A New Medical Curriculum for the National University of Samoa
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The draft has been written by a Curriculum Development Team comprising of A/Professor David Perez (UoO), Professor Helen Nicholson (UoO), Dr Teuila Percival (UoA), under the team leadership of Dr Aiono Alec Ekeroma (UoA).

Curriculum advice was provided by Dr Faafetai Sopoaga (UoO), Dr Tamasailau Sualii-Sauni (Victoria University, Wellington), Professor Glen Mola (University of Papua New Guinea) and Professor Tim Wilkinson (UoO).

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Executive Summary

The concept of a medical school to meet the needs of Samoa and the wider Pacific is strongly endorsed. A 6 year curriculum is proposed comprising a medical Medicine Year 1, 2 years of learning based on body systems but with a strong clinical focus, 2 years of clinical learning and a trainee intern year to provide practical consolidation of the previous years’ learning and advancement of medical practice.

The curriculum will integrate medical sciences into clinical practice in all years although the balance between science and practice will clearly change through the curriculum. Domains of learning should guide the content of the curriculum. In addition to the traditional domains of medical and clinical sciences we recommend four para-clinical domains covering psychology in medicine, professionalism/ethics/medico-legal, population health/epidemiology/Samoan and Pacific cultures and health/traditional medicine in the Pacific/health systems and research/evidence based medicine. The domains of learning should be represented across the curriculum.

To assist with integration of the domains of learning we recommend a programme of clinical scenarios and cases spread across the curriculum, including Year 1. This will provide a model for integration, provide a spiral of learning and will allow re-visiting and advancement of learning in the medical science and para-clinical domains.

The integrated cases, and curriculum at large, should represent the health issues faced by Samoan and Pacific peoples. We recommend greater emphasis on learning about healthcare in the community and continuing care outside the hospital setting. We recommend that the curriculum is taught largely by Faculty of Medicine lecturers. The teachers need to be familiar with the culture of Samoa and the delivery of healthcare in the Samoan context.

The evolution of the NUS curriculum will require 5-10 years to reach maturity. The concept of an ideal curriculum should be the focus during this evolution. We recommend provision of adequate support for the NUS medical curriculum committee to oversee this curriculum development. We recommend a further academic appointment to develop the integrated case programme for the curriculum.

External partnerships with established medical schools will be required, particularly in the first 3 years of curriculum development. This assistance will involve some delivery of curriculum but also developing the Samoan capacity to deliver and develop the curriculum for the future.

We recommend an external review of curriculum implementation after 3-4 years then a further external review once the whole curriculum is in place. This should be a prelude to accreditation of the curriculum.
1. Introduction

We are pleased to submit this report and draft of the new medical curriculum for consultation purposes with the Faculty of Medicine, National University of Samoa (NUS).

The draft curriculum is the culmination of the round of consultations with key stakeholders that started in 2013 with the first review of the curriculum by Prof Tim Wilkinson and A/Prof David Perez of the University of Otago and the most recent consultation in Samoa that was conducted by A/Prof David Perez and Dr Teuila Percival of the University of Auckland. The recent consultation round with key stakeholders and interested parties was guided by a curriculum discussion document (Ekeroma et al., 2014).

The National University of Samoa was established in 1984 by the government of Samoa with the aim of providing the best tertiary education based on contemporary pedagogical content that is relevant to the Samoan context. The University provides degrees in the arts and sciences that include degrees in nursing and the health sciences.

In January 2014, the government of Samoa made a decision to form a Faculty of Medicine (FoM) within NUS and this was subsequently approved by the Senate of the University. The FoM, which was formed from staff and a few resources from the Oceania University of Medicine, desired a new curriculum that shall: a) receive local and international recognition as a quality medical programme, b) produce a healthcare workforce that will meet the demands and service aspirations of Samoa and Pacific countries and communities, and c) be sensitive to current or potential resource constraints.

The aim of the Curriculum Development Team is to assist the curriculum advisory committee of the FoM of NUS design and deliver an ‘ideal’ curriculum that has a solid foundation in the biomedical sciences, early assimilation of cultural and para-clinical domains and integrates early clinical experience with the ultimate aim of producing a graduate who is clinically competent, with positive attitudes for life-long learning and possess professional qualities which includes ethical behaviour and cultural competence. The curriculum will acknowledge the importance of graduates understanding the sociocultural context in the effective delivery of health care.

This report and draft curriculum document covers most aspects of the ‘ideal’ curriculum from structure, framework and design to addressing domains and philosophies of learning. The scientific basis of medicine is universal and the core of any medical curriculum consists of the fundamental theory and practice of medicine, specifically basic biomedical, behavioural and social sciences, general clinical skills, clinical decision skills, communication abilities and medical ethics.

The draft curriculum will not have detailed content as these need to be developed over time, as the curriculum transitions to a Pacific focussed and relevant curriculum. Incremental development is acceptable – curriculum development is a continuous process and evolving the curriculum towards the ‘ideal’ may take 5 to 10 years. It is important however to adequately resource this process and build the capacity of the Faculty staff. The Curriculum Development Team is willing and able to assist the FoM and NUS achieve these aims by engendering support for the curriculum development process and building capacity of local staff with assistance from the University of Otago and the University of Auckland.

The curriculum should reflect the way that we want our doctors to practice – someone who is compassionate, ethical, always learning and who will do their best to provide evidence-based care in their environment. And it should reflect how we expect them to be flexible in learning and service to meet the expectations of our employers and our communities into the future.
What is the timeline?

The draft report and curriculum is for NUS and relevant stakeholders to review for comment. We will appreciate feedback by the 25th July to alec.ekeroma@auckland.ac.nz. The Curriculum Development Team will then submit the final curriculum to NUS by the 6th August 2014.
2. The Curriculum Framework

A) DURATION OF PROGRAMME

1. At present the usual duration of an undergraduate medical curriculum is either 5 or 6 years. Most UK and Australian schools have 5-year curricula, both schools in New Zealand continue with the 6-year model. Graduate curricula are typically 4 years. The 5-year undergraduate curriculum is adequate to give students a good understanding of basic scientific, social and clinical concepts and be able to apply these to the management of common conditions (Sales & Schlaff, 2010). The 5-year programmes may not produce mature doctors and this stresses the importance placed on the on-going vocational training in the post-graduate years (see later section).

2. Factors that have contributed to shorter programmes are integrated curriculum designs (which allow more efficient learning), structured learning, early introduction to patient-centred learning, problem solving (rather than detailed factual delivery) and the evolution of learning using electronic resources. Other contributing factors include the need to train more doctors, earlier engagement in the workforce and potential for less cost (compared to 6 years).

3. A 5-year curriculum mandates an on-going educational programme post-graduation for 2 years, as in the case at UPNG. If this does not exist, then a 6-year curriculum should be considered and this could include a period of trainee-intern learning.

Conclusions from consultation:

- After much discussion it was agreed that the curriculum should be six years in duration. The programme will consist of a Medicine Year 1, a clinically focussed curriculum based on body system teaching in years 2 and 3, a clinical curriculum based on clinical attachments in years 4 and 5 and a trainee intern year in year 6 (refer curriculum graphic in appendix).

Questions highlighted for consultation in Samoa:

Is a 5-year curriculum the desired option? If so this will have implications for the curriculum design.

Will a post-graduation vocational educational programme be in place to enable a high level of competence to be reached?

- Students will continue to complete the science foundation year at NUS prior to entry to Medicine Year 1. The science faculty at NUS is keen to include two human biology papers in the science foundation year, which should enhance preparation for Medicine Year 1. It was discussed whether this addition could allow the students to avoid having to do a medical foundation year in medical school. It was felt that Samoan students have relatively under-developed background knowledge in health sciences and they would therefore continue to need a science foundation year before Medicine Year 1.
• Feedback also indicated that new medical graduates must be “work ready” with clinical skills enabling patient assessment and patient management (with supervision) at a competent level. The proposed sixth year of trainee internship will involve students being expected to assess and manage, with supervision, approximately a third of ward cases (compared with house surgeon’s two thirds).

• Given the limited formal teaching and supervision in the house surgeon years currently, it was felt a more structured trainee intern year would ensure better competence and quality of graduates.
4. Before determining the design or structure of a curriculum the educational philosophy for the curriculum needs to be defined. This philosophy includes the educational constructs to be used, the desired learning philosophy and whether learning will be in discrete blocks or integrated in a spiral design.

5. There are a number of educational constructs which a medical curriculum can be based on. These include body systems/science focus (e.g. cardiovascular, respiratory etc.), patient presentations/pathophysiology (mechanisms of disease), specific diagnoses and learning domains. Curricula commonly contain a mixture of these constructs and there may be differences in emphasis across the years in the curriculum. However, one or two usually predominate across the curriculum.

6. These constructs offer differing educational possibilities which are indicated in the table below.

<table>
<thead>
<tr>
<th></th>
<th>Body systems science focus</th>
<th>Pathophysiology/patient presentation focus</th>
<th>Diagnosis/disease focus</th>
<th>Domain focus</th>
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<td>Science delivery</td>
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<td>Pathophysiology concepts</td>
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<td>Life-long learning</td>
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* (Created by A/Prof David Perez)

7. Based on this analysis, the patient presentation and diagnosis constructs seem to offer the best coverage of educational imperatives. The patient presentation/pathophysiology concept approach is particularly well suited to life-long learning, as the conceptual approach does not become obsolete as some specific medical facts can. (See the appendices for the University of Auckland example of learning concepts applied to acute abdominal pain). In addition this
approach offers good opportunities for problem-focussed learning. Because of this there is a trend to using patient presentations as the backbone of a medical curriculum. This also reflects real-life medicine.

8. A variety of clinical scenarios can be envisaged for a patient based presentation including the standard patient/symptom presentation, a radiologic presentation, a laboratory presentation etc. Not all learning can, or should, be based on individual patients so scenarios can be developed to include a range of other health issues such as community and population health, wise use of health resources, ethical issues, etc.

9. Examples of presentations used or planned for use at the University of Auckland and University of Otago are contained in the appendices. From these it is evident that presentations include a diversity of topics.

Conclusions from consultation:

- Following consultation the consensus was in favour of pathophysiology (patient/clinical presentation focus) and diagnosis (disease focus) being the major constructs for learning. However, medical sciences and body systems will be represented across the curriculum and will provide a useful structural framework for delivery of the curriculum. The domains will also be represented across the curriculum.

- The principle of clinical focus for as much learning as possible underpinned the preference for pathophysiology and diagnosis. Learning in consultation skills will be an extension of diagnosis. In addition pathophysiology was favoured because the concepts of health and disease embodied in pathophysiology are enduring and form the foundations for the students’ careers. Pathophysiology also represents concurrent learning about normal and abnormal structure and function, which adds interest and relevance to the medical sciences.

- The emphasis on the various constructs will change through the years. In the early curriculum medical sciences and pathophysiology will predominate and diagnosis and consultation skills will predominate later in the curriculum. The para-clinical sciences will be emphasised in Medicine Year 1 and then re-visited throughout all years but will build up progressively during the later curriculum when more clinical material is being considered.

Questions highlighted for consultation in Samoa:

Which educational construct/s will form the basis of the NUS curriculum?

Which construct would be the most inclusive i.e. could also represent the other constructs to best advantage?

Should the constructs vary with the years of the curriculum?
C) LEARNING DOMAINS

10. Learning domains are major learning themes that run throughout the curriculum. Traditionally the dominant domains have been the medical sciences and clinical disciplines. However, most contemporary medical curricula include other important topics such as behavioural medicine, communications skills, awareness of diversity and culture, evidence-based medicine, socio-economic dynamics as determinants of health and public health. These topics are configured as horizontal and vertical cross-cutting themes (Kitzes et al., 2007). Examples of domains in modern curricula are –

   a) University of Otago: medical science, clinical practice, population medicine, research and evidence based medicine, culture and medicine (Hauora Maori, Pacific Health), ethics, professional development (Otago, 2011).
   b) University of Auckland: applied science for medicine, clinical and communication skills, personal and professional skills, Hauora Maori, population health.
   c) Fiji National University: basic sciences, public health and primary care, clinical sciences, clinical skills and communication skills, personal and professional skills/professionalism.
   d) University of Papua New Guinea: community medicine, individual medicine (prevention/diagnosis/management of disease), professional and personal qualities and skills, life-long learning and teaching.
   e) University of Minnesota: scientific and clinical inquiry, medical knowledge, clinical skills and patient care, professionalism, interpersonal and communication skills, systems of health care, continuous improvement of care through reflective practice.

11. Once domains have been determined and adopted they need to be implemented by:

   a) Identifying which domains are represented in each module of learning.
   b) Ensuring representation of each domain across the components of the curriculum.
   c) Ensuring that an appropriate balance of domains exists – some domains can easily be overlooked if they are not proactively considered and built in.
   d) Ensuring that each domain is assessed.
   e) Domains should be reviewed periodically to ensure that they cover all the learning needs of students. Adjusting domains can refresh the curriculum.

Conclusions from consultation:

   o The concept of curriculum domains was endorsed during consultation. In particular it was felt that identification of domains would protect and support topics, which have not been historically regarded as being central to medical education in Samoa.
   o The suggested domains for the NUS curriculum are –

   o Medical sciences
   o Consultation and clinical skills
   o Psychology for medicine
   o Professionalism /ethics/medico-legal
Population health / epidemiology / Pacific cultures & health / traditional medicine in the Pacific / health systems
Research / evidence based medicine

Medical sciences and consultation and clinical skills were acknowledged as the traditional core themes taught in medical school but it was felt that para-clinical domains (3-6) were important and should become core topics, particularly so in the context of a Pacific curriculum.

The grouping of the para-clinical domains is suggested for pragmatic reasons. The topics grouped in each domain have some commonalities, however, each topic in these domains will need to be assured of adequate curriculum representation. It was agreed that all domains should be represented across the 6 years of the curriculum. However, the medical science domain would receive more focus in the early curriculum years, the clinical and consultation skills in the later curriculum and the para-clinical domains throughout the curriculum (see diagram below) –

A case programme operating throughout the curriculum was thought to be a useful vehicle to ensure that all domains maintained representation throughout the spiral of the curriculum.

The necessity to assess all domains across the curriculum was emphasised to ensure that students gave each domain appropriate emphasis. The assessment of medical sciences and para-clinical domains in years 4 to 6 will need to be carefully considered as these topics are not always assessed during clinical attachments. The assessment of para-clinical domains in Medicine Year 1 will be formulated as specific papers.

Questions highlighted for consultation in Samoa:

What domains serve the needs of a Pacific medical school?

Once domains are identified what weight will each receive in the curriculum?

Should all domains be assessed to the same degree?
D) MEDICINE and SOCIETY

12. The changing role of health care, the emphasis on prevention and the increase in societal expectations mean that the content and delivery of medical curricula have to change. Health care has shifted from the individual practitioner to community primary care teams, from a curative focus to prevention, from episodic care to continuous and holistic care (Jones, Higgs, De Angelis, & Prideaux, 2001; Laurence, Newbury, & Wilkinson, 2002).

13. The health challenges of Pacific Island societies are changing and differ from one Island country to the next. Melanesia has a huge infectious disease burden whereas Micronesia and Polynesia have a growing burden of non-communicable diseases (NCDs). Graduates will need to not only need a disease specific perspective but also a sound understanding of population health with specific knowledge for Samoa and the wider Pacific region.

14. Population Health skills will prepare graduates to not only provide effective public health care in Samoa, but will enable adaptation to evolving population socio-cultural and demographics changes and wider global health issues which may impact on the people of Samoa. Skills in research methods, epidemiology, critical analysis and health informatics will prepare graduates to face changing disease patterns and new health concerns.

15. Medical schools in New Zealand, United Kingdom and Australia have increased components of teaching in primary care in general practice and community-based settings. The University of Papua New Guinea (UPNG) also has a strong community health focus.

