

Outcomes and Standards for Undergraduate Medical Education in Singapore

Recommendations of the National Medical
Undergraduate Curriculum Committee



2014

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Left: NTU Lee Kong Chian School of Medicine
Centre: NUS Yong Loo Lin School of Medicine
Right: Duke-NUS Graduate Medical School

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The Physician's Pledge

The Singapore Medical Council (SMC) Physician's Pledge is based on the World Medical Association's Declaration of Geneva. It is a set of ethical values that each doctor in Singapore is expected to uphold professionally at all times. Since 1995, every doctor, upon being admitted as a fully registered practitioner with the SMC, has to make this pledge.

"I solemnly pledge to:

*dedicate my life to the service of humanity;
give due respect and gratitude to my teachers;
practise my profession with conscience and dignity;
make the health of my patient my first consideration;
respect the secrets which are confided in me;
uphold the honour and noble traditions of the medical profession;
respect my colleagues as my professional brothers and sisters;
not allow the considerations of race, religion, nationality or social
standing to intervene between my duty and my patient;
maintain due respect for human life;
use my medical knowledge in accordance with the laws of humanity;
comply with the provisions of the Ethical Code; and
constantly strive to add to my knowledge and skill.*

I make these promises solemnly, freely and upon my honour."

Foreword

The various medical schools provide different channels to achieving national requirements for doctors. However, medical education still has the ultimate goal of producing future doctors with competencies and skills that meet reasonable patient expectations within a healthcare framework.

Doctors practise in a healthcare continuum that spans both health and disease. Competence nurtured in a knowledge-based environment must be well-synchronised with performance in the patient-care clinical setting. This includes care in the preventive (pre-illness), illness and rehabilitative (post-illness) stages.

The process of acquiring these competencies utilises modern educational and assessment methodologies that have to comply with a national regulatory framework. This document is meant to provide recommendations for all medical schools in Singapore, through a national framework and principles for curriculum planning and implementation. It is not meant to be a detailed prescription for the curriculum of medical schools, which are best decided by the schools themselves.

Students learn best when they feel valued and welcomed and know what they ought to know. When the minimal expectation is clearly articulated, it helps in setting targets and expectations. It does not prevent the more enthusiastic, brilliant and audacious from pursuing more knowledge and skills.

I am deeply grateful to my committee members for all their valuable inputs and to our advisors for the various lay and professional inputs contributed towards the production of this document. Special thanks to Dr Phyllis Kim and her supporting secretariat for the hard work compiling and organising this document. We hope that this document would serve as an aid to pre-medical school applicants who are contemplating a career in medicine.

Clinical Professor C Rajasoorya

Chairman

National Medical Undergraduate Curriculum Committee

Executive Summary

Purpose of the NMUCC

The National Medical Undergraduate Curriculum Committee (NMUCC) was appointed to articulate the vision for undergraduate medical education in Singapore. This document prescribes the standards and educational outcomes it has laid out, and provides key principles and features of the clinical training framework that will support the long-term healthcare needs of Singaporeans and Singapore residents.

The Need for Outcomes and Standards

The introduction of two new medical schools in the last six years sees a total of three medical schools with different goals, course content, methods of instruction and student assessments. With this comes a need to review the undergraduate curricula at the national level, to ensure consistently high standards of training and outcomes throughout the country.

These recommendations also take into account identified national health priority areas, such as the need to enhance primary and long-term care delivery. Also, they draw from the Committee's assessment of opportunity areas for improvement in the current delivery of medical education.

Examples of such areas include the need for:

1. better training in communication skills and ethics
2. a stronger team-based approach to care
3. better emphasis on research
4. cost-effectiveness in making medical decisions

We reference international practices and documents such as the UK General Medical Council's 'Tomorrow's Doctors: Outcomes and Standards for Undergraduate Medical Education', and similar documents from Australia, Canada and the United States.

Key Recommendations

1. Standardisation of graduate outcomes

While undergraduate medical education in the three medical schools is a mix of British and American influences, our postgraduate training has adopted a modified US-style residency programme in order to blend the best of both systems. This has been done through engagement with the Accreditation Council for Graduate Medical Education (International) (ACGME-I).

Hence, to provide as seamless a transition as possible from undergraduate to postgraduate training, the Committee recommends that the six graduate outcomes for our medical schools are aligned to ACGME-I's core competencies. These are:

- i. Patient care
- ii. Medical knowledge
- iii. Practice-based learning and improvement
- iv. Interpersonal and communication skills
- v. Professionalism
- vi. Systems-based practice

2. Standards for medical undergraduate curricula

The standards for core components of the undergraduate curriculum are laid out in terms of the design and delivery. We recommend that each curriculum include an outline that ensures alignment with the six graduate outcomes, in the assessment of students and evaluation of the educational programme itself.



3. Formation of a Postgraduate Training Committee

The Committee recommends that a national Postgraduate Training Committee be formed to review all graduating students' academic and clinical performance in their first year of postgraduate training. It will have the authority to issue (or decline) the Certificates of Experience (COEs) that the students need in order to obtain Full Registration status as a medical practitioner with the SMC.

