



Curriculum for Education and Training in Orthopaedic Surgery

January 2020



The New Zealand Orthopaedic Association acknowledges and appreciates the work of the Australian Orthopaedic Association and its Curriculum Review Committee, Assessment Working Group and Training App development team in developing competencies and applying them to the practice of orthopaedic surgery, and articulating the abilities of an orthopaedic surgeon on their first day of independent practice. The NZOA acknowledges the first two sections are taken directly from the AOA 21 curriculum, and the third section has had minor changes made by the NZOA Education and Training Working Group.

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Overview

The overarching goal of the curriculum for education and training in Orthopaedic Surgery, 2019, is to guide trainees in learning and refining Foundation Competencies, in addition to those related to medical and surgical expertise, to improve the patient care they provide. The framework identifies and describes the abilities required of trainees to effectively meet the health care needs of patients.

This curriculum is divided into three sections.

SECTION 1 – FOUNDATION COMPETENCIES <i>Competencies that, together with medical and surgical expertise, are the foundation for quality patient care.</i>	
1.1 Communication and Cultural Awareness	Establishing relationships with patients and their families* Eliciting relevant information Sharing information with patients and their families Sharing information with colleagues and others Appropriately adjusts with patients and relatives to accommodate cultural and linguistic differences
1.2 Teamwork and Conflict Management	Working with others Handover Conflict management
1.3 Professionalism	Professional and ethical behaviour Commitment to Orthopaedic Surgery as a Profession Health and sustainable practice
1.4 Leadership and Organisational Skills	Leadership Organisational practice (including practice management) Cost and allocation of healthcare
1.5 Advocacy	Advocacy for individual patients Advocacy for the community Cultural awareness and sensitivity
1.6 Education and Research	Ongoing learning (CPD and integration of evidence) Teaching Critical evaluation of literature Research, development and dissemination of new knowledge

** Please note, throughout the curriculum, phrases such as ‘patients and their families’ are intended to include all those that are personally significant to the patient and are concerned with his or her care.*

Based on the CanMEDs approach, Section 1 competencies together with medical and surgical expertise are the foundations of quality patient care. They are applied across all stages of

training and have been brought together at the beginning of the curriculum document to emphasise their importance.

Competencies on conflict management and handover, practice management and critical evaluation of literature have been included. In keeping with current medical education best practice, professional and ethical behavior, and health and sustainable practice are distinct subsections of Professionalism. Although cultural awareness and sensitivity spans a number of Foundation Competencies, it has been included within Advocacy.

Each section of the curriculum builds upon the previous one. The achievement of specific competencies with regard to orthopaedic surgery detailed in later sections, is underpinned by the development of Foundation Competencies.

SECTION 2 – MEDICAL AND SURGICAL EXPERTISE	
<i>Medical and surgical expertise competencies underpin competencies within Section 3.</i>	
2.1 Orthopaedic Principles and Basic Sciences (OPBS)	Musculoskeletal Pathology Biomechanics and motion Materials and engineering Infection, immunology and inflammation Neurovascular Pharmacology Radiology and investigations
2.2 Medical Expertise (ME)	Applied Science Assessment Management
2.3 Technical Expertise (TE)	Pre-operative Intra operative Post-operative

The medical and surgical expertise competencies define the fundamental specialty knowledge and skills of orthopaedic surgeons across all areas of practice. The collation of these 'generic' orthopaedic surgery competencies prevents repetition throughout the curriculum, and when applied to a specific context within Section 3, reflects a spiral learning approach.

SECTION 3 – APPLIED MEDICAL AND SURGICAL EXPERTISE IN ORTHOPAEDICS	
<i>Medical and surgical expertise competencies applied to each topic area.</i>	
Topics:	<u>ME - Applied Sciences</u> Anatomy, including surgical approaches Biomechanics Pathology
3.1 Trauma and Injury 3.2 Shoulder 3.3 Elbow 3.4 Hand and Wrist 3.5 Hip 3.6 Knee 3.7 Foot and Ankle 3.8 Spine	<u>ME - Assessment</u> History taking Physical Examination Investigations
3.9 Tumour and Tumour-like Conditions 3.10 Paediatric 3.11 Systemic Medical Conditions	<u>ME - Management</u> Non operative Management Management Plans
	<u>SE - Surgical Skills</u> Level One - Perform independently Level Two - Have observed, assisted with or performed with supervision Level Three – Discuss how procedure would be performed

Each topic area is divided into four sub-sections; Applied Science; Assessment; Management; and Surgical Skills.

Surgical skills are categorised into three levels. On their first day of independent practice, all trainees graduating from the NZOA education and training program will be able to competently perform all procedures listed in level one. They will have been provided with the opportunity to observe, assist with or perform under supervision those procedures listed in level two. In addition, they will be able to discuss how procedures in level three would be performed. In summary the levels indicate – ‘must perform’, ‘should have performed’, ‘would be beneficial to have had some educational exposure’.

It is expected that many trainees may also be able to independently perform procedures that are listed in level two and three. The goal is to train to excellence and assess for competence. Regional training centres will encourage trainees to achieve beyond the minimum required, as described in this curriculum.

Section 1

Foundation Competencies

1.1 Communication

Establishing relationships with patients and their families

Recognise that effective communication is associated with improved patient satisfaction and outcomes.

Provide an appropriate environment for listening and sharing information.

Establish rapport with patients, sufficient to develop empathy and trust.

Use active listening techniques, including attending to non-verbal cues and recognising and addressing miscommunication.

Identify and manage communication barriers, using interpreters when indicated.

Adapt communication strategies to the individual patient's needs and a variety of clinical contexts, including emergency and life-threatening situations.

Manage interactions in emotionally difficult situations.

Eliciting relevant information

Collect appropriate baseline information regarding the patient's condition and quality of life.

Provide a clear structure for and manage the flow of the entire consultation.

Seek information from other sources, such as the patient's family and health professionals, with the patient's permission.

Demonstrate empathy and respect for the patient's expectations, concerns, goals and choices regarding their care.

Summarise the information and confirm with the patient.

Cultural Competency and Safety

Demonstrate awareness of own religious and personal beliefs and how they frame interactions with patients and colleagues.

Incorporate an understanding of Maori history and culture, to anticipate potential issues regarding perception of, or interaction with, health services.

Demonstrate respect for differences in cultural and social responses to health and illness.

Access resources and services to meet the care needs of culturally and linguistically diverse communities.

Sharing information with patients and their families

Provide explanations to the patient about their care adapted to a patient's level of understanding and need.

Outline the treatment options clearly and discuss:

- natural history;
- expected outcomes;
- likely timeframes for recovery and return to normal activities;
- risks & possible complications with relevance to the patient.

Help patients make informed choices regarding their care and treatment options.

Utilise available resources, such as models, to aid patient understanding.

Allow the patient and family time to reflect on the opinion and ask questions, promoting shared decision making.

Deliver bad news according to the needs of individual patients.

If an adverse event occurs:

- Openly disclose to patients and/or families
- Show empathy and compassion
- Clearly outline the remedial plan

Sharing information with colleagues and others

Communicate effectively and respectfully with all members of the multidisciplinary team.

Communicate effectively using a variety of telecommunication technologies, to exchange health information or provide health care services.

Document consultations accurately, contemporaneously and legibly in a way that can be understood.

Comply with legislative requirements for health records.

Be aware of confidentiality, privacy and regulatory considerations when storing and sharing clinical photographs/images and patient information.

Present concise verbal reports regarding clinical care and plans, summarising and identifying key issues.

Convey relevant information to referring practitioner in a concise, respectful and timely manner.

Promptly and appropriately respond to colleagues enquiring of a patient's previous surgical details.

1.2 Teamwork and Conflict Management

Working with others

Recognise importance of team competence and its impact on safety, quality and continuity of patient care.

Establish and maintain healthy inter- and intra-professional working relationships for collaborative care.

Collaborate with appropriate colleagues in medical decision making and perioperative care.

Respect and value the contribution, professional knowledge and skills of all clinical team members and specialist colleagues.

