

Specialty Training Requirements (STR)

Name of Specialty:	Rheumatology
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Note: In addition to the training requirements stated in this STR, residents must comply with any other regulatory requirements or practice-based requirements mandated by the healthcare institutions or place of practice.

Scope of Rheumatology

Rheumatology is a subspecialty of Internal Medicine that is devoted to the diagnosis and therapy of rheumatic diseases, their causes, pathology, diagnosis, and treatment. Rheumatic diseases often affect the connective tissues and related structures such as joints, muscles, and bones and sometimes other internal organs (e.g., kidneys, lungs, blood vessels, brain). The diseases may be caused by inflammation, degeneration or autoimmunity. As these conditions are often multi-systemic and complex, patients will benefit from the care of a rheumatologist.

Purpose of the Residency Programme

The purpose of the Rheumatology residency programme is to train residents to be accomplished practitioners and consultants in rheumatic diseases, as well as encourage the professional and scholarly attitudes and approaches of a competent specialist.

Admission Requirements

At the point of application for this residency programme:

- a) Applicants must be employed by employers endorsed by Ministry of Health (MOH); and
- b) Residents who wish to switch to this residency programme must have waited at least one year between resignation from his / her previous residency programme and application for this residency programme.

At the point of entry to this residency programme, residents must have fulfilled the following requirements:

- c) Have completed local Internal Medicine Residency programme and attained the MRCP (UK) and / or Master of Medicine (Internal Medicine) (NUS) qualifications or equivalent. Potential residents without these qualifications will need to seek ratification from the Joint Committee on Specialist Training (JCST) before they can be considered for the programme; and
- d) Have a valid Conditional or Full Registration with Singapore Medical Council (SMC).

Selection Procedures

Applicants must apply for the programme through the annual residency intake matching exercise conducted by MOH Holdings (MOHH).

Continuity plan: Selection should be conducted via a virtual platform in the event of a protracted outbreak whereby face-to-face on-site meeting is disallowed and cross institution movement is restricted.

Less Than Full Time Training

Less than full time training is not allowed. Exceptions may be granted by Specialist Accreditation Board (SAB) on a case-by-case basis.

Non-traditional Training Route

The programme should only consider the application for mid-stream entry to residency training by an International Medical Graduates (IMG) if he / she meets the following criteria:

- a) He / she is an existing resident or specialist trainee in the United States, Australia, New Zealand, Canada, United Kingdom and Hong Kong, or in other centres / countries where training may be recognised by the SAB; and
- b) His / her years of training are assessed to be equivalent to the local training by JCST and / or SAB.

Applicants may enter residency training at the appropriate year of training as determined by the Programme Director (PD) and RAC. The latest point of entry into residency for these applicants is Year 1 of the senior residency phase.

Note: Entering at Year 1 of the senior residency phase by IMG in any of the IM-related programmes / subspecialty programmes is regarded as 'mid-stream entry' because it requires the recognition of the overseas Junior Residency training / specialist accreditation of the base specialties respectively.

Separation

The PD must verify residency training for all residents within 30 days from the point of notification for residents' separation / exit, including residents who did not complete the programme.

Duration of Specialty Training

The training duration must be 36 months.

Maximum candidature: All residents must complete the training requirements, requisite examinations and obtain their exit certification from JCST not more than 36 months beyond the usual length (IM residency + Rheumatology) of their training programme. The total candidature for Rheumatology is 36 months Internal Medicine residency + 36 months Rheumatology residency + 36 months candidature.

Nomenclature: Rheumatology residents will be denoted by SR1, SR2 and SR3 according to their residency year of training.

"Make-up" Training

"Make-up" training must be arranged when residents:

- Exceed days of allowable leave of absence / duration away from training; or
- Fail to make satisfactory progress in training.

The duration of make-up training should be decided by the Clinical Competency Committee (CCC) and should depend on the duration away from training and / or the time deemed necessary for remediation in areas of deficiency. The CCC should review residents' progress at the end of the "make-up" training period and decide if further training is needed.

Any shortfall in core training requirements must be made up by the stipulated training year and / or before completion of residency training.

Learning Outcomes: Entrustable Professional Activities (EPAs)

Residents must achieve level 4 of the following EPAs by the end of residency training:

	Title
EPA 1	Managing patients with rheumatologic diseases in the outpatient setting
EPA 2	Managing patients with rheumatologic diseases and rheumatological emergencies in the inpatient setting
EPA 3	Performing arthrocentesis, joint and soft tissue injections
EPA 4	Providing rheumatology consultation to other specialties and providers
EPA 5	Leading an interprofessional health care team

Learning Outcomes: Core Competencies, Sub-competencies and Milestones

The programme must integrate the following competencies into the curriculum, and structure the curriculum to support resident attainment of these competencies in the local context.

Residents must demonstrate the following core competencies:

1) Patient care and Procedural Skills

Residents must demonstrate the ability to:

- Gather essential and accurate information about the patient
- Counsel patients and family members
- Make informed diagnostic and therapeutic decisions
- Prescribe and perform essential medical procedures
- Provide effective, compassionate and appropriate health management, maintenance, and prevention guidance

Essential Components:

The essence of being a Rheumatologist is the ability to use information derived about a patient (history, physical examination, laboratory and imaging studies)

along with medical knowledge to synthesise a differential diagnosis, plan of further evaluation and comprehensive management for the patient with a rheumatologic problem. This may broadly be categorised under four components:

a) Information Gathering:

The residents should be able to:

