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University of Vermont
MEDICAL CENTER

Rheumatology and Clinical Immunology Division Training Program Curriculum

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RHEUMATOLOGY AND CLINICAL IMMUNOLOGY DIVISION TRAINING PROGRAM

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**RHEUMATOLOGY AND CLINICAL IMMUNOLOGY DIVISION
TRAINING PROGRAM CURRICULUM**

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This curriculum was designed to formalize and make explicit the methods and cognitive content of the Rheumatology fellowship training program. It is not meant to be all inclusive, but it is meant to provide a working framework and reference for fellows and faculty. The curriculum provides goals, educational content, methods of instruction and supplementary reading. This is a working document that will be revised, updated and expanded as it is put into effect and used by fellows and faculty.

The faculty responsibility is to provide fellows with comprehensive training in Rheumatology and to assess each fellow's progress in mastering this discipline. The fellows must fully participate in the program and take responsibility for their education. The educational content of this program will provide the foundation upon which the fellows will continue to build and update their knowledge throughout their careers.

This is a competency-based curriculum that is designed to enable the fellow to become competent in clinical rheumatology. Disease-specific knowledge that is related to diagnosis, natural history and treatment is largely accomplished through supervised clinical experience in the inpatient and outpatient setting. This clinical experience involves one on one or small group instruction with faculty. This outpatient and inpatient clinical experience is supported by attendance at didactic lectures, conferences, and accessing various digital and printed resources. (see bibliography in appendix). Understanding the principles of investigative medicine and research is an essential element of the curriculum, and each fellow accomplishes this objective by involvement in a mentored research or scholarly quality improvement project, as well as presentation of multiple journal clubs throughout fellowship.

Section I	Mission / Specific Goals and Competencies (fellow's signature, page 30)
Section II	Medical Knowledge
Section III	Professional Knowledge
Section IV	Research
Section V	Rotations

SECTION I

MISSION / SPECIFIC GOALS and COMPETENCIES

Mission:

The Division of Rheumatology and Clinical Immunology at the University of Vermont Medical Center aims to produce rheumatologists who will provide excellent and compassionate clinical care and who engage in scholarly activity to improve quality of life for patients with rheumatologic diseases. Our training program graduates are well prepared to enter clinical practice in private practice and in an academic medical center. The UVM Medical Center serves as a tertiary academic referral center for Vermont and upstate New York. Fellows provide inpatient and outpatient rheumatology consultations and continuity of care and participate in multidisciplinary metabolic bone and pediatric rheumatology clinics. We have highly productive and involved clinical faculty with diverse areas of expertise including musculoskeletal ultrasound, and a strong and well-rounded clinical practice. We have our own musculoskeletal ultrasound machine and we provide MSK ultrasound training to fellows. Our faculty engage in research in clinical rheumatology, helping fellows learn about underlying mechanisms of rheumatic disease. We have a pediatric rheumatologist who teaches our fellows, which is not the case at some other programs. Fellows perform procedures including arthrocentesis and analysis of synovial fluid, and on-site musculoskeletal ultrasound (MSKUS) including guided procedures as part of their MSKUS curriculum. We have multidisciplinary rheumatology rounds, journal clubs, metabolic bone conferences, board review/case conferences, interstitial lung disease conferences, and radiology rounds (with MSK radiology faculty.) Fellows conduct original research and quality improvement projects, and teach UVM medical students, residents, other fellows and allied health professionals. Faculty, staff and fellows attend faculty/staff meetings discussing clinical operations, clinical research studies and quality improvement processes, allowing for systems-based practice education and completion of quality improvement initiatives and research.

Because our program is small, each fellow receives personalized attention and mentoring to ensure their learning goals are achieved. Our high faculty to fellow ratio also ensures that fellow fellows are exposed to a diverse array of practice styles. We provide access to and financial support for items such as UVM classes (e.g. Designing Clinical and Translational Research,), local, regional and national conferences, and enrollment in the USSONAR program (for musculoskeletal ultrasound training.) Our emphasis on patient care and training for clinical practice serves the community and the nation; in this era of physician shortages we will continue

to focus on training rheumatologists who will provide access to excellent clinical rheumatologic care.

Specific Goals and Competencies:

The specific goals of our training program are derived from the Mission Statement and include the six general competencies defined by the Accreditation Council for Graduate Medical Education:

- Medical knowledge
- Patient care
- Interpersonal and communication skills
- Practice-based learning and improvement
- Systems-based practice
- Professionalism

Performance Assessment for all Competencies:

Milestones will be used to review fellow performance and report to the ACGME. Milestones are knowledge, skills, attitudes, and other attributes for each of the ACGME competencies that describe the development of competence from an early subspecialty learner up to and beyond that expected for unsupervised practice. For details see: “Rheumatology Milestones”

([RheumatologyMilestones2.0.pdf \(acgme.org\)](#))

1. MEDICAL KNOWLEDGE

Definition: Medical knowledge refers to the understanding of established and evolving biomedical, clinical and cognate sciences, and to the application of this knowledge to patient care. The **Essential Components** of medical knowledge are found in Section II.

Methods for Acquisition

The fund of knowledge obtained through this curriculum should serve as the foundation for understanding the pathogenesis, diagnosis, and treatment of the rheumatic diseases. The methods and resources for acquiring the body of medical knowledge include, but are not limited to:

- Didactic teaching - conferences, lectures, or discussions
- Independent reading - recommended textbooks, journal articles and digital resources including ACR videos
- Supervised clinical experience
- Research experience

Performance Markers

The fellow is expected to know and apply basic and clinical science relevant to rheumatology and should demonstrate an analytic and investigatory approach to clinical situations.

Basic Science – The fellow should be able to demonstrate understanding of anatomy, basic immunology, cell biology and metabolism pertaining to the rheumatic diseases in both didactic and clinical settings.

Clinical Science – The fellow demonstrates understanding of pathogenesis, epidemiology, clinical expression, treatments and prognosis of the full range of rheumatic and musculoskeletal disease in both didactic and clinical settings.

Diagnostic Testing – The fellow displays an understanding of the biological and physical basis of the range of diagnostic testing in rheumatology and the clinical test characteristics of these procedures.

Research Principles: The fellow should be able to:

- A. Demonstrate an understanding of the essential components of clinical study design, data analysis and applicability to patient care
- B. Exhibit familiarity with the common experimental approaches used in clinical and epidemiologic research.
- C. Exhibit familiarity with the principles of the ethical conduct of research and the ability to apply these principles in the conduct of their own research during fellowship.

Evaluation Methods

- Faculty performance rating – with regard to medical knowledge
- Evaluation of conference presentations
- Annual formal ACR In-Training Exam (ITE)
- Portfolio review
- Mini-CEX
- Mentor evaluation of fellow's research performance

Suggested Reading and Reference/Resources List

1. Major textbooks of rheumatology (including Rheumatology Secrets, Kelley's Textbook of Rheumatology, Rheumatology by Hochberg and a Primer on Metabolic Bone Disease published by ASBMR).
2. Basic, translational and clinical journal articles relevant to rheumatology and immunology, available through Dana Medical Library
3. American College of Rheumatology educational materials and resources including CARE modules, Image Bank, Publications/Journals (www.rheumatology.org).

2. PATIENT CARE

Definition: Patient Care that is compassionate, appropriate, and effective for the treatment of disease and the promotion of health.

The ability to provide quality patient care is the ultimate goal of clinical training in rheumatology. The fellow must obtain competence in patient care to the level expected of a new practitioner. The fellowship will provide the educational opportunities and settings for the fellow to acquire and demonstrate the specific knowledge, skills, behaviors, and attitudes for quality patient care.