16. Consideration for tailored local curriculum content:

   a) Population Health – Population Health approaches and research skills. Current population health issues, such as NCDs, in the Pacific region including the wider social and economic determinants (Coria, McKelvey, Charlton, Woodworth, & Lahey, 2013) of health and well-being and inequalities with a particular focus on the Samoan context.

   b) Public Health Principles including Health Promotion, Preventative healthcare and the medical response to climate and public health disasters.

   c) Global Health – Global Health issues of relevance to Samoa and the wider Pacific region including Climate Change and Health, the Donor and Aid agency environment and health services.

   d) Culture, health and the practice of medicine – understanding the socio-cultural interplay of individuals and populations with healthcare and the practice of medicine.

   e) Health information/informatics – introduction to health systems and clinical information principles with particular case studies of effective information development in the developing country context e.g. verbal autopsies, STEPS surveys
f) Health systems and Medicine – an introduction to health services infrastructure, funding, prioritization and resource management

g) Introduction to research methods, epidemiology and critical analysis with local practicum student projects

h) The practice of medicine – professionalism, working in teams, the role of the doctor in society, ethical behaviour, humanistic qualities (Graber, Bellack, Musham, & O’Neil, 1997).

Conclusions from consultation:

- Wide consultation with the Health, NGO and other sectors recommended the curriculum should be designed to ensure graduates are prepared to meet the needs of Samoa and the wider Pacific with a broad view of health both at the patient level and the wider population level.

- There was agreement that the curriculum should cover public health, population health, determinants of health, culture and health, health systems, psychology and health, professionalism and ethics. With knowledge of Medicine and Society graduates will be able to understand and actively participate in healthcare from a personal, individual patient and community perspective.

- It is important that graduates can apply knowledge and understanding of population health, public health and psychology to individual and population situations in the management of lifestyle health and other problems for individual patients and communities.

- It is necessary that students have an understanding of the economic, policy level and political determinants of health, disease and health services organisation. They will understand how social and cultural contexts affect disease, health, the experience of illness and the effectiveness of healthcare for patients and communities.

- Students need to acquire an understanding of professional and ethical considerations in the behaviour of doctors, the doctor-patient relationship and the doctor-community relationship.

- In Year 1, students should begin their learning in Medicine and Society with papers in Population Health, Pacific Culture and Health, Ethics and Psychology.

- Acquired and new learning in Medicine and Society will be brought into each of the subsequent years through case based learning. As students progress the complexity

Questions highlighted for consultation in Samoa:

Thinking now on the training of doctors at NUS to reflect the needs and meet the expectations of Samoa and Pacific societies and communities, what are your thoughts on the above list and are there other issues and topics have we not identified?
of clinical cases that bring in aspects of Medicine and Society will be increased.

- In the clinical years students will be expected to incorporate their understanding of the determinants of health, culture and health and psychology into their clinical case discussion and management.

- Further experiential learning in Medicine and Society will also take place in the Community attachment in the clinical years and is an option in the sixth year elective.
3. Curriculum Design

A) LEARNING PHILOSOPHIES

1. Learning in the undergraduate medical curriculum needs to be clinically relevant whenever possible. Patient-based and apprenticeship learning is clearly relevant and encompasses the ‘ideal’ learning philosophy. In this situation, because of the patient’s relationship with the student learning is more focussed on individual students rather than groups.

2. However, much learning in medicine, particularly in the earlier years, is away from the patient and involves groups of students. There are a number of philosophies of learning that can apply here and they include:

Knowledge-based learning (KBL)

3. The traditional systematic acquisition of knowledge, which is didactic, lecture based and teacher focussed rather than student focussed. This style of learning is usually delivered in blocks and is delivered to the whole class. Students progressively build up a knowledge base from which they identify key concepts and eventually apply these to clinical problems. Students are largely left to develop their individual learning styles. Collaborative learning is not a strong feature. This style of learning forms the basis of the traditional pre-clinical curriculum.

Task-based learning (TBL)

4. Is a group learning activity, which involves the application of concepts to clinical scenarios. As the clinical scenarios unfold they provide group tasks, which require collaboration and integrated application of diverse concepts. The tasks offer a semi-structured approach to clinical problem solving. Most tasks are conceptual in nature but some also require application of specific knowledge.

5. TBL does not provide a vehicle for teaching detailed theory but rather draws on knowledge gained in other settings. The tutor’s role is to facilitate group learning, to provide guidance when necessary and to ensure that concepts are appropriately identified and integrated.

Problem-based learning (PBL)

6. Involves learning by solving problems. The objective of PBL is to help students develop an adaptive approach to knowledge acquisition, problem solving skills, self-directed learning, personal motivation and the ability to learn collaboratively. These attributes represent active learning.
7. Students work collaboratively in relatively unstructured self-directed groups with minimal supervision to focus on a clinical problem and identify what they already know, what they need to learn to understand the problem and where to access the knowledge to resolve the problem.

8. The role of the tutor is to facilitate student learning by supporting and monitoring the learning process. The tutor must instil students’ confidence to take on the problem and assist the development of new learning skills.

9. Both TBL and PBL require more input from academic staff than does KBL. Tutors are more active in the development of individual student’s learning and can provide better feedback to students on progress. Fortunately the small size of the NUS class means that the number of tutors required is also small.

Conclusions from consultation

- A clear consensus emerged from the consultation sessions in favour of Task-Based and Problem-Based Learning. It was felt that the knowledge-based approach does not provide graduates with the necessary critical faculties and problem solving skills. TBL and PBL provide a better platform for life-long learning.

- Clearly KBL will still have a place to allow efficient delivery of knowledge.

- The balance between KBL, TBL and PBL will need to be determined by the Faculty of Medicine teachers. TBL is more structured than PBL so may fit better in the NUS context.

- Some examples of TBL and PBL existed in the previous curriculum and Faculty have been developing further resources of this type. There is a general desire to promote further resource development.

- Although TBL and PBL consume more teacher time it was felt that the intended intake of 10 students would be manageable as this number represents one group only.

- There was agreement that the NUS curriculum should be a combination of block and spiral learning. The earlier years of the curriculum have greater theory content and block learning is suitable for this purpose. Clinical learning is more suited to a spiral design where students develop more sophisticated learning by re-visiting clinical syndromes and diseases.

Questions highlighted for consultation in Samoa:

- What should be the dominant learning philosophy in the NUS curriculum?
- What is the optimum balance of learning philosophies?
- Which learning philosophy/ies offer the best foundation for life-long learning?
- What resources will be required for the different approaches? Will these resources be available?

B) INTEGRATED and BLOCK LEARNING
10. Traditional medical curriculums have largely been based on a block design – topics have dedicated time for delivery, are assessed as discrete topics and have limited integration with other topics. Learning in blocks has the advantage of clear focus and simplicity of curriculum design.

11. By contrast a spiral design implies more integration, progressive learning and a more complex assessment programme. The move to greater clinical relevance throughout the curriculum has broken down traditional boundaries and encouraged progressive learning, including spiral learning structures.

12. Spiral of learning representing progressive learning is an educationally sound approach as students can re-visit previous learning and add complexity in a progressive fashion. This facilitates the connection between information and experience -

![Spiral Diagram](2.bp.blogspot.com)

Fig. 1. The Spiral of Knowing (Adapted from Wells, 1999).

13. An example of spiral learning could relate to glucose intolerance. In years 2 or 3 students might study a case of a patient with excessive thirst and urine production. The science and pathophysiology concepts here might relate to kidney function, pituitary function, glucose intolerance and high serum calcium. Diabetes would be referred to but would not be the only focus of the case. A later case in years 4 or 5 might relate to a patient presenting with kidney impairment and visual impairment due to undiagnosed diabetes. This would allow students to re-visit the earlier science concepts and build on their clinical knowledge about diabetes. The concepts required for both cases would be shared although the diabetes case would carry more clinical concepts.

14. This could mean that medical sciences and clinical practice could be delivered and assessed in all years of the curriculum. Clearly the emphasis on medical sciences would be greater in early years and less prominent in later years and vice-versa for clinical practice but the connection between the two would be reinforced throughout the curriculum.

15. However, both block and spiral models have advantages and disadvantages.

**Block design:**

**Advantages –**
- Provide clear learning focus at a given time
- Allows learning in depth
- Provides simplicity for assessment
- Can ensure required pre-requisite learning is acquired before moving to the next block
- May suit the needs of external visiting experts (if these are needed)

Disadvantages –
- Learning is largely confined to a restricted time period
- Integration is more difficult, particularly medical sciences
- Relevance to clinical practice is less obvious
- Does not provide a structure to readily accommodate new topics
- Does not provide a clear model for life-long learning

**Spiral design:**

**Advantages -**
- Easier integration, including medical sciences
- Allows learning from simple to complex
- Allows re-visiting, application and consolidation of learning
- Provides a better model for life-long learning

**Disadvantages -**
- Requires more collaboration from teaching staff
- Assessment is more complex

16. A mixture of block and spiral designs can be utilised although it is better if one predominates. For example a predominant spiral design can accommodate blocks if they are small and coordinated to provide input at the most appropriate times. A predominant block design can accommodate spiral components if mini-blocks are featured across the curriculum with the purpose of providing progressive learning.

**Questions highlighted for consultation in Samoa:**

What is the preferred model for learning at NUS – block learning, spiral learning or a combination of both?

If a combination of both, which model should predominate?

If a spiral model is chosen how will this fit with teaching of medical sciences?

If the spiral model is chosen how will this fit with discipline based clinical attachments?

**Conclusions from consultation:**

- There was agreement that the NUS curriculum should be a combination of block and spiral learning. The earlier years of the curriculum have greater theory content and block learning is suitable for this purpose. Clinical learning is better suited to a spiral design where students develop more sophisticated learning by re-visiting clinical syndromes and diseases.

**C) SCIENTIFIC METHOD**
17. The teaching and learning in medicine should be firmly grounded in science. The medical curriculum should teach the principles of scientific method, including analytical and critical thinking, medical research methods and evidence-based medicine (World Federation for Medical Education, 2012). Scientific enquiry and methods should be applied in teaching and learning at every level and course of the curriculum.

18. The learning of scientific method starts early in Year 1 training with the basic sciences and understanding the scientific principles in research methods. As the student progresses through training, the curriculum, through the para-clinical domains, should inculcate skills in critical analysis of the scientific literature to the point where the student in their final year should be able to design a simple research or audit project with some assistance. The aim is for graduates to have a firm foundation in scientific enquiry improving their participation in the development of evidence-based care with their colleagues and for the profession. Essential to this ability is a habit of critical scientific inquiry.

19. Many medical schools expect their graduates to be able to describe the principles of research and research ethics, perform a systematic search for evidence, critically appraise the literature, critical appraisal of research and own performance, and to design and do a research project. These skills and outcomes should be integrated into the curriculum and should be examinable. The 6th Year medical students at the University of Auckland are required to do an audit project, which is assessed.

20. The proposed curriculum has identified a selective and elective period where the students should be encouraged to perform supervised clinical research and audit. There are also the long school holidays where students should be encouraged to engage in research activity as they have with summer students research in New Zealand. This will be of particular value as the body of medical research in Samoa and the Pacific remains under-developed.

D) CURRICULUM OUTCOMES

21. A central component of any curriculum is the definition of expected learning objectives or outcomes. These guide the content of the curriculum and the nature of the assessment programme. Traditionally the main focus has been on objectives but this is now moving towards outcomes. This change reflects the need to produce graduates who are fit for purpose. The graduate needs to exhibit competency and mastery in addition to acquisition of knowledge (General Medical Council, 2009). Objectives can be seen as encapsulating the description of learning whereas outcomes reflect the product of learning. An example can be drawn from learning about cancer –

- a. A ‘standard’ cancer learning objective:
  Know the major routes of cancer spread
  Know the common cancer staging classifications
• b. An equivalent cancer learning outcome:
  Be able to investigate a patient with cancer to determine the extent of cancer spread

22. Outcomes reflect the ability required as well as the knowledge required. They are therefore framed as ‘doing’ rather than ‘knowing’ statements. Clearly these abilities mature throughout the curriculum but clear outcomes can still be applied early in the curriculum – the essence should always be ‘how will knowledge you are gaining be used?’ - this is relevant even early in the curriculum.

23. All components of the curriculum need to have outcomes applied. The outcomes need to be coherent and appropriately linked with other curriculum components both horizontally and vertically. This means the outcomes should be mapped across the curriculum and should illustrate progressive learning. This can involve using the same stated outcome across the years but indicating differing levels of competency – a commonly used gradation of competency is: knows about, knows how (can do), shows how (to others) and does (independently).

24. Once outcomes have been applied they can be very useful to Faculty as a sound basis for assessment. They are also useful for students to indicate the range of competencies required for successful assessment. Outcomes also provide a mechanism to introduce new material into the curriculum, but this can mean that some existing outcomes will need modification or deletion to limit the total number of outcomes.

25. In addition to learning outcomes there is a need for a statement of overarching graduate outcomes. Graduate outcomes indicate the full range of competencies desired in a well-rounded graduate. They allow a broad statement of graduate attributes and can identify particular strengths of a medical school’s programme. An example of a graduate profile from the University of Otago is contained in the appendix. In the case of the NUS graduate the graduate profile needs to identify the strengths and attributes required for a newly qualified doctor who will serve the needs of healthcare in Pacific nations.

Questions highlighted for consultation in Samoa:

- Is the concept of outcomes accepted as a key element of the revised NUS curriculum?
- Is the concept of progressive outcomes considered worthwhile?
- Will outcomes be developed at the outset or developed incrementally over a number of years?

Conclusions from consultation:

• This issue was only discussed briefly during consultation. There was acknowledgement that the curriculum should be defined by objectives or outcomes which represent knowledge, skills and competencies. Since the graduate needs to be fit for purpose it will be desirable to have a stronger representation of skill and competency objectives in the later years of the curriculum.

• As indicated in the section on spiral learning the objectives or outcomes should progressively build on previous learning and associated outcomes. It should be evident that outcomes become more sophisticated as the years of the curriculum advance.
Regulatory bodies always take considerable interest in the stated outcomes of a curriculum so it is vital that NUS can demonstrate progressive and coherent outcomes for its medical programme.
4. Course Structure

A) COURSE CONTENT

1. The agreed curriculum framework, philosophy, design, domains and the expectations and priorities of NUS and Pacific communities will determine the core curriculum content which will need to be developed with some urgency.

2. The content can also be determined by the availability of teaching resource and delivery. It is most likely however that the specifics and details of core content will be determined by the FoM-NUS from available material modified or developed by them with or without external assistance.

3. Content will need to focus on Medicine Years 1, 2 and 3 in the first instance. All pre-existing material will need to be reconfigured to conform to the new curriculum design and philosophy.

4. NUS does not have to have detailed curriculum content in all domains as the lack of detail can be tempered by exploring different learning delivery systems and encouraging students to problem solve.

5. There is a wealth of material available online, from Australian and NZ medical schools and from visiting medical experts. However, this material needs contextualising to the Pacific context and to suit delivery capacity and resource. It is also preferable that the burden of factual information is reduced encouraging students to learn through curiosity with the development of healthy attitudes and behaviour for continuous professional learning.

Questions highlighted for consultation in Samoa:

How much pre-existing resource is there that can be modified or adapted to reflect a new curriculum framework?

What new learning resource is required?

Can you list partners (institutions, individuals) who can assist with content provision and adaptation?

What teaching resource and capacity does NUS have to deliver the curriculum?

What resources do we have for on-going content development?

Conclusions from consultation:

- It was accepted that the new NUS curriculum should be seen as the ideal which will be achieved over many years, at least 5 and possibly 10

- The pressing need for 2015 is the medical foundations programme. It was felt that NUS and the Faculty of Medicine could provide the para-clinical papers although some external assistance with structuring the ethics teaching could be productive.
• It will also be imperative that external staff can visit Samoa while their discipline is being taught, possibly for a two-week period. They could contribute to the teaching programme and assist with up-skilling of Samoan staff to improve local capacity.

• Existing Faculty of Medicine and NHS staff can provide the bulk of the teaching in Years 2 to 6. The knowledge content resource for years 2 and 3 largely exists from the previous curriculum.

• However, the material will need to be contextualised in due course, usually 3 yearly, and partnership medical schools may be able to offer advice on content development and staff development.

• The major new input into course content will be in clinical cases. As mentioned previously we believe a further full time academic staff member will be required to coordinate case development and contribute to overall curriculum coordination. This appointment will require action in the near future to allow development work on cases to proceed during 2015.

• Appointment of a case coordinator position within NUS and would be worth investigating the availability of a suitable person via aid programmes such as the Australian Volunteers for International Development, Volunteer Services Abroad and the Peace Corp Volunteers.