Recognise situations when other team members are better equipped to lead.

Negotiate overlapping and shared responsibilities to prioritise patient care.

Contribute to patient safety within a team.

Be willing to help other members of the team with all clinical tasks to foster a team approach to patient care.

Liaise effectively with members of the wider health care team to ensure ongoing patient support.

Provide support for colleagues when expertise is requested.

Actively engage in feedback processes, both giving and receiving feedback, with peers, co-workers, other health professionals and trainees.

Handover

Demonstrate effective and safe handover when transferring responsibility of care to a colleague.

Demonstrate effective and safe handover during a patient transition to a different setting or stage of care.

Conflict management

Work with others to prevent misunderstandings and conflicts.

Identify existing conflict and show insight to its causes.

Consider how to avoid future misunderstandings and potential conflicts.

Manage conflict with colleagues effectively.

Recognise, negotiate and manage conflict with patients and families.

1.3 Professionalism

Professional and ethical behaviour

Demonstrate a commitment to patients by applying best practices and adhering to high ethical standards.

Demonstrate honesty, integrity, trustworthiness, respect and maintenance of confidentiality.

Show caring, compassion, respect for patient dignity and autonomy, and altruism.

Exhibit professionalism while communicating with others, including through social media.

Demonstrate professional and ethical behaviour when reviewing colleagues' patients, particularly when providing a second opinion.

Accept and respect a patient's decision to seek a second opinion.

Recognise and manage conflicts of interest, including with respect to relationship with industry and clinical research.

Identify unacceptable behaviour in the healthcare setting, including discrimination, bullying and sexual harassment, and intervene appropriately.

Appropriately report issues related to a compromise in ethics, values or competency.

Recognise limits of own professional competence and expertise and anticipate the need to seek help and advice.

Identify medico-legal issues and employ strategies to manage personal risk, such as maintaining sufficient insurances and attending risk management workshops or courses.

Apply professionalism and management principles including procedural fairness, natural justice and due diligence.

Commitment to orthopaedic surgery as a profession

Adhere to professional and ethical codes, and standards of practice outlined by relevant associations and institutions.

Fulfil regulatory and legal obligations required of practice in Australia and the relevant jurisdiction, including:

- Credentialing and scope of practice
- Registration
- Prescription and clinical use of controlled substances
- Coronial requirements
- Mandatory reporting
- Indemnity insurance

Contribute to the advancement of orthopaedic surgery by involvement in professional organisations.

Utilise and contribute to relevant surgical registries in order to improve patient outcomes, including but not limited to the New Zealand Joint Registry (NZJR).

Health and sustainable practice

Manage personal and professional priorities to ensure well-being, professional performance and sustainable practice.

Employ measures to mitigate stress related to clinical practice.

Contribute to a culture that recognises and supports colleagues in need, with the aim of helping them and protecting patients.

Recognise causes of impairment including tiredness and the effects of alcohol and other substances.

1.4 Leadership and Organisational Skills

Leadership

Engage others to work collaboratively to improve systems of care.

Support and guide the surgical team to ensure optimal outcomes in a safe working environment.

Delegate tasks and responsibilities to other team members according to competency.

Demonstrate leadership in interdisciplinary, administrative and trans-professional settings.

Assist with the development of colleagues, providing feedback, advice and support with the intent to improve patient outcomes.

Demonstrate leadership in the design of protocols and guidelines.

Facilitate change in health care to enhance services or outcomes.

Organisational practice

Demonstrate effective organisational skills in the operating theatre environment.

Quickly adapt to new work environments and teams.

Facilitate quality assurance, quality improvement and accreditation activities within the department/practice.

Identify, manage and learn from adverse events, including unplanned events that did not result in harm but had the potential to do so (near misses).

Apply an understanding of the relationship between adverse events, system factors, and human factors, so as to implement strategies and protocols to prevent future events. In relation to setting up a private practice, discuss:

- Advantages and disadvantages of various practice types;
- Administrative requirements, e.g. contracts related to shared costs, risk and liability, security of patient data; archiving patient records.
- Financial aspects, e.g. planning, billing and reporting requirements;
- Human resource considerations, including industrial laws as they pertain to employers and employees, and provision of a safe workplace.

Cost and allocation of healthcare

Apply knowledge of Australian healthcare funding models and delivery systems (public and private) when providing advice to patients about treatment options.

Apply knowledge of purchasing and procurement arrangements, particularly when considering decisions around prosthetic supply and usage.

Advise and advocate for the patient to achieve the most cost effective, quality clinical management.

Obtain informed financial consent by advising patients of anticipated cost of services and cost associated with ongoing management.

1.5 Advocacy

Advocacy for individual patients

Recognise the determinants of health that impact upon the management plan of a given patient.

Advocate for treatment priority for patients in need.

Liaise constructively with medical colleagues to negotiate goals of therapy and treatment limitations for patients with significant co-morbidities.

Facilitate access to equipment and services necessary to improve the patient's mobility, quality of life and independence.

Identify situations in which the development of an advanced care plan should be suggested to patients and families.

Promote the benefits of lifestyle change to achieve treatment goals.

Discuss the benefits of screening and other illness and disease prevention activities with patients.

Support the overall health and wellbeing of patients, beyond treatment of their immediate presenting condition.

Assist in obtaining a second opinion for a patient, if appropriate or requested.

Assist the transfer of a patient's treatment, where treatment elsewhere is in the patient's best interests.

Advocacy for the community

Recognise the determinants of, and risks to, musculoskeletal health in the community and suggest strategies to facilitate improvements.

Advocate for improved availability and access to orthopaedic services for all patients.

Minimise resource waste and cost without compromising patient care.

Advocate for environmentally sustainable practices.

Recognise the importance of contributing to orthopaedic outreach and disaster relief.

1.6 Education and Research

Ongoing learning

Regularly evaluate personal and team performance to identify opportunities for learning and development.

Seek feedback and action suggestions for improvement from peers and co-workers.

Participate in professional and educational development to address needs and apply insights to practice.

Engage in quality improvement and peer review activities.

Participate in individual and group audit, compare results to best practice standards and implement improvement strategies as needed.

Teaching

Recognise the importance of role-modelling and its impact on learners.

Demonstrate effective teaching strategies to facilitate learning in various settings.

Promote a safe learning environment.

Provide timely constructive feedback to learners.

Assess competence of junior staff.

Ensure patient safety is maintained when learners are involved.

Share knowledge, technique and skills for the advancement of the profession.

Critical evaluation of literature

For a given professional scenario, generate focussed questions to be answered and conduct a systematic search for relevant evidence.

Interpret study findings and critique their relevance to professional practice.

Determine validity and risk of bias in a wide range of scholarly resources.

Evaluate new prostheses and implanted devices, technology, new operative techniques and investigations.

Integrate conclusions reached from critical appraisal into decision-making about the care of patients.

Identify and use a systematic approach to keep up to date with new orthopaedic surgery evidence.

Research, development and dissemination of new knowledge

Design and conduct a research project relevant to orthopaedic surgery.

Discuss governance and apply ethical principles related to surgical research.

Select and apply appropriate methodology to address a research question.

Present research to an audience of peers.

Section 2

Medical and Surgical Expertise

2.1 Orthopaedic Principles and Basic Sciences

Musculoskeletal

Demonstrate a detailed understanding of the structure and function of all human tissues relevant to the musculoskeletal system.

Apply a detailed knowledge of surface and topographic anatomy as a basis for precise clinical assessment and safe surgical exposure.

Describe bone and joint development, discussing the factors that influence this process.

Explain the processes of injury, repair of bone and other connective tissues.

Pathology

Discuss the embryology of congenital orthopaedic conditions manifesting in paediatric and adult populations.

Explain the role of human genetics in the development of inherited musculoskeletal disorders.

Apply knowledge of bone cell biology, mineral homeostasis and variation in bone mineral density in the pathogenesis and treatment of orthopaedic conditions.

Outline biological processes underpinning the development of degenerative and inflammatory arthritis.

Discuss the basis for the development of the major connective tissue disorders.