- i) Demonstrate competency in obtaining a clinical history, relevant review of systems, and assessing functional status of patients with rheumatic disease symptoms.
- ii) Demonstrate competency in performing and interpreting the examination of the structure and function of all axial and peripheral joints, periarticular structures, peripheral nerves and muscles. Additionally, the resident should be able to identify extra-articular findings that are associated with specific rheumatic diseases.
- iii) Understand the indications for and costs of ordering laboratory tests, procedures to establish a diagnosis of rheumatologic disease and of different therapies used in the management of these diseases.
- iv) Understand the principles and interpretation of results of synovial fluid analysis and become proficient in the examination and interpretation of synovial fluid under conventional and polarised light microscopy from patients with a variety of rheumatic diseases.
- v) Demonstrate competence in the assessment and interpretation of:
 - Radiographs of normal and diseased joints, bones, periarticular structures and prosthetic joints
 - Bone mineral densitometry
 - Diagnostic ultrasonography of painful musculoskeletal structures commonly encountered in a rheumatology clinic, including synovial joints, periarticular soft tissues, tendons and ligaments
- vi) Apply the principles of clinical epidemiology to day-to-day clinical decision making, demonstrating understanding and competency in the indications for and the interpretation of results of laboratory tests and procedures to establish a diagnosis of a rheumatologic disease.

b) Synthesis of Treatment Plan

The residents should be able to:

- i) Demonstrate the ability to construct a list of differential diagnoses in patients presenting with signs and symptoms related to rheumatologic diseases and to outline further testing necessary to establish the correct diagnosis.
- ii) Demonstrate the ability to construct and implement an appropriate treatment plan for the care of a patient with a rheumatologic problem integrating the prescribing of medications (oral, injectable or infused), counselling, rehabilitative medicine, and, where necessary, surgical or other consultation. The fellow should be able to explain the rationale and the risks / benefits of the treatment plan.

c) Implementation of Treatment

The residents should be able to:

- i) Demonstrate competency in the treatment of:
 - Crystal induced synovitis
 - Infection of joint and soft tissues
 - Metabolic diseases of bone
 - Non-articular rheumatic diseases, including fibromyalgia
 - Non-surgical exercise-related (sports) injury
 - Dermatomyositis / Polymyositis
 - Osteoarthritis
 - Osteoporosis
 - Regional musculoskeletal pain syndromes, acute and chronic musculoskeletal pain syndromes
 - Rheumatoid arthritis
 - Scleroderma / systemic sclerosis
 - Sjogren's syndrome
 - Spondyloarthritis (SpA)
 - Systemic diseases with rheumatic manifestations
 - Systemic lupus erythematosus
 - Vasculitis
- ii) Demonstrate a working knowledge of clinical pharmacology for medications listed under the Medical Knowledge Section for each medication, understand the dosing, pharmacokinetics, metabolism, mechanisms of action, side effects, drug interactions, compliance issues, costs, and use in patients including fertile, lactating, and pregnant women.
- iii) Understand the indications for and demonstrate competence in arthrocentesis. The residents should understand the anatomy, precautions and potential sequelae of arthrocentesis and demonstrate competency in obtaining synovial fluid from or administering local steroid injections to diarthrodial joints, bursae and tenosynovial structures with adequate informed consent. The residents should also know the benefits of using ultrasound guidance for joints or periarticular structures which are difficult to access.
- iv) Understand pain assessment and pain management:
 - Methods of pain assessment including visual analogue scale scores, pain questionnaires
 - Non-pharmacological modalities of pain management including exercise, cognitive behavioural therapy
 - Pharmacological therapy including:
 - Immunosuppressive and anti-inflammatory management of underlying rheumatic disorder
 - Analgesic agents including acetaminophen, nonsteroidal anti-inflammatory agents and narcotic analgesics
 - Antidepressants
 - Other drugs including pregabalin and gabapentin.
- v) Understand changes required in patient management should the rheumatology patient become pregnant; this should include pre-pregnancy counselling about effects of pregnancy on the disease process, the use of medications before and during pregnancy and in the postpartum period.

- vi) Demonstrate the ability to identify physical impairment; relate the impairment to the observed functional deficits; prescribe appropriate rehabilitation (physical therapy, occupational therapy) to achieve goals to improve the defined impairment.
- vii) Understand indications for surgical and orthopaedic consultation in acute and chronic rheumatic diseases.
- viii) Pre- and post-operative management of the surgical patient:
 - o Understand indications for surgical and orthopaedic consultation in acute and chronic rheumatic diseases
 - o Understand perioperative evaluation, appropriate referral and medication adjustments
 - o Rehabilitation of the rheumatic disease patient after a surgical or orthopaedic procedure, as well as aspects of postoperative medical management pertaining to the rheumatologic condition
- ix) To be aware of experimental therapies: Myeloablative therapy and immune reconstitution including haemopoietic stem cell transplantation.
- x) To be aware of complementary and unconventional medical practices: diet, nutritional supplements, antimicrobials, acupuncture, topical therapeutic agents, traditional Chinese medications, and others.

d) Reassessment and Patient Follow Up

The residents should be able to demonstrate the ability to reassess the patient over time, including recognition of treatment related adverse events, and alter the treatment plan accordingly. This should include principles of stepping-up and stepping down immunomodulatory therapy, and guidelines for drug monitoring.

2) Medical knowledge

Residents must demonstrate knowledge of established and evolving biomedical, clinical, epidemiological and social-behavioural sciences, as well as the application of this knowledge to patient care.

A working knowledge of the basic and clinical sciences that relate to musculoskeletal and rheumatic disease is fundamental to the practice of Rheumatology. Understanding of normal and pathogenic processes of the immune system forms the basis of reliable diagnosis and the development and use of an increasingly sophisticated range of immunomodulatory treatments for the rheumatic diseases. Similarly, knowledge of the basis for and use of laboratory tests of immune activity is a principal asset of the practising Rheumatologist.

Rheumatology residents must also have practical understanding of the approaches and modalities used by other specialists and allied health professionals for the treatment of rheumatic diseases to manage the care of their patients effectively. Training programmes must teach and emphasise the cognitive skills that are necessary to apply this detailed knowledge to problem solving for diagnosis, treatment and research of the rheumatic diseases.