4. Other considerations to optimise delivery of medical education

The Committee recommends more emphasis in specific areas of training based on the changing health landscape, the social dynamics of the population and anticipated healthcare needs. These areas include more deliberate exposure to community (as opposed to hospital) paediatric medicine, family medicine, palliative medicine, communication skills and medical ethics.

To this end, the Committee provides suggestions to modify undergraduate training in highly specialised fields that can be pursued at the postgraduate level. These include areas within Paediatrics, Obstetrics and Gynaecology and Orthopaedics. Nevertheless, the core areas which help a General Practitioner are preserved. Those with special interest in the above areas should be encouraged to do the relevant advanced electives. We acknowledge certain limitations, such as the fixed course duration and the need to balance the above with other important core aspects of medical training.

In addition, we also address the need for adequate faculty training, development and recognition.

5. Student admissions and fitness to practise

The Committee emphasises the need for transparency in admissions policies and processes to ensure fairness in selection. This document lists various recommended pre-admission tests to assess academic as well as humanistic abilities. It also provides guidance on the necessary health requirements, and checking for past criminal convictions.

Conclusion

Ultimately, the goal of undergraduate medical training is to produce future doctors with competencies and skills that meet reasonable patient expectations within a healthcare setting. The process of acquiring such competencies and skills utilises various methodologies that have to comply with a national framework. Hence, this document provides guiding principles in curriculum planning, implementation and programme evaluation.

I. Introduction

Singapore's Three Medical Schools

The delivery of undergraduate education in Singapore has thus far been served by two medical schools: Yong Loo Lin School of Medicine at the National University of Singapore (NUS), founded in 1905; and Duke-NUS Graduate Medical School, founded in 2007. Both schools have unique and differing goals.

- a. A 1993 White Paper (Ministry of Health, MOH) stated that medical students in NUS must receive training that is relevant to Singapore's health needs, and in line with national policy. It steered medical training towards an emphasis on producing Family Physicians by having a higher ratio for primary care physicians (60% of each cohort of doctors) than specialists, so as to meet the nation's needs for good quality, yet affordable, healthcare.¹
- b. In contrast, Duke-NUS was birthed from the 2001 Oxburgh report, which identified the need for clinician-scientists as a result of an emerging prominence of the biomedical science industry here.² Its objective was to create a pipeline of doctors with strong capabilities in translational medicine – the creation of new treatments and procedures for patients from laboratory research findings. Duke-NUS has a graduate entry programme in place. For purposes of this report the term 'undergraduate' in the context of Duke-NUS is used to refer to the training prior to graduating as a doctor.

More recently, Singapore announced the introduction of its third medical school, the Lee Kong Chian School of Medicine (LKCMedicine), which sees its first student intake in August 2013.

1 Affordable Health Care: A White Paper; 1993, Ministry of Health, Singapore

2 Oxburgh ER, Belfrage D, Bell J et al. Medical Education in Singapore: A Review of the System of Medical Education in Singapore, 2001, Ministry of Education, Singapore

LKCMedicine is the product of collaborations with Imperial College in the United Kingdom and Nanyang Technological University (NTU), and leverages on the latter for its engineering, business and biomedical research strengths. Students will have a good grasp of healthcare technology and systems perspectives. They will also have exposure to financing/economics at the institutional as well as national levels, and management skills.

Hence, the need has arisen for a unified review of undergraduate curricula at the national level, which would take into account the medical schools' differing goals as well as Singapore's changing healthcare landscape.

The Roles of SMC and NMUCC

The Singapore Medical Council (SMC) and the Ministry of Health (MOH) appointed the National Medical Undergraduate Curriculum Committee (NMUCC) to craft national outcomes and minimum standards for our undergraduate medical curriculum.

The SMC is provided by legislation to make recommendations to the appropriate authorities on the courses of instructions and examinations leading to the Singapore degree (Section 5 of the Medical Registration Act³). These recommendations address the nation's healthcare needs over a long-term view, over the next 20 years. Its recommendations encompass about 70% of the core curriculum for all three medical schools, leaving 30% for each medical school to develop their own niche.

³ Section 5 of the Medical Registration Act (Cap 174) outlines the functions of the Medical Council as follows:

- (a) to keep and maintain registers of registered medical practitioners;
- (b) to approve or reject applications for registration under this Act or to approve any such application subject to such restrictions as it may think fit;
- (c) to issue practising certificates to registered medical practitioners;
- (d) to make recommendations to the appropriate authorities on the courses of instructions and examinations leading to the Singapore degree; and
- (e) to make recommendations to the appropriate authorities for the training and education of registered medical practitioners.