Essential Components of Patient Care

The essence of being a rheumatologist is the ability to use information about a patient (history, physical examination, laboratory and imaging studies) along with medical knowledge to effectively formulate a differential diagnosis and a plan for evaluation and comprehensive management for a patient with a rheumatologic problem. This may broadly be categorized under four steps:

- **Gather Information**

- A. Obtain the history
- B. Perform a careful physical examination
- C. Obtain and review appropriate tests, including laboratory tests, imaging studies, and others

- **Formulate a Differential Diagnosis and Treatment Plan**

Informed medical decision making based on up-to-date scientific information and clinical judgment that also accounts for patient preferences and circumstances.

- **Implement Treatment**

- A. Prescribe pharmacologic and non-pharmacologic therapy (e.g. medications, physical therapy)
- B. Patient education and counseling
- C. Preventive therapies and proactive care
- D. Therapeutic aspiration and injection of joints, bursae, tendons and other soft tissues
- E. Work as part of a multidisciplinary team, with allied health care professionals and staff, as well as with colleagues from other disciplines and specialties

- **Reassessment and patient follow up**

- A. Assessment of response to therapy
- B. Recognition of therapy related adverse events
- C. Ongoing communication with patient including education and counseling

Methods for Acquisition

Learning the essentials of patient care is primarily acquired by caring for patients in the outpatient and inpatient (hospitalized) settings. These supervised experiences are the focus of clinical training where the fellow observes skilled clinician role models, and participates with the patient in the management of their rheumatologic disease. Situations in which components of patient care are taught and learned include:

- Didactic teaching - conferences, lectures, or discussions

- Clinical experience in a supervised, mentored clinical setting
- Interactive case-based discussions
- Independent study - recommended textbooks, journal articles and other digital resources
- Attendance at local, regional and national clinical meetings and conferences
- Preparation of and reflection upon portfolios

Performance Markers

- **Gather Information** - The fellow should be able to:
 - A. Understand principles and demonstrate competency in obtaining a clinical history, relevant review of systems, and assessing functional status of patients with rheumatic disease symptoms.
 - B. Understand principles and 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 fellow should be able to identify extraarticular findings that are associated with specific rheumatic diseases.
 - C. Understand the indications for and costs of ordering appropriate laboratory tests and procedures to establish a diagnosis of rheumatologic disease and of different therapies used in the management of these diseases.
 - D. Understand and interpret the results of synovial fluid analysis and become proficient in the examination and interpretation of synovial fluid under conventional and polarized light microscopy from patients with a variety of rheumatic diseases.
 - E. Demonstrate understanding and competency in the assessment and interpretation of:
 1. Radiographs of normal and diseased joints, bones, periarticular structures and prosthetic joints
 2. Bone densitometry
 3. Musculoskeletal ultrasound
 - F. 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 from laboratory tests and procedures to establish a diagnosis of a rheumatologic disease, including:
 1. Arthrography, ultrasonography, computed tomography, magnetic resonance imaging of joints, bones and periarticular structures, bone density testing
 2. Radionuclide scans of bones and joints
 3. Arteriograms (conventional and CT/CTA, MRI/MRA) for patients with suspected or confirmed vasculitis
 4. Computed tomography of lungs and paranasal sinuses
 5. Magnetic resonance imaging of the central nervous system (brain and spinal cord)

6. Electromyograms and nerve conduction studies
 7. Biopsy specimens including histochemistry and immunofluorescence of tissues relevant to the diagnosis of rheumatic diseases: skin, synovium, muscle, nerve, bone (e.g. metabolic bone disease), minor salivary gland, artery, kidney and lung
 8. Specific laboratory tests (including, but not limited to) erythrocyte sedimentation rate, C-reactive protein, other acute phase response proteins (e.g. ferritin), rheumatoid factor, anti-cyclical citrullinated peptides, antinuclear antibodies, anti dsDNA, anti SSA (anti-Ro 52 and 60), anti SSB (anti-La), anti-U1RNP, anti-Sm, anti-topoisomerase I (Scl-70), anti-Jo-1, anti-PM-Scl, antihistone antibodies, antineutrophil cytoplasmic antibodies (including anti-myeloperoxidase and anti-proteinase-3), myositis antibodies, cryoglobulins, complement component levels, CH50, serum protein electrophoresis, serum immunoglobulin levels, RPR, lupus anticoagulant assays, anticardiolipin and other antiphospholipid antibodies, HLA typing (e.g. HLA-B27), ASO and other streptococcal antibody tests, Lyme serologies, serum and urine uric acid levels, circulating immune complexes, lymphocyte subset and function data, anticellular antibodies (e.g. Coombs' test, neutrophil antibodies and anti-platelet antibodies), 25 OH vitamin D, 1,25 dihydroxy-vitamin D, PTH.
 9. Arthroscopy
 10. Schirmer's and ocular staining tests; parotid scans and salivary flow studies
- **Formulate a Differential Diagnosis and Treatment Plan** - The fellow should be able to:
 - A. Demonstrate the ability to construct a differential diagnosis in patients presenting with signs and symptoms related to rheumatologic diseases and to outline further testing necessary to establish the correct diagnosis.
 - B. 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), counseling, rehabilitative medicine, and, when necessary, surgical or other consultation. The fellow should be able to explain the rationale and the risks/benefits for the treatment plan.
 - **Implement Treatment** - The fellow should be able to:
 - A. Demonstrate a working knowledge of clinical pharmacology: 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.
 1. Nonsteroidal anti-inflammatory drugs and adequate gastroprotection
 2. Glucocorticoids: topical, intraarticular, systemic
 3. Disease modifying antirheumatic drugs:

- a. oral agents: methotrexate, hydroxychloroquine and other antimalarials, sulfasalazine, leflunomide,
 - b. parenteral biological response modifiers including inhibitors of TNF α , IL-6, IL-1, IL-12/IL-23, IL-23, IL-17 and other cytokines and immune based therapies such as CTLA4Ig, anti-CD20, anti-B-lymphocyte stimulator
 - 4. Cytotoxic drugs: azathioprine, cyclophosphamide
 - 5. Immunomodulators: cyclosporine, mycophenolate mofetil, tofacitinib, baricitinib, upadacitinib, apremilast
 - 6. Gout drugs: colchicine, allopurinol, sulfapyrazone, probenecid, febuxostat, pegloticase
 - 7. Antibiotic therapy for septic arthritis, Lyme disease
 - 8. Medications and neutraceuticals for osteoporosis: calcium, vitamin D, bisphosphonates, SERMs, recombinant PTH, PTHrP, RANKL inhibitors, sclerostin inhibitors.
- B. Demonstrate knowledge of other (including experimental or unlabeled) therapies: plasmapheresis, intravenous immunoglobulin, myeloablative therapy and immune reconstitution including stem cell transplantation
- C. Understand the indications for and demonstrate competence in arthrocentesis. The fellow should understand the anatomy, precautions and potential adverse sequelae of arthrocentesis and demonstrate competency in obtaining synovial fluid from diarthrodial joints, bursae and tenosynovial structures with adequate informed consent.
- D. Understand pain assessment and pain management:
- 1. Methods of pain assessment including visual analog scale scores, pain questionnaires
 - 2. Non-pharmacological modalities of pain management including exercise, cognitive behavioral therapy, acupuncture and others.
 - 3. Pharmacological therapy including:
 - a. Immunosuppressive and anti-inflammatory management of underlying rheumatic disorder.
 - b. Analgesic agents including acetaminophen, nonsteroidal anti-inflammatory agents and narcotic analgesics.
 - c. Muscle relaxants including cyclobenzaprine, carisoprodol, methocarbamol, baclofen, metaxalone
 - d. Antidepressants including duloxetine, milnacipran, tricyclics and other SSRIs
 - e. Pain modifiers such as gabapentin, pregabalin
- E. Understand changes required in patient management should the rheumatology patient become pregnant; this should include pre-pregnancy counseling about ramifications