• The students requested greater availability of e-textbooks and this is desirable if the costs are realistic.
B) OVERVIEW OF STRUCTURE

6. Traditionally papers have been topic or discipline focussed. Ideally the papers for the medical curriculum should reflect the students’ styles of learning e.g. integrated learning should be embodied in an integrated paper and assessed in an integrated fashion. The structures of the papers therefore need to reflect the components of the curriculum.

7. However, other factors which need to be considered in the development of papers are:

   a) The size of papers should be standardised. The size should reflect the learning time required.
   b) The assessment required for each paper should be proportionate to the size of the paper.
   c) Assessment formats need to be considered when defining the structure of papers – the contribution of in-course and summative assessment
   d) Papers should be based on semester or yearly cycles.
   e) Papers need to be defined with progression criteria in mind e.g. is a pass required in all papers to progress to the next year.
   f) The ability to repeat papers needs to be considered.

8. Through problem-based learning based on clinical cases small group teaching, students are introduced to human health and the description and pathogenesis of disease processes as a basis for the systematic study of human illness.

9. The above structure is further enveloped in the learning of the remaining curriculum domains in population health, epidemiology, Pacific cultures and health, health systems, professionalism, ethics, medico-legal, communication skills, research and evidence-based medicine.

Conclusions from consultation:

- Papers should reflect the integrated curriculum with some topic based learning such as anatomy but endeavouring to bring in coverage of the six domains Medical Sciences, Population Health/ Epidemiology & Culture, Clinical Skills, Professionalism & ethics, Research and EBM, Psychology for Medicine throughout the years.

Questions highlighted for consultation in Samoa:

Will the NUS papers be predominantly topic based or integrated?

How should clinical relevance be included within the papers?

For each paper what will the balance between in-course and summative assessment be?

Will students need to pass all papers in a year to progress?

Suggested Structure of the Programme
Year 1 (Foundations of Medicine): Phase 1.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Catalog</th>
<th>Long Title</th>
<th>Points</th>
<th>Semester (20 weeks)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBBS1</td>
<td>1A1*</td>
<td>Anatomy</td>
<td>15*</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1A2</td>
<td>Physiology</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1A3</td>
<td>Population Health</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1A4</td>
<td>Samoa/Pacific cultures and Health</td>
<td>7.5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1B1</td>
<td>Biochemistry/Genetics</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1B2</td>
<td>Microbiology/Immunology</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1B3</td>
<td>Pharmacology/Pathology</td>
<td>15</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>1B4</td>
<td>Professionalism/Ethics</td>
<td>7.5</td>
<td>2</td>
</tr>
</tbody>
</table>

(*The Catalog No. is in sequence and is for illustrative purposes; the Points for papers are based on the weighting assigned by the University of Auckland for the various components of its medical programme. NUS may decide to change the weighting of the papers as it sees fit).

Integration of the para-clinical and clinical domains:

<table>
<thead>
<tr>
<th>Semesters</th>
<th>Medical sciences domain</th>
<th>Para-clinical domains</th>
<th>Consultation and clinical skills domain</th>
<th>Weekly TBL cases (brief) application and illustration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 &amp; 2 (1 year) Medical Foundation</td>
<td>Anatomy, Physiology, Biochemistry, Genetics, Microbiology, Immunology, Pharmacology</td>
<td>1. Psychology for medicine, 2. Professional development /ethics/medico-legal, 3. Population health/ Pacific cultures &amp; health/ epidemiology/health systems, 4. Research/evidence based medicine</td>
<td>History taking, examination, problem identification, approach to the patient, communication skills</td>
<td>Simple clinical scenarios to illustrate application</td>
</tr>
</tbody>
</table>

Years 2 & 3 (Organ systems): Phase 2
### Integration of the para-clinical and clinical domains

<table>
<thead>
<tr>
<th>Trimesters 3,4,5,6,7,8 (2 years) Body systems</th>
<th>Weekly TBL cases</th>
<th>Body systems block learning</th>
<th>Clinical contact – hospital and community</th>
<th>Integrative days or week (periodic)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBBS2 2A-C Musculoskeletal, Cardiovascular, Respiratory, Gastrointestinal, Nervous system, Renal, Metabolic, Endocrine, Reproductive, Immunity and Infection, Development and Aging, Blood and Neoplasia. Learning in – medical sciences, para-clinical sciences, consultation skills, introduce clinical reasoning</td>
<td>Musculoskeletal, Cardiovascular, Respiratory, Gastrointestinal, Nervous system, Renal, Metabolic, Endocrine, Reproductive, Immunity and Infection, Development and Aging, Blood and Neoplasia. Learning in – medical sciences, para-clinical sciences, consultation skills, introduce clinical reasoning</td>
<td>Hospital to illustrate body systems</td>
<td>Community to reinforce para-clinical and integrative themes</td>
<td>To integrate across body systems</td>
</tr>
</tbody>
</table>
**Years 4 & 5 (Clinical attachments): Phase 3**

<table>
<thead>
<tr>
<th>Subject</th>
<th>Catalog</th>
<th>Long Title</th>
<th>Points</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MBBS4</strong></td>
<td>4A1</td>
<td>6 clinical attachments</td>
<td>120</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>4B1</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>4 weeks:</td>
<td>Anaesthetics</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 weeks:</td>
<td>Surgery</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12 weeks:</td>
<td>Medicine</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4 weeks:</td>
<td>Public Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 weeks:</td>
<td>Psychiatry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 weeks:</td>
<td>Selective</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>MBBS5</strong></td>
<td>5A1</td>
<td>5 clinical attachments</td>
<td>120</td>
</tr>
<tr>
<td></td>
<td>5B1</td>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>10 weeks:</td>
<td>Obstetrics &amp; Gynaecology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 weeks:</td>
<td>Paediatrics</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4 weeks:</td>
<td>Emergency Medicine</td>
<td></td>
<td></td>
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<tr>
<td>2 weeks:</td>
<td>Ophthalmology</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2 weeks:</td>
<td>Ear, Nose and Throat</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8 weeks:</td>
<td>Community/Rural Medicine and Primary Health</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 weeks:</td>
<td>Selective</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**Integration of the para-clinical and clinical domains:**

<table>
<thead>
<tr>
<th>Trimesters</th>
<th>Clinical attachment learning</th>
<th>Weekly TBL cases</th>
<th>Integrative days or week</th>
<th>Medical science and para-clinical domain learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>9,10,11,12, 13,14 (2 years) Clinical and community attachments</td>
<td>Major clinical disciplines including mental health, outpatient, community practice and elective Focus on consultation and clinical skills, clinical reasoning, para-clinical domains, acute and chronic medical management. Includes selective or overseas elective in Year 5.</td>
<td>Clinical presentations relevant to the attachment, include para-clinical domains</td>
<td>To integrate across attachments and promote clinical reasoning</td>
<td>Advanced theory</td>
</tr>
</tbody>
</table>
Year 6 Trainee Intern

<table>
<thead>
<tr>
<th>Subject</th>
<th>Catalog</th>
<th>Long Title</th>
<th>Points</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBBS6</td>
<td>6A1</td>
<td>Apprentice Year</td>
<td>60</td>
<td>1</td>
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<tr>
<td></td>
<td>6B1</td>
<td></td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

- 7 weeks: Surgery
- 7 weeks: Medicine
- 7 weeks: Obstetrics & Gynaecology
- 7 weeks: Paediatrics
- 4 weeks: Community/Rural Health
- 8 weeks: Elective

Integration of the para-clinical and clinical domains:

<table>
<thead>
<tr>
<th>Trimesters 15,16,17 (1 year)</th>
<th>Clinical attachment apprenticeship learning</th>
<th>Integrative sessions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Include community attachment and an option to perform research or concentrate on a clinical area of interest.</td>
<td>To integrate across attachments and promote clinical reasoning</td>
</tr>
</tbody>
</table>
C) OVERVIEW of the ASSESSMENT PROGRAMME

10. The assessment programme for an undergraduate medical curriculum should follow a number of principles:

- The modalities chosen for assessment should reflect the learning modalities eg case based work should be assessed using a method that tests for the ability to integrate concepts, clinical work should be assessed by clinical presentations
- Assessment should explicitly test the defined outcomes for the components of the curriculum
- Assessment should test both conceptual and factual material
- There should be a balance between in-course formative assessment, in-course summative assessment and final summative assessment
- The assessment programme should be moderated with application of assessment metrics
- A programmatic approach should be taken whereby assessment decisions are made by domain, rather than by module.

11. Ideally assessment should be seen as an extension of learning, hence the need to assess learning in the manner it was delivered – this gives assessment face-validity. Well-crafted MCQ exams have a part in assessment programmes and should complement other assessment modalities.

12. Modalities that do have validity include clinical scenario based paragraph questions, objective structured practical exams (OSPE) which test interpretation of data, objective structured clinical exams (OSCE) or mini-clinical exams, written case histories, long case oral exams, assessment of clinical work via log books.

13. Since medical knowledge evolves rapidly it is essential that assessment tests concepts as well as facts and student’s abilities to scrutinise information. Concepts do not change rapidly and therefore form the basis for life-long learning. The best way to test concepts is through assessment of the integrated approach to patient scenarios or clinical problems.

14. Students commonly have a desire to be assessed frequently as this can provide feedback on progress. However, assessment can overshadow learning so it is necessary to strike a balance between too much and too little.

15. There also needs to be a balance between in-course and finals assessment. Finals exams have the advantage of allowing more assessment of integrated knowledge and offer the student a chance to re-visit and consolidate previous learning.

16. Peer review is becoming increasingly important for practicing doctors and the inclusion of formative peer assessment may help in preparing students to be life long learners.
Conclusions from consultation

- It was agreed that a variety of assessment modalities should be used including multiple choice, short answer, objective structured clinical examinations (OSCE), written cases and ward assessments.

- There was no determination about the possibilities for assessment of group work but this should be considered in due course.

- It was agreed that a balance of in-course and finals assessments was desirable.

- It was agreed that formative (feedback) and summative (finals, grade determination) examinations should be used. Students should have exposure to formative examinations before attempting the summative version.

- It was felt that one summative examination per trimester was appropriate, however, formative assessments could also occur.

- The end of trimester 3 assessment should cover trimester 3 learning but should also include relevant material from the year's learning.

- It was felt that the assessment programme should have a built-in mechanism to avoid failing the year by enabling students to have in-course remediation when there is a marginal failure of a component.

Questions highlighted for consultation in Samoa:

- What modalities of assessment will be used?
- What is the optimal number of assessments per year?
- What should be the balance between in-course and finals assessment?
- Will there be provision of a ‘Specials’ final for those who perform below expectation in the finals exams?
D) DETAILS of COURSE STRUCTURE

Phase 1: Year 1 – Medicine Year 1

Structure

<table>
<thead>
<tr>
<th>Subject</th>
<th>Catalog*</th>
<th>Long Title</th>
<th>Points*</th>
<th>Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>MBBS1</td>
<td>1A1</td>
<td>Anatomy</td>
<td>15</td>
<td>1</td>
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<tr>
<td></td>
<td>1A2</td>
<td>Physiology</td>
<td>15</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1A3</td>
<td>Population Health</td>
<td>15</td>
<td>1</td>
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<tr>
<td></td>
<td>1A4</td>
<td>Samoa/Pacific cultures and Health</td>
<td>7.5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>1B1</td>
<td>Biochemistry/Genetics</td>
<td>15</td>
<td>2</td>
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<td>Microbiology/Immunology</td>
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<td>2</td>
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<tr>
<td></td>
<td>1B3</td>
<td>Pharmacology/Pathology</td>
<td>15</td>
<td>2</td>
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<tr>
<td></td>
<td>1B4</td>
<td>Professionalism/Ethics</td>
<td>7.5</td>
<td>2</td>
</tr>
</tbody>
</table>

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COURSE DESCRIPTIONS

1A1  ANATOMY
1A2  PHYSIOLOGY

These two courses will give instruction in normal structure and function. Tutorials and self-paced student learning will be augmented with prescribed textbooks, electronic instruction and audio-visual material. Anatomy and physiology will be integrated into case-based discussions where the correlations between normal physiology and pathophysiology, normal anatomy and pathology, and homeostasis and homeostatic imbalances is emphasised.

1A3  POPULATION HEALTH

The two courses will outline the importance and principles of Population Health and Pacific cultures. The two papers have synergies as inclusive cultural systems addresses population health especially in vulnerable populations. Samoan culture and context will be emphasised within the broader context of Pacific Island cultures.

Topics covered in the Population Health course are:

- Population Health - introduction to epidemiology, public health, the wider determinants of health, Global Health. Health issues and epidemiology in the Pacific region.
- Public Health principles and practice including health promotion and prevention of disease.
- Inequity and vulnerable population groups
- Social science
• An introduction to Health Systems – Health system organisation, health informatics, Primary Health Care, Secondary healthcare and Community based healthcare
• An introduction to research methods, critical appraisal and analysis

1A4 SAMOAN/PACIFIC CULTURES and HEALTH

Samoan cultural references which underpin the indigenous value system of Samoan society and its village and community health sector will be emphasised. The paper will explore indigenous knowledge and how it relates to concepts of health and disease. Traditional health in the context of complimentary medicine will also be explored. Non-Samoan Pacific Island students will be able to apply the frameworks explored and analytical tools to be used in this Samoan focused paper to analyse their own respective country/cultural contexts.

Topics covered in Pacific Culture and Health are:

• Samoan culture, Pacific cultures and non-Pacific cultures and interpretation of diseases and healing
• Culture and Disease, illness experience, health and well-being
• Traditional medicine and healing in Samoa
• Pacific research methodologies and frameworks
• Pacific frameworks for assessing health and illness (e.g. Fonofale)\(^1\)
• Individual patient based care should extend beyond clinical and pathological considerations and include social and cultural considerations, promoting a more “holistic” approach to patients
• Health systems in the Pacific.

1B1 BIOCHEMISTRY/GENETICS

The course will provide learning in the structure and function of biological molecules, including carbohydrates, lipids, and proteins. Emphasis on relation to the health sciences. Topics include enzymology, special properties of biological membranes, hormones, vitamins, metabolic pathways and molecular biology.

The genetics component will provide an introduction to the mechanisms of heredity and evolution. Mechanisms of Mendelian inheritance, meiosis, recombination, gene mutation and mapping, and an introduction to modern biochemical, molecular, and population genetics.

1B2 MICROBIOLOGY/IMMUNOLOGY

The course will provide an introductory course in microbiology that focuses on the structure, biology, and genetics of microbes in relation to human disease and the immune system. It will cover sterilization, disinfection, action of antimicrobial chemotherapeutic agents, concepts of infection and immunity and the study of certain selected infectious agents.

The immunology component will teach principles of immunology including: development of the immune system, innate immunity, immunoglobulin structure and genetics, antigen-antibody reactions, the major histocompatibility complex reactions and antigen presentation, T cell receptors (genetics, structure, selection), T cell activation and effector functions, anergy and

\(^1\) http://www.hauora.co.nz/resources/Fonofalemodelexplanation.pdf
apoptosis, cytokines, phagocytic cell function, immune responses to infectious organisms and tumors, autoimmune diseases, autoimmunity, allergies, and immune deficiencies.

1B3 PHARMACOLOGY

The course will provide students basic concepts of the interactions of chemical agents with living tissues, basic pharmacological principles, therapeutic and toxic actions of important drugs, toxicology and therapeutics. Social responsibility aspect of pharmacology will also be taught.

1B4 PROFESSIONALISM/ETHICS

This course is designed to introduce students to principles of professional behaviour, ethics and legal aspects of medicine. They will also have instruction in the doctor’s role, communication and diversity of patients and communities, contribution to the profession and learning in communities. The course will also cover clinical leadership, clinical governance and being a clinical educator.

The course will also cover the basis of medical ethics, the theory of value (goodness and badness), and the theory of virtue and vice. This course is designed to help students develop their abilities to read, explicate, analyze, and evaluate ethical positions, and think critically and analytically about ethical issues.

Assessment

- This year will comprise standard semester-based courses and summative assessments. These assessments should not be exclusively multi-choice and may be balanced with short answer questions, essays and objective structured clinical examinations as well.
- Consideration should be given to allowing a pass for the year even if there is a marginal failure in one paper but a good performance in other aspects of the course (e.g. define the minimum average grade for the year and the minimum mark allowed in any one paper).
- Papers will be assessed at the end of each semester and students need to obtain more than 50% of the points at the end of the year.