Discuss the effect of neuromuscular conditions on growth and their role in the development of orthopaedic deformity of the musculoskeletal system.

Explain the pathological basis of primary and secondary musculoskeletal tumours, particularly relating to their diagnosis and management.

Biomechanics and motion

Describe the biomechanics of the musculoskeletal system and principles as it relates to the development and management of musculoskeletal conditions.

Discuss the kinetics and dynamics of joint motion, including in normal and pathological limb function.

Assess deformity, understand the 'centre of rotation' of angular deformity and the principles of correction in planning osteotomies.

Materials and engineering

Describe the properties and use of biomaterials in orthopaedic surgery.

Discuss the principles of tissue engineering in orthopaedics.

Infection, immunology and inflammation

Discuss the manifestations of infectious diseases in orthopaedic surgery.

Discuss inflammation and its relevance to orthopaedic conditions and orthopaedic surgery.

Describe the prevention and management of infection.

Discuss immunological influence in development of orthopaedic conditions, response to musculoskeletal infections and reaction to foreign materials.

Neurovascular

Discuss venous and arterial embolism relating to orthopaedic practice.

Discuss vascular homeostasis and the prevention of pathological surgical thrombosis and bleeding.

Discuss the physiology of pain and the development of abnormal pain responses.

Discuss the physiology, neural pathways, injury, repair and recovery of the peripheral nervous system.

Pharmacology

Outline the safe use of medications and drugs encountered in orthopaedics including:

- Local anaesthetics
- Analgesics
- Antibiotics
- Anti-inflammatories
- Medications used for rheumatological conditions
- Interventions that affect bone mineral homeostasis
- Anticoagulants

Describe natural and alternative therapies patients may use to treat orthopaedic conditions, including risks, potential/proposed benefits and interaction with other medications.

Radiology & investigations

Explain the basic scientific principles that underpin radiological and nuclear medicine investigations.

Explain radiation biology and describe the appropriate use of radiation, including measures employed to ensure maximum safety.

Discuss the rationale for selection and use of orthopaedic imaging modalities for diagnosing conditions.

Research Methodology

Discuss the advantages and disadvantages of different study designs and the impact of study design on results and conclusions.

Explain levels of evidence and quality of evidence

Describe principles of basic biostatistics to analyse data.

2.2 Medical Expertise

In relation to an orthopaedic problem, an NZOA graduate will be able to:

Applied Science

Apply knowledge of relevant surgical anatomy.

Apply knowledge of embryology and developmental anatomy to interpret and manage congenital and developmental orthopaedic anomalies.

Apply biomechanical principles.

Explain the pathophysiology of orthopaedic conditions and presentations.

Explain the pathology relating specifically to implants and prostheses, including reaction to debris, failure and infection.

Describe the natural history of untreated orthopaedic conditions.

Interpret the outcomes and explain the relevance of laboratory tests, including their validity and potential for false positive and negative results.

Assessment

Elicit a comprehensive and relevant history.

Perform a clinical assessment of gait.

Perform a targeted physical examination to identify relevant clinical signs.

Focus on the patient during examination, minimising discomfort and warning of potential pain.

Develop a credible differential diagnosis.

Select and order appropriate investigations.

Interpret radiological imaging and appraise the quality of the images and report for the purpose of diagnosis and management.

Evaluate the findings from investigations and the relevance of results.

Assess radiographs of previous operative procedures and identify common orthopaedic implants that have been used.

Assess patient comorbidities and balance management risk accordingly.

Management

Formulate a valid evidence-based management plan.

Discuss the rationale for clinical decisions, based on evidence and balancing risk vs benefit of options.

Outline the likely prognosis for non-operative and operative management.

Take into consideration the patient modifying factors, adjusting to create a realistic plan for an individual patient.

Manage the non-operative care of the patient applying knowledge of natural history, appropriate medications, physical therapy options and orthoses.

Manage acute pain by implementing a safe, individualised pain management strategy appropriate to the patient, the injury and/or procedure.

Manage chronic pain using a multimodal and multidisciplinary approach, appropriate to the patient's individual, psychological and social needs.

Describe the expected rehabilitation for common conditions and surgeries, including work capacity and return to sport.

Assist patients to manage the psychological effects of trauma and orthopaedic conditions.

Perform procedures, including:

- Injection of joints and sites of inflammation using anatomical landmarks with imaging, when appropriate.
- Aspiration of joints, with imaging, when appropriate.

Discuss emerging techniques, evaluate their use in comparison to accepted practices and integrate into practice as appropriate.

2.3 Surgical Expertise

In relation to performing an orthopaedic surgery procedure, an NZOA graduate will be able to:

Pre-Operative

Obtain and document valid informed consent, being aware of how consent may be affected by the context in which it is obtained.

Recognise risk factors and optimise patient health for surgery.

Assess patient comorbidities and Body Mass Index (BMI) prior to surgery, and necessity for physician input and/or post-operative High Dependence Unit (HDU) / Intensive Care Unit (ICU) care.

Stratify the venous thromboembolism (VTE) risk of the patient and plan appropriate perioperative prophylaxis measures, commensurate with the risk of the individual patient.

Utilise pre-admission processes where applicable.

Prescribe antibiotic coverage, according to therapeutic guidelines:

- prophylactically for patients undergoing major surgery or having orthopaedic implants inserted
- to protect patients from infection of heart valvular conditions and other non-orthopaedic devices
- to protect patients at increased risk of post-operative infection

Plan procedure, including operative steps and ensure availability of all necessary surgical equipment and prostheses.

Personally check patient records, review investigations and ensure operation site is identified and marked.

Confirm the surgical plan with the operating theatre team.

Lead the theatre team in confirming correct patient, correct site and completion of surgical safety checklist.

Prepare the patient for surgery including appropriate positioning, prepping and draping to ensure adequate exposure of the surgical site.

Describe and discuss anaesthetic techniques, including indications, contraindications and effect on the postoperative signs and outcomes of surgical and nonsurgical management.

Advocate and negotiate for appropriate anaesthetic techniques for the patient's perioperative needs.

Intra Operative

Select and safely perform surgical approach, protecting tissues and vital structures. .

Skilfully perform operative techniques ensuring safety for patients and staff.

Administer local anaesthesia and perform peripheral nerve blocks for surgery and the provision of post-operative pain relief, where appropriate.

Efficiently perform steps of procedure, including prosthesis implantation where appropriate.

Describe the principles, exposure, technique and perform:

- Open fracture management
- Closed reduction of a fracture and percutaneous fixation
- Metaphyseal fracture fixation
- Plating and intramedullary nailing
- Tension band wiring
- External fixation
- Arthrotomy for infection
- Arthroplasty
- Arthrodesis
- Therapeutic arthroscopy
- Osteotomy or osteectomy
- Tendon repair or reconstruction
- Amputation
- Nerve decompression

Demonstrate appropriate wound management, including:

- Debridement
- Primary and delayed closure
- Application of dressings, including negative pressure dressings

Demonstrate situational awareness and adapt to changing clinical circumstances.

Anticipate, recognise and deal with actual and potential intraoperative complications appropriately.

Manage time critical situations by effectively communicating with the theatre team and implementing a strategy to stabilize the situation to achieve best possible patient outcome.

Communicate professionally and effectively with all members of theatre staff.

Demonstrate appropriate wound repair and protection.

Ensure patient is transferred safely from the operating table to the bed.

Post-Operative

Formulate and implement a safe, relevant post-operative management plan, including:

- documenting post-operative orders, including notification parameters for vital signs
- prescribing appropriate medications, including for pain management
- intravenous fluid management.
- organising the involvement of appropriate subspecialists in the management of complex medical and surgical issues.
- advising safe post-operative mobilisation and rehabilitation

Recognise and manage post-operative variations and complications in a timely manner.

Manage blood loss in a timely manner, using surgical and non-surgical methods to minimise harm to the patient.

Investigate the likely causes of postoperative confusion in a patient, correct when possible and explain the situation to relatives.

Monitor and manage surgical wounds in a timely manner.