Addressing Singapore's Needs

Medical schools have an obligation to promote social accountability in order to prepare the medical workforce that society needs for the future. Singapore's healthcare needs are shaped by our healthcare landscape; we face issues common to many developed countries, including a growing ageing population, changing disease patterns from communicable diseases to more chronic, lifestyle-related diseases, higher public expectations, and the possibility of fragmentation of care. Besides having been trained in a core curriculum, the doctor graduating from a medical school must clearly demonstrate competency, safe practice, high ethical standards and professionalism. The objective in a practising doctor's training should inculcate holistic care that is patient-centric that avoids fragmentation of care.

Acknowledging these trends, the Ministry of Health has laid out its vision in the Ministry's Healthcare 2020 Master Plan, which is to build an inclusive healthcare system for the future – one that will provide affordable, effective and good quality healthcare. This includes investing more in the areas of primary care, long-term care and care for the aged.

The NMUCC has also assessed and identified opportunity areas for improvement in the current delivery of medical education. In their deliberations, the Committee referenced international practices and documents such as the UK General Medical Council's 'Tomorrow's Doctors: Outcomes and Standards for Undergraduate Medical Education', and similar documents from Australia, Canada and the United States.

In view of these considerations, the NMUCC's recommendations aim to address the following priority areas:

a. *The need for more Family Physicians*

While there are Family Physicians (FPs) both in polyclinics as well as private General Practice clinics, the polyclinics tend to see a

higher caseload of chronic diseases as compared to the private General Practitioners.⁴ However, the number of FPs is currently deficient, and at a time when one of the priorities of the MOH is to expand and redevelop the polyclinics. Hence, our medical students should be provided with optimal exposure to Family Medicine so as to appreciate the value and fulfilment in pursuing this area of expertise after graduation from medical school.

b. Increasing undergraduate focus on integrated care, geriatric medicine and palliative care

This forms part of a wider initiative to address both the demographic imperatives (the needs of a growing ageing population) as well as how care should be delivered (seamless, integrated transitions from acute to sub-acute care and to home/residential care). Transforming long-term care would involve equipping all healthcare professionals with core competencies in geriatrics, improving our infrastructure, connecting acute and long-term care to provide seamless, integrated patient care. Research capabilities will also have to be developed. This holistic, integrated approach to care provision should thus be inculcated from early undergraduate years.

c. Better training in soft skills such as communication skills, ethics, patient safety and professionalism

While termed as 'soft skills', interpersonal or communication skills, ethics (including patient confidentiality and conflict of interest issues), patient safety considerations and professionalism are essential qualities to the medical profession. The NMUCC acknowledges the need to provide all medical students with well-designed, structured modules to address this need. Graduates should not only learn these skills but be able to demonstrate them in their day-to-day delivery of medical care. As part of professionalism, they must be trained and given opportunities to

⁴ Family Physicians have postgraduate training in Family Medicine, whereas General Practitioners are currently not required to hold postgraduate qualifications to practise independently.

teach and contribute to the professional development of others. The medical curriculum in its entirety must also emphasise the importance of self-directed and life-long learning.

d. Team-based approach to care

As Singapore moves towards a more integrated system, collaborations amongst the various healthcare professionals (e.g. nurses, pharmacists and other allied health professionals) would become a practice norm. When they work in institutions as well as organisations, it becomes even more important to demonstrate the integrated collaborative approach. As such, inter-professional education whereby students from different professional programmes train together would be a positive step towards a collaborative, practice-ready healthcare workforce.

e. Better emphasis on research and technology

The nature of the advances in medical sciences research is such that 'the facts' as we know them invariably evolve with new evidence. Our medical students must be equipped with the ability to critically appraise the literature, apply evidence-based medicine in their clinical decision-making, and understand basic principles of research. They should also be kept abreast of local technological advances. For example, Singapore has embarked on the first step towards an integrated Information Technology system that will connect healthcare institutions nationwide. Undergraduate students should learn to leverage on electronic medical records for safer and more effective practice.

f. Cost-effective management solutions

Students should understand the processes and systems of patient-centred care, including its economic and financial dimension in the Singapore context. This helps them to work under affordability and resource constraints, without compromising the needs of the individual patient.

II. Graduate Outcomes

From May 2010, Singapore modified the postgraduate medical education system and adopted a modified US-style residency programmes in order to blend the best of the British and American postgraduate systems. This was done through engagement with the Accreditation Council for Graduate Medical Education (International), or ACGME-I, which lays emphasis on the training curriculum, structure, supervision and formative assessments of residents. The residency programmes' outcomes are defined by the residents' attainment of the six ACGME core competencies in the areas of: patient care; medical knowledge; practice-based learning and improvement; interpersonal and communication skills; professionalism and systems-based practice. In order to provide continuity from undergraduate to postgraduate training, the graduate outcomes for our medical schools are aligned to the ACGME-I's core competencies, as outlined below.

As an overarching goal, medical education must seek to equip every graduate with all the requisite knowledge, technical skills, behavioural and communication skills (verbal, written and body language), empathy, compassion and professionalism in order to provide holistic, patient-centred care.