- of becoming pregnant on the disease process, the use of medications before and during pregnancy and in the postpartum period.
- F. 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.
 - G. Understand indications for surgical and orthopedic consultation in acute and chronic rheumatic diseases.
 - H. Pre- and Post-operative Management of the rheumatic disease patient:
 - 1. Understand indications for surgical and orthopedic consultation in acute and chronic rheumatic diseases.
 - 2. Understand perioperative evaluation, appropriate referral and medication adjustments.
 - 3. Rehabilitation of the rheumatic disease patient after a surgical or orthopedic procedure, as well as aspects of postoperative medical management pertaining to the rheumatologic condition.
 - I. Understand complementary and alternative medical practices including diet, nutritional supplements, antimicrobials, acupuncture, topical therapeutic agents, homeopathic remedies, and others.
 - J. Evaluate patients with fractures or low bone mass for need for treatment
- **Reassessment and patient follow up** - The fellow 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.

Evaluation Methods

- Faculty performance rating – with regard to patient care
- Chart review – for patient care, drug prescribing, or outcomes
- Mini Clinical Evaluation Exercise (mini-CEX)
- 360 degree evaluation
- Patient survey
- Clinical note review
- Portfolio review

Suggested Reading List and Resources

1. American College of Rheumatology educational materials and resources including CARE modules, Image Bank, Publications/Journals (www.rheumatology.org); digital and printed research articles available through Dana Medical Library.

3. PRACTICE –BASED LEARNING AND IMPROVEMENT

Definition:

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.

The practice of rheumatology entails the assessment and treatment of patients with clinical disorders that are often complex with regard to the variable organ systems involved, variations in musculoskeletal and immune system biology, and impact upon patient lifestyle and livelihood. This complexity and the rapid advances in understanding of both disease pathogenesis and treatment of the rheumatic diseases demands that the rheumatologist continually evaluate and improve the quality of their care in the context of their own clinical practice. The development of skills in self-directed, reflective learning and practice improvement will facilitate the delivery of state-of-the-art, evidence-based patient care that maximizes the likelihood for successful clinical outcomes.

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:

- **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.

- **Self-evaluation of performance**

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

- **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 behavior.

Methods for Acquisition

- Clinical experience in a supervised, mentored clinical setting
- Independent study - recommended textbooks, journal articles and other digital resources
- Faculty-facilitated group discussions and tutorials
- Faculty role modeling

- Interactive case-based discussions
- Systematic chart review of their own patients
- Preparation of and reflection upon portfolios
- Presentations to faculty, staff, colleagues, students and lay audiences
- Participation in individual or group quality improvement projects

Performance Markers

- **Independent learning** - the fellow should be able to:
 - A. Utilize information technology to search, retrieve, and interpret medical information relevant to the care of patients with rheumatic disease from sources such as:
 1. Peer-reviewed clinical journal articles
 2. Clinical case reports
 3. Internet-based resources such as Up-To-Date and PubMed
 4. Clinical performance guidelines published by the ACR and other groups
 5. Conversations with colleagues and peers
 6. CME activities including attendance at national and regional professional society and medical meetings
 - B. Critically evaluate and interpret the medical literature using knowledge of clinical study methodology, statistics and methods of health services research.
 - C. Apply learned concepts and conclusions from studies and case reports to the care of individual patients.
 - D. Facilitate the learning of students and other health care professionals.
- **Self-evaluation of performance** - the fellow should be able to use a systematic approach, such as a chart review, to analyze own practice and identify learning or practice improvement needs. Maintaining a portfolio is part of this process.
- **Incorporation of feedback into improvement of clinical activity** - the fellow should be able to:
 - A. Demonstrate the ability to improve own practice based upon specific feedback and learned concepts.
 - B. Assess the impact of practice improvements on the care of own patients.
 - C. Implement global quality improvement measures in own practice.

Evaluation Methods

- Faculty performance rating - with regard to demonstration of reflective learning in clinical venues.
- Review of fellow presentations, portfolio-based presentations, and journal article reviews related to practice-based learning and improvement.

- Portfolio review - with respect to fellows' narratives of critical incidences or other experiences (usually accompanied by reflection on the event), and practice improvement.

Suggested Reading List and Resources

American College of Rheumatology Resources (www.rheumatology.org)

[Practice-based Learning and Improvement: ACGME Core Competencies \(nejm.org\)](http://www.nejm.org)

4. SYSTEMS-BASED PRACTICE

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

The increasing complexity and diversity of health care delivery systems presents both challenges and opportunities for the practice of rheumatology. Knowledge of the nature and variety of the external and internal systems that can impact clinical practice and the effective utilization of that knowledge to positively impact patient care is an essential skill. Fellow competence in such systems-based practice "...includes an understanding of how their own practices affect others, and knowing how to partner with others to improve health care"¹.

The knowledge base of systems-based practice comprises the advantages and disadvantages of different health care systems that impact patients with rheumatic disease. Some of these include the academic system in which rheumatology fellows are training, the various private and public health care delivery systems, the governmental agencies and programs that regulate these systems, the volunteer, private and governmental agencies that are available to educate and assist patients, the bureaucracy faced by disabled patients negotiating these systems and the social and economic burden of chronic rheumatic diseases. The goal of the systems-based practice curriculum is to enhance the ability of rheumatology fellows to positively influence patient care by effectively utilizing these internal and external resources, to serve as effective advocates for their patients, and to provide cost-effective patient care. In some cases this may also mean identifying and organizing change in the local systematic problems that lead to inferior patient care.

These two major aspects of systems-based practice (systems knowledge acquisition and systems utilization) are already incorporated in rheumatology training programs. The purpose of the systems-based practice curriculum is to clarify the components of systems-based practice, describe how and where the knowledge is acquired, set benchmarks of performance expected of the fellows, and describe the tools used to measure that performance.

Essential Components

- **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)

- **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 nurses, physiatrists, orthopedists and allied health professionals available within the local healthcare system. Partners also include outside volunteer agencies, both locally and nationally, such as the American College of Rheumatology, the Arthritis Foundation, the disease-specific foundations (Lupus, Scleroderma, Ankylosing Spondylitis, etc.), the National Institute of Arthritis, Musculoskeletal and Skin Diseases (NIAMS) and pharmaceutical companies that have specific patient-related initiatives. Other agencies that impact on the practice of rheumatology include the American Medical Association (AMA), the Food and Drug Administration (FDA) and the Center for Medicare and Medicaid Services (CMS).

- **Advocacy for the patient:** the importance, opportunities and limits of patient advocacy

This advocacy might consist of assisting patients with applications for disability, completing preauthorization documents for the use of certain medications and appealing to insurance companies and other third-party payers with respect to denial of certain treatments, benefits and claims. In addition, obtain assistance for patients by utilizing community resources (e.g. patient advocacy and the financial department of UVM Medical Center, co-payment assistance programs supplied by pharmaceutical companies).

- **Cost-effective health care:** the principles of cost allocation and resource management within the external (state, national) and local systems

This includes a knowledge of the cost and availability of certain drugs (and unavailability of others) on the hospital's formulary, the mechanisms by which compensation (by CMS and other carriers) is dependent upon the delivery of various levels of service to patients and the methods in place for Quality Review of inpatient and outpatient practice patterns. The utilization of evidence-based cost-conscious strategies for the diagnosis and treatment of patients with rheumatic diseases is paramount. Awareness of and involvement with "choosing wisely" or high value care campaigns is also important.