The rheumatology patient will often have other medical co-morbidities that will constantly require the residents to apply their knowledge of general internal medicine and manage these concurrently within the rheumatology residency programme.

Essential Components:

a) Basic Sciences

The residents must demonstrate knowledge of the anatomy, basic immunology, genetic basis, cell biology, and metabolism pertaining to rheumatic diseases, disorders of connective tissue, metabolic disease of bone, osteoporosis, and musculoskeletal pain syndromes.

i) *Anatomy and Biology of Musculoskeletal Tissues*

- Connective tissue cells and components
- Joints and ligaments
- Bone
- Muscle and tendons
- Blood vessels

ii) *Immunology*

- Anatomy and cellular elements of the immune system
 - Lymphoid organs
 - Organisation of the immune system
 - Specific cells: for each cell type, understand the structure, phenotype, function, and major activation makers / receptors:
 - Lymphocytes: T cells and B cells (naïve, memory, activated, regulatory)
 - Antigen presenting cells: dendritic cells, monocytes and macrophages
 - Natural killer cells
 - Neutrophils and eosinophils
- Immune and inflammatory mechanisms
 - Antibody structure and genetic basis of antibody diversity
 - Receptor / ligand interactions
 - Molecular basis of T cell antigen recognition and activation
 - B cell receptors: structure, function, antigen binding, effector functions
 - Antigens: types, structure, processing, presentation, and elimination
 - Major histocompatibility complex
 - Major immune cell signalling pathways
 - Complement / Kinin systems
 - Acute phase reactants and enzymatic defences
- Cellular interactions and immunomodulation
 - Cellular activation and regulation
 - Pertinent cytokines
 - Immune cell trafficking; adhesion molecules, chemokines
 - Inflammatory mediators
- Immune responses
 - Antibody-mediated: opsonisation, complement fixation, and antibody dependent cellular cytotoxicity
 - Cell-mediated: cells and effector mechanisms in cellular cytotoxicity and granuloma formation
 - IgE-mediated: acute and late-phase reactions

- Mucosal immunity: interactions between gut and bronchus-associated lymphoid tissue and secretory IgA
 - Innate immune responses: natural killer cells, pattern recognition, interaction with adaptive responses
 - Pathologic immune responses: immune complex-mediated, graft versus host response, abnormal apoptosis
 - Immunoregulation
 - Tolerance: mechanisms of central and peripheral tolerance, including clonal selection, deletion and anergy
- iii) **Purine and Uric Acid Metabolism**
 - Purine: biochemistry, synthesis, and regulation
 - Uric acid: origin, elimination, and physicochemical properties
 - Crystals: factors affecting formation, induction of inflammation
 - Purine pathway enzyme deficiencies and immunodeficiency: Adenosine deaminase deficiency, Purine nucleoside phosphorylase deficiency
- iv) **Biomechanics of Bones, Joints and Muscles**
 - Understand the principles of kinesiology of peripheral / axial joints and gait and how alterations in biomechanics contribute to musculoskeletal disorders.
- v) **Neurobiology of Pain**
 - Peripheral afferent nociceptive pathways
 - Central processing of nociceptive information
 - Mechanisms of action of drugs used for the treatment of neuropathic pain
 - Biopsychosocial model of pain

b) Clinical Sciences

i) **Rheumatic Diseases**

For each disease, the residents must demonstrate knowledge of the pathogenesis, epidemiology, clinical expression, treatments, and prognosis of the full range of rheumatic and musculoskeletal diseases.

- Rheumatoid Arthritis
- SpA including arthritis associated with acne and other skin diseases, SAPHO syndrome
- Lupus erythematosus: systemic, discoid, subacute and acute cutaneous lupus, lupus panniculitis and drug-related;
- Antiphospholipid antibody syndrome: Primary and secondary
- Scleroderma: diffuse and limited systemic sclerosis, localised syndromes, chemical / drug induced
- Vasculitides: polyarteritis nodosa, Wegener's granulomatosis and other ANCA-associated diseases, Churg-Strauss, polymyalgia rheumatica, Takayasu's arteritis, systemic necrotising vasculitis overlaps, Behcet's disease, hypersensitivity and small vessel angiitis, cryoglobulinemia, Cogan's syndrome
- Other systemic connective tissue diseases: Sjögren's syndrome, relapsing polychondritis, adult-onset Still's disease, overlap syndromes, mixed connective tissue disease, undifferentiated connective tissue disease
- Infectious and reactive arthritis

- Infectious arthritis: bacterial (non-gonococcal and gonococcal), mycobacterial, spirochetal (Syphilis, Lyme), viral (HIV, Hepatitis B and C, parvovirus, Chikungunya, dengue), fungal
 - Reactive arthritis: acute rheumatic fever, arthritis associated with sub-acute bacterial endocarditis, intestinal bypass arthritis, post-immunisation arthritis, other colitis-associated arthropathies
- Metabolic, endocrine and hematologic disease associated rheumatic disorders
 - Crystal-associated diseases: monosodium urate monohydrate (gout), calcium pyrophosphate dehydrate deposition disease, basic calcium phosphate (hydroxyapatite), calcium oxalate
 - Endocrine-associated diseases
 - Hematologic / lymphoreticular -associated diseases: Kikuchi's lymphadenitis, Castleman's Disease
- Bone and cartilage disorders
 - Osteoarthritis – primary and secondary osteoarthritis, chondromalacia patellae
 - Metabolic bone diseases: osteoporosis, osteomalacia
 - Paget's disease of bone
 - Avascular necrosis of bone
 - Others: hypertrophic osteoarthropathy, diffuse idiopathic skeletal hyperostosis, insufficiency fractures
- Hereditary, congenital, and inborn errors of metabolism associated with rheumatic syndromes
 - Disorders of connective tissues: Marfan's syndrome, osteogenesis imperfecta, hypermobility syndrome, others.
 - Immunodeficiency: common variable immunodeficiency, hypogammaglobulinaemia, selective IgA deficiency, complement component deficiency
 - Auto-inflammatory syndromes
- Non-articular and regional musculoskeletal disorders
 - Fibromyalgia
 - Myofascial pain syndromes
 - Axial syndromes: low back pain, spinal stenosis, intervertebral disc disease and radiculopathies, cervical pain syndromes, coccydynia, osteitis condensans ilii, osteitis pubis, spondylolisthesis / spondylolysis, discitis
 - Regional musculoskeletal disorders: bursitis, tendinitis, or enthesitis (e.g. shoulder-rotator cuff tear, adhesive capsulitis, impingement syndrome; wrist ganglions; trigger fingers and Dupuytren's contractures; hallux rigidus, heel pain, and metatarsalgia; temporomandibular joint syndromes; costochondritis
 - Biomechanical / anatomic abnormalities associated with regional pain syndromes: scoliosis and kyphosis, leg length discrepancy, foot deformities
 - Overuse rheumatic syndromes: occupational, sports, recreational, performing artists
 - Sports Medicine: injuries, strains, sprains, female athlete, medication issues