Consider and diagnose surgical site infection as early as possible including:

- providing a strategy for bacterial diagnosis;
- anticipating likely organisms;
- implementing provisional antibiotic coverage, where appropriate;
- liaising with infectious disease specialists;
- providing surgical management

Utilise postoperative x-rays to evaluate surgical outcomes.

Actively liaise with allied health professionals to achieve optimal rehabilitation and surgical outcomes.

Clearly define the discharge plan including follow-up, pain management, wound and plaster care, rehabilitation plan and access to medical care.

Demonstrate continued leadership, responsibility and accountability for the care of patients, post operatively.

Section 3

Applied Medical and Surgical Expertise in Orthopaedics

3.1 Trauma and Injury

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy / physiology

Describe the:

- blood supply of bones
- physiology and types of fracture healing
- physiological response to trauma
- extensile approaches used to expose long bones and joints for fracture fixation

Compare and contrast the difference between paediatric, adult, geriatric and pathological bone.

Explain the effects of trauma on growth plates throughout the body.

Describe the patterns of bone and soft tissue injury in trauma.

Define and discuss the aetiology of delayed union and non-union.

Pathology

Demonstrate knowledge of the presentation, pathophysiology and natural history of:

Skeletal Trauma

- Closed and open fractures
- Intra and extra-articular fractures
- Stress fractures
- Pathological fractures
- Malunion, non-union, late infection of fractures
- Post-traumatic joint dislocations, subluxations and instabilities
- Chondral and osteochondral injuries

Biomechanics

Explain the principles and role of stability in fracture fixation.

Explain the mechanisms of failure of fracture fixation.

Explain the principles and practice of closed management techniques, including skeletal traction.

Describe the principles and mechanics of fixation devices.

- Polytrauma
- Paediatric fractures and trauma, including physeal and non-accidental injuries

Non-skeletal trauma

- Compartment Syndrome
- Soft-tissue defects
- Intra-muscular tears
- Pressure injection injuries
- Degloving injuries (open and closed)
- Electrocution relevant to orthopaedics
- Thermal injury
- Vascular Injuries with Limb Compromise
- Nerve Injuries including Emergent and Delayed Care
- Peripheral nerve, brachial and lumbosacral plexus injuries
- Traumatic shock
- Neurogenic shock
- Fat Embolism
- Crush Injuries
- High Energy Projectile and Blast Injuries
- ARDS / Multisystem organ failure (MSOF)
- Complex Regional Pain Syndromes (CRPS)

Trauma Specific to Regional Areas

- Long bones fractures of the upper and lower limbs, including interosseous membrane injuries and concomitant joint disruptions

Shoulder

- Fractures and dislocations of the shoulder girdle including the sternoclavicular joint

Elbow

- Fractures and dislocations of the elbow joint, including terrible triad injuries
- Ruptures of the biceps tendon
- Paediatric condylar and supracondylar fractures and associated neurovascular complications

Hand, wrist and forearm

- Fractures and dislocations of the wrist, carpus, hand and digits
- Tendon injuries and ruptures
- Ligamentous injuries of the wrist, carpus, hand and digits

Pelvis

- Fractures and dislocations of the pelvic ring, including sacrum and coccyx
- Acetabular fractures
- Tendon avulsions and avulsion fractures.

Hip and femur

- Fractures and dislocations of the hip joint
- Fractures of femoral neck and trochanteric region

Knee, Tibia and Fibula

- Fractures of the distal femur, proximal tibia and patella
- Dislocations of the knee patellofemoral and proximal tibio-fibular joints
- Extensor mechanism injuries
- Ligamentous injuries of the knee
- Osteochondral fractures

Foot and Ankle

- Fractures of the distal tibia and ankle joint
- Fractures and dislocations of the ankle, hindfoot, midfoot and forefoot
- Tendon injuries including the Achilles tendon
- Penetrating injuries of the foot
- Crush injuries and Compartment Syndrome of the foot

Spine

- Fractures of the vertebral column
- Complete and partial spinal cord syndromes and injuries
- Spinal cord injury without radiological abnormality (SCIWORA)

Assessment

Assess patients according to principles of Emergency Management of Severe Trauma (EMST)/Advanced Trauma Life Support (ATLS) protocols.

Take a detailed and focused history relevant to the injury.

Demonstrate a focused physical examination of the injured patient to elicit signs, including special clinical tests.

Assess for evidence of non-accidental trauma.

Assess for damage to associated neural and vascular structures.

Request and interpret radiological imaging of likely trauma regions including plain x-rays, ultrasound, CT, MRI, fluoroscopy and nuclear medicine.

Discuss the significance of pelvic fractures, and traumatic shock.

Demonstrate the clinical assessment of compartment pressures, including measurement.

Work with trauma team to prioritise care in the multiply injured patient with musculoskeletal injuries.

Assess stability of the joints of the upper and lower limb.

Assess stability to guide management of spinal fractures.

Assess stability of the injured ankylosed spine.

Recognise vertebral column injury that can be safely managed non-operatively.

Recognise vertebral column injuries requiring tertiary referral.

Assess the risk of impending pathological fracture.

Management

For paediatric fractures, counsel about the need to intervene, explaining the concept of bone remodelling and define acceptable limits of angulation and displacement.

Apply strategy and technique to protect growth plates when managing paediatric fractures.

Manage patients according to Early Management of Severe Trauma (EMST) / Advanced Trauma Life Support (ATLS) principles.

Resuscitate patients with traumatic, septic or neurogenic shock.

Apply the principles of 'damage control orthopaedics' or 'early total care'.

Discuss the role of appropriate pain relief, reduction of deformity and splinting in the management of skeletal injury.

Manage open wounds, determine and manage the tetanus immunisation status.

Prescribe antibiotics appropriately for the management of both open and closed fractures.

Recognise the signs of a tight plaster, bandage or splint and provide immediate treatment.

Monitor compartment pressures and prevent ischaemia.

Document appropriate reporting parameters for limb ischaemia and provide immediate treatment.

Anticipate, detect and resolve soft tissue pressure lesions under casts and braces.

Apply and manage negative pressure wound dressings.

Demonstrate knowledge of skeletal traction, including indications, application and the circumstances when it may be indicated in modern orthopaedics.

Discuss principles of muscle and tendon rehabilitation protocols.

Manage established soft tissue and bony infection.

Discuss the use of bone substitutes for grafting and the management of bone defects.

Discuss the principles of non-operative management of fractures (including anaesthetic manipulation and plaster) and tendon ruptures, where appropriate.

Non-operatively manage pelvic ring fractures, including the appropriate use of pelvic binders.

Manage non-skeletal trauma-related injuries, including:

- Soft-tissue defects
- Pressure injection injuries
- Degloving injuries (open and closed)
- Electrocution relevant to orthopaedics
- Thermal injury
- Crush Injuries
- Vascular Injuries with Limb Compromise
- Nerve Injuries including Emergent and Delayed Care
- Brachial and lumbosacral plexus injuries
- Fat Embolism
- High Energy Projectile and Blast Injuries
- ARDS / Multisystem organ failure (MSOF)
- Complex Regional Pain Syndromes

Manage peri-prosthetic and pathological fractures when surgery not indicated.

Manage amputation stumps, including preparation for prosthesis fitting.

Manage stable spinal fractures with non-operative methods (braces, rest etc.).