Methods for Acquisition

- Clinical experience in a supervised, mentored clinical setting
- Didactic teaching - conferences, lectures, or discussions that highlight particular systems-based practice issues, including multidisciplinary conferences related to individual patients
- Faculty-facilitated group discussions and tutorials used to identify systematic problems in-patient care delivery
- Independent reading specifically related to systems-based practice issues
- Preparation of portfolios. Appropriate portfolio entries might include:
 - Documentation of instances of leadership in the multidisciplinary management of complicated patients, of utilization of outside resources for patient care, of patient advocacy.
 - Participation in a project to modify and improve the patient medical record system.
 - Developing a system that would improve access for patients to timely appointments in the outpatient clinic.
 - Outpatient records survey for compliance with evidence-based diagnostic or therapeutic guidelines and development of strategies to correct deficiencies, e.g. laboratory monitoring of patients on DMARDs, TB testing before TNF antagonists.
- Participation in individual or group quality improvement projects

Performance Markers

- **Systems:** The fellow should be able to:
 - A. Demonstrate knowledge about how different health care delivery systems affect the management of patients with rheumatic diseases.
 - B. Practice management: be familiar with types of practice, equipment, insurance, economics, personnel, ethical aspects, quality assurance, and managed care issues relating to the practice of rheumatology.
 - C. Identify the strengths and weaknesses of the system in which they are training and practicing. They should also demonstrate the ability to develop strategies to overcome systematic problems they have identified, and/or QI projects to improve it.
 - D. Understand the influence on rheumatology of the American Medical Association, Food and Drug Administration, CMS and other governmental agencies involved in health care legislation, and peer review organizations.
- **Partners** – The fellow should be able to utilize multiple providers and resources as needed for optimal patient care.
 - A. Understand the rheumatologist's role as well as when to consult other health professionals (pharmacist, physiatrist, nurse practitioner, visiting nurse, physical therapist, occupational therapist, podiatrist, social worker, vocational rehabilitation

- counselor, psychologist, others) in the outpatient and inpatient rehabilitation of patients with rheumatic diseases.
- B. Demonstrate the ability to educate patients about outside resources that might be of assistance to their physical, emotional and financial well-being. Examples of these external resources include the American College of Rheumatology patient information, Arthritis Foundation self-help groups, Lupus Foundation support groups and pharmaceutical company sponsored financial aid programs.
- **Advocacy**
 - A. The rheumatology fellow should demonstrate the ability to act as an effective advocate for quality care for their patients in a variety of situations, such as dealing with insurance companies and HMO's, pre-authorizations for medications, disability claims, etc.
 - B. The fellow should demonstrate the ability to assist patients in dealing with health system complexities.
 - **Cost effective care**
 - A. The fellow should be aware of the cost burden of the medications they prescribe, rheumatologic lab tests they order and commonly used diagnostic tests and procedures.
 - B. The fellow should demonstrate a commitment to the practice of appropriate evidence-based and cost-conscious patient care.

Evaluation Methods

- Faculty performance rating - with regard to demonstration of effective systems-based performance markers.

An example would be an assessment of the fellow's performance in assembling and leading multidisciplinary health care teams in the management of inpatients and outpatients. This might involve directing patient management with social work, physical and occupational therapists, rehabilitation medicine specialists, orthopedics, and/or geriatrics.
- Patient survey - with components that specifically address advocacy issues and cost effective health care delivery.
- 360 evaluations
- Portfolio review - for documentation of systems-based practice performance markers, including QI projects.

Suggested Reading List and Resources

1. Choosing Wisely Campaign, ABIM
<https://www.choosingwisely.org>

2. American College of Rheumatology Focus on Patient Care, Choosing Wisely
<https://www.choosingwisely.org/wp-content/uploads/2015/02/ACRheum-Choosing-Wisely-List.pdf>
3. [Systems-based Practice: ACGME Core Competencies \(Part 4 of 7\) \(nejm.org\)](https://www.nejm.org/doi/full/10.1056/NEJMe1707501)

5. INTERPERSONAL AND COMMUNICATION SKILLS

Interpersonal and communication skills are essential for the formation of a desirable and effective physician-patient relationship. The complexity of most of the rheumatic diseases, as well as the increasingly complicated treatment regimens, require a working partnership between patient and physician, and often between physician and the patient's family. In addition to improved patient satisfaction, confidence and understanding, such working partnerships promote medical compliance. Effective physician and allied health care professional collegial relationships are also dependent upon these skills. The ability to properly document a patient's medical care as well as work in a multidisciplinary manner with colleagues, staff and other allied health professionals requires excellent interpersonal and communication skills.

Definition

Interpersonal and communication skills that result in the effective exchange of information and collaboration with patients, their families, and other health professionals.

Essential Components:

- **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.

- **Understanding and incorporating the perspectives of others**

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. There should be awareness of and sensitivity to psychological, educational, cultural and socio-economic differences as well as language barriers that impact patient-provider interaction and patient's ability to manage their health care. Appreciating other points of view of colleagues and allied health professionals is essential when working as part of a health care team.

- **Providing Information**

Communication regarding disease causation, diagnosis and treatment is only as effective as the ability of the recipient to understand the information. Effective explanation therefore requires that the physician communicate by writing or by speaking in a manner that is clear and understandable.

- **Trust and respect**

Establishment of trust with patient and patient's family and respecting their opinions is important. Behaving in a respectful manner with colleagues and staff also establishes good working relationships that enhance patient care.

Methods of Acquisition

- Clinical experience in a supervised, mentored clinical setting
- Faculty role modeling
- Independent reading
- Faculty-facilitated group discussions and tutorials
- Interactive case-based discussions
- Systematic chart review of their own patients
- Presentations to peers and lay audiences
- Participation in quality assurance/improvement initiatives

Performance Markers

- **Gathering information** - the fellow should be able to (either via direct communication or via communication with others (e.g. friend, family member, interpreter.):
 - A. Use effective verbal, nonverbal, listening, questioning and explanatory skills to obtain a complete and accurate history
 - B. Obtain properly informed consent.
- **Understanding and incorporating the perspectives of others** - the fellow should be able to:
 - A. Reliably and accurately communicate the patient's and their family's views and concerns to others.
 - B. Interact with patients, colleagues and staff in an empathic, respectful and understandable manner.

- **Providing information** - the fellow should be able to:
 - A. Write clear and effective consultations in the medical record and in letters to referring physicians.
 - B. Work effectively with colleagues and peers as a member or leader of a health care team.
 - C. Clearly explain benefits and risks of treatment.
 - D. Display effective teaching skills to colleagues, staff and patients.
- **Trust** - the fellow should be able to create and maintain an effective therapeutic and ethically sound relationship with patients, colleagues and staff over time.

Evaluation Methods

- Faculty performance rating – with respect to communication skills and interpersonal relations
- Internal patient surveys - with components that specifically address fellow's interpersonal skills
- Press-Ganey survey data
- Mini-CEX

Suggested Reading List

1. [ACGME Core Competencies: Interpersonal and Communication Skills \(nejm.org\)](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2729222/)

6. PROFESSIONALISM

Professionalism is one of the foundations of the practice of medicine and is frequently an inherent character trait in a well-rounded physician. By virtue of their prior medical school and internal medicine training, rheumatology fellows have already attained a substantial level of professionalism, which can be refined during the fellowship training period. The range of current therapies, including biologic agents, and the complexity of many severe or life-threatening rheumatic diseases that require potentially toxic chemotherapeutic agents, place rheumatology fellows in close contact with referring providers, subspecialty consultants, allied health care providers, and hospital and health insurance administrators during the care of their patients. Fellows also interact with patients from a wide range of cultural and socioeconomic backgrounds. In addition, fellows are increasingly targeted by the pharmaceutical industry in an attempt to influence prescribing habits at an early phase of their careers. A substantial level of professionalism is thus required to maintain the balance required by an effective rheumatologist.