Outcome #1: Patient Care

The graduate must be able to adopt a patient-centric holistic approach to care, as evidenced by the ability to:

- a. gather essential and accurate information about his/her patients through history-taking, physical examination and mental state examination
- b. make informed and cost-effective decisions about ordering

diagnostic and therapeutic interventions based on the above, as well as evidence-based medicine, and clinical judgement

- c. formulate and implement patient management plans
- d. prescribe drugs safely, economically and effectively, and be able to communicate important side effects and adverse events clearly to patients
- e. understand and evaluate patient safety in the clinical context
- f. carry out a range of diagnostic and therapeutic interventions, including obtaining informed consent (Please refer to **Annex A**)
- g. communicate effectively and demonstrate caring and respectful behaviours when interacting with patients and their families at every point of care

It must be emphasised that simulation should be a preparation, not a substitution for learning about patient care which calls for good clinical experience. Medical schools should clearly articulate the process in which the defined outcomes will be achieved, rather than defining it purely by time and exposure alone.

Outcome #2: Medical Knowledge

The graduate must demonstrate:

- a. knowledge in the principles of biomedical sciences, psychological/social science, public health and epidemiology, healthcare systems and basic healthcare economics, research and technology and ethics
- b. the ability to apply the knowledge acquired in the basic and clinically supportive sciences to medical practice
- c. an analytical and logical approach to clinical scenarios

Outcome #3: Practice-Based Learning and Improvement

The graduate must demonstrate the ability to:

- a. critically appraise and assimilate scientific evidence from his/her patients' health problems
- b. analyse his/her practices using quality improvement methods where available, and suggest changes to improve practice
- c. identify own strengths and development opportunities, and set learning goals from this
- d. set his/her own learning and improvement goals, including self-directed and life-long learning
- e. utilise information technology to optimise learning and practice

Outcome #4: Interpersonal and Communication Skills

The graduate must demonstrate skills that enable effective information exchange with patients, their families and other healthcare professionals. This would be evidenced by demonstrating:

- a. openness and respect for patients, relatives and other healthcare professionals that includes cultural and religious sensitivities
- b. the ability to develop good rapport with patients, whilst eliciting and delivering information through verbal and non-verbal communications
- c. the ability to maintain accurate, timely and legible medical records, and to accurately present findings to other healthcare professionals, such as on ward or grand rounds

Outcome #5: Professionalism

The graduate must be committed to adhere to the ethical and professional principles as laid out in the Physician's Pledge and the SMC Ethical Code. The graduate must clearly demonstrate:

- a. awareness of his/her clinical responsibilities
- b. respect for patients' rights and confidentiality
- c. a commitment to protecting patients' needs and safety
- d. improvement of care for patients
- e. ability and willingness to promote, monitor and maintain health and safety in the clinical setting

Outcome #6: Systems-Based Practice

The graduate must clearly demonstrate the ability to:

- a. understand Singapore's healthcare system, financial framework, resources and levels of care
- b. understand the concepts, principles and practice of patient-based care through participation in multidisciplinary teams
- c. appreciate healthcare as a process, system and learning organisation
- d. identify strengths, deficiencies and limits in his/her knowledge and expertise
- e. incorporate constructive formal and informal feedback from supervisors, mentors and peers into daily practice
- f. participate in the education of patients, families, and other students in the various healthcare professions

III. Statement of Mission and Objectives

Each medical school must clearly state its mission and objectives, which can incorporate institutional and national policy. It would be useful for each medical school to define briefly the kind of doctor the school wants to produce.

IV. Standards for Medical Undergraduate Curriculum

The core national curriculum defines 70% of the curriculum covered in Singapore's medical schools; the remaining 30% allows flexibility for the individual medical schools to develop their own niche. In this document, any core component of the curriculum can be found within the sections on Design and Delivery, Assessment, and Evaluation, and are indicated by statements using 'must' or 'will'.

Design and Delivery

The medical school must have a *blueprint* for the curriculum that is designed and delivered to ensure alignment with the six graduate outcomes as laid out in this document. It must:

- a. contain core problems that a graduating doctor should be able to handle independently, taking into account disease burden (the top reasons for outpatient consultations and inpatient admissions), population trends and Singapore's goal to become a leading biomedical hub.

- b. describe the content, extent and sequencing of courses, with specific outcomes or objectives for each year
- c. clearly set out how the six graduate outcomes will be met

The **core content** must provide a comprehensive coverage of:

- a. Biomedical scientific principles relating to anatomy, biochemistry, cell biology, genetics, immunology, microbiology, molecular biology, nutrition, pathology, pharmacology and physiology
- b. Behavioural, population and clinical sciences relevant to the healthcare and health maintenance of adults and children
- c. Clinical skills, such as taking a detailed medical history, physical and mental state examination, formulating a diagnosis and management plan
- d. Acute care (medical and surgical emergency) skills and procedures relevant to practice at the level of a houseman or intern
- e. General Medicine
- f. General Surgery
- g. Family Medicine
- h. Geriatric Medicine and Palliative Medicine
- i. Psychiatry
- j. Obstetrics and Gynaecology
- k. Paediatrics
- l. Orthopaedics
- m. Integrated care (the link between acute and sub-acute care in the community)

- n. Communication skills
- o. Ethics and professionalism
- p. Health systems
- q. Inter-professional education
- r. **Research (scientific method, critical appraisal and evidence-based medicine) and technology**

(The above in bold type is further described in *Annex B*)

The medical school curriculum should be structured using a wide range of curriculum models, such as system-based, case-based and discipline-based learning, to provide balanced and varied learning opportunities.