- Entrapment neuropathies: thoracic outlet syndrome, upper extremity entrapments, lower extremity entrapments
- Others: reflex sympathetic dystrophy, erythromelalgia
- Neoplasms and tumour-like lesions
 - Benign
 - Joints: loose bodies, fatty and vascular lesions, synovial osteochondromatosis, pigmented villonodular synovitis, ganglions
 - Tendon sheaths: fibroma, giant cell tumour, nodular tenosynovitis
 - Bone: osteoid osteoma, others
 - Malignant
 - Primary: synovial sarcoma, others
 - Secondary: leukaemia, myeloma, metastatic malignant tumours
 - Malignancy-associated rheumatic syndromes: carcinomatous polyarthritis, palmoplantar fasciitis, Sweet's syndrome
- Muscle diseases
 - Inflammatory polymyositis, dermatomyositis, inclusion body myositis
 - Metabolic:
 - Primary: e.g. glycogen storage disease
 - Secondary: nutritional, toxic, endocrine disorders, electrolyte disorders
 - Muscular dystrophies
 - Myasthenia gravis
- Miscellaneous rheumatic disorders
 - Amyloidosis: primary, secondary, hereditary
 - Charcot joint
 - Remitting seronegative symmetrical synovitis with pitting oedema
 - Multicentric reticulohistiocytosis
 - Foreign body synovitis
 - Arthritic and rheumatic syndromes associated with sarcoidosis, scurvy, pancreatic disease, autoimmune hepatitis, primary biliary cirrhosis, drugs
 - Rheumatic disease in the geriatric population, pregnant patients, patients with chronic hepatitis B and C and dialysis patients
 - Cutaneous manifestations of systemic disease: erythema nodosum, Sweet's syndrome
 - Ocular manifestations of systemic disease: uveitis, iritis, scleritis.
 - ENT manifestations of CTD, e.g. vertigo in Cogan's Syndrome, sensory neural deafness in SpA

ii) ***Therapeutic Modalities and Strategies***

The residents must demonstrate knowledge of the pharmacokinetics, metabolism, adverse events, interactions, and relative costs of drug therapies used in the management of rheumatic disorders.

- Pharmacology:
 - For each medication, the residents must understand the dosing, pharmacokinetics, metabolism, mechanisms of action, side effects, drug interactions, compliance issues, costs, and use in specific patient

populations, such as renal insufficiency and including fertile, lactating, and pregnant women; and men planning to start a family:

- Nonsteroidal anti-inflammatory drugs (both COX non-selective and selective inhibitors)
 - Glucocorticoids: topical, intraarticular, systemic; and the relative potencies of each - methylprednisolone, hydrocortisone, prednisolone, dexamethasone, betamethasone
 - Systemic anti-rheumatic drugs: antimalarials, sulfasalazine, methotrexate, leflunomide, gold
 - Cytotoxic drugs: azathioprine, cyclophosphamide
 - Immunomodulatory drugs: cyclosporine, mycophenolate mofetil, tacrolimus
 - Biologic agents: anti-TNF (including usage of autoinjectors), IL-inhibitors, co-stimulation blockade, B-cell depleting agent etc.
 - Hypouricemic drugs: allopurinol, probenecid, benzbromarone, febuxostat
 - Osteoporosis therapy: bisphosphonates, denosumab, strontium and teriparatide
 - Antibiotic therapy for septic joints
 - Narcotic and non-narcotic analgesics
 - Tricyclics and other agents used for pain modulation
 - Anticholinergics and non-pharmacologic agents used for the treatment of sicca including various types of ocular and oral lubricants
- Rehabilitation and disability issues:
The residents must demonstrate knowledge of the appropriate employment of principles of physical medicine and rehabilitation in the care of patients with rheumatic disorders.
- Methods of rehabilitation: for each method, understand principles, mechanism of action, indications, precautions
 - Importance of multidisciplinary approaches to rehabilitation and pain control. Appropriate use of and referral / prescription to rehabilitation specialists and pain clinics
 - Exercise: range of motion, strengthening, conditioning, and stretching
 - Rest and splinting
 - Modalities and hydrotherapy: ultrasound, TENS
 - Joint protection and energy conservation techniques
 - Adaptive equipment and assistive devices
 - Job site / home evaluation and adaptation
 - Footwear and orthotics
 - Acupuncture and other alternative modalities
 - Demonstrate understanding of specific rehabilitative techniques / modalities and what modification of these techniques are needed depending on the patient's disease
 - Psychosocial aspects of disability
- Surgical management:
The residents should know the indications for surgical and orthopaedic consultation, including indications and interpretation of arthroscopy and

joint replacement / arthroplasty as well as preoperative evaluation and medication adjustments, complications.

