulate HbF production in adults, which may help the condition.

The psycho-social implications of sickle cell disease are considerable, as the lives of sufferers are disturbed in unpredictable ways.

As the lecture progresses we will begin to construct the concept map that you will use for the remaining tasks.

Your concept map:

Group work: concept map

By the end of this lecture you should be able to complete your concept map in the space above. Spend the first part of the group work on this task.

Your next task is to consider the following list of questions . For each question: **First** locate the question on your concept map. There are some phrases in italics to help you. Which box does it fit into? Why? **Second**, write a **brief** answer to that question. In some cases you may already know it, or it may come from the lecture. In others you may have to seek out information from textbooks or other sources.

Sickle cell disease is an inherited disease.

- What is the inheritance pattern for sickle cell disease?

- If the parents decide to have another child, how likely is that child to have the disease?

The genetic mutation for sickle cell disease leads to changes in the structure of haemoglobin.

- What type of subunits are there in normal adult haemoglobin, and how many are there of each type?

- How does the subunit structure of the haemoglobin in a person with sickle cell disease differ from normal adult haemoglobin?

The core function of haemoglobin is the transport of oxygen and carbon dioxide.

- Without referring elsewhere, draw the oxygen dissociation curve for normal adult haemoglobin.

- How does the oxygen dissociation curve differ for sickled red blood cells?

The predominant feature of sickle cell disease is anaemia.

- What are the other clinical sequelae of sickle cell disease?

Session six

Sickle Cell Disease (2) and Module Skills Assessment

Aim

The aim of this session is that you should use the example of sickle cell disease to explore how to build conceptual structures which will help you to diagnose and manage that and related conditions, and that you should appreciate the challenge of the End of Semester Assessments (ESAs).

Structure of the session

09:00 – 10:00	Group Work	Review of concept maps and secondary questions
10:30 – 12:30	Assessment	Module Skills Assessment

Learning outcomes

By the end of this cycle you will be able to:

- identify a map in the logical way the topics relevant to the understanding, diagnosis and management of sickle cell disease
- identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map
- understand the challenges of the assessment methods used for End of Semester Assessments (ESAs)

Group work: concept map

Review and compare concept maps. Does your concept map enable you to answer the following secondary questions? If not, consider how your concept map could be developed to lead you to consider the following secondary questions and other potential secondary questions.

- The parents ask if it is their fault that their son has sickle cell disease. What do you say to them?

- Why has sickle cell trait persisted in some populations?

- What is the amino acid mutation that causes the sickle cell haemoglobin?

- How does the amino acid mutation affect the overall charge of the molecule?

- How does this change in the overall charge of the molecule lead to the sickle shape of the red blood cells?

- What are the advantages conferred to normal red blood cells of being biconcave?

- What are the disadvantages to red blood cells of having a sickle shape?

- What are the consequences of sickled red blood cells having an inflexible shape, and what factors make them more likely to occur?

- What organ destroys most of the red blood cells in the body, and how do sickled red blood cells affect it?

- How does the sickle shape of the red blood cells affect their lifespan compared with normal red blood cells, and why?

- What happens to the by products of the breakdown of red blood cells, and what is consequently associated with sickle cell disease?

- Why is oxygen given to patients in a sickle cell crisis?

- What other treatments are given to patients in a sickle cell crisis?

- What is the common feature that links all but one of the clinical sequelae?

- What specific vaccination should be considered for people with sickle cell disease, and why?

Session seven
Falls (1)

Aim

The aim of this session is that you should use the example of falls to explore how to build conceptual structures which will help you to diagnose and manage complex multi-factorial conditions.

Structure of the session

09:00 – 10:00	Lecture	Falls
10:30 – 12:30	Group Work	Constructing a concept map and preliminary questions

Learning outcomes

By the end of this cycle you will be able to:

- identify and map in the logical way the topics relevant to the understanding, diagnosis and management of falls
- identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map

Lecture Synopsis

Falls

Falls are a huge problem for the elderly in particular. This is in part because elderly people are more likely to fall, but also because injuries from falls, especially fractures, are much more likely. We will therefore consider first why people might be more likely to fall and second, why fractures are more likely if they do.

Everyone falls at some stage. It is impossible to avoid occasional trips even when sober and in many sports falls are common. Individuals who are elderly or who suffer disability may well fall when other people would not. Most falls in young fit people do not, however lead to serious injury.