Definition

Professionalism is manifested through a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity to patients of diverse backgrounds.

Essential Components

- **Primacy of patient interest**

Placing the interest of the patient before all other external interests is the most fundamental aspect of the medical profession and forms part of the unwritten contract in the patient-physician relationship. This primacy also implies patient autonomy in the determination of treatment.

- **Physician autonomy in medical decision making**

While an increasing array of bureaucratic, administrative and economic forces continue to limit physician autonomy, some degree of autonomy at the level of medical decision making must be preserved by the physician in order to maintain the primacy of interest.

- **Physician responsibility and accountability**

The practice of medicine incurs responsibility and accountability to:

- A. Patients
- B. Colleagues
- C. Society
- D. Self

- **Humanistic qualities and altruism**

Physicians should provide compassionate care and serve all patients with respect to their cultural, emotional, spiritual and social needs.

- **Ethical behavior**

This includes being trustworthy and cognizant of conflicts of interest. Integrity as a physician and consultant rheumatologist must pervade all components of professionalism.

Methods for Acquisition

- Professionalism can be fostered throughout the fellowship training period beginning with an emphasis on the essential components of professionalism and the specific performance goals at the beginning of the fellowship.
- Faculty role modeling. A culture of professionalism in the training environment is created by mentors, role model clinicians, and a culture that demonstrates the values of professionalism and a spirit of collegiality in placing the needs of patients first, maintaining a commitment to scholarship, helping colleagues meet their responsibilities, establishing a commitment to continuous quality improvement, and being responsive to society's healthcare needs. A commitment to professional ethics is demonstrated by establishing and maintaining a high standard of moral and ethical behavior within the clinical setting in the care of patients, in the education of residents, in conducting research, and in interacting with medical device and pharmaceutical companies and funding organizations.
- Participation in professional activities. Fellows should be given the opportunity to participate in community service, professional organizations, and institutional committee activities.
- Clinical experience in a supervised, mentored clinical setting - to provide experiential learning opportunities to observe and practice the key components of professionalism. Faculty can be encouraged to highlight pertinent professional issues with their fellows at the bedside, at weekly conferences, and in the outpatient clinic setting.
- Didactic teaching - conferences, lectures, or discussions devoted to topics of professionalism. These might also include instructive case conferences using case scenarios to highlight professionalism and ethical issues.
- Faculty-facilitated group discussions. Case vignettes or journal club discussions of issues of professionalism that provide the opportunity for frank discussions between faculty and fellows about these issues.
- Independent reading. Reading assignments of peer reviewed publications and specialty organization publications from the AMA, ABIM, ACP, ACGME and web-based discussions on professionalism.

Performance Markers

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

- **Patient Primacy** - the fellow should be able to:
 - A. Demonstrate responsiveness to the needs of patients that supersedes self-interest.
 - B. Demonstrate sensitivity and attention to the interests of own patients in formulation of treatment plans.
 - C. Demonstrate the ability to provide autonomy to their patients to decide upon treatment once all treatment options and risks have been outlined for them.
 - D. Provide and obtain key elements of informed consent in an understandable manner for therapeutic interventions and clinical research endeavors.

- **Physician Autonomy** - the fellow should be able to demonstrate independent medical decision-making skill.
- **Physician accountability and responsibility including:**
 - A. Demonstrates timeliness and reliability in clinical care of patients, including completion of medical records and in responding to patient calls and requests.
 - B. Reliably follows through on duties and clinical tasks, including timely response to calls from colleagues. Exhibits regular attendance and active participation in divisional and departmental educational and administrative activities and scholarly endeavors.
 - C. Strives for excellence in care and scholarly activities as a rheumatologist.
 - D. Works to maintain personal physical and emotional health and demonstrates an understanding of and ability to recognize physician impairment in self and colleagues.
- **Humanistic qualities and altruism**
 - A. Exhibits empathy and compassion in physician-patient interactions and is sensitive to patient needs for comfort and encouragement.
 - B. Is courteous and respectful in interactions with patients, staff and colleagues.
 - C. Treats all patients with respect regardless of race, gender, ethnic, religious or socioeconomic background.
 - D. Provides equitable care to all patients.
 - E. 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.
- **Ethical behavior**
 - A. Demonstrates a commitment to ethical principles relating to provision and withholding of clinical care, confidentiality of patient information and business practices.
 - B. Is trustworthy in following through on clinical questions, laboratory results, and other patient care responsibilities.
 - C. Recognizes and addresses actual and potential conflicts of interest including pharmaceutical industry involvement in their medical education and program funding and guarding against this influencing their current and future prescribing habits.
 - D. Demonstrates integrity in reporting clinical and research findings to supervisors and colleagues.

Evaluation Methods

It is very important to utilize measures that accurately evaluate professionalism. Providing feedback to fellows will allow constructive or corrective action to be taken in the final phase of

their medical education prior to embarking on their career when, although frequently proceeding without any specific supervision, they remain accountable to their patients, society, their peers and themselves.

- Faculty performance rating - with regard to demonstration of professional behavior
- 360 evaluations – regarding professional attitudes and behavior. Fellows may also fill out self-evaluations in the sphere of professionalism and compare it to responses from others for self-reflection and self-improvement.
- Portfolio review – which should include a section to include reflective entries on issues of professionalism such as difficult patient and peer encounters, conflicts of interest, and barriers to providing equitable care.
- Patient survey - with components that specifically address fellow's professionalism.

Suggested Reading List and Web Links

1. [ACGME Core Competencies: Professionalism and Quality Care. NEJM Knowledge+](#)

These specific goals are further amplified as follows:

1. **Competence in patient care and acquisition of medical knowledge for a rheumatologist are defined as:**
 - a. To act as provider of specialty rheumatologic care to patients in the outpatient setting, the inpatient setting, the emergency department, and the intensive care setting; as the consultant to other internists or non-internists in the acute inpatient setting, the ambulatory clinic, the emergency department, and the intensive care setting; as the leader of a multidisciplinary health care team, i.e. rehabilitation facilities or home health care.
 - b. The knowledge to treat the common and uncommon diseases found in the practice of rheumatology. To develop the understanding of the principles, indications, contraindications, risk, cost and expected outcome of the various treatments. To recognize the need for appropriate consultation and the reasonable expectations from a consultant.
 - c. The performance and/or interpretation of diagnostic and therapeutic procedures common in the practice of rheumatology. This skill should include the understanding of the principles, indications, contraindications, risk, cost and expected outcome of these procedures.
2. **Interpersonal and Communication Skills**
 - a. The development of appropriate communication skills that result in effective information exchange with patients, their families and professional associates.
 - b. Be able to create and sustain a therapeutic and ethically sound relationship with patients.

- c. Be able to use effective listening skills and elicit and provide information using effective nonverbal, explanatory, questioning and writing skills.
- d. Work effectively with others as a member or leader of a health care team or other professional group.

3. Professionalism

- a. Demonstrate a commitment to excellence and on-going professional development.
- b. Demonstrate a commitment to carrying out professional responsibilities, adherence to ethical principles, and sensitivity and responsiveness to patients' culture, age, gender, and disabilities.
- c. Demonstrate respect, compassion and integrity.
- d. Develop responsiveness to the needs of patients and society that supersedes self-interest.
- e. Develop a commitment to ethical principles pertaining to provision or withholding of clinical care, confidentiality of patient information, informed consent and business practices.