- Examples of orthopaedic surgical procedures are:
 - Bone biopsy
 - Arthroscopy
 - Synovectomy of tendons and joints
 - Entrapment neuropathy release
 - Spine surgery: radiculopathy, stenosis, and instability
 - Total joint replacement – hip, knee, shoulder, others
- Specific surgical management problems:
 - Rheumatoid arthritis patient
 - Infected joint: arthroscopy vs. arthrotomy
 - Infected prosthetic joint
 - Prevention and treatment of deep venous thrombosis
 - Perioperative antirheumatic medication management.

c) Diagnostic Testing

The residents must demonstrate knowledge of the physical and biologic basis of the various diagnostic tests used in Rheumatology, and the clinical test characteristics of these tests.

i) **Laboratory tests**

For each test, the residents must understand the biologic rationale, methods for performing, utility / limitations of specific laboratory tests, interpretation and reporting; including but not limited to:

- Erythrocyte sedimentation rate, C-reactive protein, and other acute phase reactants
- Rheumatoid factors
- Anti-cyclic citrullinated peptide antibodies
- Antinuclear antibodies including methodologies and limitations of each (indirect immunofluorescence vs ELISA)
- Anti-dsDNA
- Antibodies to extractable nuclear antigens (anti-Sm, anti-RNP, anti-Ro, anti-La)
- Anti-topoisomerase 1, and anti-synthetase antibodies including anti-Jo-1
- Anti-neutrophil cytoplasmic antibodies including specificities for neutrophil granule constituents [anti-proteinase 3, anti-myeloperoxidase]
- Lupus anticoagulant
- Antiphospholipid antibodies including anti-cardiolipin and beta-2-glycoprotein I antibodies
- Cryoglobulins
- Antibodies to formed blood elements including direct and indirect Coombs testing, anti-platelet antibodies
- Assays for complement activity and components of the complement cascade
- Quantitative serum immunoglobulin levels, serum protein electrophoresis and immunofixation electrophoresis
- HLA typing and methods

- Serologic and PCR tests for HIV, Hepatitis B, Hepatitis C, parvovirus, cytomegalovirus Serum and urine measurements for uric acid
- Iron studies including ferritin
- Flow cytometry studies for analysis of lymphocyte subsets
- Interferon gamma release assays for evaluation of latent tuberculosis infection (Quantiferon gold and T-spot TB assays)

ii) **Diagnostic imaging techniques**

The residents must know the indications for and interpretation of:

- Biopsy specimens, including histopathology and direct immunofluorescence of tissues relevant to the diagnosis of rheumatic diseases: in particular skin, renal, muscle, nerve biopsy, minor salivary gland biopsy;
- Bone mineral densitometry;
- CT of lungs and paranasal sinuses for patients with suspected or confirmed rheumatic disorders, including HRCT lungs and CT pulmonary angiography;
- Electromyograms and nerve conduction studies for patients with suspected or confirmed rheumatic disorders;
- MRI of the central nervous system (brain and spinal cord) for patients with suspected or confirmed rheumatic disorders, including principles of T1 and T2 weighting, fluid attenuated inversion recovery (FLAIR), diffusion weighted imaging (DWI);
- Plain radiography, arthrography, ultrasonography, radionuclide scans, CT, and MRI of joints including sacroiliac joints, bones, and periarticular structures;
- Arteriograms (conventional and MRI / magnetic resonance angiogram (MRA)) for patients with suspected or confirmed vasculitis;
- Schirmer's test;
- Parotid scans and salivary flow studies;
- Ultrasound scans of normal and painful musculoskeletal structures commonly encountered in a rheumatology clinic, including synovial joints, periarticular soft tissues, tendons, and ligaments; power doppler for synovitis; erosions;
- Doppler ultrasound scanning of relevant arteries and veins for thrombosis and occlusion, including renal veins, arteries of the limbs;
- Transthoracic echocardiography and right heart catheterisation for evaluation of pulmonary hypertension; and
- Nailfold capillaroscopy for Raynaud's phenomenon.

iii) **Synovial fluid analysis**

Cell count and differential, crystal identification, viscosity, protein, glucose, and other special stains / analyses. Principles of polarising light microscopy.

iv) **Test-performance characteristics**

Principles of sensitivity, specificity, and predictive value, ROC curves in determining cut-offs for autoimmune serologies.

d) Research Principles

The residents must demonstrate knowledge of the essential components of quality experimental design, clinical trial design, data analysis, and interpretation of results, and the importance of adherence to ethical standards of experimentation.

- i) ***Principles and methods of epidemiological research***
 - Definitions of incidence and prevalence
 - Basic biostatistics: including major methods of comparative analysis, types of error, likelihood ratios
 - Methods of health services research
 - Measurement of health and functional status (HAQ, SF36, etc)
 - Quality of life measurements / assessments
 - Components of cost analysis (direct costs, QALY, etc)
- ii) ***Principles of clinical research***
 - Major study designs and the limitations and biases associated with each
 - Diagnostic criteria and assessment of disease activity
 - Objective assessments, e.g. tender / swollen joint count
 - Composite indices (ACR composite, DAS, WOMAC, etc.)
 - Damage and functional indices (e.g. HAQ)
 - Clinical trials
 - Major design types
 - Definitions and uses of clinical trial phases
 - Roles of principle investigator, sponsors, study coordinators, monitors, institutional review boards (IRB)
- iii) ***Evidence-based medicine: Data analysis, biostatistics, meta-analysis***
- iv) ***Research laboratory techniques if interested***
- v) ***Bioethics of clinical and basic research***
- vi) ***Critical literature review***

3) System-based practice

Residents must demonstrate the ability to:

- Work effectively in various health care delivery settings and systems relevant to their clinical specialty
- Coordinate patient care within the health care system relevant to their clinical specialty
- Incorporate considerations of cost awareness and risk / benefit analysis in patient care
- Advocate for quality patient care and optimal patient care systems
- Work in inter-professional teams to enhance patient safety and improve patient care quality. This includes effective transitions of patient care and structured patient hand-off processes
- Participate in identifying systems errors and in implementing potential systems solutions

Systems-based practice reflects an understanding of and responsiveness to the larger context and system of health care, as well as the ability to call effectively on other resources in the system to provide optimal health care.