Staying upright requires considerable motor control informed by sensory input from a variety of sources. Impairment of any part of this process leads to an unexpected fall. Falls may occur if the sensory inputs are disrupted. Damage to the bMohammadce organs in the middle ear can lead to dizziness and instability. Impaired sensation from the feet and legs may compromise bMohammadce, as may impaired vision, as humans use a wide variety of sensory inputs to stay upright and to detect trip hazards whilst walking.

Information from sensory organs must be centrally processed by the brain. Many falls follow from poor central processing, either because of long term neurological problems, or short term shortage of oxygen if blood flow to the brain is compromised. Many falls in the elderly are attributable to cardiovascular problems, which cause a transient fall in arterial blood pressure and therefore blood flow to the brain in the upright position. The resulting transient loss of consciousness leads to a fall. These are commonly attributable to disruption of the normal pattern of the heart beat – arrhythmias, many of which can readily be treated.

Even if sensory inputs are intact and central processing functioning, defects in motor outputs can lead to stumbles and falls, such as happens in diseases like Multiple Sclerosis.

Most falls in the elderly are multifactorial, but often simple intervention, such as removing clutter to trip over can greatly reduce the incidence even with underlying medical problems.

So long as the patient can get up unaided a fall per se is not too harmful, but unfortunately in the elderly the risk of serious injury especially fractures is very high, even in an apparently trivial fall. Most commonly this is because bones weaken – a condition known as osteoporosis.

Osteoporosis

Osteoporosis is a condition characterised by a reduction in bone mass associated with characteristic changes in the micro-architecture of bone, making it much less strong, and so prone to fracture. Osteoporosis is very common, and a significant cause of ill health and disability leading to major demand on health service resources. Osteoporosis is mostly manifest in older people, and is more common in women than men.

Bone mass peaks around the age of 30, then declines slowly with age in everyone. Women attain a lower peak, and after the menopause there is a period of more rapid decline, so that, on average bone mass is lower in older women than older men. Increased risk of fracture is strongly associated with reducing bone mass, so that, for example, by the age of eighty 30% of women will have sustained a hip fracture, which is painful, debilitating and can lead to significant lasting disability and loss of independence.

Bone is made up of calcium salts (mainly calcium hydroxy-apatite) in a proteoglycan matrix. The main protein is type 1 collagen, whose alpha helical structure confers strength. Mature bone is composed of osteons, which are cylindrical units made up of concentric lamellae. Within individual bones some parts are made of compact (dense) bone, usually the outer parts (cortex), and some parts are spongy (cancellous or trabecular), where the bone is organised as trabeculae with spaces in between. Osteoporosis tends to weaken spongy bone more so those parts of bones with most spongy bone are the most likely to fracture.

Bone is constantly remodelled throughout life. One group of cells, the *osteoblasts*, form bone, another group the *osteoclasts* break it down. The dynamic bMohammadce between the activity of these two groups of cells determines bone mass. Osteoblasts form the extracellular matrix which is then mineralised. Osteoclasts break down the matrix, releasing calcium salts into the circulation.

The calcium concentration in blood is critical. If it becomes too low, then uncontrolled muscle contractions occur ('tetany') which can be fatal. If it is too high, then nervous function is suppressed, and calcium salts tend to precipitate in unfortunate places. Hormones from the parathyroid and thyroid glands control blood calcium levels by drawing upon the reserves of calcium in bone through control of the activity of osteoclasts. So long as sufficient calcium is absorbed from the diet, then bone mass is maintained in youth at least. Calcium absorption from food requires vitamin D, which must either be ingested from foods or made in the skin by the action of sunlight.

The osteoclasts and osteoblasts are also affected by other hormones, especially the gonadal steroids. Testosterone favours bone formation, which is why men have a higher bone mass. In women oestrogen stimulates osteoblasts, and inhibits osteoclasts, also favouring bone formation, but less powerfully. At the menopause oestrogen secretion from the ovaries declines, and as a result the bMohammadce between osteoblast and osteoclast activity changes, favouring bone reabsorption over formation. Only a tiny imbMohammadce will lead to significant bone loss over time. If there is less oestrogen earlier, then bone loss will be greater. Steroids from the cortex of the adrenal gland ('gluco-corticoids') tend to stimulate osteoclasts, so reducing bone density. Steroid drugs used to reduce inflammation in a variety of conditions are related to gluco-corticoids, and so will also reduce bone density.