The curriculum should include both horizontal (concurrent) and vertical (sequential) integration of curricular components that would link biomedical, clinical and behavioural/social sciences, hence enabling students to link theory with practice.

Medical students must be an integral member of healthcare delivery teams, so that their learning experience has context and relevance. They should take increasing responsibility for patient care as they progress.

The curriculum should provide opportunities for students to pursue choices that encourage broad personal development. This can be done through research (e.g. an intercalated year), elective periods, self-directed learning and advanced study modules in optional areas.

The medical school should endeavour to set up platforms and courses that allow for inter-professional education.

Assessment

The medical school must have a clear statement of assessment and progression rules. The assessments must include both summative and formative assessments for the purposes of student progression, feedback and guidance. The assessment programme should support, enhance and create learning opportunities. Assessments must include all of the following methodologies, to be applied appropriately according to what is being assessed:

- a. Written exercises (e.g. multiple choice, extended match, short answer and essay questions)
- b. Faculty assessments (e.g. oral exams, faculty global and checklist ratings)
- c. Simulated assessments (e.g. objective, structured clinical examinations and technology-based simulations)
- d. Peer review and self-assessments
- e. Observation in the real clinical environment on work-based assessment (e.g. mini-clinical evaluation exercise [mini-CEX] or other variants)

The six graduate outcomes must be assessed at appropriate points during the course, using a range of assessment formats, and ensuring that only students who meet these outcomes would be permitted to progress on an annual and gradual basis. Assessments must be valid, reliable, generalisable, feasible and fair.

The medical school must provide students with timely guidance on the details of the assessments e.g. format, length and contribution to overall grade.

The medical school must ensure that the scope, standards and processes of assessments are consistent across all its teaching sites. It must also have mechanisms to ensure comparability of standards with other institutions.

Examiners must be appropriately selected and adequately trained to apply assessment criteria consistently. There must be proper calibrations and standardisation amongst examiners, particularly in a summative assessment.

The assessment programme must be subject to rigorous and continuous quality control processes.

Evaluation/Improvement

The medical school must establish a mechanism for programme evaluation that reviews the curriculum content, quality of delivery, assessment and student progress.

Faculty and student feedback must be systematically sought and used as part of the evaluation process, and responded to.

Student performance should be analysed in relation to the curriculum and graduate outcomes. This should include:

- a. Analysis of performance in relation to student background and entrance qualification, using such information as feedback to the relevant committees responsible for student selection, curriculum planning and student counselling
- b. Course outcomes in terms of postgraduate performance and career choices

The medical school should collaborate with other education institutions (local or foreign), e.g. through student exchange programmes and seek reciprocal recognition with well-recognised foreign organisations, so as to facilitate both undergraduate and postgraduate training.

V. House Officer (HO) / Post Graduate Year 1 (PGY1) Training Committees

The House Officer (HO) year may be considered as an extension of undergraduate training, forming the transitional phase between undergraduate and postgraduate years. The first two medical schools currently have a House Officer Training Committee (HOTC) that oversees HOs and first-year residents.

With the opening of the third medical school, the NMUCC recommends that there should be a gradual merger of the various review committees to a national committee, which will be the certifying authority to review each student's academic and clinical performance. Graduates in good standing who have performed satisfactorily will be issued Certificates of Experience (COEs), which are necessary to obtain Full Registration status with the SMC.

The NMUCC recommends that the national committee include representation from all of the following:

- a. The three medical schools – Dean or an appointed representative of at least Vice Dean level
- b. Sponsoring Institutions (SIs) – Designated Institutional Officer (DIO)
- c. SMC

VI. Enablers

Paediatric Medicine, Orthopaedics and Obstetrics and Gynaecology

The NMUCC is aware that with the changing health scene and social dynamics of the population, the expectations of the population in terms of specialised care will change accordingly. There will thus be important implications on training in areas such as Paediatric Medicine, Orthopaedics and Obstetrics and Gynaecology. Additionally, the NMUCC takes into account that Paediatrics, Obstetrics and Gynaecology and Orthopaedics are highly specialised fields with separate tracks for specialisation.