Essential Components:

a) Systems: a concept of “systems thinking” in health care delivery

This includes an understanding of the limitations and opportunities of various types of Rheumatology practices and delivery systems, practice management strategies, managed care and health insurance issues. It also comprises an

ongoing analysis of the strengths and weaknesses of the local academic system, in both the inpatient and outpatient settings, and its impact on the health care delivery to rheumatic patients. In particular, efforts should be made to identify potentially correctable systematic weaknesses and medical errors due to systems failure and to develop strategies to rectify the problems (i.e. Quality Improvement projects).

b) Partners in Health Care Delivery: *the various providers and resources available to deliver optimal care*

The principal partners in delivering health care to rheumatic patients include providers such as rheumatology nurse clinicians, advanced practice nurses (APN), medical social workers and allied health professionals including the physiotherapists, occupational therapists, podiatrist available within the local healthcare system. Other external resources include the Integrated Care Services (ICS), the National Arthritis Foundation (Singapore), the disease-specific patient support groups (Lupus Association (Singapore), and the Ankylosing Spondylitis Club, etc).

c) Advocacy for the Patient: *the importance, opportunities and limits of patient advocacy*

This advocacy might consist of assisting patients with applications for disability, completing application forms for the use of certain non-standard medications.

d) Cost-Effective Health Care: *the principles of cost allocation and resource management within local and national systems*

This includes knowledge of the cost and availability of certain drugs (and unavailability of others) in the resident's hospital formulary, the use of Medisave, MediShield and MediFund by the patients for their hospitalisations; and the availability of medication assistance funds like MediFund, MediFund Silver, Medication Assistance Fund (MAF) for subsidising high-cost drugs for patients who are unable to afford these. Fellows must understand that the utilisation of evidence-based cost-conscious strategies for the diagnosis and treatment of patients with rheumatic diseases is paramount.

4) Practice-based learning and Improvement

Residents must demonstrate a commitment to lifelong learning.

Residents must demonstrate the ability to:

- Investigate and evaluate patient care practices
- Appraise and assimilate scientific evidence
- Improve the practice of medicine
- Identify and perform appropriate learning activities based on learning needs

Practice-based learning and improvement involves the evaluation of care provided to both individual patients as well as to groups of patients in a given practice, the appraisal and assimilation of scientific evidence relevant to clinical problems encountered, evaluations of the care provided in the context of this evidence, and effecting improvements in patient care based upon these evaluations.

Essential Components:

In addition to structured learning of the basic components of medical knowledge and patient care, the rheumatologist must evaluate their knowledge base and care delivery on an ongoing basis with the goal of continually improving that care. This process includes the following components:

a) Independent Learning

The ability to access and critically appraise appropriate information systems and sources to improve understanding of underlying pathology, assess the accuracy of diagnoses, and gauge appropriateness of therapeutic interventions for the patient population they encounter.

b) Self-evaluation of Performance

The effective resident must engage in ongoing self-assessment activities. This includes the ability to continuously self-evaluate learning needs and to monitor practice behaviours and outcomes to ascertain whether clinical decisions and therapeutic interventions are effective and adhere to accepted standards of care.

c) Incorporation of Feedback into Improvement of Clinical Activity

The ability to appropriately interpret results of clinical outcome studies, practice data, quality improvement measures, and faculty / peer feedback and evaluations and apply them to patient care and practice behaviour.

5) Professionalism

Residents must demonstrate a commitment to professionalism and adherence to ethical principles including the SMC's Ethical Code and Ethical Guidelines (ECEG).

Residents must:

- Demonstrate professional conduct and accountability
- Demonstrate humanism and cultural proficiency
- Maintain emotional, physical and mental health, and pursue continual personal and professional growth
- Demonstrate an understanding of medical ethics and law

By the end of their training, the residents should be able to demonstrate competency in the following areas:

a) Patient Primary

The residents should be able to:

- i) Demonstrate sensitivity and attention to the interests of their patients in the formulation of treatment plans. Demonstrate responsiveness to the needs of patients that supersedes self-interest.
- ii) Demonstrate the ability to provide autonomy to their patients to decide upon treatment once all treatment options and risks have been outlined for them.
- iii) Provide and obtain key elements of informed consent in an understandable manner for therapeutic interventions and clinical research endeavours.

b) Physician Autonomy

The residents should be able to demonstrate independent medical decision-making skills.

c) Physician Accountability and Responsibility including:

- i) Demonstrates timeliness and reliability in clinical care of patients, including completion of medical records and in responding to patient calls and requests.
- ii) Reliably follows through on duties and clinical tasks, including timely response to calls from colleagues.
- iii) Exhibits regular attendance and active participation in divisional and departmental training activities and scholarly endeavours.
- iv) Strives for excellence in care and scholarly activities as a rheumatologist.
- v) Works to maintain personal physical and emotional health and demonstrates an understanding of and ability to recognise physician impairment in self and colleagues.

d) Human Qualities and Altruism

- i) Exhibits empathy and compassion in physician-patient interactions and is sensitive to patient needs for comfort and encouragement.
- ii) Is courteous and respectful in interactions with patients, staff and colleagues.
- iii) Treats all patients with respect regardless of race, gender, ethnic, religious or socioeconomic background.
- iv) Provides equitable care to all patients.
- v) Demonstrates culturally competent care, which is defined here as the ability to deliver effective medical care to patients, regardless of cultural or language differences between the patient and the physician.

e) Ethical Behaviour

- i) Demonstrates a commitment to ethical principles relating to provision and withholding of clinical care, confidentiality of patient information and business practices.
- ii) Is trustworthy in following through on clinical questions, laboratory results, and other patient care responsibilities.
- iii) Recognises and addresses actual and potential conflicts of interest including pharmaceutical industry involvement in their medical education and programme funding and guarding against this influencing their current and future prescribing habits.
- iv) Demonstrates integrity in reporting clinical and research findings to supervisors and colleagues.