Surgical Skills

Trauma – General

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
• Casting and bracing of fractures • Closed reduction of fractures, with or without percutaneous stabilization • Closed and open reduction of joint dislocations • Stabilisation of dislocated joints • Reduction and internal fixation of all long bone fractures • Open reduction and fixation of all limb intra-articular fractures. • Corrective osteotomy for malunion • Fixation for periprosthetic fractures • External fixation of long bone and articular fractures for definitive and temporising stabilisation • Fixation of osteochondral fractures • Soft tissue debridement • Fasciotomy and escharotomy for the management of compartment syndrome • Bone grafting and re-fixation for non union • Above and below knee amputation • Fixation of pathological fractures, including prophylactic fixation • Prevention and management of post-traumatic joint stiffness • Insertion of pins for skeletal traction	• Simple split skin grafting • Local flaps • Correction of chronic infection and bone defects • Reconstructive surgery for post-traumatic deformity and instability • Component revision for periprosthetic fractures	• Fine wire ring fixation for complex periarticular fractures • Tendon transfers, tenodesis and arthrodesis for neurological limb deficits • Flaps for fractures with soft tissue cover deficiency • Forequarter and other upper limb amputations • Hindquarter amputation and hemipelvectomy • Management of post traumatic deformity

Trauma – Specific to Regional Topic Areas

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
<i>Shoulder and Humerus</i> • Closed and open reduction and stabilisation of acromioclavicular and sternoclavicular dislocations • Internal fixation of clavicular fractures and non-unions • Internal fixation of humeral shaft fractures • Stabilisation of traumatic shoulder dislocation • Repair of the traumatic rotator cuff tear • Repair of tendon ruptures • Internal fixation of proximal humerus fractures	<i>Shoulder and Humerus</i> • Arthroplasty of complex proximal humeral fractures	<i>Shoulder and Humerus</i> • Internal fixation of scapular/glenoid fracture • Stabilisation of scapula-thoracic dissociation
<i>Elbow</i> • Management of displaced paediatric supracondylar fractures including open reduction • Management of the distal humerus, radial head, olecranon fractures • Radial head replacement for fracture • The application of a spanning external fixator	<i>Elbow</i> • Management of elbow fractures with associated ligamentous instabilities (e.g. “terrible triad”)	<i>Elbow</i> • Joint Replacement in the management of complex distal humeral fractures • Ligamentous stabilisation of persistent instability
<i>Hand, Wrist and Forearm</i> • Fixation of forearm fractures and dislocations • Closed reduction and percutaneous fixation of fractures • Internal fixation of carpal, metacarpal and phalangeal fractures • Stabilisation of joint dislocations of the wrist, carpus and fingers • Thumb ulnar collateral ligament repair	<i>Hand, Wrist and Forearm</i> • Scapholunate ligament repair • PIPJ volar plate reconstruction	<i>Hand, Wrist and Forearm</i> • Scapholunate reconstruction • Replantation • Hand ray amputation

• Amputations of digits		
<i>Pelvis, Hip and Femur</i> • External fixation of the pelvic ring • Closed and open reduction of the hip joint • Internal fixation of femoral neck and trochanteric fractures • Internal fixation of distal femoral fractures • Hemiarthroplasty	<i>Pelvis, Hip and Femur</i> • Internal fixation of posterior wall acetabular fractures	<i>Pelvis, Hip and Femur</i> • Internal fixation of pelvic ring fractures, including fractures of the sacrum • Internal fixation of complex acetabular fractures • Fixation of avulsion fractures including the proximal hamstring tendon avulsion • Internal fixation of femoral head fractures
<i>Knee, Tibia and Fibula</i> • Closed and open reduction of the knee joint • Internal fixation of proximal tibial fractures /fibular fractures • Reduction and fixation of patella fractures • Reduction and fixation of intra-articular fractures • Repair of the extensor mechanism • Repair of the collateral ligaments and capsule • Management of osteochondral fractures	<i>Knee, Tibia and Fibula</i> • Posterolateral and posteromedial corner knee repair and reconstruction • Posterior cruciate ligament avulsion re-attachment	<i>Knee, Tibia and Fibula</i> • Definitive management of knee dislocations
<i>Foot and Ankle</i> • Temporising and definitive bridging external fixation • Open reduction and stabilisation of dislocations of the ankle, subtalar, midfoot and forefoot joints • Fixation of ankle fractures • Fixation of tibial plafond fractures • Fixation of talus, midfoot and forefoot fractures • Repair of tendon injuries including the Achilles tendon	<i>Foot and Ankle</i> • Fixation of calcaneal fractures	<i>Foot and Ankle</i> • Correction and stabilisation of neuropathic fractures and subluxations
<i>Spine</i> • Safely apply skull tongs and halo vests	<i>Spine</i> • Stabilisation of fractures of the spinal column	<i>Spine</i> • Reduction of spinal dislocation

3.2 Shoulder

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy

Describe the anatomy of the shoulder and related structures.

Discuss the following surgical approaches:

- Deltopectoral
- Transdeltoid
- Posterior
- Arthroscopy portal placement
- Clavicular shaft, acromioclavicular and sternoclavicular joint exposure
- Scapular body exposure

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of the following conditions affecting the shoulder joint:

- Sepsis of the shoulder joint
- Glenohumeral joint instability and labral pathology
- Frozen shoulder
- Rotator cuff disease and tear
- Calcific tendonitis
- Primary osteoarthritis of the shoulder
- Rotator cuff arthropathy
- Inflammatory arthropathies
- Referred pain to the shoulder region

Assessment

Take a detailed and focused history relevant to diseases and injuries affecting the shoulder.

Demonstrate a focused physical examination of the shoulder to elicit signs, including special clinical tests for the common pathologies and functional deficiencies.

Demonstrate the examination techniques used to assess the differential diagnoses arising from conditions of the spine and upper limb.

Biomechanics

Explain the biomechanics of:

- Individual shoulder joints
- Composite shoulder movements
- Prosthesis function
- Total Shoulder Replacement Anatomic and Reverse

Request and interpret imaging of the shoulder including plain x-ray (including shoulder specific views), ultrasound, MRI, CT and nuclear medicine scans.

Management

Describe the non-operative management of conditions of the shoulder.

Perform injections to the subacromial space, acromioclavicular and glenohumeral joints.

Review and discuss reports available from the New Zealand Joint Registry (NZJR) regarding use of implants for the shoulder.

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the AOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
• Diagnostic arthroscopy and lavage • Open rotator cuff repair • Open/arthroscopic acromioplasty • Acromioclavicular joint excision • Arthrotomy of the shoulder, acromioclavicular and sternoclavicular joint • Surgical approaches to humerus	• Glenohumeral joint stabilisation for anterior stability • Therapeutic arthroscopy • Arthroscopic rotator cuff repair	• Glenohumeral joint stabilisation for posterior and multidirectional instability • Revision total shoulder arthroplasty • Reverse total shoulder arthroplasty • Anatomic Total shoulder arthroplasty • Latarjet procedure

3.3 Elbow

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy

Describe the anatomy of the elbow and related structures.

Discuss the following surgical approaches:

- Posterior (including olecranon osteotomy)
- Anterolateral
- Anterior
- Medial
- Lateral
- Posterolateral
- Approaches to the radial head
- Approaches to the coronoid process

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of the following conditions affecting the elbow joint:

- Septic arthritis
- Primary osteoarthritis of the elbow
- Post-traumatic osteoarthritis and stiffness
- Inflammatory arthropathies
- Peri-articular heterotopic ossification of the elbow
- Elbow instability
- Osteochondritis dissecans
- Epicondylitis
- Nerve entrapment at the elbow
- Acute olecranon bursitis

Biomechanics

Explain the biomechanics of the elbow including:

- The normal range of motion
- The effect of the joint orientation of range of motion
- Functional arcs of movement
- Osteo-ligamentous static and dynamic stability
- Biomechanics of Total Elbow Replacement

Assessment

Take a detailed and targeted history relevant to diseases and injuries affecting the elbow.

Demonstrate physical examination of the elbow to elicit signs, including tests for instability, epicondylitis and nerve palsy.

Request and interpret imaging of the shoulder including plain x-rays, ultrasound, MRI, CT and nuclear medicine scans.

Management

Describe the non-operative management of conditions of the elbow region including:

- Epicondylitis
- Olecranon bursitis
- Tendonitis

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
• Arthrotomy, including removal of loose bodies and for elbow drainage. • Debridement and reconstruction for chronic epicondylitis • Ulnar nerve release/transposition • Distal biceps tendon repair • Olecranon bursa excision • Surgical approaches to humerus		• Diagnostic arthroscopy • Therapeutic arthroscopy • Total elbow arthroplasty • Revision total elbow arthroplasty • Elbow ligamentous stabilisation for chronic instability • Open debridement/capsular release for osteoarthritis and post traumatic elbow stiffness.