The NMUCC wishes to highlight that the importance of core and basic skills in these specialties that must not be forgotten or ignored in medical training at any level (e.g. basic assessment and management of minor injuries and emergencies, and dealing with crying babies or pregnant women) are essential for a Family Physician or doctor with little exposure to these fields in the postgraduate years

The NMUCC acknowledges that adding to the core curriculum content (Section IV – Standards for Medical Undergraduate Curriculum) without affecting the overall course duration may require altering or integrating content into other specialties, or relinquishing some ‘specialist’ components of the current curriculum. This may be circumvented by revising the depth of curriculum content and duration of the clinical postings in Obstetrics and Gynaecology, Paediatric Medicine and Orthopaedics.

The NMUCC accepts the absence of clear evidence that the duration of posting alone reflects sufficient competency in a particular field. Thus we recommend that medical schools define competencies and articulate the expected process of assessment of these competencies with reasonable accuracy, as well as the level of

achievement at the end of clinical exposure in the three specialties. These competencies should include basic knowledge and skills to handle common emergencies, and the ability to recognise, diagnose and manage at least ten of the most common conditions in each of the areas.

However, those with special interest in any of these areas should be encouraged to pursue the relevant advanced clerkships and electives.

While the fundamentals of basic assessment and management should never be de-emphasised, there should be greater emphasis on community Paediatrics and outpatient Orthopaedics and Obstetrics and Gynaecology as opposed to acute hospital practice. Such experience should be increasingly provided for under the Family Medicine setting or postings, as it would form a meaningful and relevant experience in preparation for Family Practitioner training in postgraduate years (Section I - Introduction).

Medical schools can modify their curricula for medical students to work hand in hand with nursing teams, pharmacists and other healthcare workers for exposure in the basics of specialised care as well as to tap on the need for healthcare workers to work collaboratively in a team environment.

Medical schools should provide for opportunities and exposure in the integrated long-term care setting with involvement of community hospitals and nursing homes.

Faculty Training and Development

Academic and clinical faculty must be adequately trained and supported to deliver the curriculum adequately. This would be particularly relevant in priority areas such as Family Medicine, Palliative Medicine, communication skills, ethics, inter-professional education and health systems (refer to Section I).

Each medical school must outline the type and responsibilities of the various academic and non-academic staff, with adequate faculty numbers to deliver the curriculum effectively. For instance, teaching of Family Medicine could include role modelling, which may involve engaging private General Practitioners. The medical school should communicate its goals and objectives for basic medical education to these practitioners and facilitate training for them in both their teaching and assessing roles.

Medical schools should draw on educational expertise in the development and delivery of the curriculum, and have a medical education unit to promote this to the school.

A spirit of cooperation amongst the three medical schools and affiliated sites is strongly encouraged with regard to the sharing of clinical resources, assessment methodology and physical environments. This should preferably extend to other zones like simulation, faculty training as well as sharing of examiners.

Establishing National Policies Concerning Clinical Faculty

There must be uniform national policies on the criteria for selection of clinical faculty. The broad principles can be provided by the MOH, but the recruitment can be left to the individual medical schools.

Medical schools must clearly define and be explicitly transparent on appointment and promotion policies for academic staff that address a balance of capacity for teaching, research and service functions. Criteria for the appointment and promotion of academic staff must provide for excellence in teaching, in research and in service to the profession and to the community.

VII. Students

Admission Policy and Selection

Each medical school must clearly and transparently define the selection policy and processes, including their rationale, the key attributes sought and methods of student selection process. These must be consistently applied and are intended to minimise discrimination and bias.

The medical school must state details of the process, the relationship between the selection criteria and objectives of the course and graduate outcomes, and the mechanism for appeals.

The medical school must clearly define the size of student intake, which should relate to the capacity of the medical school to adequately resource the course at all stages.

The medical school must show a clear non-discrimination policy (cultural, political or financial) for its selection process.

Admission Criteria

Medical schools must clearly articulate the pre-admission tests for selection. The criteria must recognise the importance of both academic and humanistic qualities required of medical students. The NMUCC recommends academic abilities to be based on performance in GCE 'A' Level, the International Baccalaureate (IB) or equivalent, or Grade Point Average (GPA) in polytechnic students (health sciences-related diploma) or university students for graduate entry programmes. Schools may additionally use Medical College Admission Test (MCAT) or Biomedical Admission Test (BMAT) as deemed necessary. Humanistic abilities may be obtained through various methods of assessment including interviews, portfolio assessment, essays, Situational Judgement Tests (SJT), observational stints and letters of reference.

Fitness to Practise Policies

Health requirements

The medical school must adhere to prevailing guidelines issued by the MOH on the requirements for pre-admission medical examinations and tests.

Medical schools must ensure the ability of individuals to technically function as doctors. This calls for assessment of the observation, communication, motor function, intellectual and integrative abilities as well as behavioural and emotional attributes of the candidates.

Each medical school must adhere to any additional requirements for foreign students who require Student Passes, as issued by the Immigration and Checkpoints Authority of Singapore.

Criminal convictions

Each medical school must require all prospective students to declare all previous criminal convictions.

Foreign applicants must complete an enhanced criminal record disclosure (e.g. as issued by the Criminal Records Bureau, an Executive Agency of the UK Home Office).