The bone mass later in life depends upon the maximum achieved in youth and the rate of subsequent decline. Both are affected by 'risk factors' which lead to lower bone mass in old age. Whilst there are some genetic factors, osteoporosis is not primarily a genetic disease. The main risk factors are

- Gender - primarily because of the effects of declining oestrogen levels in women after the menopause
- Ethnicity – Caucasian and south Asian people are more susceptible
- Changes in gonadal function – if there is hypo-gonadism for any other reason in men or women bone mass will be lower later in life
- Long term treatment with steroid drugs - stimulate bone reabsorption

- Diets low in calcium and vitamin D – reduce initial bone mass, and favour bone reabsorption
- Immobilisation – bones need stress to remodel effectively, and lose mass if not subject to day to day stresses

Osteoporosis is often undetected until a fracture occurs. In some patients this follows a fall, and may involve the distal radius (a 'Colles' fracture), or the neck of the femur (a 'hip' fracture). In other patients, often at a later age, the vertebrae may collapse, commonly during activities of daily life without obvious trauma.

It is however, possible to scan for bone density in individuals who might be at risk. If a patient is found to be suffering from osteoporosis then the rate of reduction of bone density may be reduced by drugs. Bisphosphonates are analogues of normal bone pyrophosphate and bind to hydroxy-apatite, so inhibiting the action of osteoclasts. Oestrogen replacement therapy, which is prescribed for other effects of the menopause also helps to limit osteoporosis. Dietary calcium supplements with vitamin D are also important.

Your concept map:

Group work: concept map

By the end of this lecture you should be able to complete your concept map in the space above. Spend the first part of the group work on this task.

Your next task is to consider the following list of questions . For each question: **First** locate the question on your concept map. There are some phrases in italics to help you. Which box does it fit into? Why? **Second**, write a **brief** answer to that question. In some cases you may already know it, or it may come from the lecture. In others you may have to seek out information from textbooks or other sources.

"Low bone mineral density" is a description of a physiological state, not a disease.

- What conditions could "low bone mineral density" be describing?

- What differentiates the conditions described by "low bone mineral density"?

Protein synthesis often involves post-translational modification to enable the protein to serve specialised functions.

- What is the major protein of bone?

- What are the SIX key features in the synthesis of this protein?

The maintenance of homeostasis is the key to maintenance of most functions in the body. The derangement of homeostasis inevitably leads to pathological processes and events.

- Where are calcium and phosphate stored in the body?

- How is the level of calcium in the blood controlled?

Anatomical and histological structure is linked to function. When function is not in accord with the structure, breaks occur.

- Name the sites where fractures associated with osteoporosis most commonly occur.

- Why are those sites susceptible to fractures with osteoporosis?

Session eight
Falls (2) and Internet Research

Aim

The aim of this session is that you should use the example of falls to explore how to build conceptual structures which will help you to diagnose and manage complex multi-factorial conditions.

Structure of the session

09:00 – 10:00	Group Work	Review of concept maps and secondary questions
10:30 – 12:30	Group Work	Review of internet research

Learning outcomes

By the end of this cycle you will be able to:

- identify and map in the logical way the topics relevant to the understanding, diagnosis and management of falls
- identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map
- understand where to look for different types of information, in particular current and reliable research evidence in support of evidence based medicine
- devise an effective search strategy
- identify appropriate and relevant resources
- evaluate the reliability of information resources

Group work: concept map

Review and compare concept maps. Does your concept map enable you to answer the following secondary questions? If not, consider how your concept map could be developed to lead you to consider the following secondary questions and other potential secondary questions.

- How does the molecular structure of this protein relate to its mechanical strength?

- What is the effect of a DNA mutation that introduces a stop early in the DNA sequence?

- Name THREE tissues, other than bone, in which collagen is a major component.

- What would you predict to be the effect of increased hydroxylation of proline and lysine residues in the proαchain polypeptide? What actually happens to collagen where this occurs?

The maintenance of homeostasis is the key to maintenance of most functions in the body. The derangement of homeostasis inevitably leads to pathological processes and events.

- In a thyroidectomy, why can the thyroid gland be removed but it is important to leave the parathyroid gland behind?

- What are the THREE cell types intimately involved in the maintenance and remodelling of bone?

- What are the THREE main oestrogen hormones in humans?

- What happens to the level of plasma oestrogen hormone in postmenopausal women?