3.4 Hand and Wrist

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy

Describe the anatomy of the hand and wrist and the common variations.

Demonstrate the following surgical approaches:

- Hand
 - Carpal tunnel, extended carpal tunnel, Guyon's canal
 - Drainage of infections
 - Extensile approaches to the hand, wrist and forearm
 - Volar, lateral or dorsal approaches to fingers and joints
 - Volar and dorsal approaches to the thumb
- Wrist
 - Volar radial
 - Dorsal radial and dorsal ulnar
 - Approaches to the radial and ulnar styloid processes
 - Volar ulnar and dorsal approach to the carpus and distal radius

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of the following conditions affecting the hand and wrist:

- Inflammatory arthritis
- Osteoarthritis
- Septic arthritis
- Tenosynovitis
- Dupuytren's contracture/disease
- Vascular conditions such as vasculitides and frostbite
- Compression neuropathies
- Osteonecrosis of the carpals
- Congenital differences of the hand and wrist

Biomechanics

Explain the biomechanics and kinematics of the hand, wrist and radioulnar joints including:

- Axes of motion
- Osseo-ligamentous stability
- Force transmission
- Tendon function
- Positions of fusion of the fingers, thumb and wrist

Assessment

Take a detailed and focused history relevant to diseases and injuries affecting the hand and wrist.

Demonstrate a focused physical examination of the hand and wrist to elicit signs, including special clinical tests.

Request and interpret radiological imaging of the hand and wrist including plain x-rays, ultrasound, MRI, CT and nuclear medicine.

Management

Describe the non-operative management of hand and wrist conditions, including:

- Splintage
- Injections of hand joints and tendon sheaths
- The role of anti-inflammatory and immunosuppressive medication.
- The role of physical therapy

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
• Open carpal tunnel release • Excision of dorsal or volar ganglion • A1 pulley release • Wrist and finger arthrotomy • Incision and drainage of flexor tendon sheath for flexor tenosynovitis and infection • Extensor tendon repair • Trapeziectomy	• Wrist and finger joint arthrodesis • Suspensionplasty/fusion for carpometacarpal arthritis of the thumb • Fasciectomy for Dupuytren's disease • Wrist reconstruction for distal radial ulnar joint (DRUJ) pathology • Flexor tendon repair • Tenosynovectomy of flexor and extensor tendons • Nailbed repair • Distal radius, wrist and finger osteotomies	• Wrist arthroscopy • Triangular fibro cartilage complex (TFCC) • Boutonniere and swan-neck reconstruction • Tendon transfers and reconstruction for functional deficiencies of the hand and wrist • Limited wrist fusions and proximal row carpectomy • Arthroplasty of fingers and wrist • Amputation of rays

3.5 Hip

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy

Describe the anatomy of the hip and pelvis and related structures.

Describe the following surgical approaches:

- Anterior
- Posterior
- Direct lateral (with or without trochanteric osteotomy)
- Medial
- Ilioinguinal
- Extensile posterior

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of the following conditions affecting the hip joint:

- Osteoarthritis
- Sequelae of childhood hip disorders
- Septic arthritis
- Inflammatory arthropathy
- Labral or other soft tissue injury
- Femoroacetabular impingement
- Osteonecrosis
- Gluteal tendinopathy
- Metastatic bone tumour
- Painful/unstable/failed total hip arthroplasty
- Implant loosening

Assessment

Take a detailed and focused history relevant to diseases and injuries affecting the hip.

Demonstrate a focused physical examination of the hip to elicit signs, including special clinical tests.

Assess leg length and gait pattern.

Biomechanics

Explain the biomechanics of the hip joint and related structures including total hip arthroplasty.

Request and interpret radiological imaging of the hip including plain x-rays, ultrasound, CT, MRI and nuclear medicine.

Management

Describe the non-operative management of hip conditions.

Review and discuss reports available from the New Zealand Joint Registry (NZJR) regarding use of implants for the hip.

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
• Primary total hip arthroplasty • Arthrotomy • Bone graft harvest from pelvis • Excision arthroplasty	• Revision total hip arthroplasty	• Arthroscopy • Arthrodesis • Femoral and pelvic osteotomy • Femoro-acetabular impingement surgery • Gluteal tendon repair and reconstruction for gluteal tendinopathy

3.6 Knee

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy

Describe the normal anatomy of the knee and related structures, both macroscopically and arthroscopically.

Discuss the following surgical approaches:

- Anterior
- Medial
- Lateral
- Posterior
- Posterolateral
- Posteromedial

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of the following conditions affecting the knee joint:

- Osteoarthritis
- Septic arthritis
- Inflammatory arthropathy
- Osteonecrosis/ spontaneous osteonecrosis of the knee (SONK)
- Patellofemoral disorders
- Meniscal degeneration and tears
- Disorders of the skeletally immature knee including osteochondritis dissecans
- Tendinopathies
- Chronic instabilities of the knee joint
- Acute ligamentous injuries including knee dislocation
- Painful/unstable/failed total knee arthroplasty
- Implant loosening

Biomechanics

Explain the biomechanics of the region including:

- Ligamentous stability
- Knee joint arthroplasty
- Femoral and tibial osteotomy
- Patello-femoral mechanics

Assessment

Take a detailed and focused history relevant to diseases and injuries affecting the knee.

Demonstrate a focused physical examination of the knee to elicit signs, including special clinical tests for instability and gait pattern.

Request and interpret radiological imaging of the knee including plain x-rays, ultrasound, CT Scan, MRI and nuclear medicine.

Management

Devise appropriate treatment including both non-operative and operative management of knee conditions.

Review and discuss reports available from the New Zealand Joint Registry (NZJR) regarding use of implants for the knee.

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
• Arthrotomy • Therapeutic arthroscopy • Total knee arthroplasty • Prepatellar bursa excision	• Meniscal repair • Anterior cruciate ligament reconstruction • High tibial osteotomy • Unicompartmental knee arthroplasty • Patellofemoral stabilization (including medial patellofemoral ligament reconstruction, distal re-alignment) • Revision total knee arthroplasty	• Distal femoral osteotomy • Posterior cruciate ligament reconstruction • Posterolateral corner knee reconstruction • Multiligament repair/reconstruction • Arthrodesis • Revision anterior cruciate ligament reconstruction

3.7 Foot and Ankle

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy

Describe the anatomy of the foot and ankle and related structures.

Discuss the following surgical approaches:

- Ankle
 - Anterior
 - Medial
 - Lateral
 - Posteromedial
 - Posterolateral
 - Anterolateral
 - Anteromedial
 - Medial transmalleolar
 - Lateral transmalleolar
- Foot
 - Anterior
 - Lateral approaches to subtalar joint and calcaneus
 - Medial approach to the midfoot
 - Dorsal and plantar approaches to the metatarsals and toes
 - Dorsal, dorsomedial and medial approaches to the great toe

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of the following conditions affecting the foot and ankle region:

- Osteoarthritis, post traumatic arthritis, rheumatoid arthritis and other arthropathies of the ankle, subtalar, midfoot and forefoot joints
- Sepsis of the bones, joints and tendon sheaths of the ankle, hindfoot, midfoot and forefoot
- Tendinopathy of the Achilles tendon and other tendons surrounding the foot and ankle
- Deformities of the forefoot, midfoot and hindfoot including:
 - Greater and lesser toe deformities
 - Pes planus and pes cavus (and their variants)

Biomechanics

Explain the biomechanics of the ankle, subtalar mid foot and forefoot joints.

Explain the biomechanics and functional role of prostheses in amputations and orthotic devices with regard to the foot and ankle.

Explain the load sharing and weight bearing function of the foot.

Analyse gait for foot / ankle diagnosis and management.

Relate anatomical variations to weight bearing pressure consequences.

- Gastrocnemius-soleus complex and/or Achilles' contracture
- Diabetic foot disease
- Neuropathic foot diseases
- Plantar fibromatosis
- Neuromas and bursitis
- Soft tissue and bone problems in the foot and ankle associated with metabolic, vascular, inflammatory, and neuropathic conditions.