4. Practice-Based Learning and Improvement

- a. Fellows must be able to investigate and evaluate their patient care practices, appraise and assimilate scientific evidence, and improve their patient care practices.
- b. Fellows are expected to analyze practice experience and perform practice-based improvement activities using a systematic methodology.
- c. Fellows must be able to locate, appraise and assimilate evidence from scientific studies related to their patients' health problem, and obtain and use information about their own population of patients and the larger population from which their patients are drawn.
- d. Fellows must possess a level of skill and expertise in research. All fellows must be capable of demonstrating competence in the understanding of the design, implementation and interpretation of research studies; specifically including research methodology, critical interpretation of data, critical interpretation of published research, and the responsible use of informed consent.
- e. Fellows must be able to use information technology to manage information and access information to support their own education and facilitate the learning of other health care professionals.

5. Systems-Based Practice

- a. Fellows must demonstrate an awareness of and responsiveness to the larger context and system of health care and the ability to effectively call on system resources to provide care that is of optimal value.

- b. Fellows are expected to understand how their patient care and other professional practices affect other health care professionals, the health care organization, and the larger society and how these elements of the system affect their own practice.
- c. Fellows must know how types of medical practice and delivery systems differ from one another, including methods of controlling health care costs and allocating resources.
- d. Fellows should be able to practice cost-effective health care and resource allocation that does not compromise quality of care.
- e. Fellows should be able to advocate for quality patient care and assist patients in dealing with system complexities.
- f. Fellows should know how to partner with health care managers and health care providers to assess, coordinate, and improve health care and know how these activities can affect system performance.

Specific Objectives:

At the completion of the rheumatology fellowship training, the fellow should meet the following specific objectives as they pertain to each of the specific goals of the curriculum:

1. Clinical competence in a variety of clinical settings:
 - a. All fellows should meet those specific clinical objectives for the majority of diseases seen in the practice of rheumatology, including the uncommon and complicated diseases.
 - b. Demonstrate proficiency as a consultant and/or leader of a multidisciplinary health care team.
 - c. Possess communication skills that will allow the fellow to perform as the health care team leader with peers and professionals.
 - d. The clinical proficiency of the fellow will be at a level where they not only demonstrate their proficiency, but also are capable of teaching these skills to trainees at junior levels.
 - e. Qualities of professionalism and humanistic skills will be demonstrated at a level, which serves as a model for trainees at a junior level.
 - f. All fellows should meet specific research objectives outlined for the fellowship program and have produced sufficient research work to enable them to submit their work for peer reviewed presentation, scientific meetings, manuscript submissions, or grant applications for research funding.
2. Life-long learning:
 - a. Fellows will demonstrate proficiency at attending and participating in conferences, and coordinating conferences, conference topics, and conference schedules.

- b. Fellows will be competent at teaching in their interaction with trainees in junior levels of training. This may include supervised teaching interactions with junior-level fellows, residents, and medical students.

Methodology for Teaching Rheumatology

In order to achieve the goals and objectives for the fellowship program, the following experiences have been established for the purpose of teaching Rheumatology fellows. These include: A) the inpatient rheumatology experience, B) the ambulatory rheumatology experience, C) ambulatory rotations with other clinical subspecialties, D) didactic conferences, E) a research experience, F) continuing medical education and society participation, and G) development of teaching skills.

A) The inpatient rheumatology experience.

The fellows assigned to this rotation are responsible for organizing the activities of this service. This primarily includes the supervised evaluation of inpatient consultations and continued follow up of these patients during their hospitalization. Essential in this role is the development and refinement of clinical evaluation skills of patients with rheumatic diseases. These skills include the development of appropriate differential diagnosis, assessing the need for hospitalization, diagnostic evaluation strategies and treatment plans. Essential in this rotation will be developing skills in providing consultation services, to include communicating with the referring physicians and ensuring support for continuing care of the patients' rheumatic condition. A fellow will be called upon to perform literature research on topics appropriate to the case at hand. They will participate actively in the teaching activities of the consultation team. Through this experience the fellow will also develop a comprehensive understanding of the indications, contraindications, techniques, complications of arthrocentesis as well as the interpretation of results from this procedure. The fellow will also acquire the knowledge of and skill in educating patients about the procedure and in obtaining informed consent. Faculty supervision is required in developing these skills.

B) The ambulatory rheumatology experience.

All fellows will be required to maintain at a minimum the equivalent of a full day clinic per week for the entire duration of the fellowship (24 months) for patients with rheumatic diseases. A more usual schedule for the first year is four to five half-days per week in the rheumatology outpatient department and three to four half-days per week in the second year. This experience will continue with progressive responsibility through the fellowship and will be appropriately supervised by dedicated attending faculty members.

The goal of this experience will be for fellows to gain expertise in the outpatient evaluation and management of rheumatic problems. The experience provides an opportunity to develop an understanding for the natural history of these conditions over an extended period of time.

C) Interdisciplinary interactions.

The fellow will be provided experience with other disciplines whose expertise is required in the care of patients with rheumatic diseases. These disciplines include: (1) pediatric rheumatology (clinic), (2) endocrinology (metabolic bone disease clinic), (3) pulmonology (combined ILD conferences), (4) neuroimmunology-rheumatology multidisciplinary clinic, (5) dermatology-rheumatology multidisciplinary clinic, (6) nephrology and pathology (TBL on lupus nephritis), and (7) radiology (Radiology Rounds). The goal of these experiences is for the fellow to appreciate the approach to the specific conditions that relate to rheumatic disorders within these subspecialties. This interdisciplinary interaction may occur in the form of a clinical rotation, multidisciplinary conference, or didactic. Clinical experiences will be under the direction of attending physicians in the respective subspecialty who participate fully in the educational goals of the rotation.

D) Didactic conferences.

Conferences will be held on a regularly scheduled basis with attendance required of all fellows and divisional faculty. Fellows, faculty, students and house staff will attend a weekly conference. The content of the weekly conference will rotate between clinical presentations/discussion, basic science topics, and literature reviews (journal club). A radiology conference will be held with faculty from the Department of Radiology on alternate months. The first-year fellow will attend an introductory conference for fellows at UPenn in July of their first year. A series of didactic presentations designated the Core Lecture Series may be presented for all fellows in the Department of Medicine. During the initial orientation to UVM Medical Center, fellows receive talks related to the resources available, ethics, compliance, physician impairment and fatigue and stress management. A monthly staff meeting for all outpatient providers, nursing staff, and ancillary personnel is scheduled to discuss clinic operations and problems, Quality Assurance programs, issues related to patient communication and confidentiality, compliance issues, clinical studies and educational responsibilities. A monthly faculty and fellows meeting is scheduled to discuss a variety of subjects including quality improvement programs and promotion of teaching and other academic skills. All fellows attend the day-long American College of Rheumatology (ACR) Review Course which is part of the annual ACR meeting. Fellows also attend regional meetings including the ACR State of the Art Clinical Symposium. Team Based Learning on lupus nephritis and renal pathology will be available.

E) Research experience.

An active research component will be included within the fellowship training program. Exposure to divisional research and scholarly quality improvement projects will be initiated at the beginning of the fellowship to allow the fellow adequate insight into the areas of active or potential research and QI with selection of a faculty member to serve as a mentor for the remainder of the fellowship training program. The immediate goal of the research experience is for the fellow to learn sound methodology in designing and performing research studies and QI projects and the correct interpretation and synthesis of data. During this phase of training, the fellow will work under close guidance of their mentor.

F) Continuing medical education and society memberships.

In addition to participating in the organized didactic conferences established within the fellowship program, fellows are encouraged to become members of the American College of Rheumatology. Participation in the continuing medical education activities of professional organizations will help foster the standards of professionalism and augment the process of lifelong learning.