6) Interpersonal and communication skill

Residents must demonstrate ability to:

- Effectively exchange information with patients, their families and professional associates
- Create and sustain a therapeutic relationship with patients and families
- Work effectively as a member or leader of a health care team
- Maintain accurate medical records

Interpersonal and communication skills with patients, their families and other health professionals are essential for effective physician-patient and collegial relationships due to the complexity of rheumatic diseases and treatment regimens. Good working partnerships promote medical compliance, improve patient satisfaction and confidence as well as professional collaboration.

Essential Components:

a) Gathering Information

Reliable and effective communication depends upon the availability of accurate and complete information obtained from patients, their family and the complete medical record. This requires the use of effective listening and communication skills.

b) Understanding and Incorporating patient's perspective

Such understanding impacts the ability of the physician to appreciate the functional impact of disease and the desire and ability of the patient to be an active partner in the physician's treatment efforts.

c) Providing Information

Effective communication regarding disease causation, diagnosis and treatment in a manner that is understandable to the listener.

d) Trust

Establishment of trust with patient and patient's family.

Other Competency: Teaching and Supervisory Skills

Residents must demonstrate ability to:

- Teach others
- Supervise others

Learning Outcomes: Others

Residents must attend Medical Ethics, Professionalism and Health Law course conducted by Singapore Medical Association (SMA).

Training requirement for AY2025 intake onwards:

Residents must attend a Rheumatology Conference at least once a year. Additionally, residents must also attend Quality Improvement Course or Workshop.

Curriculum

The curriculum and detailed syllabus relevant for local practice must be made available in the Residency Programme Handbook and given to the residents at the start of residency.

The PD must provide clear goals and objectives for each component of clinical experience.

Learning Methods and Approaches: Scheduled Didactic and Classroom Sessions

The programme must provide opportunities for residents to interact with other residents and faculty members in educational sessions at a frequency sufficient for peer-peer and peer-faculty member interaction.

The programme must provide the following didactic sessions, and residents must attend a minimum of 70% of all described sessions below.

Didactic session	Frequency	Learning outcome
National Core Rheumatology Series (NCRS)	2 times per month	<ul style="list-style-type: none">• Knowledge of the basic and clinical sciences that relate to musculoskeletal and rheumatic disease
Grand Ward Rounds	3 – 4 times per month	<ul style="list-style-type: none">• To be able to present and discuss patients with rheumatic diseases in the inpatient setting and their management plans.
Journal club and topic review	2 – 4 times per month	<ul style="list-style-type: none">• To be able to critically apprise medical literature and practice-evidence-based medicine.
Mortality and Morbidity Rounds	6 -12 times per year	<ul style="list-style-type: none">• To discuss the mortality and morbidity cases, and if the management of these cases can be further improved in future.
Senior Residency Teaching sessions	2 times per month	<ul style="list-style-type: none">• To be able to take a complete rheumatological history and perform relevant physical examination of patients.• To be able to order relevant investigations and implement individualised treatment plans.
Radiology rounds	Monthly	<ul style="list-style-type: none">• To be able to interpret common radiological investigations used in the field of rheumatic diseases.

In the event of a protracted outbreak where face-to-face meeting is disallowed, the didactic sessions should be conducted via virtual platforms.

Learning Methods and Approaches: Clinical Experiences

Current training requirements for inflight trainees

- Inpatient / outpatient rheumatology experience: At least 4 to 6 months.
- Continuity / Ambulatory Rheumatology Clinics:
 - At least 2 half-day per week throughout the year;
 - Each senior resident should, on average, be responsible for four-to-eight patients during each continuity clinic half-day session;
 - On average, be responsible for about 15 patients during each half-day ambulatory session; and
 - Experience should involve a balanced mix of patients across various age groups; continuity patients should cover a range of diseases at different stages and complications, rather being limited to one specific type.
- General Medicine / Geriatric Medicine rotations: 2 months per year as required by MOH

- Research: 2 to 6 months depending on whether the senior resident is on a research track; with at least a poster presentation by the end of the third year for all senior residents

Residents may choose to do these electives, if not already done so in the first 2 years of training. Electives include:

- Rehabilitation Medicine
- Musculoskeletal allied health e.g. Physiotherapy, Occupational therapy, Podiatry etc
- Sports Medicine
- Musculoskeletal clinic
- Laboratory Medicine
- Immunodermatology
- Paediatric / Adolescent Rheumatology
- Clinical Immunology / Allergy
- Rheumatology Unit / Department - Rheumatology ultrasound sessions to learn about the role of Musculoskeletal Ultrasound in Rheumatology

When Should Cross-Cluster Rotation Take Place	Duration of Rotation
During SR3	3 to 6 months in Rheumatology

In the event of a protracted outbreak whereby cross institution movement is restricted, residents should resume their rotations in their own institution. This is because the scope of activity and learning is similar between different institutions, although the case mix may differ. The restriction of cross institution movement is not expected to have a significant impact on the resident's learning.