Assessment

Take a detailed and targeted history relevant to diseases and injuries affecting the foot and ankle.

Demonstrate physical examination of the ankle, hindfoot, midfoot, forefoot and muscles of the leg to elicit signs, including special tests and objective sensory testing.

Assess ankle mortise stability.

Assess vascularity (micro and macro) of the foot and interpret circulatory indices.

Assess shoe wear patterns and appropriateness.

Request and interpret imaging of the foot and ankle including plain x-rays, ultrasound, CT scans, MRI scans and nuclear medicine scans.

Management

Manage patients that require non-operative treatment of foot and ankle conditions including neuropathic conditions and ulcers.

Provide shoe wear advice and referral for orthoses and custom shoe wear.

Discuss the contraindications to foot and ankle surgery.

Discuss the role, principles and indications for tendon re-balancing for foot and ankle diseases and deformities.

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
• Arthroscopy of the ankle • Arthrotomy of the ankle • Surgery for instability of the ankle • Corrective surgery to tendo achilles • Corrective surgery for hallux deformity • Arthrodesis of the 1st MTP joint • Cheilectomy 1st MTP joint • Debride ulcers and gouty tophi • Partial and sequential amputation of the forefoot • Corrective surgery for lesser toe deformity, including metatarsal neck osteotomy (e.g. Weil) • Harvest bone from distal tibia, fibula or hindfoot	• Arthroscopy of the ankle diagnosis and therapeutic • Hindfoot reconstruction for tibialis posterior dysfunction • Surgery for instability of the ankle • Mid and hindfoot amputation • Corrective osteotomies • Operative intervention for talar osteochondral lesions • Arthrodesis of the ankle and subtalar joint • Triple arthrodesis • Surgery for Morton's neuroma • Peroneal tendon surgery including repair, stabilisation and tenodesis	• Total ankle and other foot arthroplasties • Revision surgery for failed arthroplasties • Corrective surgery for footdrop • Corrective surgery for Charcot foot deformity and complications • Pantalar arthrodesis • Arthrodesis of the midfoot • Plantar fascia release • Tarsal tunnel decompression • Salvage surgeries for severe rheumatoid forefoot pathology

3.8 Spine

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy

Explain vertebral column, spinal cord / cauda equina anatomy with relevance to spinal pathologies, vertebral column and spinal cord / cauda equina injuries.

Discuss the following surgical approaches to cervical, thoracic and lumbar spine:

- Anterior
- Posterior
- Posterolateral

Discuss approaches to the sacrum and coccyx.

Biomechanics

Explain the biomechanics of the spine, describing in detail spinal malalignment - incorporating concepts of balance and spinal stability.

Apply the concepts of spinal stability to assess spinal column fractures.

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of the following conditions affecting the vertebral column and its neural contents:

- Infections of the vertebral column and epidural space
- Primary tumours of the vertebral column and spinal cord
- Metastatic tumour disease
- Benign destructive lesions
- Endocrine conditions
- Osteoporosis
- Inflammatory and ankylosing conditions
- Spondylosis and disc disorders
- Scoliosis
- Acute disc prolapse
- Stenosing conditions of the cervical, thoracic and lumbar spine
- Congenital abnormalities
- Developmental abnormalities of the vertebral column

- Coccydynia

Assessment

Take a detailed and focused history of diseases and injuries affecting the spine.

Elicit signs in a focused examination of the spine, relevant neurological assessment of the limbs and assessment of regional joints secondarily affecting the spine.

Assess and differentiate axial, radicular and somatic pain presentations.

Differentiate spinal cord, cauda equina and nerve root surgical problems from non-orthopaedic neurological presentations.

Recognise and assess acute cauda equina compression.

Assess the spine as a source of differential diagnosis for limb presentations.

Assess spinal deformity.

Clinically assess spinal cord and cauda equina compression and nerve root injury.

Assess, advise, and supervise spinal stability and neural protection.

Request and interpret radiological imaging plain x-ray, CT, MRI and nuclear medicine images of the spine for diagnosis and management.

Identify spinal patients likely to benefit from operative management.

Explain the principles of spinal cord monitoring and “wake up” testing in deformity correction.

Management

Assess and direct the management for patients with spinal pain, but without indications for surgery.

Describe the clinical indications for each type of spinal bracing.

Select contemporary percutaneous spinal interventions.

Identify failure of spinal arthrodesis, iatrogenic instability, and the reasons for failed spinal surgery outcomes.

Direct the management of pain and radiculopathy after failed spinal surgery.

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
	• Simple lumbar discectomy • Lumbar laminectomy • Anterior cervical discectomy and fusion • Surgical control of post op cerebrospinal fluid (CSF) fistula • Posterolateral lumbar fusion and pedicle screw fixation. • Drain post-operative epidural haematoma	• Cervical or thoracic discectomy • Cervical or lumbar disc replacement • Lumbar interbody fusion techniques (anterior lumbar interbody fusion (LIF), transformational LIF, posterior LIF etc) • Corrective surgery for spinal deformity • Open biopsy, vertebrectomy and reconstruction for infection or tumour

3.9 Tumour and Tumour-Like Conditions

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Describe tumour classes and their behaviour:

- Primary lesions
 - Benign, including latent, active and aggressive
 - Malignant
- Metastatic lesions

Describe mechanism of action and side-effects of adjuvant therapies including common chemotherapy agents and radiotherapy.

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of:

Primary bone tumour types

- Chondroid lesions
- Osteoid lesions
- Fibrous lesions
- Others, including unicameral bone cyst, Langerhans cell histiocytosis (including eosinophilic granuloma), giant cell tumour, aneurysmal bone cyst, Ewings sarcoma, adamantinoma, chordoma.

Primary soft tissue tumours types

- Fibrous lesions
- Lipoid lesions
- Muscle lesions
- Vascular anomalies
- Nerve lesions
- Others including giant cell tumour of tendon sheath

Metastatic lesions

- Including breast, prostate and renal cell carcinoma

Haematological malignancy

- Including lymphoma, leukaemia and multiple myeloma

Tumour like conditions

- pigmented villonodular synovitis
- synovial osteochondromatosis
- giant cell tumour of tendon sheath
- myositis ossificans
- tumoral calcinosis
- myxoma
- fibrous dysplasia
- osteofibrous dysplasia
- multiple hereditary exostoses

Assessment

Take a detailed and focussed history relevant to determining characteristics and sites of primary tumours and metastatic disease and complications.

Demonstrate a focused physical examination to elicit signs and assess the following:

- Size of the tumour and its relationship to adjacent anatomical structures
- Lymphatic involvement
- Sites of metastatic potential for primary musculoskeletal tumours
- Organ systems likely to metastasize to the musculoskeletal system

Recognise primary bone and soft tissue tumours on medical imaging and differentiate between them based on known characteristics.

Request and interpret appropriate investigations to determine local and systemic staging.

Assess risk of pathological fracture.

Management

Acknowledge the importance and role of the multidisciplinary musculoskeletal tumour service.

Identify lesions appropriate for interventional radiology investigation/management.

Prescribe appropriate follow-up/screening for conditions with malignant potential.

Describe the principles of tumour biopsy.

Recognise threshold for referring to a specialist.

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
• Open biopsy of appropriately selected bone and soft tissue lesions including skeletal metastases • Stabilisation of pathological fractures and impending fractures with internal fixation • Joint arthroplasty for metastatic and/or haematological pathological fractures of femoral neck	• Surgical treatment of common benign tumours including simple bone cyst and giant cell tumour of bone • Amputation below knee • Amputation above knee	• Techniques for limb salvage surgery for primary bone and soft tissue malignant tumors • Amputation below elbow/above elbow, hip disarticulation, shoulder disarticulation

3.10 Paediatrics

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Anatomy

Describe paediatric musculoskeletal anatomy and growth, including anatomy of the physis.

Apply knowledge of bone age and differential epiphyseal growth rates in the management of paediatric orthopaedic conditions, particularly to leg length discrepancy.