- How does this effect on oestrogen hormones affect bone homeostasis in postmenopausal women?

- What are the types of pharmacological treatments for osteoporosis in postmenopausal women?

- What non-pharmacological measures are commonly suggested to osteoporosis patients to reduce the rate of progressive bone loss?

Review of Internet Research

In October, your group was provided with a list of twenty online resources and was allocated one of the following themes:

1. Patient information

2. Clinical guidelines

3. Drug information

4. Evidence based summaries for clinicians.

From the list of resources, you should have selected five that you think will be the most useful to research your topic and theme.

Your group has been given 10 minutes to teach the rest of the class about the online resources it has chosen from the list. You should:

- Explain why you selected the five resources, including their suitability for the question you were given.

- Evaluate all five of the resources.

- State which of the five resources your group considers the best, with the reasons for your choice.

Session nine

Tuberculosis (1)

Aim

The aim of this session is that you should use the example of tuberculosis to explore how to build conceptual structure which will help you to diagnose and manage that and related conditions.

Structure of the session

09:00-10:00	Lecture	Tuberculosis
10:30-12:30	Group Work	Constructing a concept map and Preliminary questions

Learning outcomes

By the end of this cycle you will be able to:

.identify and map in a logical way the topics relevant to the understanding , diagnosis and management of tuberculosis.

.identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map.

Lecture Synopsis

This lecture will introduce tuberculosis ,and construct for you a part of the concept map you may use.

Tuberculosis

Tuberculosis (TB) is the second leading infectious cause of death world-wide (after AIDS), despite being potentially curable disease .The disease is spread by airborne droplets containing **Mycobacterium tuberculosis (MTB)**.Droplets can remain airborne for hours after expectoration , because of their small size .Infectious droplets are inhaled and become lodged in the distal airways.

MTB is taken up by alveolar macrophages , with either successful containment of the infection , or progression to primary disease (**primary progressive**

TB).MTB replicate following ingestion by alveolar macrophages ,with spread via lymphatics to hilar lymph nodes .Active disease occurs when the host 's immune response is unable to contain MTB replication , occurring most often in the lung parenchyma and hilar lymph nodes .It can occur in any organ , from haematogenous spread .This is most common in young children and in immunosuppressed adults.

Many factors influence whether or not infection leads to active disease, including age, host immunity, and time since infection .Most disease in adults is due to reactivation of childhood disease ,so called **'post primary disease'** ,from activation of latent TB lying dormant in the lung Gohn's focus.

Symptoms of pulmonary TB include productive cough ,haemoptysis ,breathlessness ,systemic symptoms like weight loss ,night sweats ,and malaise ,and chest pain .On examination , signs are often non-specific and include normal findings , lymphadenopathy (particularly cervical) ,crackles ,pleural effusion, consolidation ,weight loss ,and extrapulmonary disease .

The diagnosis is usually made in one of three ways: **sputum** (or other sample ,e.g. pus ,CSF ,urine , a minimum of three samples) **smear or culture ,**or the identification of tissue **caseating granulomas** .**CXR** classically shows upper lobe infiltrates with infection .Treatment aims to cure disease without relapse, prevent transmission ,and prevent emergence of drug resistance .The majority of patients can be treated as out- patients .**Compliance is of major importance** and all patients should have a risk assessment for treatment adherence.

Your concept map:

Group work :concept map

By the end of this lecture you should be able to complete your concept map in the space above. Spend the first part of the group work on this task.

Your next task is to consider the following list of questions. **First** locate the question on your concept map. There are some phrases in italics to help you. Which box does it into? why? **second** , write a **brief** answer to that question .In some cases you may already know it ,or it may come from the lecture. In others you may have to seek out information from textbooks or other sources.

Tuberculosis is characterized by a conflict between an organism and the patient 's immune system.

.What are Langhans cells?

.What are the defense mechanisms of pulmonary mucosa against infection by mycobacterium species?

Your school friend noticed that the patient with tuberculosis look slim.

.What mechanisms commonly involved in losing weight?

.What risk factors play role in getting tuberculosis?

Your school friend noticed that the supraclavicular area of the patient had an abnormal swelling.

.What is the medical term for such swelling?

.Mention other types (at least 3) of mycobacteria species.

Session ten
Tuberculosis (2) and Literacy skills

Aim

The aim of this session is that you should use the example of tuberculosis to explore how to build conceptual structures which will help you to diagnose and manage that and related conditions, and audit your literacy skills relevant to medical practice.