G) Experience in developing teaching skills.

The program will provide an environment for the fellow, which fosters and highly regards the activities of teaching. This includes the education of medical students, residents, fellows, colleagues and other allied health personnel and also the education of patients. Development of these skills requires the fellow to receive instruction and feedback in counseling and communication techniques. This latter training will include cultural, social, behavioral and economic issues such as confidentiality of information and indications for life support systems.

The Methods of Evaluation:

In order for the training program to assess its ability to meet its goals and objectives, the program has an evaluation process, including formative and summative evaluations of the fellows, and an evaluation process of the program and the faculty. The evaluation instruments listed below are used to assess the fellows' progress in developing competency in clinical care, acquisition of knowledge, communication skills, professionalism, practice-based and systems-based learning.

Instruments Used in the Evaluation of Fellows

- Rotation evaluation forms
- Mini Clinical Evaluation Exercise (mini-CEX)
- Annual American College of Rheumatology (ACR) In-Training Exam (ITE)
- Patient surveys
- Procedure log and evaluation
- Staff (360 degree) evaluation forms
- Mentored research evaluation
- Evaluation of presentations
- Portfolio review

Formative Evaluation of the Fellows

Formal formative evaluations will occur at regular intervals. Outpatient rotation evaluations are performed every 6 months. For each inpatient rotation, the supervising faculty member will complete an evaluation form. Procedure evaluations are completed after procedure is performed. All faculty must review their impressions directly with the fellow. All completed evaluation forms are returned to the Program Director for review and placed in the fellow's permanent file. Fellows are regularly evaluated using the mini-consultation exam (CEX). The results of the CEX are discussed with the fellow, reviewed by the Program Director and placed in the fellow's permanent file.

360° evaluation forms, patient surveys, and evaluations of conference presentations are sent to the Program Director. If areas needing improvement are noted, this information is immediately brought to the attention of the fellow. If the evaluations are satisfactory, they are placed in the fellow's file for review at the semi-annual meeting with the Program Director.

During the research phase of training, the program director reviews research progress as part of the portfolio review, and this is placed in the fellow's permanent file.

All completed evaluation forms submitted to the Program Director are immediately reviewed upon their receipt. Any forms that contain a rating less than satisfactory in any category will require an immediate conference between the fellow and the Program Director to identify causes for the poor performance and identify means for improving the deficiency.

All fellows will be required to keep a procedures log, identifying the procedure, date, indication, outcome, complication, performance assessment and name of supervising physician. A copy of this log will be provided to the Program Director semi-annually for placement in the fellow's permanent file.

Summative Evaluation of the Fellows

At least semi-annually, all fellows confer individually with the Program Director to review all of their evaluations and provide an overview of progress, and areas that require additional effort or attention. A written summary of this evaluation session is placed in the fellow's permanent file. Milestones will be used to assess fellow performance and for reporting to the ACGME.

Any adverse judgments or evaluations regarding the fellow's level of performance or competence will first be directed to the Program Director. If the fellow feels that this is not to their satisfaction, then the grievance can be addressed to the Designated Institutional Official of UVM Medical Center Graduate Medical Education (GME) and/or the GME Ombudsman according to established institutional policy.

Evaluation of the Faculty and Program

All fellows are required to complete an annual evaluation form of the faculty and the program and review these with the Program Director of another program to preserve anonymity. Evaluations are collected in a fashion to assure the anonymity of the fellow. Fellows are encouraged to maintain a high level of communication with the Program Director and faculty. Periodically, meetings will be established with the fellows and Program Director. These meetings can be used to disseminate information, receive timely feedback, etc. The feedback received during informal meeting, formal meetings, and the semi-annual evaluation form will be used to make programmatic changes. Fellows who have completed training will be sent a questionnaire requesting information on the strengths and weaknesses of the training program.

I have read and received a copy of this curriculum.

Signature

Date

SECTION II

KNOWLEDGE BASED LEARNING

The subspecialty of rheumatology includes a wide array of autoimmune, inflammatory, and degenerative diseases that affect the musculoskeletal and other organ systems. 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 form 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 practicing rheumatologist. Rheumatology fellows must also have practical understanding of the approaches and modalities used by other specialists and allied health professionals for the treatment of rheumatic diseases in order to manage the care of their patients effectively. Training programs must teach and emphasize the cognitive skills that are necessary to apply this detailed knowledge to problem solving for diagnosis, treatment and research of the rheumatic diseases.

Definition

Medical knowledge refers to the understanding of established and evolving biomedical, clinical, and cognate sciences, and to the application of this knowledge to patient care.

Essential Components

- **Basic Sciences**
 - A. Anatomy and biology of musculoskeletal tissues: for each tissue, understand the embryology, development, biochemistry and metabolism, structure, function, and classification.
 - 1. Connective tissue cells and components: fibroblasts, collagens, proteoglycans, elastin, matrix glycoproteins
 - 2. Joints and ligaments: diarthrodial joints, intervertebral discs, synovium, cartilage
 - 3. Bone: development, structure, cellular basis of turnover and remodeling, hormonal and cytokine regulation
 - 4. Muscle and tendons
 - 5. Blood vessels
 - B. Immunology
 - 1. Anatomy and cellular elements of the immune system

- a. Lymphoid organs: gross and microscopic anatomy, structure and function
- b. Organization of the immune system: innate and adaptive immune systems
- c. Specific cells: for each cell type, understand the ontogeny, structure, phenotype, function, and major activation markers/receptors.
 - 1) Lymphocytes: T cells and B cells (naive, memory, activated, regulatory)
 - 2) Antigen presenting cells: dendritic cells, monocytes and macrophages
 - 3) Natural killer cells
 - 4) Neutrophils and eosinophils
 - 5) Other cells: NKT cells, $\gamma\delta$ T cells, innate lymphocytes, mast cells, endothelial cells, platelets, fibroblasts

2. Immune and inflammatory mechanisms

- a. Antibody structure and genetic basis of antibody diversity
- b. Receptor/ligand interactions: activating and inhibiting receptors, signal transduction, complement receptors, Fc receptors, toll receptors, adhesion molecules
- c. Molecular basis of T cell antigen recognition and activation.
- d. B cell receptors: structure, function, antigen binding, effector functions
- e. Antigens: types, structure, processing, presentation, and elimination. Superantigens: types, site of binding, and effects on immune system
- f. Major histocompatibility complex: structure, function, nomenclature, and immunogenetics
- g. Major immune cell signaling pathways
- h. Complement/Kinin systems: structure, function, and regulation
- i. Acute phase reactants and enzymatic defenses
- j. Inflammasome components and activation.

3. Cellular interactions and immunomodulation

- a. Cellular activation and regulation: for each cell type, understand mechanisms of activation and suppression of function (e.g. T cell:B cell interactions via CD28:CD80/86, and checkpoint blockers, PD-1, Lag3).
- b. Cytokines: for each cytokine, understand the origin, structure, effect, site of action, metabolism, regulation, and gene activation.
- c. Immune cell trafficking; adhesion molecules, chemokines
- d. Inflammatory mediators: for each mediator, understand the origin, structure, effect, site of action, metabolism, and regulation.