Learning Philosophy

- The Medicine Year 1 will be largely Knowledge Based Learning. However, the case programme during this year will allow some TBL or PBL to be utilised. In addition there should be opportunities for some TBL arising from lectures.
- Since laboratories are not part of the Year 1 curriculum exercises in application of KBL are recommended. This would be a natural extension of learning in areas such as public health, ethics etc. It will be helpful if students have an early introduction to the styles of learning used in years 2-6.
Phase 2: Year 2 and 3 – Body systems

Structure

<table>
<thead>
<tr>
<th>Subject</th>
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<td>2B1</td>
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<td>2C1</td>
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</tr>
<tr>
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<td>2C2</td>
<td>Nervous system</td>
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<td>Blood &amp; Neoplasia</td>
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<td></td>
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<tr>
<td>MBBS3</td>
<td>3B1</td>
<td>Immunity &amp; Infection</td>
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<td></td>
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<tr>
<td>MBBS3</td>
<td>3C1</td>
<td>Endocrine</td>
<td>3</td>
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<tr>
<td>MBBS3</td>
<td>3C2</td>
<td>Metabolic and Body systems regulation</td>
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</tbody>
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COURSE DESCRIPTIONS

2A-C MUSCULOSKELETAL, CARDIOVASCULAR, RESPIRATORY, GASTROINTESTINAL, RENAL, NERVOUS SYSTEM ANATOMY

Through clinical scenarios, lectures and laboratories (audiovisual, electronic, podcasts), students are introduced to human health and the description and pathogenesis of disease processes as a basis for the systematic study of human illness. This is integrated with the study of human organ systems through components focusing on digestive, genitourinary, cardiovascular, respiratory, autonomic and endocrine systems, linked with spiral learning and practical work in anatomy, physiology, pathology, medical imaging, and professional, clinical and communication skills.

Prerequisite: MBBS1

3A-C REPRODUCTION, DEVELOPMENT and AGING, BLOOD and NEOPLASIA, IMMUNITY and INFECTION, ENDOCRINE, BODY SYSTEMS REGULATION

Through clinical scenarios, lectures and laboratories (audiovisual, electronic, podcasts) students are introduced to human health and the description and pathogenesis of disease processes as a basis for the systematic study of human illness. This is integrated with the study of human organ systems through components focusing on musculoskeletal, reproduction, haematology, immunity and infection, development and aging, body systems regulation linked with practical work in anatomy, physiology, pathology, medical imaging, and professional, clinical and communication skills, as well as ward-based learning experiences.

Prerequisite: MBBS2 2A-C
**Assessment**

- The end of Year 3 Exam will include material from all 3 preceding years.
- Students will need to pass the whole year in total.
- A summative examination will occur at the end of each trimester and a formative assessment will occur mid-trimester.
- The summative exams should include multiple choice, short answer and OSCE assessments.
- The end of trimester 3 exam will include assessment of learning for the whole year and should therefore carry a greater weighting of 50% for the year. The other 50% can be allocated to the end of trimester 1 and 2 assessments.

**Learning Philosophies**

- The weekly case programme and periodic integrative weeks will provide the main platform for TBL and PBL. The cases will not deliver new content to students but they will be expected to identify and apply the pertinent knowledge from previous KBL.

- The tasks should not be purely knowledge based and students should be provided with realistic clinical issues or problems, which, in many cases, they will not have previously met. TBL and PBL should be a challenge for active learning and ‘thinking outside the square’.

- The presence of the case programme does not mean that TBL and PBL should be confined to this programme. Elements of TBL and PBL can be incorporated into lectures.

- The clinical consultation and skills programme also represents application of TBL and PBL in the sense that the outcome of the consultation is to solve patient problems. The formulation of a problem list is a good working example of problem solving.

- Even though block-learning features more in the early years it was agreed that further learning in subjects initially taught, as blocks should be delivered throughout the curriculum. This delivery may be achieved by small blocks of learning – ‘mini-blocks’ – which ideally would be delivered during integrated weeks. Alternatively this could be delivered during tutorials in years 4-6 then applied during case work.

- There will be a need for special topic block learning when a visiting external academic delivers this. Sometimes this learning will be opportunistic when a visiting teacher happens to be available. An example of such opportunistic learning might be in radiology, at least until a staff radiologist is appointed.

- The case and integrated week programme provide good structures for spiral learning. The spiral will need to be carefully crafted and should commence in the early clinical years in relation to a patient presentation then proceed through re-visiting disease states of increasing complexity in the later curriculum. For example, breathlessness could be represented in a year 2 case with concepts of cardiovascular and respiratory pathology then be re-visited as a case of pneumonia and later as a case of pulmonary embolism which represent increasing levels of understanding and investigation.

- Learning in the para-clinical and consultation skills programmes is ideally suited to spiral learning since these are represented in almost all clinical conditions.
• The outcomes applied to learning opportunities will need to be fashioned in a spiral fashion. It will be helpful to students if the outcomes for learning acknowledge and build on previous learning.

• The concept of spiral learning brings complexity to the curriculum as careful coordination and cross-referencing is required. The previous comments about the need for a case-coordinator apply strongly in the spiral curriculum. It is very difficult for individual teachers to foster spiral learning on their own whereas this is feasible if there is a Faculty member whose role is embedded in curriculum coordination.
Phase 3: Years 4 & 5 - Clinical attachments

Structure

<table>
<thead>
<tr>
<th>Subject</th>
<th>Catalog</th>
<th>Long Title</th>
<th>Points</th>
<th>Semester</th>
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<td></td>
<td>4B1</td>
<td></td>
<td></td>
<td>2</td>
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<td></td>
<td></td>
<td>4 weeks: Anaesthetics</td>
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<td></td>
<td></td>
<td>12 weeks: Surgery</td>
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<td></td>
<td></td>
<td>12 weeks: Medicine</td>
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<td></td>
<td></td>
<td>4 weeks: Public Health</td>
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<td></td>
<td></td>
<td>4 weeks: Psychiatry</td>
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<td></td>
<td></td>
<td>4 weeks: Selective</td>
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<td>MBBS5</td>
<td>5A1</td>
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<td></td>
<td>5B1</td>
<td></td>
<td></td>
<td>2</td>
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<td></td>
<td></td>
<td>10 weeks: Obstetrics &amp; Gynaecology</td>
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<td>10 weeks: Paediatrics</td>
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<td></td>
<td>4 weeks: Emergency Medicine</td>
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<td></td>
<td></td>
<td>2 weeks: Ophthalmology</td>
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<td></td>
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<td>2 weeks: Ear, Nose and Throat</td>
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<td></td>
<td></td>
<td>8 weeks: Community/Rural Medicine and Primary Health</td>
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<td></td>
<td></td>
<td>4 weeks: Selective</td>
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</tr>
</tbody>
</table>

COURSE DESCRIPTIONS

4A1 & 4B1: Clinical attachments

During Year 4, students spend 40 weeks in five clinical attachments: emergency medicine, anaesthetics, surgery, medicine, general practice/public health and selective. There is also a compulsory Samoa/Pacific culture and Health assignment.

The FoM will decide the number of weeks apportioned to each attachment, as it will depend on the weighting given for each discipline and the availability of local clinical supervisors. For example, the Surgical attachment can be for 8 weeks and Anaesthetics for 2 weeks. We suggest that the minimum duration of the Selective attachments be at least 4 weeks which will allow the student to do a clinical attachment in an area of interest, perform a research project or for remediation for those who had borderline fail in a discipline.

There will be weekly whole class teaching during Year 4 for integrated case presentation and discussion bringing in biomedical sciences with clinical, pathological and socio-cultural aspects of patient care. This will also be an opportunity for specialist topic teaching such as radiology.

5A1 & 5B1: Clinical attachments
Students spend 40 weeks in 5 clinical attachment areas. These are obstetrics and gynaecology, paediatrics, psychiatry/renal unit/ophthalmology, community/rural health and a selective/overseas elective.

The FoM will decide on the number of weeks apportioned to each attachment, as it will depend on the weighting given for each discipline and the availability of local clinical supervisors. The five clinical attachment areas for 40 weeks in the year can mean 8 weeks per attachment. Rural Health is for the student to acquire knowledge and skills in a rural setting in either a district hospital in Upolu or at the hospital in Tuasivi. Students from the other Pacific Island countries may choose to do this attachment in their own country as long as they have an approved clinical supervisor. Students who wish to do research or need remediation for a borderline fail should do the Selective attachment and this can be done overseas as long as they have an approved clinical supervisor. Other students should be encouraged to apply for an overseas Elective attachment in Australia or NZ.

There will be weekly whole class teaching during Year 5 for integrated case presentation and discussion bringing in biomedical sciences with clinical, pathological and socio-cultural aspects of patient care. This will also be an opportunity for specialist topic teaching such as radiology.

**Assessment**

- These years will be structured on semesters each of which will cover three attachments. Assessment will be largely attachment related and will include short (OSCE, miniCEX) and long case clinical assessments (written and oral assessments) and an assessment of performance during the attachment (diligence, professionalism, contribution to group learning).

- Consideration should be given to the concept of a ‘conditional’ pass for a marginal attachment performance. A conditional pass would allow the student to proceed to the next attachment with the requirement that they can demonstrate achievement of specific competencies by the end of the next attachment. This allows students a remediation opportunity in order to avoid failing the whole year. If competency is not demonstrated or the student fails an attachment assessment badly they would need to repeat the attachment during the summer break. If the student fails a number of attachments they should be required to repeat the year.

- Since students will spend considerable time on case-work during years 4 and 5, including new medical science and para-clinical science material, it will be essential that this material is represented in the Year 5 exam.

- Students will be assessed in each clinical attachment through supervisor’s report/written clinical case discussions/short cases/assignments. Students will be expected to pass or ‘conditionally pass’ each clinical attachment

- There will not be a summative assessment at completion of year 4 but there will be a high-stakes summative assessment at the end of year 5 which will assess the culmination of all learning in medicine. The exam should be done before the Selective/Elective attachment. Consideration should be given to including multiple choice, short answer and clinical assessments.
• Consideration should be given to the weightings allocated to in-course assessments and the summative exams. Since the fifth year exam is the final high-stakes exam the weighting allocated to this exam should be high, possibly 50 to 70% of the year’s assessment.

Learning Philosophies

• As in years 2 and 3 the case programme, integrative weeks and consultation skills programme offer excellent opportunities for TBL and PBL.

• However, the work on the wards and in other clinical settings is by definition focussed on problem solving. Despite this there can be a tendency for teachers to concentrate too much on knowledge and too little on application. With a culture of TBL and PBL in the curriculum this should not be a major issue.

• The value of some KBL in the later years should not be lost sight of. New knowledge adds interest and sophistication to the learning process. This applies equally to material in the para-clinical sciences and medical sciences.

• To ensure that all domains continue to be represented across the curriculum it is strongly recommended that each attachment and case defines the domains that will be actively taught or included in TBL or PBL exercises.
Phase 4: Year 6 - Trainee Intern

Structure

<table>
<thead>
<tr>
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<td></td>
</tr>
<tr>
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<td></td>
<td>8 weeks: Medicine</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>8 weeks: Obstetrics &amp; Gynaecology</td>
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<td>8 weeks: Elective</td>
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COURSE DESCRIPTIONS

6A1 & 6B1: Trainee Internship Year

The trainee intern year is designed to offer students ‘hands-on’ experience of patient management and contribution to clinical teamwork. In a sense it will provide an apprenticeship experience. However, learning of new content will continue and should be assessed. The outcomes for the trainee intern year will need to be carefully defined and assessment will need to reflect these outcomes, particularly in relation to group learning and the contribution to the clinical team.

Assessment

- Students are expected to pass each clinical attachment. The assessment is made by the clinical supervisor who would have closely observed the student’s clinical and professional performance during the attachment. Reports from other members of the team or department may be necessary. A 30-minute MiniCEX forms part of the attachments assessment.

- Case learning will continue in Year 6 with formal half day instructions per week either within the department/the hospital or provided by Faculty staff.

Learning Philosophies

- The comments made concerning years 4 and 5 also apply to year 6 as this is has a high focus on clinical problem solving and management.

- The exposure to clinical practice immediately raises issues that were taught in the para-clinical sciences. These areas should be actively addressed as part of problem solving in year 6 and it is strongly recommended that each attachment defines the domains.
5. The Trainee Intern year

1. The one or two years following graduation from medical school are known as pre-registration or internship year and they form an important learning and development phase that bridges graduation from university and full vocational training. During this period, with appropriate supervision, it is expected that the doctor will become an increasingly competent clinician “who is able to use the skills of history-taking, examination, and interpretation of investigations, to synthesize patient information and to formulate a patient management plan” (Australia, 2014).

2. In order to make sure that new graduates are supervised and receive the appropriate training, most developed countries have developed curriculums of training for the internship year. The Australian Curriculum Framework for Junior Doctors (ACF) “is an educational template outlining the learning outcomes required of prevocational doctors, to be achieved through their clinical rotations, education programs and individual learning, in order to promote safe, quality health care” (Australia, 2014).

3. The structure revolves around three main themes: clinical management, professionalism and communication with learning and assessment strategies. The Foundation Programme Curriculum in the United Kingdom requires doctors demonstrate competence in defined areas including communication and consultation skills, patient safety and team work (UKFPO, 2014). All doctors are assessed against curriculum outcomes and all assessments are kept in an e-Portfolio. PGY1 and 2 doctors in NZ are required to keep structured learning plans for approval by the Medical Council as competence programmes.

4. The UPNG MBBS programme has two pre-registration years whereas the Fiji National University has one. Both universities have requirements and objectives of training for these years but these are not formally assessed although heads of departments provide recommendations for registration purposes.

Conclusions from consultation:

- There was strong support from consultations for a trainee intern 6th year in the curriculum. Feedback from NHS and SMA doctors was that students should graduate with skills enabling them to work effectively as junior medical practitioners with supervision.

Questions highlighted for consultation in Samoa:

- How many pre-registration years should the NUS-postgraduate doctors have?

- Should a curriculum with learning objectives and defined outcomes be developed for the pre-registration year? And who should perform and report the assessment of competence?
transitional year with a strong focus on developing clinical competence necessary for practice as a junior doctor (Dare, Cardinal, Kolbe, & Bagg, 2008).

- The year will consist of supervised clinical attachments in Medicine, Surgery, Paediatrics, O&G, Psychiatry, Emergency Department/Outpatients, Primary Care along with an Elective of the student’s choice.

- Trainee interns will be expected to work as integral members of the clinical team with an expectation that they will assume limited responsibility for approximately on third of the patients for their clinical team. This will include admitting and managing patients, presenting cases on ward rounds and carrying out clinical procedures.

- Trainee interns will also be expected to prepare and accommodate themselves to the socio-cultural characteristics of Samoan life or their home communities and be conversant in protocols and language that facilitate mutually instructive interaction with traditional/rural communities.

- The focus will be on practical experiential learning with some formal case or task-based teaching. Along with practical clinical skills, students will consolidate biomedical science, pathophysiology and clinical knowledge in the clinical cases they see. This learning, along with new knowledge and concepts learnt will need to be assessed.

- Assessment of trainee interns will occur during and at the end of each clinical attachment. Students will be assessed on:
  
  o Medical knowledge
  o Clinical skills (History and examination, case notes, problem identification and solving, decision making, patient management, organisational skills, communication with patients/families and staff)
  o Professionalism (attitude, curiosity and initiative, sense of responsibility, attendance, awareness of limitations, ability to work in a team)
  o The clinical and professional skills that students need to acquire are complex. Assessment will be determined by each Clinical specialty but will need to consider consolidating clinical skills, medical knowledge and professionalism. Assessment will consist of a supervisor’s report together with other forms of assessment such as a Long case, OSCE, Mini CEX or project. The emphasis is on assessing competency with the ability of students to incorporate curriculum learning to date along with trainee intern experiential learning.

- Students will be encouraged to be active life long learners and reflect on their own progress and learning with their supervisors. Clinical attachments might also consider students keeping a Log Book of patients seen and procedures carried out.