Structure of the session

09:00-10:00 Group work Review of concept maps and secondary questions

10:30-12:30 Assessment Literacy skills and Group Work

Learning outcomes

By the end of this cycle you will be able to:

.identify a map in the logical way the topics relevant to the understanding ,diagnosis and management of tuberculosis.

.identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map.

.audit your literacy skills and advice an action plan to address deficiencies.

Group work: concept map

Review and compare concept maps .Does your concept map enable you to answer the following secondary questions? if not, consider how your concept map could be developed to lead you to consider the following secondary questions and other potential secondary questions.

.Isoniazid,or INH,is one of the most useful agents used in treating TB.Why give vitamin B6 during treatment?

.Explain the most likely interpretation of hypercalcaemia in some patients with tuberculosis.

.After a period of starting the treatment, your colleague find out yellowish appearance of the patient's eyes. How can you explain this?

.ESR is very high in tuberculosis.Describe the mechanism of this phenomenon.

.Why patient with pulmonary TB is likely coughing-up blood ?

.What is the medical term of coughing up blood?

.The prevalence of TB-associated anaemia is approximately 30%.Mention three causes of TB-associated anaemia.

.What are the common site of human lung TB germ most likely reside? Why?

.Is tuberculosis is a communicable disease? What I do if I have some of the symptoms of TB or think I might have been exposed to TB?

.Could TB affect only the lungs? Enumerate other organs of human body might be affected by TB.

.Your school friend inquire about the effects of TB on the lung mechanics.

.Suppose that there are 70 cases of TB had been diagnosed during the previous year in Annajaf city and there are 77 cases had been diagnosed during 2012 ,if the population of Annajaf city is 1000000 persons ,find:

A.incidence
B.prevalence
C.What are the factors affecting the prevalence?

Literacy skills

This part of the session has two components. First you will take an unseen test which will examine your literacy skills. We will collect this for marketing. Second, there are a number of exercises for you to complete to illustrate the importance of literacy in medical practice.

Individual Assessment

N.B:You will need a pencil and an eraser for this assessment.

You will be given a GP's referral letter to read. The letter contains spelling errors and grammatical errors which include punctuation errors. You should work on your own, without referring to your peers, to correct these mistakes using a pencil. Your corrections should render the letter fully grammatical. Your corrected letter will be corrected and marked.

Group work

Once all the members of your group have handed in their individually corrected letters you should attempt the following tasks as group. The examples chosen are real, many produced by medical students.

Task: Punctuation matters

Punctuate the following so that it make grammatical sense. Other than changing lower case letters to upper case letters, you should only insert punctuate. You should not delete, insert or move letters or words.

- As a result of such vision research forward looking labor unions are all beginning to monitor carefully the quality and quantity of illumination by which employees perform their jobs. Furthermore they are looking to technology to bring more flexibility more efficiency and to provide higher quality illumination for the seeing environment. In short they are looking at light in a new light.

Task: tautological repetition

The following quote is attributed to William of Ockham, a fourteenth century Franciscan theologian, "Entia non sunt multiplicanda praeter necessitation". It means, 'Entities should not be multiplied beyond necessity'. Ockham was referring to philosophy but you would be well advised to follow his exhortation (which could be interpreted,' words should not be used unnecessarily') in all your future medical writing, including your 10,000 word people and Disease dissertation. One way to avoid using too many words is to avoid tautology. Tautology is the use of words which merely repeat something already stated, as in 'reverse back'.

Cross out redundant words, as you rewrite the following sentences, so that meaning and grammatical corrections are maintained

- *I can't believe I'm seeing it with my own eyes.*
- A vast majority of people were infected by the disease
- She has decided to lead her remaining life in lonely isolation
- During the phase the team and the software programmer met on four occasions to discuss strategy at the planned Phase 1 strategy meetings.
- The purpose of this paper is to describe the experience of a team of academics in the Department of French, School of Modern Languages within the Faculty of Arts, Humanities and Social Studies at the University Institute of X in the development of a Computer-assisted learning software program.

Task: writing correctly

A student tells her personal tutor about the incident below. Retell the following incident using formal, grammatically correct prose.