Apply knowledge of spinal embryology to congenital orthopaedic anomalies.

Apply knowledge of developmental anatomy of major joints and their blood supply, particularly the hip joint.

Discuss the following surgical approaches:

- Anterior approach to the hip including extension to the pelvis for osteotomy
- Medial approach to the hip joint
- Posteromedial and lateral approach to the ankle and foot, including Cincinnati approach

Biomechanics

Explain principles of gait analysis.

Explain normal spinal and limb balance, including the concepts of compensation after deformity.

Explain the interaction of common paediatric neurological conditions on paediatric musculoskeletal deformity.

Describe the coronal, torsional and sagittal alignment of the long bones and spine, the variation with age and natural history.

Describe the principles of spinal bracing.

Discuss the types and application of paediatric orthoses and prostheses.

Normal Variation

Demonstrate an understanding of normal childhood variation in musculoskeletal development; including:

- Normal Motor Development
- Coronal plane – genu varum and valgum
- Axial plane – in toeing and out toeing
- Pes planus

- Normal and accessory ossification centres

Pathology

Demonstrate knowledge of the various presentations, pathophysiology and natural history of the following presentations in paediatrics:

- Bone and joint infection
- Tumour and tumour-like conditions occurring in childhood
- Slipped capital femoral epiphysis (SCFE)
- Developmental dysplasia of the hip (DDH)
- Anterior knee pain and patellar instability
- Inflammatory arthropathies
- Idiopathic avascular necrosis including Perthes disease
- Leg length discrepancy
- Torsional and angular limb deformities
- Pes planus and pes cavus deformities
- Back pain in childhood
- Spinal abnormalities, including spinal dysraphism, spinal deformity and spondylolisthesis and scoliosis
- Short stature
- Collagen and metabolic disorders
- Congenital limb anomalies including deficiencies and their associations
- Neurological conditions including cerebral palsy, spinal dysraphism, polio and inherited conditions
- Myopathy and muscular dystrophy
- Osteochondritis dissecans and apophysitis
- Skeletal dysplasia
- Torticollis
- Obstetrical brachial plexus injury
- Congenital foot deformities including congenital talipes equinovarus (CTEV), calcaneovalgus and congenital vertical talus
- Orthopaedic manifestations associated with common syndromes
- Trigger digits and common hand / foot deformities

Demonstrate advanced knowledge of the patho-anatomy of metaphyseal bone infection and its extension into joints.

Know the likely age-related causative organisms of musculoskeletal infections, their identification and the appropriate antimicrobial therapy.

Assessment

Take a detailed and focused history relevant to diseases and injuries affecting children.

Document relevant family and known risk factor history for paediatric diagnoses.

Adapt physical examination technique for children.

Perform observational gait analysis and recognise types of limp.

Physically assess children with limb pain, refusal to walk and with limp, to focus differential diagnosis.

Examine the spine to classify deformity and assess risk factors, associated neurology and balance for management.

Assess the clinical stability of the neonatal hip.

Explain the role of imaging of the hip, including ultrasound and arthrography.

Request and interpret appropriate age specific imaging and specifically interpret imaging of fractures, age-related physal appearance, hip/foot/spinal anomalies and limb deficiencies.

Assess leg length by clinical and radiological means.

Management

Manage patients non-operatively, including:

- Counselling parents, carers and children about the natural history of diagnosed paediatric conditions
- Advising on shoe wear, splints and braces
- Applying and managing the use of hip orthoses for developmental dysplasia of the hip (DDH)
- Performing specialized casting techniques, including Ponseti and hip spica
- Explaining the principles of spinal bracing for spinal disorders
- Managing a course of antibiotic therapy for paediatric musculoskeletal infection

Develop a management plan, drawing on an understanding of the natural history of the condition, the social context that may affect the outcome, and the appropriate timing of the intervention.

Discuss the medical management of spasticity.

Manage osteochondritis and apophysitis.

Determine the threshold for referral for tertiary paediatric orthopaedic management.

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
<i>General</i> • Arthrotomy for lavage and drainage of all major joints, specifically the anterior approach to the hip • Drain sub-periosteal abscesses in the limbs and pelvis • Management of osteochondromas and simple bone cysts		<i>General</i> • Management of paediatric bone tumours and tumour-like conditions • Corrective surgery for post-traumatic and post-infective deformities • Surgery for cerebral palsy and other neuromuscular conditions • Surgery for premature epiphyseal arrest
<i>Upper limb</i> • Trigger thumb release		<i>Upper Limb</i> • Corrective osteotomies
<i>Lower Limb</i> • Stabilization of slipped capital femoral epiphysis (SCFE) • Open and percutaneous Achilles lengthening • Corrective surgery for lesser toe deformities	<i>Lower limb</i> • Epiphyseodesis for leg length correction and deformity • Femoral and Pelvic Osteotomy • Lower limb osteotomy • ACL reconstruction with open epiphyses • Surgery for Tarsal Coalition • Corrective surgery for foot deformity including complicated congenital talipes equinovarus (CTEV), congenital vertical talus and cavovarus foot • Patello-femoral stabilization prior to epiphyseal closure • Corrective surgery for hallux valgus	<i>Lower limb</i> • Surgery for developmental dysplasia of the hip (DDH), including hip arthrography • Reduction of severe slipped capital femoral epiphysis (SCFE) • Leg lengthening surgery • Syme amputation
		<i>Spinal</i> • Corrective surgery for spinal deformity • Release of torticollis

3.11 Systemic Medical Conditions

In addition to medical and surgical expertise competencies, the NZOA graduate will be able to:

Applied Science

Discuss bone metabolism and the role of calcium and vitamin D.

Describe the mechanism of action and side effects of common and important medications used to treat systemic medical conditions, when relevant to orthopaedic presentations.

Pathology

Demonstrate knowledge of the aetiology, pathophysiology, clinical features and orthopaedic clinical manifestations of the following conditions:

- Acute and chronic osteomyelitis
- Septic arthritis
- Musculoskeletal tuberculosis
- Inflammatory Disorders
 - Rheumatoid arthritis
 - Seronegative spondyloarthropathies: including ankylosing spondylitis, reactive arthritis, psoriatic arthritis and enteropathic arthritis
 - Gout
 - Pseudogout
- Other connective tissue disorders including systemic lupus erythematosus and scleroderma
- Osteoarthritis
- Diabetes
- Obesity and undernourishment
- Substance abuse, including alcohol and smoking.
- Metabolic Disorders
 - Osteoporosis
 - Disorders of calcium homeostasis
 - Paget's disease
 - Scurvy
- Disorders of the hypothalamic pituitary axis
- Cerebral vascular accident (CVA) and systemic neurological conditions
- Neuropathic musculoskeletal diseases

Assessment

Take a detailed and focused history relevant to systemic medical conditions.

Demonstrate a focused physical examination to elicit signs.

Order suitable diagnostic investigations and demonstrate knowledge of relevant criteria to determine a diagnosis of inflammatory or metabolic disorders.

Describe expected radiographic changes associated with systemic medical conditions.

Management

Manage systemic medical conditions within the context of a multidisciplinary team.

Describe the common and important current medical therapies used to treat systemic medical conditions, relevant to orthopaedic conditions.

Manage the orthopaedic complications of systemic medical conditions including deformity and fracture.

Know which medications, used to treat systemic medical conditions, should be ceased peri-operatively.

Manage acute and chronic osteomyelitis

Manage septic arthritis

Surgical Skills

Demonstrate comprehensive knowledge of the operative procedures listed in the following table, including indication, approaches, technical considerations, outcomes and complications.

In addition to medical and surgical expertise competencies, the NZOA graduate will:

Level One	Level Two	Level Three
<i>Be able to perform independently:</i>	<i>Have observed, assisted with or performed with supervision:</i>	<i>Be able to discuss how the procedure would be performed:</i>
Debridement of chronic osteomyelitis	Stabilisation of fractures, including osteotomy, associated with deformity related to the systemic medical conditions.	Corrective surgery for skeletal deformity due to systemic medical disorders

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