- Formal whole class learning will occur with a weekly session on a clinical case or a specialty topic such as radiology. Clinical cases will be complex or multi-system and bring in aspects of the curriculum learning domains.
6. Implementation

A) THE MEDICAL and MEDICAL SCIENCE DOMAIN

The Medicine Year 1 –

1. The Medicine Year 1 will be partly based on the Year 1 in the previous OUM curriculum. This is particularly the case for learning in the medical sciences. It is highly desirable that as much teaching as possible is delivered by Samoa based teachers with involvement of staff from the Faculty of Medicine, NUS and NHS. However, some disciplines including anatomy, physiology, pharmacology and pathology will need assistance from external partners during a transitional phase, possibly over 3 years.

2. Medicine Year 1 requires, as a pre-requisite, a minimum of A3 (80 percent) graded certificate for English and best 3 in the NUS foundation science year or equivalent from a Senate recognised institution.

3. The contribution from external partners may include sharing information on course structure, provision of lecture resources such as pod-casts, a visit to Samoa during teaching of the relevant course to assist with teaching delivery and assist with development of Samoan capacity and offer on-going support on an as required basis.

Years 2 and 3: the integrated clinically focussed curriculum (body systems) –

4. The years 2 and 3 integrated clinically focussed curriculum will be largely based on the body domain from the previous OUM curriculum although the integration of para-clinical topics adds a new dimension. The ten body systems will utilise much of the previous learning material and there should not be a need to develop much new resource in the first instance. This curriculum should be delivered largely by the Faculty of Medicine staff. The availability of electronic or web-based learning resources should be borne in mind and introduced over time to complement face to face delivery.

5. The appointment of a case-coordinator will be essential to upgrade the existing clinical cases to incorporate the para-clinical domains, to ensure that continuing care is represented and to maintain the spiral of learning. The case coordinator will also be involved in developing case material for the integrated weeks. With time some of the cases should be developed and delivered as interactive electronic learning.

Years 4 and 5: the integrated clinical curriculum (clinical attachments)

6. The years 4 and 5 integrated clinical curriculum will be largely based on the attachments used in the previous curriculum although greater emphasis on community learning is desirable. The teachers will be provided by the Faculty of Medicine (FoM). FoM will also make necessary
arrangements for the engagement of appropriate NHS staff as adjunct clinical instructors.

7. Conditions of appointment and remuneration of the NHS teachers needs to be formalised and documented, including a memorandum of understanding between NUS and NHS.

8. The integrated case programme will continue and appointment of a case-coordinator to develop resource will be essential as described above. With time some of the cases should be developed and delivered as interactive electronic learning.

9. Some clinical learning such as radiology, pathology and dermatology cannot be fully delivered by Samoan staff. External partners need to be encouraged to facilitate visits, either in person or using web technology, from experts in these areas and students should have the flexibility necessary to take advantage of visiting experts. Small blocks of teaching could be provided, particularly during integrated weeks.

10. Selective attachments are desirable in years 4 and 5. It provides options to students to perform a research project, repeat a clinical attachment of their choice, remediation for those who need it and one of them can be used for an overseas elective. External partners may be able to offer overseas attachments, particularly in disciplines not well represented in Samoa.

Year 6: the Trainee Intern year –

11. The trainee intern year will be based on the major clinical specialties plus a community attachment and an elective attachment. Because this is a new year in the NUS curriculum the educational structure for the year will need definition, outcomes defined and an assessment programme developed, although this is likely to be small. The teachers will be largely provided by the NHS with contributions from Faculty of Medicine staff.

12. The appointment of a case-coordinator will be essential to develop new cases for the trainee intern year. These cases should represent multi-system conditions and the broad issues required for health management and should cover all learning domains.

13. Medical science learning will be well catered for in years 1 to 3 of the curriculum and will have representation similar to that in the previous curriculum.

14. The challenge will be the delivery and assessment of medical sciences in years 4-6. Once again the case programme should ensure that new medical science teaching is delivered in years 4 to 6. It will be essential to define the outcomes for learning in medical sciences carefully to ensure that the learning builds on medical science material delivered in the earlier years of the curriculum. It will be helpful to have specification of domains represented in each case and medical science outcomes listed. This will help to ensure that medical sciences are also assessed.

15. The delivery of medical sciences in years 4 to 6 should be feasible using existing teachers in these years. However, support resources for teachers will be useful to refresh them on the appropriate medical science theory and application. The staff development programme should reflect this requirement.
B) THE CONSULTATION and CLINICAL SKILLS DOMAIN

16. Consultation and clinical skills will be well catered for in years 4 to 6 of the curriculum and will reflect the learning which occurred in the previous curriculum.

17. Clinical reasoning should be more explicitly profiled in these years and explicitly assessed.

18. In the Medicine Year 1, the case programme will make a small start and will give students a basic understanding of medical history taking, physical examination and investigations. In years 2 to 3 a programme for learning basic consultation and reasoning skills is strongly recommended. This should be based on a comprehensive and coherent structure such as is represented in the Calgary-Cambridge method.

19. Early patient contact is also recommended both in the hospital and, when possible, in the community. This learning should be linked to the body system being taught at the time. These consultation and clinical skills should be assessed through written and clinical (OSCE) assessments. Consultation and clinical skills learning early in the curriculum can be delivered by Faculty of Medicine staff.

C) THE PARA-CLINICAL DOMAINS

20. The teaching of these domains in the Medicine Year 1, will largely be provided by existing teachers in NUS and the Faculty of Medicine. The design of some of these papers would be assisted by having access to course descriptions from partner medical schools. The proposed paper structure for the Medicine Year 1 indicates that the para-clinical domains will be encompassed in two papers, one per semester.

21. Much of the subsequent learning in the para-clinical domains will occur through the case programme, however, it is important that some advanced theory in these areas is provided in years 2-6. Some of this can be built into the cases but it should also be possible to deliver new material during the integrated weeks. It will be essential for teachers in the clinical attachments to be aware of these broader health issues and to ensure that they are built in to case presentations and discussions.

22. Even though block learning features more in the early years it was agreed that further learning in subjects initially taught as blocks should be delivered throughout the curriculum. This delivery may be achieved by small blocks of learning – ‘mini-blocks’ – which ideally would be delivered during integrated weeks. Alternatively this could be delivered during tutorials in years 4-6 then applied during case-work.

23. There will be a need for special topic block learning if this is delivered by a visiting external academic. Sometimes this learning will be opportunistic when a visiting teacher happens to be available. An example of such opportunistic learning might be radiology, at least until a staff radiologist is appointed.

24. The case and integrated week programme provide good structures for spiral learning. The spiral will need to be carefully crafted and should commence in the early clinical years in relation to a
patient presentation then proceed through re-visiting disease states of increasing complexity in the later curriculum. For example, breathlessness could be represented in a year 2 case with concepts of cardiovascular and respiratory pathology then be re-visited as a case of pneumonia and later as a case of pulmonary embolism which represent increasing levels of understanding and investigation.

25. Learning in the para-clinical and consultation skills programmes is ideally suited to spiral learning since these are represented in almost all clinical conditions.

26. The outcomes applied to learning opportunities will need to be designed in a spiral fashion. It will be helpful to students if the outcomes for learning acknowledge and build on previous learning.

27. The concept of spiral learning brings complexity to the curriculum and careful coordination and cross-referencing is required. The previous comments about the need for a case-coordinator apply strongly in the spiral curriculum. It is very difficult for individual teachers to foster spiral learning on their own, whereas this is feasible when there is a Faculty member whose role is curriculum coordination.

D) ELECTRONIC LEARNING RESOURCES

28. There are many good quality electronic and web-based resources in medical education. Many of these will be applicable in the NUS curriculum and should be taken advantage of, particularly in those areas where local expertise is not available. The OUM programme was almost exclusively delivered using electronic media and the use of Elluminate and Moodle encouraged interactivity with students in real time. Universities in New Zealand are also increasingly and successfully using improved electronic delivery of lectures and teaching material.

29. Teaching methods can also be complemented by the wealth of podcasts and audio-visual material online. Most of this material is not copyrighted and can be downloaded and adapted to suit local learning objectives and context.

30. However, electronic resource should complement teaching rather than substantially replace it. This is particularly the case in an integrated curriculum where learning in the context of patient presentations or community health initiatives occurs and requires face-to-face interaction with other students and teachers. Group discussion face to face is always better at engaging students where expertise and teaching skills are available locally.

31. The Samoa Institutional Linkage Programme between the Samoa National Health Service (NHS) and Counties Manukau District Health Board (CMDHB) are planning a telemedicine service that will enhance communication that will aid in teaching, diagnostics and patient care (Eagleton & Costzee, 2014). Specialist staff at CMDHB are excited at the opportunity to use the telemedicine link to assist Samoa in both the improvement of patient care at the NHS and the teaching of clinical staff and medical students. The project has already identified link specialists in New Zealand to provide clinical advice to the Samoa NHS.

32. There is no doubt that electronic resources will become increasingly interactive and sophisticated and will offer greater opportunities within the NUS curriculum. In addition it is desirable that a proportion of the curriculum resource developed by the NUS Faculty is formatted electronically.
33. A reliable internet connection in the Faculty of Medicine premises will assist staff in preparing teaching material and research and will also assist the students with their self-learning and research. The use of electronic resource is not inexpensive and it is recommended that a budget for electronic resource is identified by NUS.

E) EXTERNAL ASSISTANCE/PARTNERSHIPS

34. The main areas of deficiency lie in the medical sciences, particularly physiology, anatomy, pharmacology and pathology. The Universities of Otago and Auckland are willing to assist in these areas.

35. NUS have a Memorandum of Understanding (MOU) with the University of Otago and Victoria University in Wellington. The former has had a long commitment to assisting NUS with building educational capacity and the latter has the potential to assist NUS in developing the Samoa/Pacific culture and Health module, if this was needed. NUS and the University of Auckland should explore the need for an MOU given the potential of its Pacific programme and personnel in assisting NUS.

36. The partnership between NUS and the NHS need to be formalised in an MOU. The Clinical and scientific staff of the NHS contributes to teaching of medical students and they should be acknowledged. Acknowledgement can be in the form of a honorary academic title, some NUS staff privileges or a teaching stipend.

37. A formal partnership with the NHS may mean that all staff employed by the NHS at the Teaching Hospital has a contractual obligation to teach medical (and other health) students.

38. Teaching assistance from and collaboration with all other sectors of the medical and education fraternity in Samoa should be encouraged. For example, private medical practitioners with a special interest area should be encouraged to teach the students in their area of interest.

39. A template of named NUS and NHS staff who could contribute to medical science teaching is needed in the first instance. Corresponding staff from the Universities of Otago and Auckland would be identified and communication channels opened. Ideally these external staff will be able to assist with developing the structure for the discipline and provide considerable teaching resource such as pod-cast lectures.

40. In Years 4-6 there will be some disciplines, which are not, catered for currently in Samoa e.g. radiology and pathology. It would be worth exploring with partnership schools whether visiting experts in these areas could visit Samoa to provide brief block teaching in these areas.

41. To achieve the ideal there will be a need for assistance from partnership medical schools in New Zealand and possibly elsewhere for at least 3 years. The immediate resource these partnership schools could provide are copies of their course descriptions.

42. External partners may contribute by sharing information on course structure, provision of lecture resources such as pod-casts and providing teaching opportunities through visiting academics.

43. There are also a host of clinician specialists, health personnel and clinical teams visiting Samoa in any one year. NUS should liaise with the NHS to share the dates of these visits well in advance
and clinicians requested to teach the students (block teaching of topics) and assist the staff with the development/improvement of course material where appropriate.
7. Evaluation and Review

Evaluation programme:

1. It is essential that a programme of feedback and evaluation is built in to the governance of the NUS curriculum. This should involve contributions from all stakeholders including students, graduates, academic staff and wider stakeholders in the community. There should be a number of methods used to elicit feedback including questionnaires using both closed and open questions, focus groups or periodic wider consultation. It is also helpful to have a regular staff-student forum to discuss issues relating to the curriculum delivery.

2. Clearly, students will be the main contributors to evaluation. Evaluation fatigue can set in if students are evaluated too frequently. The principles which should guide evaluation include:
   a. More regular evaluation for new curriculum developments, possibly annually in the initial phases
   b. Less frequent evaluation for established curriculum, possibly every 3 years
   c. Evaluation should be administered by non-academic staff so students do not feel undue influence
   d. Evaluation should be anonymous
   e. Feedback to those providing evaluation should be mandated so they can see the issues identified and any remedies that are being put in place

Review of the NUS curriculum and ultimate accreditation:

3. Realistic milestones should be pegged along an implementation roadmap that eventually leads to a curriculum that NUS can be proud of. NUS should, by December 2015, have set in motion processes in at least six of the nine areas of the Global Standards for Quality Improvement by the World Federation for Medical Education (WFME) (World Federation for Medical Education, 2012) as approved by the World Health Organization (WHO) and the World Medical Association (WMA). The aim for doing this is so that the medical school can be listed as a medical school in the World Directory of Medical Schools (http://www.wdoms.org) by early 2016. This is important for boosting staff morale and also for marketing purposes to attract overseas fee-paying students. The standards do not have to be achieved by then – but processes should be in place to have them achieved eventually. The six of the nine standards that nine standards are:
   - Defining a Mission and have determined desired Educational Outcomes. Internal NUS processes should make this highly achievable by December 2015.
   - Agree or modify the proposed Educational Programme. Then develop an implementation plan and start the process in developing the different aspects of the curriculum. Again, whereas it is acceptable for the various aspects of the curriculum to be achieved incrementally and may take 3 or 5 years, the process as evidenced in a transparent
implementation plan should be in place by December 2015.

- Assessment methods should have been agreed to by December 2015, even if the methods are still being refined.

- Policies on admission policy, selection and support of students should have been clarified by December 2015.

- A plan to build the capacity of the FoM staff and a policy on recruitment and selection even if confined to a few positions should be in place by December 2015. Partnerships with external institutions should either be in place or being developed with the aim of strengthening local capacity.

- Educational Resources - The FoM has significant and improved physical facilities with the completion of the teaching hospital. Training resources including information technology are essential components of the curriculum and policies or processes should be in place by December 2015 in how those can be acquired if they are not already in place. The partnership institutions in NZ could assist with educational expertise and educational exchanges.

4. There will be many challenges in the development of the ideal NUS curriculum. This will be an evolutionary process but it is essential to ensure that progress continues to be made and that the fundamental tenets are adhered to. It is therefore recommended that an interim external review of progress is conducted after 3 to 4 years and a further review after 6 to 7 years when the full programme is in place.

5. The full review may involve an accreditation body such as the Samoa Qualifications Authority (SQA), the Philippines Accreditation Authority (PASCCU) or the Australian Medical Council (AMC) although the review would need to be of a ‘formative’ nature rather than ‘summative’ or binding.

6. Ultimately it would be a worthwhile goal for the NUS curriculum to be externally accredited. This would provide credibility in the Pacific community of nations and would assist with attraction of fee-paying students. To achieve accreditation the principles underpinning the ideal curriculum would need to be kept in focus over the next few years of curriculum development.
8. Comparison of the proposed and previous curriculums

1. This section was requested to compare what was offered under the Oceania University of Medicine curriculum to what is being proposed.

2. The comparison is arbitrary because whereas what we are proposing is an ideal curriculum with an implementation strategy to transition the curriculum from basic to an ideal, details of the previous curriculum can only be compiled from material supplied and evidence obtained by the Curriculum Development Team. We do not have detailed information about the previous curriculum framework or design whereas we have detailed information on course descriptions. We can only compare the course structures and content with a degree of certainty.

3. We decided from the outset that the aim of our curriculum development work was to build the structure, framework and design with an implementation strategy of the curriculum in collaboration with stakeholders and not to report on details of course papers or content. As suggested in previous sections, that work will take time as we build course content that is relevant to Samoa, the Pacific and the proposed curriculum.