You have ever noticed that the cars peoples drive often are an expression of their personalities Ahmed uncle a gentle giant and exwrestler turned farmer drive a muscle bound 4*4 with steer horn mounted on the hood Guess what colour it is Baby blue then there is my cousin Mustafa a bird like lawyer for some industrial big wig always who own a brand new turbo charged sport s car painted in the fashionable season s most colour The best match however is my Ali brother who a ccountant.His sensible sedan size mid is clean so and you tidy could eat your lunch off floor

Session Eleven
Tired all the Time (1)

Aim

The aim of this session is that you should use the example of a patient presenting to report that they are "tired all the time" to explore how to build conceptual structures which will help you to diagnose and manage complex multi-factorial conditions.

Structure of the session

09:00 – 10:00	Lecture	Tired all the Time (TATT)
10:30 – 12:30	Group Work	Constructing a concept map

Learning outcomes

By the end of this cycle you will be able to:

- identify and map in the logical way the topics relevant to the understanding, diagnosis and management of a patient who reports feeling "tired all the time"
- identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map
- be able to construct and analyse questions of the type used in ESA assessments

Lecture Synopsis

Just about the most common reason for patients attending their General Practitioner is to report feeling "tired all the time". This can be very challenging to deal with as there is a multitude of reasons why it could occur. Feeling tired is normal human experience and can occur either because of a lack of physical energy or because of a lack of psychological motivation to act. There is a very powerful interaction between these two broad factors. "Tired all the time" is a relative change in any or all of these factors, so that the patient feels unusually tired for much of the time.

"Physical energy" is the capacity of the tissues of the body to engage in their normal metabolic activity. To function normally tissues require oxygen and fuel to provide energy and the stimulus of a wide variety of chemical messengers to drive metabolism. Some tissues also require period of recuperation in a different state to maintain their function (most obviously the brain, which needs sleep). Psychological motivation is complex and varies naturally, but is affected by psychological conditions such as depression.

The metabolism of cells may be depressed if they receive too little oxygen. Oxygen enters the body via the lungs and is transported to tissues attached to Haemoglobin in the bloodstream. Poor oxygen supply may therefore be due to poor lung function, insufficient functioning haemoglobin, or insufficient blood flow.

Patients who cannot get air into the lungs because of airway or muscle problems, or who cannot get oxygen from the lungs unto the blood will tire easily. This will occur in conditions such as obstructive pulmonary disease (COPD), or diseases affected the interstitial tissues in the lung or blood flow through it.

Oxygen transport in the blood requires normal levels of haemoglobin. Low haemoglobin or anaemia is common and often undetected. Sufferers often feel tired and have low exercise tolerance. Making haemoglobin requires iron and vitamins such as B12. If these are deficient then there will be anaemia, as will also happen if the processes which make red blood cells are disturbed.

Alternatively, haemoglobin may be present, but not functioning, as happens in low level carbon monoxide poisoning.

Cells also need glucose. If the concentration of the glucose in the blood is low, or more commonly glucose cannot enter cells then metabolism will be compromised. This latter happens in diabetes, whose presentation often involves patients feeling very tired.

Even if blood flow is well supplied with oxygen and glucose, it may not reach the tissues in adequate amounts. This commonly happens in 'heart failure' where poor general perfusion can leave patients feeling very tired.

The metabolism of cells is affected by a wide variety of chemical signals. Thyroid hormones determine overall metabolic rate. Chemical messengers produced by the immune system or by pathogens often produce profound feelings of tiredness – lethargy, both acutely and sometimes long term (Chronic Fatigue Syndrome).

Patients may also feel tired because their sleep is chronically disrupted. There may be obvious causes such as new parenthood or shift work, or more subtle issues such as "sleep apnoea" when breathing stops for short periods during the night leading to repeated transient waking.

"Tired all the time" is also however, a common property of psychological problems, most commonly depression, which is associated with disturbance of appetite and sleep disruption such as early wakening. Depression is associated with chemical disturbances in the brain.

You should therefore, be able to see that the multitude of possible interacting reasons for "TATT" leads to considerable diagnostic and management challenges, which require the doctor to access concepts across the full range of basic and applied medical sciences.