Each medical school should define which convictions will or will not result in exclusion. The only caveat will be that all convictions related to offences against children or other persons must result in disqualification.

The final-year student must make an upfront declaration of any encumbrance (criminal or otherwise) prior to starting the Postgraduate Year 1 training.

ANNEX A

Section II – Graduate Outcomes: Outcome #1 on Patient Care

This annex specifies the basic diagnostic and therapeutic procedures that a medical graduate must be proficient in upon graduation:

Diagnostic procedures⁵

- Body temperature measurement in adults and paediatric patients
- Pulse rate and blood pressure measurement
- Transcutaneous oxygen saturation measurement
- Venepuncture
- Urinalysis
- Advising patients on how to collect a mid-stream urine specimen
- Correct and safe management of blood samples/bodily fluids
- Blood glucose measurement
- Taking blood cultures using aseptic techniques
- Taking nose, throat and skin swabs
- Pregnancy testing
- Nutritional assessment e.g. measurement of body mass index
- Electrocardiograph (ECG) set up, function and interpretation of 12-lead ECG

Therapeutic procedures

- Oxygen administration and use of delivery methods e.g. nasal cannula, face mask
- Establishing peripheral venous access, and infusion setup and devices

⁵ Tomorrow's Doctors: Outcomes and Standards for Undergraduate Medical Education, 2009, General Medical Council

- Preparing drugs for parenteral administration
- Calculating dosage and administration of insulin, and the use of sliding scales
- Administering subcutaneous and intramuscular injections
- Blood transfusion, including necessary checks e.g. correct identification of patient, blood group and observation for adverse reactions
- Urinary catheterisation
- Administering local anaesthetics
- Skin suturing
- Basic wound care and dressing
- Correct technique for moving and handling patients in the context of clinical care

Miscellaneous

- Obtaining informed consent
- Hand washing procedure prior to surgical operations
- Appropriate use of personal protective equipment
- Infection control in relation to procedures
- Safe disposal of clinical waste, needles and other sharp instruments

ANNEX B

Section IV – Standards for Medical Undergraduate Curriculum: Detailed Recommendations on the Design and Delivery of the Curriculum Core Content

The course components highlighted in **bold** type (refer to pg 23, core content) pertain to areas of priority within Singapore's context, of which the NMUCC has specific recommendations, as outlined below:

General Medicine and General Surgery

- i. The exposure to General Medicine and General Surgery respectively offers a unifying clinical perspective that integrates all the patients' evaluations, treatments as well as his/her overall wishes and values (patient autonomy).
- ii. General Medicine or General Surgical Training should not be considered as a mere summation of subspecialty training.
- iii. Schools should liaise with hospitals in posting students to General Medical units and General Surgical units wherever possible, in preference to subspecialty units – so that the students will have opportunities to see patients presenting with an 'undifferentiated' diagnosis or multiple clinical diagnoses. Where they are posted to subspecialty wards, it is preferable to ensure that they are taught general principles on Surgery and Medicine in general.

Family Medicine

- i. There must be early and adequate student exposure to Family Practice.
- ii. In the medical curriculum blueprint, core Family Medicine skills may include continuous healing relationships, whole person orientation, family and community context and comprehensive care.

iii. Suggested enablers:

- Adequate Family Medicine faculty numbers, including engagement of private General Practitioners
- Faculty training and development programmes
- Recognition of faculty by the medical school

Integrated Care, Geriatric Medicine and Palliative Medicine

The curriculum blueprint must include these core contents:

- i. Geriatric Medicine – to include the clinical, behavioural and attitudinal components in which all medical students should be confident of. Geriatric Medicine should go beyond geriatric syndromes and include acute medical conditions that affect the elderly.
- ii. Palliative Medicine – to include basic pain management, and management of the psychological aspects of end-of-life care.
- iii. Vertical and/or horizontal curricula in Geriatrics and Palliative Medicine that reflect a balance between acute and community-focused care.
- iv. Compulsory attachments to:
 - geriatric wards (acute care);
 - community hospitals (sub-acute and/or rehabilitation); and
 - hospices.

The attachments should be designed to allow medical students to follow up with a group of patients with common chronic medical conditions over a period of time (e.g. from acute admission to recovery, the rehabilitation process, or the discharge and outpatient follow-up period). There should also be opportunities created in the clinical environment that would allow students to follow a group of patients under a faculty mentor, over an extended period of time.

Communication skills

- i. In the medical school curriculum blueprint, core skills in communication skills should include:
 - effective doctor-patient communication
 - communication about the patient
 - communication about medicine and science
- ii. There should be early, horizontal integration of such communication skills into the curriculum.
- iii. The curriculum should provide opportunities for students to practise their presentation skills and be observed while doing it, so that it is not just assumed that what is taught has been assimilated.