4. The following table provides an oversight comparison of the proposed NUS medical curriculum structure and the previous curriculum –

<table>
<thead>
<tr>
<th>Framework, Design and Structure</th>
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<tbody>
<tr>
<td><strong>Notes</strong></td>
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<tr>
<td>Para-clinical domains</td>
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<tr>
<td>Clinical skills domains</td>
</tr>
<tr>
<td>Duration of Programme</td>
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<tr>
<td>Delivery</td>
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<tr>
<td>Phase 1: Year 1 – Foundation</td>
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<td>-------------------------------</td>
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<tr>
<td>Courses</td>
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<tr>
<td>Emphasis</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Phase 2: YEAR 2 and 3 – Body systems</th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Duration</td>
<td>6 trimesters (78 weeks)</td>
<td>4 semesters (80 weeks)</td>
</tr>
<tr>
<td>Courses</td>
<td>2 papers – 12 courses</td>
<td>9 modules –</td>
</tr>
<tr>
<td></td>
<td>• Musculoskeletal</td>
<td>• Musculoskeletal</td>
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<td></td>
<td>• Cardiovascular</td>
<td>• Respiratory</td>
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<td></td>
<td>• Respiratory</td>
<td>• Cardiovascular</td>
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<td>• Gastrointestinal</td>
<td>• Gastrointestinal</td>
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<tr>
<td>Section</td>
<td>Topics</td>
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<tr>
<td>Renal</td>
<td>Reproductive</td>
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<tr>
<td>Nervous System</td>
<td>Hemic Immune</td>
<td></td>
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<tr>
<td>Reproduction</td>
<td>Endocrine</td>
<td></td>
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<tr>
<td>Development and Aging</td>
<td>Neurology and Neuroscience</td>
<td></td>
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<tr>
<td>Blood and Neoplasia</td>
<td>Psychosocial and Renal</td>
<td></td>
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<tr>
<td>Immunity and Infection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Autonomic and Endocrine</td>
<td>(Self directed learning for 20 of the 40 hours per week)</td>
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<tr>
<td>Body systems regulation</td>
<td></td>
<td></td>
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<tr>
<td>Reproductive</td>
<td></td>
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</tr>
<tr>
<td>Hemic Immune</td>
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<tr>
<td>Endocrine</td>
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<tr>
<td>Neurology and Neuroscience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychosocial and Renal</td>
<td></td>
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</tr>
</tbody>
</table>

| Assessment                 | 50% in the end of year exams which assess the whole years work and 50% from formative and end of trimester exams. | Formative assessments and summative pre-clinical exam at end of Year 3 |
| Philosophy of delivery     | Articulated                                                          | Not clear                                                               |

**Phase 3: YEAR 4 and 5 – Clinical attachments**

| Duration                  | 4 Semesters (80 weeks)                                                | 4 Semesters (72 weeks)                                                |
| Courses                   | 2 papers – 9 clinical attachments and 2 electives                      | 7 attachments and 4 electives –                                      |
|                           | • Emergency Medicine                                                  | • Internal Medicine                                                   |
|                           | • Anaesthetics                                                        | • Surgery                                                             |
|                           | • Surgery                                                             | • Paediatrics                                                        |
|                           | • Medicine                                                            | • Obstetrics and Gynaecology                                          |
|                           | • General Practice/Public Health                                       | • Psychiatry                                                         |
|                           | • Obstetrics and Gynaecology                                           | • Emergency Medicine                                                 |
|                           | • Paediatrics                                                         | • Community Medicine                                                 |
|                           | • Psychiatry/Ophthalmology/Renal                                       |                                                                      |
|                           | • Community/Rural Health                                              |                                                                      |

| Assessment                 | Attachment related and will include short (OSCE, MiniCEX) and long case clinical assessments (written and oral assessments) and an assessment of performance during the attachment (diligence, professionalism, contribution to group learning). | Details not available other than a final clinical exam at end of Year 5. |
| Philosophy of delivery     | Articulated                                                          | Not clear                                                               |

**Phase 4: YEAR 6 – Trainee Intern Year**

| Duration                  | 2 semesters (40 weeks)                                                | Not in University schedule or unstructured                            |
| Courses                   | 1 paper, 5 attachments and 1 Option                                    | Not in University schedule or unstructured                            |
|                           | • Surgery                                                             |                                                                      |
5. A further illustrative comparison can be provided for a module to be delivered in the Year 2 and 3 clinical curriculum (body systems). The comparison is with the previous musculo-skeletal module. This module was well designed and delivered and it included a good amount of clinical material to add interest and relevance to the learning in medical sciences.

6. However, the learning orientation in the new curriculum will be moderately different as illustrated in the following table –

<table>
<thead>
<tr>
<th>Proposed NUS curriculum</th>
<th>Previous curriculum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning topics</td>
<td>Pathophysiology based eg polyarthritis or systemic arthritis</td>
</tr>
<tr>
<td>Conditions represented</td>
<td>Focus on common conditions, including trauma</td>
</tr>
<tr>
<td>Therapeutic approach</td>
<td>Principles of management of polyarthritis including relevant drugs</td>
</tr>
<tr>
<td>Clinical cases</td>
<td>Body system focus but also include multi-system features. Include para-clinical domain material (holistic)</td>
</tr>
<tr>
<td>Consultation and clinical skills</td>
<td>Basic skills to be learnt during the module</td>
</tr>
</tbody>
</table>
9. Recommendations

1. The curriculum should be designed to ensure graduates are prepared to meet the needs of Samoa and the wider Pacific with a broad view of health both at the patient level and the wider population level.

2. The new curriculum should be of 6 years duration.

3. That pathophysiology (patient/clinical presentation focus) and diagnosis (disease focus) should be the major educational constructs underpinning the curriculum.

4. The curriculum should mainly feature task and problem based learning.

5. The suggested learning domains that run throughout the curriculum are: medical sciences; consultation and clinical skills; psychology for medicine; professionalism /ethics/medico-legal; population health / epidemiology/ Pacific cultures & health / traditional medicine in the Pacific / health systems; research / evidence based medicine.

6. The curriculum should include a combination of block and spiral learning.

7. Learning objectives or outcomes should be defined for the whole curriculum.

8. Papers should support and reflect the integrated curriculum with some topic based learning but endeavouring to include learning related to the six domains.

9. The curriculum should consist of a Phase 1: year 1 Foundations of medicine; Phase 2: years 2-3 Organ systems; Phase 3: years 4-5 Clinical attachments; Phase 4: year 6 Trainee intern.

10. A variety of modalities should be used to assess learning including multiple choice, objective structured examinations, written examination and ward assessments.

11. A balance of in-course and final examinations is desirable.

12. The assessment should be clearly linked to the learning outcomes.

13. External assistance will be required for the development and delivery of the Foundations in Medicine phase in 2015 and probably for a further 2 years.

14. Appointment of a full time academic to coordinate case development and assist in coordination of the curriculum is recommended.

15. A budget for adequate electronic resources is identified.

16. That evaluation processes are developed and that the curriculum is reviewed after 3 years.
17. Clear governance structures for the curriculum should be established.

18. The Faculty of Medicine should establish a curriculum committee that has responsibility for planning and implementing the curriculum and also monitors innovations in the programme.
10. Useful Resources

a). Websites and documents:

University of Auckland MBChB Portal
https://wiki.auckland.ac.nz/display/MBChB/MBChB+Portal

University of Otago Faculty of Medicine Curriculum, 2011

Clinical Skills in the Undergraduate Medical Curriculum

WHO/WFME Guideline for Accreditation of Basic Medical Education
https://www.google.co.nz/search?client=safari&rls=en&q=WHO/WFME+Guideline+for+Accreditation&ie=UTF-8&oe=UTF-8&gfe_rd=cr&ei=QguGU_34F-nC8gfG_4DIDQ

Tomorrow’s Doctors by the UK General Medical Council, 2009
http://www.gmc-uk.org/static/documents/content/Tomorrow_s_Doctors_0414.pdf

Review of Curriculum: Oceania University of Medicine, 2013.
https://www.dropbox.com/s/r5rj8h4s5kl7454/%23220%20Review%20of%20Oceania%20University%20of%20Medicine%202013.docx

University of Papua New Guinea Curriculum and Domains, 2014
http://www.upng.ac.pg/smhs_mbbs.html

Standards for Doctors, Medical Council of New Zealand

b). Podcasts and other resources
c). University of Otago - List of podcasts and lectures

Individual lectures by podcast from the University of Otago may be available to NUS by arrangement with the UoO and the individual lecturers.

HUBS 192: Human Body Systems II  Dr Jeff Erikson
Cardiovascular System (CVS)
Lecture 1: Design of the Circulation and Haemodynamics
Objectives

After you have revised this lecture you should:

- Know the direction in which blood flows through the circulation.
- Understand how unidirectional blood flow is achieved.
- Identify the two most important haemodynamic factors that affect blood flow.

HUBS 192 Human Body Systems
Cardiovascular System
Lecture 2: Anatomy of the Heart, Part I
Objectives

After you have revised this lecture you should be able to:

- Describe the general organisation of the cardiovascular system.
- Orientate the heart within the thorax.
- Describe the chambered structure of the heart and relate this to the pumping action of the organ.
- Name the layers of the heart wall.

HUBS 192 Human Body Systems
Cardiovascular System
Lecture 3: Anatomy of the heart, Part II
Objectives

After you have revised this lecture you should be able to:

- Describe the heart valves & relate this to the flow of blood through the heart chambers.
- Identify the vessels of the cardiac circulation.
- Compare and contrast the structural features of cardiac muscle with that of skeletal muscle.
- Compare the structure and function of cardiac muscle and Purkinje cells.

HUBS 192 Human Body Systems
Cardiovascular System
Lecture 4: Circulatory system anatomy (Arteries and Veins)
Objectives

After you have revised this lecture you should be able to:

- Name the major arteries and veins within the body.
- Describe the layered structure of blood vessels.
- Compare the structures of arteries with that of veins.

HUBS 192 Human Body Systems
Cardiovascular System
Lecture 5: Circulatory system anatomy (Capillaries and Lymphatics)
Objectives

After you have revised this lecture you should be able to:

- Describe the structure of blood capillaries and contrast it with that of arteries and veins.
- Describe, giving examples, the three different types of blood capillaries.
- Name the major components of the lymph vascular system.
- Describe the structure of lymph capillaries.

**HUBS 192: Human Body Systems II** Dr Jeff Erickson  
**Cardiovascular System**  
**Lecture 6: The Heart as a Pump**  
**Objectives**

After you have revised this lecture you should:

- Understand that the heart is two pumps in series.
- Know the anatomical and cellular basis of contraction.
- Know the key phases of the cardiac cycle and accurately define the terms 'systole' and 'diastole'.
- Identify key aspects of the blood pressure wave.

**HUBS 192: Human Body Systems II** Dr Jeff Erickson  
**Cardiovascular System**  
**Lecture 7: The Excitable Heart**  
**Objectives**

After you have revised this lecture you should:

- Identify the key functional difference between contractile and electrical cells of the heart.
- Know the key parts of the electrical conduction pathway of the heart.
- Know the key parts of the ECG trace.
- Understand how the ECG relates to some haemodynamic events during the cardiac cycle.

**HUBS 192: Human Body Systems II** Dr Jeff Erickson  
**Cardiovascular System**  
**Lecture 8: Controlling the Heart and Blood Pressure**  
**Objectives**

After you have revised this lecture you should:

- Define cardiac output and identify the two major ways through which it can be altered.
- Identify the nerves involved, as well as their effects, in controlling heart rate and stroke volume.
- Understand how cardiac output can affect arterial blood pressure.

**HUBS 192: Human Body Systems II** Dr Jeff Erickson  
**Cardiovascular System**  
**Lecture 9: Controlling ‘Regional’ Blood Flows**  
**Objectives**

After you have revised this lecture you should:

- Understand what is meant by the phrase, “the distribution of cardiac output”.
- Understand how blood flow to one region can be reduced, while at the same time blood flow to another region can be increased.

**HUBS 192: Human Body Systems II** Dr Jeff Erickson  
**Cardiovascular System**  
**Lecture 10: Venous Blood Flow and the Heart**  
**Objectives**

After you have revised this lecture you should:

- Accurately define vascular compliance and contrast compliances between arteries and veins.
- Understand how valves and venous tone counteract ‘venous pooling’.
- Understand how veins have ‘survival value’.
- And state one way in which venous return affects the performance of the heart.

**HUBS 192: Human Body Systems II:** Rachel Lissaman  
**Module 2: Respiratory System**  
**Lecture 11: Upper Respiratory Tract**  
**Objectives**
After you have revised this lecture you should be able to:

- List the structures of the upper respiratory tract (URT) Explain how the anatomy of the URT structures reflect their function Describe the ‘respiratory mucosa’ and explain how the structure reflects its function.

HUBS 192: Human Body Systems II: Rachel Lissaman
Lecture 12: Lower Respiratory Tract
Objectives

After you have revised this lecture you should be able to:

- List the structures of the lower respiratory tract (LRT) that air passes through on the way to the alveoli Explain how the anatomy of the LRT structures reflect their function Describe the ‘blood-air barrier’ and explain how the structure reflects its function.

HUBS 192: Human Body Systems II: Rachel Lissaman
Lecture 13: Thorax, pleura, muscles, and ribs
Objectives

After you have revised this lecture you should be able to:

- List the structures within the thoracic cavity and the boundaries of the thoracic cavity.
- Describe the anatomical landmarks and boundaries of the lungs.
- Describe the pleural membranes and explain how the structure reflects its function.
- Describe the structures that change the dimensions of the thoracic cavity and the effect this has on ventilation.

HUBS 192 Human Body Systems II Dr Matt Bevin
Lecture 14: Overview of respiratory physiology (RES 4)
Objectives

After you have revised this lecture you should be able to:

- Describe a framework for the function of the respiratory system.
- Explain how we breathe air in and out of the lungs.
- Use Dalton’s law to calculate gas partial pressures.
- Describe the changes in respiratory muscles, thoracic volume, and consequential changes in pressure (intrapleural and alveolar) during inspiration and expiration.

HUBS 192 Human Body Systems II Dr Matt Bevin
Lecture 15: Work of Breathing / Lung Volumes (RES 5)
Objectives

After you have revised this lecture you should be able to:

- Explain the concept of “Work of Breathing” and how it is influenced by compliance, surfactant and airways resistance.
- Define the various lung volumes and capacities.
- Describe the measurements taken from a forced expiration and their uses.
- State typical resting values for tidal volume, breathing frequency and ventilation.
- Explain the terms alveolar ventilation and anatomical dead space.

HUBS 192 Human Body Systems II Dr Matt Bevin
Lecture 16: O₂ and CO₂ exchange (RES 6)
Objectives

After you have revised this lecture you should be able to:

- Quantify the amount of oxygen consumed and carbon dioxide produced by the body at rest and in exercise.
• Define partial pressure of a gas and know values for O₂ and CO₂ in the atmosphere, alveoli, arterial blood and venous blood.
• Explain principles related to diffusion of gases.
• Describe how alveolar ventilation, inspired gas composition and amount of gas exchange determine alveolar gas partial pressures.

HUBS 192 Human Body Systems II
Dr Matt Bevin

Lecture 17: O₂ and CO₂ transport (RES 7)
Objectives
After you have revised this lecture you should be able to:

• State the content of O₂ in plasma and bound to haemoglobin in arterial and venous blood.
• Draw and describe the oxygen-haemoglobin dissociation curve.
• State the mechanisms (and proportions of each) of CO₂ transport in the blood.
• Describe the Bohr and Haldane effects.

HUBS 192 Human Body Systems II
Dr Matt Bevin

Lecture 18: Control of breathing (RES 8)
Objectives
After you have revised this lecture you should be able to:

• Describe the generation of rhythmical breathing and the automatic and voluntary control of breathing.
• Describe the regulation of breathing by chemoreceptors and its homeostatic purpose.

HUBS 192 Human Body Systems II: Dr Jeff Erikson
Cardiovascular and Respiratory Systems
Lecture 19: Revision and Integration
Objectives
After you have revised this lecture you should be able to:

• Apply what you have learned in the Cardiovascular and Respiratory Systems lectures to novel situations.

HUBS 192 Human Body Systems II: Dr Daryl Schwenke
Module 3: Blood
Lecture 20: Composition and general function of blood; production of blood cells, anaemia (BLS 1)
Objectives
After you have revised this lecture you should be able to:

• Describe, in general terms, the functions of blood, its plasma and its blood cell types.
• State relative proportions for components of blood.
• Describe the physical features of the blood cells.
• Describe, in general terms, the formation of blood cells.
• Describe the control of production/destruction of red blood cells and the term ‘anaemia’.