Your concept map:

Group work: constructing questions

Hussein is 56 years old, and was diagnosed with type 2 diabetes five years ago. He is struggling to maintain his blood glucose within acceptable limits on his current regime of diet and oral hypoglycaemic drugs, and you need to decide with him what should be done next.

a **List three risks of poor control of blood glucose in patients with diabetes**

Max. Mark		Actual Mark
3		

b

Max. Mark		Actual Mark

c

Max. Mark

Actual Mark

d

Max. Mark

Actual Mark

e

Max. Mark

Actual Mark

f

Max. Mark

Actual Mark

g		
Max. Mark		Actual Mark

Mohammad is 13 years old. A few weeks ago he had a non-specific viral illness, and since then has begun to feel very tired. His mother has noticed that he is losing some weight, and he is complaining of being very thirsty. His teachers are complaining that his frequent visits to the toilet at school are disrupting classes.

a **Why might you smell an acetone-like odour on his breath?**

Max. Mark	Actual Mark
1	

b

Max. Mark	Actual Mark

c

Max. Mark	Actual Mark

d

Max. Mark

Actual Mark

e

Max. Mark

Actual Mark

f

Max. Mark

Actual Mark

g

Max. Mark

Actual Mark

Session Twelve
Tired all the Time (2)

Aim

The aim of this session is that you should use the example of a patient presenting to report that they are “tired all the time” to explore how to build conceptual structures which will help you to diagnose and manage complex multi-factorial conditions.

Structure of the session

09:00 – 10:00	Group Work	Review concept maps
10:30 – 12:30	Group Work	Understanding ESA questions

Learning outcomes

By the end of this cycle you will be able to:

- identify and map in the logical way the topics relevant to the understanding, diagnosis and management of a patient who reports feeling “tired all the time”
- identify detailed information both from concurrent modules in semester 1 and from previous study to populate your map
- be able to construct and analyse questions of the type used in ESA assessments

Group work: concept map

Review and compare concept maps.

Group work: Creating and reviewing questions

Review the questions from last week, and create more with the following stems:

Zaid is 44 years old, and has a painful back, for which he has been taking non-steroidal anti-inflammatory drugs. He has neglected to take his proton pump inhibitors to protect against gastric damage, and now wakes at night with epigastric pain. He has also felt continuously tired for some weeks.

a **From where might Zaid be losing blood?**

Max. Mark	Actual Mark
1	

b

Max. Mark	Actual Mark

c

Max. Mark	Actual Mark

d

Max. Mark

Actual Mark

e

Max. Mark

Actual Mark

f

Max. Mark

Actual Mark

g

Max. Mark

Actual Mark

Fatima is 62. Last year she spent a while in the coronary care unit following a myocardial infarction, from which she seems to have recovered well. More recently, however she has been feeling very tired, and noticed a marked reduction in her capacity for exercise. She has also noticed that she feels breathless when she is lying down at night. You suspect heart failure.

a **Why does Fatima become breathless when lying down?**

Max. Mark	Actual Mark
1	

b

Max. Mark	Actual Mark

c

Max. Mark	Actual Mark

d

Max. Mark

Actual Mark

e

Max. Mark

Actual Mark

f

Max. Mark

Actual Mark

g

Max. Mark

Actual Mark

Session Thirteen
Preparing for Assessments (1)

Aim

The aim of this session is that you should understand precisely the way in which you will be assessed in end of Semester Assessments (ESAs), to develop skills to read and understand questions, to identify the nature of answers required, and to express those answers concisely.

Structure of the session

09:00 – 10:00	Lecture	Preparing for assessments
10:30 – 12:30	Group work	Review of questions

Learning outcomes

By the end of this cycle you will be able to:

- identify the strategies that you will need to adopt to maximise the chance of success in End of Semester Assessments
- analyse ESA style questions to establish precisely the answer that is required, and express it concisely

Lecture synopsis

All written assessments in Phase 1 are in the same format, based around case scenarios linked to a set of key presentations. The case scenario introduces a patient, and will often cue the relevant key presentation of condition. The questions that follow are constructed by reference to the 'concept maps' that staff have in their own heads, by systematic or random sampling from different parts. The best way to prepare for these assessments is therefore to emulate the process by which the questions are set, and prepare your own concept maps for each entry on the list. This will allow you to identify virtually all questions which we may ask. You will not be able to construct all of these maps immediately, but you may begin with some of the more obvious, and then build the set up over the next few semesters. The list we use is published I the Code of Practice for assessment, but is reproduced here for your information. This lecture will focus on the approaches you should use to do well in this type of assessment.