Ethics

- i. Individual medical schools should run concurrent teaching activities within and outside of the students' clinical attachments to reinforce theoretical principles of medical ethics.
- ii. It is recommended that those involved in teaching ethics in medical schools hold concurrent and perhaps honorary appointments at the Centre for Biomedical Ethics (CBmE).
- iii. The NMUCC recommends that each medical school appoint a faculty member to champion ethics training.

Team-based approach to care

- i. As stated in the general recommendations, delivery of the curriculum may include platforms for inter-professional education amongst medical, dental, nursing and pharmacy students to cultivate professional relationships that will enable them to work better in collaborative care teams in the future e.g. diabetes care and wound care.

- ii. Core competencies should be clearly defined, and may include patient, family and community focus; teamwork, roles and responsibilities; communication; learning and critical reflection; and ethical practice.
- iii. Suggested enablers:
 - An infrastructure that supports the operation of the programme
 - A programme for faculty development

Research and technology

- i. The curriculum must clearly define **core** as well as **elective** competencies in the areas of research and technology.
- ii. Research
 - **Core** skills may include understanding various types of clinical studies, literature research, critical appraisal of scientific journals and translational research.
 - Skills included in an **elective** may include: research methodology and design, biostatistics, qualitative research methods, writing a research proposal, scientific paper writing skills and conducting and reporting on a research project.
- iii. Technology
 - **Core** skills may include the ability to leverage on electronic medical records for safer and more effective practice; common medical equipment in the ward e.g. oxygen delivery system and infusion pumps.
 - Skills included in an **elective** may include in-depth learning of a particular technology e.g. computer programs, engineering solutions, research methodology and design for the use of technology in solving medical problems, writing a research proposal and conducting and reporting on a research project.

Health systems

- i. The curriculum must include various methods of instruction (e.g. combination of didactics, team-based projects and other activities) that will enable students to understand healthcare as a system. This includes forming the link between the theoretical and clinical bases of medical science, and conceptualising ways to improve the health system. Clinical teaching must include outpatients as well as ambulatory sites, given the changing shift in patient care.
- ii. In the era of limited resources, the medical curriculum must emphasise healthcare economics within Singapore and include funding frameworks, cost of care and clinical decisions.
- iii. Medical students should be introduced to concepts such as patient safety and quality assurance.

ANNEX C

The National Medical Undergraduate Curriculum Committee (NMUCC)

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Terms of Reference for the NMUCC

- To articulate the vision for undergraduate medical education in Singapore, in support of the long-term healthcare needs of Singaporeans and Singapore residents;
- To prescribe standards and educational outcomes for undergraduate medical education in Singapore, including core curriculum components that will underpin the design of undergraduate medical education in Singapore;
- To articulate key principles and features of a clinical training framework that would support the vision and educational outcomes of undergraduate medical education in Singapore, and;
- To provide guidance on any other related matters.

The overarching objective of the NMUCC is to provide strategic oversight and steer the long-term development of Singapore's undergraduate medical education. In carrying out this task, the Committee consulted a group of advisors from diverse backgrounds, both medical and non-medical.

One of the subsidiary objectives of the NMUCC is to provide high school students aspiring to apply to a local medical school with the expected end-points of medical school training. This will help equip them with the necessary information they need to decide whether or not to take up medicine as a vocation and career.

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Mr Benedict Cheong

Chief Executive Officer, TF

Terms of Reference for the Advisors to the NMUCC

- The overall objective of the advisors to the NMUCC is to provide a broader perspective on issues related to Singapore's medico-social needs.
- The main function of the advisors is to review issues presented to them by the NMUCC or DMS's office on a regular basis during the tenure of the committee.
- Each advisor is appointed for a term of two years.

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GLOSSARY

ACGME-I	Accreditation Council for Graduate Medical Education (International)
BMAT	Biomedical Admission Test
CBmE	Centre for Biomedical Ethics
COE	Certificate of Experience
DIO	Designated Institutional Officer
DMS	Director of Medical Services
Duke-NUS GMS	Duke-NUS Graduate Medical School
ECG	Electrocardiograph
FP	Family Physician
GCE 'A' Level	General Certificate of Education Advanced Level
GPA	Grade Point Average
HO	House Officer
HOTC	House Officer Training Committee
IB	International Baccalaureate
KTPH	Khoo Teck Puat Hospital
LKCMedicine	Lee Kong Chian School of Medicine
Marine Parade CC	Marine Parade Community Club
MCAT	Medical College Admission Test
Mini-CEX	Mini-Clinical Evaluation Exercise
MOH	Ministry of Health
NHG	National Healthcare Group
NMUCC	National Medical Undergraduate Curriculum Committee
NTU	Nanyang Technological University
NTUC	National Trade Union Congress
NUHS	National University Health System

NUS	National University of Singapore
PGYI	Post Graduate Year I
SGH	Singapore General Hospital
SI	Sponsoring Institution
SJT	Situational Judgement Tests
SMC	Singapore Medical Council
TF	Temasek Foundation
TTSH	Tan Tock Seng Hospital
UK	United Kingdom
US	United States



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