HUBS 192 Human Body Systems II: Dr Daryl Schwenke
Lecture 21: Blood clotting and blood groups (BLS 2)
Objectives
After you have revised this lecture you should be able to:

• Describe the process of platelet plug formation in preventing bleeding.
• Describe the intrinsic and extrinsic clotting pathways involved in blood coagulation (clotting).
• Describe factors that oppose and hasten coagulation.
• Explain how the blood clot later dissolves.
• Explain a clotting disorder like haemophilia.
• Describe the ABO blood group system and the fundamentals of blood transfusion.
• Describe the consequences of the Rhesus system.

HUBS 192: Human Body Systems II  
Gastrointestinal System  
Lecture 22: Introduction to GI Anatomy and Physiology  
Objectives

After you have revised this lecture you should be able to:

• Identify and describe the overall primary function of the gastrointestinal system.
• Describe the mechanisms that underlie the primary function of the gastrointestinal system: motility, secretion, digestion and absorption.
• Identify the structures of the gastrointestinal system.
• Describe the location and the function of the peritoneum.
• Describe the blood supply of the abdominal portions of the GI tract. Be able to describe features of the blood supply that are important for GI

HUBS 192: Human Body Systems II  
Gastrointestinal System  
Lecture 23: The Basic structure of the GI system  
Objectives

After you have revised this lecture you should be able to:

• Describe the structure of epithelial membranes, many of their specializations and discuss the importance of epithelium in the GI system.
• Describe the ‘essential’ 4-layered structure of the tubular portion of the GI system and describe the tissue composition and function of each layer.
• Describe key structural features of the mouth, salivary glands and oesophagus and how in each, their structure is linked to function.

HUBS 192: Human Body Systems II  
Gastrointestinal System (GI)  
Lecture 24: Motility of the GI tract (GI 3)  
Objectives

After you have revised this lecture you should be able to:

• Describe the functions of motility in the gastrointestinal tract: reduction, propulsion, mixing, and exposure to absorptive surfaces.
• Describe the basic patterns of motility in the GI tract: mastication, storage, peristalsis and segmentation.
• Describe the motility patterns associated with the mouth, the esophagus, the stomach, and the intestine.

HUBS 192: Human Body Systems II  
Gastrointestinal System  
Lecture 25: The stomach and pancreas  
Objectives

After you have revised this lecture you should be able to:

• Describe the location and gross anatomical structure of the stomach and be able to discuss how these contribute to its role in storage and mechanical digestion
• Describe the structural specializations of the wall of the stomach that are important in the digestive process (both chemical and mechanical digestion).
• Describe the location and structure of the pancreas. Discuss why it is an important accessory organ in digestion.
HUBS 192: Human Body Systems II  Prof. Dave Grattan
Gastrointestinal System
Lecture 26: The structure of the small intestine

Objectives

After you have revised this lecture you should be able to:

- Describe the location and gross anatomical features of the small intestine and how it is arranged in the abdominopelvic cavity.
- Describe the structural specializations of the wall of the small intestine that are important in the digestive process.

HUBS 192: Human Body Systems II  Prof. Dave Grattan
Gastrointestinal System
Lecture 27: The structure of the large intestine, rectum and anal canal. Brief comments on the liver.

Objectives

After you have revised this lecture you should be able to:

- Locate the large intestine, the rectum and anal canal and describe their relationship to other organs and to the abdominal wall.
- Describe the specializations that have occurred in the layered structure of the GI tract in the large intestine, rectum and anal canal.
- Recognize key features of the liver and be able to describe the unique arrangement of the blood supply of the liver.

HUBS 192  Human Body Systems II:  Dr Steven Condliffe
Gastrointestinal System (GI)
Lecture 28: Secretion (GI 7)

Objectives

After you have revised this lecture you should be able to:

- Identify and describe the composition and function of different secretions associated with the gastrointestinal system.
- Describe the function of the salivary, gastric, pancreatic and biliary secretions.
- Discuss the regulation of salivary, gastric and pancreatic secretion.

HUBS 192  Human Body Systems II:  Dr Steven Condliffe
Gastrointestinal System (GI)
Lecture 29: Chemical Digestion (GI 8)

Objectives

After you have revised this lecture you should be able to:

- Describe and understand the changes in the chemical composition of food caused by digestion processes.
- Understand the catalytic role of digestive enzymes.
- Understand the sequence of events that occur during the hydrolysis of chemicals.
- Describe the processes of carbohydrate, protein and fat digestion.

HUBS 192  Human Body Systems II:  Dr Steven Condliffe Gastrointestinal System (GI)
Lecture 30: Absorption (GI 9)

Objectives

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After you have revised this lecture you should be able to:

- Describe and understand the general principles of absorption.
- Identify and describe the sites of absorption.
- Identify and describe the mechanisms of the absorption of water, sodium, products of protein, sugar and fat digestion and vitamins.

HUBS 192 Human Body Systems II: Dr Steven Condliffe Gastrointestinal System (GI)
Lecture 31: GI revision and integration (GI 10)
Objectives

After you have revised this lecture you should be able to:

- Understand how the primary functions of motility, secretion, digestion and absorption are integrated in response to a meal.
- Describe how neurohumoral mechanisms regulate the function of the GI tract as a whole.
- Identify the key anatomical specialisations of the GI tract that contribute to function.

HUBS 192: Human Body Systems II Dr Rebecca Bird
Urinary System
Lecture 32: Overview of the Urinary System
Objectives

After you have revised this lecture you should be able to:

- List the major parts of the urinary system.
- Describe the position and orientation of the kidneys.
- Describe the internal structure of the kidneys.
- Explain the blood and nerve supplies to the kidneys.

HUBS 192: Human Body Systems II Dr Rebecca Bird
Urinary System
Lecture 33: The Nephron
Objectives

After you have revised this lecture you should be able to:

- Describe the nephron and identify its component parts, including Bowman’s capsule and the renal tubular system.
- Describe the renal corpuscle and the collecting ducts.
- Describe the vascular arrangements associated with the nephron

HUBS 192: Human Body Systems II Dr Rebecca Bird
Urinary System
Lecture 34: Ureters, Bladder and Urethra
Objectives

After you have revised this lecture you should be able to:

- Describe the structure and function of the ureters, the urinary bladder and the urethra.
- Compare the anatomy of the urinary system and adjacent structures in the male and the female.

HUBS 192: Human Body Systems II Matt Bevin
Urinary System
Lecture 35: Controlling and Coordinating the Urinary System
Objectives

After you have revised this lecture you should be able to:
Describe the major functions of the kidney - including regulatory, excretory, endocrine, and metabolic functions.

- Broadly describe the roles of each of the component parts of the nephron in renal function.
- Know the three basic functions of the nephron that determine how much of a given compound is excreted into urine.

HUBS 192: Human Body Systems II  
Urinary System
Lecture 36: Glomerular Function
Objectives

After you have revised this lecture you should be able to:

- Understand the regulation of renal blood flow.
- Describe the process of glomerular filtration and the determinants of glomerular filtration rate (GFR).
- Explain the concepts of filtration fraction, filtered load and clearance and be able to calculate the clearance of a given compound.

HUBS 192: Human Body Systems II  
Urinary System
Lecture 37: Tubular Function
Objectives

After you have revised this lecture you should be able to:

- Identify the reabsorptive and secretory roles of each of the component parts of the renal tubule.
- Understand the “bulk reabsorption” processes of the proximal tubule.
- Understand the processes in the Loop of Henle that produce a hyperosmotic medulla.
- Explain the effects of antidiuretic hormone (ADH) on the renal tubule.

HUBS 192: Human Body Systems II  
Urinary System
Lecture 38: Body Water - Distribution and Regulation
Objectives

After you have revised this lecture you should be able to:

- Know the fluid compartments of the human body, their volumes and composition.
- Understand the role of the kidney and ADH in normal water balance.
- Explain the effects of typical situations of altered fluid balance.

HUBS 192: Human Body Systems II  
Urinary System
Lecture 39: Renal Regulation of Extracellular Fluid Composition and Volume
Objectives

After you have revised this lecture you should be able to:

- Describe the fundamental role of the kidney in maintaining volume and composition of the extracellular fluid.
- Explain how transport of NaCl is used by the kidneys to regulate extracellular fluid volume.
- State the effects of renin, angiotensin, and aldosterone and atrial natriuretic hormone on renal Na handling and blood pressure.

HUBS 192: Human Body Systems II  
Acid-Base Balance
Lecture 40: Definition/Importance of Acid-Base Balance, Concept of pH
Objectives
After you have revised this lecture you should be able to:

- Define and understand the following terms: pH, acidity, alkalinity, acid and base.
- Describe the sources of hydrogen gain and loss from the body.
- Describe the mechanisms for controlling body fluid pH.

HUBS 192: Human Body Systems II  
Acid-Base Balance  
Lecture 41: Respiratory and Renal Mechanisms of pH Control  
Objectives

After you have revised this lecture you should be able to:

- Describe the role of respiratory mechanisms of pH control.
- Describe the role of renal mechanisms of HCO₃ handling and pH control.
- Understand acid-base abnormalities and compensation mechanisms.

HUBS 192: Human Body Systems II  
Dr Matt Bevin  
Dr Rebecca Bird  
Dr Steven Condliffe  

Gastrointestinal System, Renal/Urinary System and Acid Base Balance  
Lecture 42: Revision and Integration  
Objectives

After you have revised this lecture you should be able to:  
Integrate what you have learned in Renal and GI lectures.

HUBS 192: Human Body Systems II  
Dr Elspeth Gold  

Reproductive System and Development  
Lecture 43: Male Reproductive System I  
Objectives

After you have revised this lecture you should be able to:

- Define the regions of the pelvis and describe the differences between the male and female pelves.
- Define the perineum and its subdivisions.
- Describe the anatomy of the male reproductive tracts including the testis, epididymis, and the ejaculatory ducts.

HUBS 192: Human Body Systems II  
Dr Elspeth Gold  

Reproductive System and Development  
Lecture 44: Male Reproductive System II and Spermatogenesis  
Objectives

After you have revised this lecture you should be able to:

- Describe the three parts of the male urethra in relation to the male reproductive tract.
- Describe the anatomy of the supporting structures - penis, scrotum and the spermatic cords.
- Describe the accessory reproductive glands - seminal vesicles, prostate gland, bulbourethral glands.
- Describe spermatogenesis.

HUBS 192: Human Body Systems II  
Dr Elspeth Gold  

Reproductive System and Development  
Lecture 45: Female Reproductive System I
Objectives

After you have revised this lecture you should be able to:

- Describe the basic differences between the male and the female perineum, and describe the components that make up the vulva.
- Describe the anatomical structure of the uterus and associated tubes - uterine tube (Fallopian/oviduct/salpinx) and the vagina.
- Describe the location and structure of the female gonad - ovary.

HUBS 192: Human Body Systems II   Dr Elspeth Gold
Reproductive System and Development
Lecture 46: Female Reproductive System II and Menstrual Cycle
Objectives

After you have revised this lecture you should be able to:

- Describe the structure of the ovary in association with oogenesis (formation of the ova).
- Describe the female reproductive cycles - ovarian and the menstrual / endometrial cycles.
- Describe the structure and function of the breasts.
- Define menarche and menopause.

HUBS 192: Human Body Systems II   Dr Elspeth Gold
Reproductive System and Development
Lecture 47: Coitus - Neurologic and Vascular Components
Objectives

After you have revised this lecture you should be able to:

- Revise the anatomy of the corpora of the penis.
- Describe the blood and nerve supply of the penis.
- Describe the neural control of sexual act - erection and ejaculation.
- Describe the components of the semen.

HUBS 192: Human Body Systems II   Dr Elspeth Gold
Reproductive System and Development
Lecture 48: Development I - Fertilisation and Implantation
Objectives

After you have revised this lecture you should be able to:

- Revisit the anatomy of the uterus and the ovary.
- Describe the process of fertilisation.
- Describe the process of cleavage and implantation.
- Define the process of gastrulation.
- Discuss the function of the placenta.

HUBS 192: Human Body Systems II   Dr Elspeth Gold
Reproductive System and Development
Lecture 49: Development II - Formation of Primary Germ Layers
Objectives

After you have revised this lecture you should be able to:

- Describe the formation of the three primary germ layers - endoderm, mesoderm, ectoderm.
- List the structures which arise from each of these germ layers.
HUBS 192: Human Body Systems II  Dr Elspeth Gold  
Reproductive System and Development  
Lecture 50: Development III - Formation of the Reproductive Tracts  
Objectives  
After you have revised this lecture you should be able to:  

- Describe the formation of the testes and ovaries.  
- Discuss the derivatives of the mesonephric and paramesonephric ducts.  
- Describe the development of the genitalia.  

HUBS 192: Human Body Systems II  Dr Elspeth Gold  
Reproductive System and Development  
Lecture 51: Revision and Integration  
Objectives  
After you have revised this lecture you should be able to:  

- Describe the anatomy of the male and female reproductive organs.  
- Describe the processes of spermatogenesis and oogenesis.  
- Describe fertilisation, implantation and the maintenance of embryo and fetus.  
- Describe the development of the male and female genitalia.  

Lecture 1: Introduction to HUBS 191  
Dr Ruth Empson (Dept. of Physiology, Academic Course Co-ordinator HUBS 191);  
Professor Helen Nicholson, (Dean, Otago School of Medical Sciences, and Department of Anatomy and Structural Biology).  
Objectives  
After you have revised this lecture you should be able to:  

- Give a general overview of the course.  
- Understand the special considerations of the Human Tissue Act (2008) and how they affect you.  
- Consider the levels of organisation that contribute to the human body.  
- Describe the four basic types of tissue in the human body.  
- Be aware of learning tools and services that are available to help you with your learning.  

HUBS 191: Human Body Systems: Philip Kelly  
Principles of Homeostasis  
Lecture 2: Homeostatic Principles: The importance of the internal environment and the concept of homeostasis.  
Objectives  
After you have revised this lecture you should be able to:  

- Define 'homeostasis' and explain why extracellular fluid (ECF) composition is regulated in multicellular organisms.  
- Understand the importance of controlling selected ECF variables and be able to state their normal range.  
- Outline selected transport mechanisms across cell membranes.  
- Define ‘osmosis’, ‘osmolarity’ and ‘tonicity’and understand their relevance to cell volume.  

HUBS 191: Human Body Systems: Philip Kelly  
Principles of Homeostasis  
Lecture 3: Homeostatic Control: Physiological control systems  
Objectives  
After you have revised this lecture you should be able to:
• Understand the basis of the cell’s ‘resting membrane potential’ and appreciate its physiological significance.
• Define ‘controlled variable’, ‘set point’ and ‘reference range’.
• Explain why there is variability in controlled variable values between individuals and within individuals.
• Describe how negative feedback and feed-forward control systems operate to achieve homeostasis.
• Describe the physiological control systems for thermoregulation.
• Define ‘positive feedback’ and outline a physiological example.

HUBS 191: Human Body Systems: Philip Kelly
Principles of Homeostasis
Lecture 4: Homeostasis in action.
Objectives
After you have revised this lecture you should be able to:

• Use specific examples (e.g. control of blood glucose) to explain how homeostasis is achieved.
• To understand that failure to maintain homeostasis may result in disease and state examples.
• Appreciate that several physiological control systems can cooperate simultaneously, or successively, to maintain homeostasis.

HUBS 191: Human Body Systems I  Dr Sian Halcrow
Musculoskeletal Tissues and Movement
Lecture 5: Anatomical terms
Objectives
After you have revised this lecture you should be able to:

• Explain the Anatomical Position.
• Define the terms used to describe spatial and positional relationships of human anatomy.
• Define and demonstrate terms of movements as related to joints.

HUBS 191: Human Body Systems I  Dr Sian Halcrow
Musculoskeletal Tissues and Movement
Lecture 6: Bones - Structure of the Skeleton
Objectives
After you have revised this lecture you should be able to:

• Describe the functions of the skeletal system.
• Describe the gross structure of bones and explain how they reflect their functions.
• Describe the structure of the human skeleton and explain how the structure reflects its function.

HUBS 191: Human Body Systems I  Dr Sian Halcrow
Musculoskeletal Tissues and Movement
Lecture 7: Bone Tissue – Microscopic Structure
Objectives
After you have revised this lecture you should be able to:

• Discuss the structure of the human skeleton and explain how the structure reflects its function.
• Describe the microanatomical structure of bone tissue and explain how this reflects its function.