Training requirements from AY2025 onwards

- Inpatient / outpatient rheumatology experience: At least 8 months per year
- Continuity / Ambulatory Rheumatology Clinics:
 - At least 2 half-day per week throughout the year;
 - Each senior resident should, on average, be responsible for at least 8 patients during each half-day outpatient clinic session; and
 - Experience should involve a balanced mix of patients across various age groups; continuity patients should cover a range of diseases at different stages and complications, rather being limited to one specific type.
- General Medicine / Geriatric Medicine rotations: 2 months per year as required by MOH
- Research: 1 to 3 months (over 3 years) (excluding resident on research track); with at least a poster presentation by the end of the third year for all senior residents

Total duration spent on the electives should be between 1 and 3 months. Elective postings may include one or more of the following:

- Rehabilitation Medicine
- Musculoskeletal allied health e.g. Physiotherapy, Occupational therapy, Podiatry etc
- Sports Medicine
- Pain Medicine
- Laboratory Medicine
- Immunodermatology
- Paediatric / Adolescent Rheumatology
- Clinical Immunology / Allergy
- Renal Medicine
- Rheumatology Unit / Department - Rheumatology ultrasound sessions to learn about the role of Musculoskeletal Ultrasound in Rheumatology
- Rheumatology Unit / Department - Nailfold capillaroscopy sessions to learn about nailfold capillaroscopy
- Hand Microsurgery
- Obstetrics Rheumatology

When Should Cross-Cluster Rotation Take Place	Duration of Rotation
During SR2 – 3	3 months in Rheumatology

In the event of a protracted outbreak whereby cross institution movement is restricted, residents should resume their rotations in their own institution. This is because the scope of activity and learning is similar between different institutions, although the case mix may differ. The restriction of cross institution movement is not expected to have a significant impact on the resident's learning.

Learning Methods and Approaches: Scholarly / Teaching Activities

Residents must participate in the following scholarly and teaching activities.

	Name of activity	Brief description: nature of activity, minimum number to be achieved, when it is attempted
1.	Research project	To present at least a poster by SR3.
2.	Teaching of medical students and junior residents / medical officers	To teach junior residents / medical officers during the ward rounds and other assigned teaching duties.
3.	Training requirement for AY2025 intake onwards: Quality Improvement Project	To complete at least 1 PDSA cycle by SR3.

In the event of a protracted outbreak where face-to-face meeting is disallowed, all the above activities should be conducted via virtual platforms.

Residents are also encouraged to participate in the following scholarly activities.

	Name of activity	Brief description: nature of activity, when it is attempted
1.	Give public lectures to educate the patients and the public on various rheumatic diseases	To give public lectures under the supervision of faculty members on various rheumatic diseases.
2.	Support the activities or even stand for office in the executive committees of related organisations	To participate in the activities of related organisations e.g. Singapore Society of Rheumatology, Lupus Association of Singapore, National Arthritis Foundation.
3.	Do a 1st Author Publication	To be a 1 st author in a peer-reviewed publication.

Learning Methods and Approaches: Documentation of Learning

- Residents must keep a log of their clinical and procedural experience in the designated Rheumatology Training Logbook.
- Residents must fulfil the following procedural requirements by the end of their residency training.

	Procedures	Requirement (the min. number of procedures stated is cumulative and not by per residency year)		
		Min. No. for certification of competency *(Level 3)	Min. No. of procedures by end of SR2	Min. No. of procedures by end of SR3
1	Shoulder arthrocentesis / injection	3	3	5
2	Subacromial bursitis injection	3	3	5
3	Elbow arthrocentesis / injection	3	3	5
4	Wrist injection	3	3	5
5	MCPJ / PIPJ / MTPJ injection	3	3	5
6	Knee arthrocentesis / injection	3	10	15
7	Ankle arthrocentesis / injection	3	3	5

8	De Quervain's or flexor tenosynovitis injection	3	3	5
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*A resident is certified competent to perform a procedure under indirect supervision if they have met the minimum number of satisfactory DOPS under direct supervision as listed above. After certification of competency, prior to exiting the training programme, all procedures performed by residents remain under indirect supervision by the supervising faculty.

PDs will regularly check the residents' logbook to ensure timely completion of training requirements. Any observed shortfalls in training will be noted on the resident's exit examination application form.

Before the exit examination, the RAC will review the resident's logbook submitted with the exit exam application. Major shortfalls (if any) will be communicated via the JCST Secretariat, with PDs informed throughout the process.

Summative Assessments

For AY2024 intake onwards

	Summative assessments	
	Clinical, patient-facing, psychomotor skills etc.	Cognitive, written etc.
SR3	Clinical Component (Patient-facing) – Total duration: 1.5 hours, 1 hour of clerking (includes history taking, physical examination and drawing up management plan) and 30 minutes of structured discussion	Structured Viva Component (8 stations) – Total duration: 1 hour 20 mins (10 mins per station)
SR2	Nil	Nil
SR1	Nil	Written Component (MRCP Speciality Certificate Exam in Rheumatology) (200 MCQs) – Total duration: 6 hours, with a one-hour break between papers 1 and 2) can be taken from SR1 onwards

For AY2023 intake and before	Summative assessments	
	Clinical, patient-facing, psychomotor skills etc.	Cognitive, written etc.
SR3	Clinical Component (Patient-facing) – Total duration: 1.5 hours, 1 hour of clerking	Written Component (Short Answer Questions) – This is a 2-hour paper consisting of six blueprinted structured

	(includes history taking, physical examination and drawing up management plan) and 30 minutes of structured discussion	questions (five on clinical scenarios and one on ethics) covering core areas of rheumatology. Viva Component – This is a 1-hour test consisting of 7 blueprinted structured questions covering core areas of Rheumatology.
SR2	Nil	Nil
SR1	Nil	Nil

S/N	<u>Learning outcomes</u>	<u>Summative assessment components</u>			
		Clinical Component	Written Component (SAQ) – For AY2023 intake and before	Written Component (SCE in Rheumatology) – For AY2024 intake onwards	Viva Component
1	EPA 1: Managing patients with rheumatologic diseases in the outpatient setting	✓	✓	✓	✓
2	EPA 2: Managing patients with rheumatologic diseases, and rheumatological emergencies in the inpatient setting	✓	✓	✓	✓
3	EPA 3: Performing arthrocenteses, joint and soft tissue injections				✓
4	EPA 4: Providing rheumatology consultation to other specialties and providers	✓	✓	✓	✓
5	EPA 5: Leading an interprofessional health care team	✓	✓		✓