Patient Presentations for blueprinting of written question in phase 1

A person who:

- has acute or chronic recurrent central chest pain
- has heart failure
- has palpitations or ECG abnormality
- has hypertension
- has anaemia
- has a swollen painful leg
- has oedema
- has intermittent claudication
- is losing blood or in shock
- needs cardiopulmonary resuscitation
- has autonomic dysfunction
- has an infection of ear, nose, throat or respiratory tract

- has either acute or chronic productive cough
- has haemoptysis
- has sudden or progressive breathlessness
- has respiratory failure
- has a hoarse voice
- has an acid-base disturbance
- has a bone fracture affecting a limb, joint or the vertebral column
- has traumatic injury to the thorax, pelvis or limbs
- has problems from a bone disorder
- has a disorder of a joint or joints or ageing
- has muscle weakness or muscle pain
- has a central or peripheral nerve lesion
- has dysphagia
- has either acute or chronic abdominal pain
- has either acute or chronic pelvic pain
- has jaundice or ascites or both
- has problems relating to biliary tree, liver or pancreas
- has either acute or chronic gastrointestinal functional disturbances
- has either acute or chronic blood loss from the GI tract
- has a problem with impaired voiding or with incontinence
- has obvious or microscopic haematuria or proteinuria or both
- has an upper or a lower urinary tract infection
- is in acute or chronic renal failure
- has any type of diabetes mellitus and complications thereof
- has no energy
- has a disorder of the pituitary, thyroid or adrenal glands
- has a problem with body weight or a plasma lipid abnormality
- has an itchy skin rash or other condition affecting their skin
- has abnormal palpable lymph nodes in the neck or other neck swelling
- has an inherited disorder or a family history with genetic implications
- has or is at risk of cancer
- has an immune disorder
- has a local or systemic infection
- has problems relating to fertility or contraception
- is pregnant
- has an abnormality of embryological development or fetal growth
- has abnormal menstruation
- has an abnormal cervical smear or reproductive malignancy
- has a breast lump or local or disseminated breast malignancy
- has a urogenital discharge
- has prolapse of uterus and / or rectum
- has a lump in the groin or scrotum or testis
- has chronic headache or acute severe headache
- has a head or neck injury with or without a disturbance of consciousness
- has a problem with their memory
- has developed various neurological problems over some years
- has an acute or progressive movement disorder
- fits
- has or is developing loss of vision or other visual disturbance
- has hearing or bMohammadce problems
- has a cranial nerve lesion
- has mental health problems
- is elderly, confused, depressed or demented

A baby or child who:

- has developmental delay or failure to thrive
- has a congenital problem
- has wheezy breathlessness
- fits
- has a high fever

Group work

Review questions that you have written and try to write some more:

Huda is 42. Over the last few months her periods have become much heavier. She is beginning to feel much more tired of late, and her partner has commented that she looks rather pale. You take some blood for analysis, as you suspect anaemia.

a **What changes in Huda's blood results would suggest that she has anaemia due to chronic blood loss?**

Max. Mark	Actual Mark
2	

b

Max. Mark	Actual Mark

c

Max. Mark

Actual Mark

d

Max. Mark

Actual Mark

e

Max. Mark

Actual Mark

f

Max. Mark

Actual Mark

Atheer is 82. He remains active, and whilst out walking on the local fells he tripped and took a tumble. He landed awkwardly, and has fractured his right wrist and a rib. Guidelines suggest that all elderly patients with fractures need to be treated with calcium supplements and bisphosponates.

a **Describe how you will explain to Atheer why he needs these drugs**

Max. Mark	Actual Mark
4	

b

Max. Mark	Actual Mark

c

Max. Mark	Actual Mark

d

Max. Mark

Actual Mark

e

Max. Mark

Actual Mark

f

Max. Mark

Actual Mark

g

Max. Mark

Actual Mark

Session fourteen
Preparing for Assessments (2)

Aim

The aim of this session is that you should understand precisely the way in which you will be assessed in end of Semester Assessments (ESAs), to develop skills to read and understand questions, to identify the nature of answers required, and to express those answers concisely

Structure of the session

09:00 – 10:00	Lecture	Module review
10:30 – 12:30	Group Work	Module review

Learning outcomes

By the end of this cycle you will be able to:

- identify the strategies that you will need to adopt to maximise the chance of success in End of Semester Assessments
- analyse ESA style questions to establish precisely the answer that is required, and express it concisely

Lecture synopsis

This session will collect together the main messages from this module, to help you both prepare for the forthcoming assessments, and for learning in Semester Two and beyond.