HUBS 191: Human Body Systems I  Dr Sian Halcrow
Musculoskeletal Tissues and Movement
Lecture 8: Bone Tissue - Cellular Activity
Objectives
After you have revised this lecture you should be able to:
• Discuss the microanatomical structure of bone tissue and explain how this reflects its function.
• Describe the general principles of bone growth.
• Describe the process of bone remodelling and explain how this relates to osteoporosis.
• Describe the healing of bone fractures.
• Understand that the same muscle can have different actions and roles.

HUBS 191: Human Body Systems I  Dr Louise Parr-Brownlie
Musculoskeletal Tissues and Movement
Lecture 14:  Muscle - Form and Concentric Action
Objectives
After you have revised this lecture you should be able to:

• List the muscles described in this lecture and describe their general attachments to the skeleton.
• Understand the relationship between muscle location, muscle contraction and joint movement.
• Determine the ‘concentric action’ of these muscles.

HUBS 191: Human Body Systems I  Dr Louise Parr-Brownlie
Musculoskeletal Tissues and Movement
Lecture 15: Complex Movements
Objectives
After you have revised this lecture you should be able to:

• Describe the anatomical features in the lower limb that allow us to stand with minimal energy expenditure.
• Define the phases of the gait cycle of walking.
• Understand (by relating this material to the GLM 2 module) the sequence of muscle activity that occurs during walking.

HUBS 191: Human Body Systems I  Dr Louise Parr-Brownlie
Musculoskeletal Tissues and Movement
Lecture 16: Revision and Integration
Objectives
After you have revised this lecture you should be able to:

• Integrate the form and function of the tissues and organs system you have learnt about thus far.
• Apply what you have learnt to new situations involving musculoskeletal tissues and movement.

HUBS 191 Human Movement and Sensation: Dr Christine Jasoni
Integrating and Coordinating Roles of the Nervous System
Lecture 17: Cells of the Nervous System
Objectives
After you have revised this lecture you should be able to:

• Describe how the structure of a neuron is specialised for conduction of nerve impulses.
• Name the five main types of glial cells and their functions, and contrast these with neuronal structure and function.
• Describe how the electrical nerve impulse changes to a chemical signal at the synapse.
• Describe the subdivision of the nervous system by its anatomical boundaries (‘central’ vs ‘peripheral’) and its targeted effector organs (‘somatic’ vs ‘autonomic’).

HUBS191 Human Movement and Sensation: Dr Christine Jasoni
Integrating and Coordinating Roles of the Nervous System
Lecture 18: Organisation and Subdivisions of the Nervous System
Objectives
After you have revised this lecture you should be able to:
• Review the subdivision of the nervous system by its anatomical boundaries ('central' vs 'peripheral'), by its targeted effector organs ('somatic' vs 'autonomic') and by direction of signal ('afferent' vs. 'efferent').
• Describe the two subdivisions of the autonomic nervous system ('sympathetic' vs. 'parasympathetic').
• Understand how the anatomy and the neurotransmitters of the efferent pathways of the autonomic nervous system differs from each other and from the somatic motor system.

HUBS191 Human Movement and Sensation: Dr Christine Jasoni  
Integrating and Coordinating Roles of the Nervous System  
Objectives  
After you have revised this lecture you should be able to:
• Describe the anatomical features of the spinal cord.
• Describe the origin and constituents of a spinal nerve.
• Explain the differences between white and grey matter and describe their locations in the nervous system.

HUBS191 Human Movement and Sensation: Dr Christine Jasoni  
Integrating and Coordinating Roles of the Nervous System  
Lecture 20: Support and Protection of the Nervous System  
Objectives  
After you have revised this lecture you should be able to:
• Describe the anatomy of the skull and vertebral column and its relationship to components of the Central and Peripheral Nervous Systems.
• Detail the anatomy of the meninges and how it is related to its function.
• Describe in general terms the formation, distribution and function of cerebrospinal fluid (CSF).

HUBS191 Human Movement and Sensation: Dr Christine Jasoni  
Integrating and Coordinating Roles of the Nervous System  
Lecture 21: Structure and Layout of Major Brain Areas and Basic Motor and Sensory Pathways  
Objectives  
After you have revised this lecture you should be able to:
• List the major divisions of the brain and their anatomical relationships.
• Describe in general terms the structure and function of each brain division.
• Be able to give a broad outline of somatic sensory and motor pathways.

HUBS191 Human Movement and Sensation: Dr Ruth Empson  
Integrating & Coordinating Roles of the Nervous System  
Lecture 22: HMS 12 BIOELECTRICITY – Membrane Potentials in Neurons  
Objectives  
After you have revised this lecture you should be able to:
• Know the two main cations that contribute to the electrical properties of a neuron.
• Understand the different ways these cations can move across the semi permeable membrane of the neuron.
• List the different types of polarisation of a nerve cell membrane.
• Explain what is meant by the resting membrane potential.
• Explain what is meant by a local potential.

HUBS 191 Human Movement and Sensation: Dr Ruth Empson
Integrating & Coordinating Roles of the Nervous System

Lecture 23: HMS 13 BIOELECTRICITY – Action Potentials in Neurons

Objectives

After you have revised this lecture you should be able to:

- List the events that must occur for the action potential to happen.
- Know the two types of refractory period of the axon.
- Explain how the speed of conduction of the action potential can be enhanced.

HUBS 191 Human Movement and Sensation: Dr Ruth Empson

Integrating & Coordinating Roles of the Nervous System

Lecture 24: HMS 14 BIOELECTRICITY – The Synapse

Objectives

After you have revised this lecture you should be able to:

- Know the two types of synapse and how they differ.
- List the structures that make up a chemical synapse.
- Explain the steps that must occur for synaptic transmission to occur.
- Know the mechanisms that terminate the chemical signal.

HUBS 191 Human Movement and Sensation: Dr Ruth Empson

Integrating & Coordinating Roles of the Nervous System

Lecture 25: HMS 15 BIOELECTRICITY – Network Integration

Objectives

After you have revised this lecture you should be able to:

- List the main types of neurotransmitter and name some examples.
- Explain the different types of synaptic integration.
- Know the two types of synaptic network and explain their different advantages.

HUBS191 Human Movement and Sensation: Prof Brian Hyland

Musculo-skeletal tissues and movement

Lecture 26: HMS 16 Skeletal Muscle Activation

Objectives

After you have revised this lecture you should be able to:

- Know the molecular components of muscle and how they interact.
- Explain the sequence of events that lead from nerve activation to muscle contraction and finally muscle relaxation
- Explain how muscle contracts – understand the sliding filament model

HUBS191 Human Movement and Sensation: Prof. Brian Hyland

Musculo-skeletal tissues and movement

Lecture 27: HMS 17 Skeletal Muscle Contraction

Objectives

After you have revised this lecture you should be able to:

- Explain where the energy for contraction comes from
- Describe three types of muscle fibre and their different properties
- Outline the concept of the “motor unit”
- Understand how muscle twitches from each action potential summate to generate smooth force
- Summarize key effects of exercise & fatigue on muscle physiology

HUBS 191 Human Movement & Sensation: Prof Brian Hyland

Musculo-skeletal tissues and movement

Lecture 28: Cardiac and Smooth Muscle: Comparison of Functional Differences

Objectives
After you have revised this lecture you should be able to:-

- Compare and contrast structural and functional differences between skeletal, cardiac and smooth muscle.
- Review the role of effectors in a specific homeostatic example – the control of core body temperature.

HUBS191 Human Body Systems: Dr Rebecca Campbell
Sensory functions, Somatic Control and Autonomic Control (based on material developed by Justine Dallimore)

Lecture 29: Sensory Functions: Sensory Receptors and the Somatosensory Cortex
Lecture 30: Somatic Control: Voluntary and Reflex Control of Movement
Lecture 31: Autonomic Control: Sympathetic and Parasympathetic Nervous Systems

Objectives

After you have revised these three lectures you should be able to:-

- State four types of information that describe a sensory stimulus and use examples to explain how these are encoded by sensory systems (lecture 29).
- Define somatic sensation and special senses (lecture 29).
- Briefly describe the specific structures that enable sensations of touch, changes in muscle length, and pain (lecture 29).
- Describe the two major somatosensory pathways (lecture 29).
- Describe the primary somatosensory cortex (lecture 29).
- Compare and contrast reflex and voluntary movements (lecture 30).
- Draw a functional diagram of the stretch reflex (lecture 30).
- Describe the primary motor cortex and premotor cortex (lecture 30).
- List the major steps leading to voluntary movement (lecture 30).
- Briefly describe the roles of the basal nuclei and cerebellum in voluntary movement (lecture 30).
- Compare and contrast sympathetic and parasympathetic innervation of target tissues (lecture 31).
- Compare and contrast the way the autonomic and somatic nervous systems innervate target tissue (lecture 31).

HUBS191 Human Body Systems: Dr Ruth Empson
Revision and Integration
Lecture 32: Revision & Integration

HUBS 191 Endocrine System: Associate Professor Colin Brown
Introduction to the Endocrine System
Based on material developed by Dr Janice Bolter
Lecture 33: What are hormones and how do they work?

Objectives

After you have revised this lecture you should be able to:

- Describe the function of the endocrine system in maintaining homeostasis and provide examples of homeostatic control.
- Define the terms endocrine gland, hormone, receptor and target cell.
- Describe the mechanism of hormone action for peptide hormones and catecholamines (water-soluble hormones).
- Describe the mechanism of hormone action for steroid hormones and thyroid hormones (lipid-soluble hormones).
- Compare and contrast the way that the endocrine system and the nervous system regulate effectors.

HUBS 191 Endocrine System: Associate Professor Colin Brown
The Pituitary Gland and the Hypothalamus
Lecture 34: The pituitary gland and the hypothalamus: What is the connection?
Objectives

After you have revised this lecture you should be able to:

- Draw a diagram to illustrate the structure, location and connections of the hypothalamus and the pituitary gland.
- Explain how the hypothalamus controls the release of hormones from the posterior lobe of the pituitary gland.
- State the major effects of the posterior pituitary hormones.
- Explain how the hypothalamus controls the release of hormones from the anterior lobe of the pituitary gland, using prolactin as an example.

HUBS 191 Endocrine System: Associate Professor Colin Brown
Growth Hormone: Regulation of Growth and Metabolism
Lecture 35: How are growth and metabolism controlled?
Objectives

After you have revised this lecture you should be able to:

- Describe the endocrine control of growth hormone secretion.
- Describe the metabolic effects of growth hormone.
- Describe the effects of growth hormone on human growth.
- Explain what occurs when there is too much or too little growth hormone secreted during childhood.

HUBS 191 Endocrine System: Associate Professor Fiona McDonald
Pancreatic Islets: Control of Metabolic Fuels
Lecture 36: How does the body regulate the storage and release of fuel?
Objectives

After you have revised this lecture you should be able to:

- Describe the structure and location of the pancreatic islets.
- Outline the sequence of events that occurs when blood glucose concentration increases above the reference range.
- Outline the sequence of events that occurs when blood glucose concentration decreases below the reference range.
- Describe the effects of insulin on each type of target cell.
- Compare the role of insulin and glucagon in the control of blood glucose concentration in the fed state and the fasting state.
- Explain what diabetes mellitus is and distinguish between type 1 diabetes and type 2 diabetes.

HUBS 191 Endocrine System: Associate Professor Fiona McDonald
Adrenal Glands and Stress
Lecture 37: How does the body respond to stress?
Objectives

After you have revised this lecture you should be able to:

- Describe the structure and location of the adrenal glands.
- Name the main hormones made and released by the adrenal glands.
- Outline the sequence of events that results in the secretion of cortisol and how cortisol secretion is regulated.
- Describe the metabolic effects of cortisol on each type of target cell and state other major effects of cortisol.
- Describe the metabolic effects of adrenaline on each type of target cell.
- List the components of the stress response.
HUBS 191 Endocrine System: Associate Professor Fiona McDonald

Thyroid and Parathyroid Glands
Lecture 38: How does the body regulate basal metabolic rate (BMR) and the concentration of calcium?

Objectives
After you have revised this lecture you should be able to:

- Describe the structure and location of the thyroid and parathyroid glands.
- Outline the sequence of events that results in the secretion of thyroid hormone.
- Describe the main effects of thyroid hormone.
- Describe how parathyroid hormone and calcitonin regulate blood calcium concentration.

HUBS 191 Endocrine System: Associate Professor Fiona McDonald

Lecture 39: Revision and Integration
Objectives
After you have revised this lecture you should be able to:

- Integrate the Endocrine System lecture material with the information contained in the Homeostatic Principles and Human Movement and Sensation lectures.
- Apply what you have learned in the Endocrine System lectures to novel situations that involve hormonal control.

HUBS 191: Human Body Systems I Dr Joanna Kirman

Immune System
Lecture 40: The Body’s First Line of Defence: Physical and Chemical Barriers to Infection
Objectives
After you have revised this lecture you should be able to:

- Outline the three lines of defence of the human body.
- Identify the physical and chemical aspects of skin that enable it to prevent the entrance of pathogens.
- Identify the locations of the body’s mucous membranes and explain how they protect the body both physically and chemically.
- Define normal microbiota and explain how they help provide protection against disease.
- Describe the role of tears and antimicrobial peptides in combating infection.

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Immune System
Lecture 41: The Body’s Second Line of Defence: Non-specific Cellular Defences Against Pathogens
Objectives
After you have revised this lecture you should be able to:

- Describe the role of Toll-like receptors in the innate immune response.
- Describe the cellular components of blood associated with the innate response.
- Describe their functions in the body’s defence.
- Describe the main features of the human lymphatic system.
- Name and describe the five stages of phagocytosis: chemotaxis, adherence, ingestion, killing, elimination.
Immune System
Lecture 42: Inflammation
Objectives

After you have revised this lecture you should be able to:

- Describe the role of antimicrobial peptides and proteins in body defences.
- Outline the complement system.
- Describe the main characteristics of inflammation.
- Describe the benefits of inflammation in fighting infection.
- Outline ways by which pathogens can evade the innate immune system.

Immune System
Lecture 43: Elements of Adaptive Immunity
Objectives

After you have revised this lecture you should be able to:

- Describe the tissues and organs of the lymphatic system.
- Define the term ‘antigen’.
- Explain the roles of the antigen presenting cells.
- Describe the two classes of major histocompatibility complex (MHC) proteins with regard to their location and function.
- Contrast endogenous antigen processing with exogenous antigen processing.

Immune System
Lecture 44: T Lymphocytes (T cells)
Objectives

After you have revised this lecture you should be able to:

- Describe the thymic origin and basic characteristics of T cells.
- Contrast the roles of CD4 helper cells with CD8 cytotoxic T cells.

Immune System
Lecture 45: B Lymphocytes (B cells) and Antibodies
Objectives

After you have revised this lecture you should be able to:

- Describe the characteristics of B lymphocytes and their B cell receptors.
- Describe the basic structure of an antibody (immunoglobulin) molecule.
- Contrast the structure and function of the five classes of immunoglobulins.
- Describe three functions of antibodies.
Objectives

After you have revised this lecture you should be able to:

- Describe the formation and functions of plasma cells and memory B cells.
- Describe the steps and effect of clonal selection.
- Contrast primary and memory immune responses.

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Lecture 47: Immune Responses to Microbial Pathogens
Objectives

After you have revised this lecture you should be able to:

- Describe the pathways of humoral immunity for protection against extracellular bacterial pathogens.
- Describe the pathways of cell mediated immunity for protection against intracellular bacterial and virus infections.
- Contrast the effector responses mediated by antibodies and immune cells.

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Lecture 48: Immunization (Vaccination) to Prevent Infection
Objectives

After you have revised this lecture you should be able to:

- Describe the mechanisms involved with active and passive immunisation.
- Describe the strategies used to induce antibody and cell mediated immunity through immunisation.
- Define the properties of commonly used vaccines.

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Lecture 49: Immune Reactions that Cause Disease
Objectives

After you have revised this lecture you should be able to:

- Describe the mechanisms involved in allergies.
- Understand how allergies develop against food and drugs
- Describe the mechanisms that result in autoimmunity.
- Contrast normal and immunodeficient states.

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Lecture 50: Overview Immune Response
Objectives

After you have revised this lecture you should be able to:

- Understand Introductory Immunology.
References


World Federation for Medical Education. (2012). Basic Medical Education - WFME Global Standards for Quality Improvement University of Copenhagen, Denmark.