4. Immune responses

- a. Antibody-mediated: opsonization, complement fixation, and antibody dependent cellular cytotoxicity
- b. Cell-mediated: cells and effector mechanisms in cellular cytotoxicity and granuloma formation

- c. IgE-mediated: acute and late - phase reactions
- d. Mucosal immunity: interactions between gut and bronchus-associated lymphoid tissue and secretory IgA
- e. Innate immune responses: natural killer cells, pattern recognition, interaction with adaptive responses
- f. Pathologic immune responses: Immune complex-mediated (physicochemical properties and clearance of immune complexes), graft versus host response, abnormal apoptosis

5. Immunoregulation

- a. Tolerance: mechanisms of central and peripheral tolerance, including clonal selection, deletion, and anergy
- b. Cell-cell interactions: help and suppression. Understand the collaboration among cells for control of the immune response.
- c. Idiotype networks: inhibition and stimulation

C. Purine and uric acid metabolism

- 1. Purine: biochemistry, synthesis, and regulation
- 2. Uric acid: origin, elimination, and physicochemical properties
- 3. Crystals: factors affecting formation, induction of inflammation
- 4. Purine pathway enzyme deficiencies and immunodeficiency: ADA, PNP

D. 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.

E. Neurobiology of Pain

- 1. Peripheral afferent nociceptive pathways
- 2. Central processing of nociceptive information
- 3. Mechanisms of action of drugs used for the treatment of neuropathic pain.
- 4. Biopsychosocial model of pain

F. Basic regulation of bone metabolism and calcium

• Clinical Sciences

A. Rheumatic Diseases

For each disease, understand the epidemiology, genetics, natural history, clinical expression including clinical subtypes, pathology, and disease pathogenesis.

1. Rheumatoid Arthritis
2. Seronegative spondyloarthropathies: ankylosing spondylitis, reactive arthritis, psoriatic arthritis, inflammatory bowel disease-associated arthritis, arthritis associated with acne and other skin diseases, SAPHO syndrome, and undifferentiated spondyloarthritides
3. Lupus erythematosus: systemic, discoid, and drug-related; antiphospholipid antibody syndrome, including primary APLS
4. Scleroderma: diffuse and limited systemic sclerosis, localized syndromes, chemical/drug-related
5. Other systemic connective tissue diseases: eosinophilic fasciitis, eosinophila-myalgia syndrome, Sjögren's syndrome, polymyositis and dermatomyositis, relapsing polychondritis, relapsing panniculitis, erythema nodosum, adult-onset Still's disease, overlap syndromes including mixed connective tissue disease, undifferentiated connective tissue disease
6. Vasculitides: polyarteritis nodosa, ANCA-associated vasculitis, giant cell arteritis/polymyalgia rheumatica, Takayasu's arteritis, systemic necrotizing vasculitis overlaps, Behcet's disease, hypersensitivity and small vessel angiitis, cryoglobulinemia, Cogan's syndrome
7. Infectious and reactive arthritides
 - a. Infectious arthritides: bacterial (nongonococcal and gonococcal), mycobacterial, spirochetal (syphilis, Lyme), viral (HIV, hepatitis B, hepatitis C, parvovirus, other), fungal, parasitic
 - b. Whipple's disease
 - c. Reactive arthritides: acute rheumatic fever, arthritis associated with subacute bacterial endocarditis, intestinal bypass arthritis, post-dysenteric arthritides, post-immunization arthritis, other gastrointestinal-associated arthropathies
8. Metabolic, endocrine, and hematologic disease associated rheumatic disorders
 - a. Crystal-associated diseases: monosodium urate monohydrate (gout), calcium pyrophosphate dihydrate deposition disease, basic calcium phosphate (hydroxyapatite), calcium oxalate
 - b. Endocrine-associated diseases: rheumatic syndromes associated with diabetes mellitus, acromegaly, hyperparathyroidism, hypoparathyroidism, hyperthyroidism, hypothyroidism, Cushing's disease
 - c. Hematologic-associated diseases: rheumatic syndromes associated with hemophilia, hemoglobinopathies, angioimmunoblastic lymphadenopathy, multiple myeloma
9. Bone and cartilage disorders
 - a. Osteoarthritis - primary and secondary osteoarthritis, chondromalacia patellae

- b. Metabolic bone disease: osteoporosis, osteomalacia, bone disease related to renal disease, CKD-MBD.
 - c. Paget's disease of bone
 - d. Avascular necrosis of bone: idiopathic, secondary causes, osteochondritis dissecans
 - e. Others: transient osteoporosis, hypertrophic osteoarthropathy, diffuse idiopathic skeletal hyperostosis, insufficiency fractures
10. Hereditary, congenital, and inborn errors of metabolism associated with rheumatic syndromes
- a. Disorders of connective tissue: Marfan's syndrome, osteogenesis imperfecta, Ehlers-Danlos syndromes, pseudoxanthoma elasticum, hypermobility syndrome, others
 - b. Mucopolysaccharidoses
 - c. Osteochondrodysplasias: multiple epiphyseal dysplasia, spondylepiphyseal dysplasia
 - d. Inborn errors of metabolism affecting connective tissue: homocystinuria, ochronosis
 - e. Storage disorders: Gaucher's disease, Fabry's disease, Farber's lipogranulomatosis
 - f. Immunodeficiency: IgA deficiency, complement component deficiency, SCID and ADA deficiency, PNP deficiency, others
 - g. Autoinflammatory syndromes including familial Mediterranean fever, Muckle-Wells Syndrome, tumor necrosis factor receptor-associated periodic syndromes (TRAPS), Schnitzler syndrome.
 - h. Others: hemochromatosis, hyperlipidemic arthropathy, myositis ossificans progressiva, Wilson's disease, others
11. Non-articular and regional musculoskeletal disorders
- a. Fibromyalgia
 - b. Myofascial pain syndromes
 - c. Axial syndromes: low back pain, spinal stenosis, intervertebral disc disease and radiculopathies, cervical pain syndromes, coccydynia, osteitis condensans ilii, osteitis pubis, spondylolisthesis/spondylolysis, discitis
 - d. Regional musculoskeletal disorders: in addition to bursitis, tendinitis, or enthesitis occurring around each joint, the fellow should be familiar with other disorders occurring at each specific joint site (e.g., shoulder-rotator cuff tear, adhesive capsulitis, impingement syndrome; wrist ganglions; trigger fingers and Dupuytren's contractures; knee synovial plicae, internal derangements, cysts; hallux rigidus, heel pain, and metatarsalgia; TMJ syndromes; costochondritis.
 - e. Biomechanical/anatomic abnormalities associated with regional pain syndromes: scoliosis and kyphosis, leg length discrepancy, foot deformities

- f. Overuse rheumatic syndromes: occupational, sports, recreational, performing artists
- g. Sports medicine: injuries, strains, sprains, nutrition, female athlete, medication issues
- h. Entrapment neuropathies: thoracic outlet syndrome, upper extremity entrapments, lower extremity entrapments
- i. Other: complex regional pain syndrome, erythromelalgia

12. Neoplasms and tumor-like lesions

a. Benign

- 1) Joints: loose bodies, fatty and vascular lesions, synovial osteochondromatosis, pigmented villonodular synovitis, ganglions
- 2) Tendon sheaths: fibroma, giant cell tumor, nodular tenosynovitis
- 3) Bone: osteoid osteoma, others

b. Malignant

- 1) Primary: synovial sarcoma, others
- 2) Secondary: leukemia, myeloma, metastatic malignant tumors
- 3) Malignancy-associated rheumatic syndromes: carcinomatous polyarthritis, palmoplantar fasciitis, Sweet's syndrome

13. Muscle diseases

a. Inflammatory: polymyositis, dermatomyositis, inclusion body myositis

b. Metabolic

- 1) Primary: glycogen storage diseases, lipid metabolic disorders, myoadenylate deaminase deficiency, mitochondrial myopathies
- 2) Secondary: nutritional, toxic, endocrine disorders, electrolyte disorders, drug-induced

c. Muscular dystrophies

d. Myasthenia gravis

e. Statin myopathy and myositis

14. Miscellaneous rheumatic disorders

- a. Amyloidosis: primary, secondary, hereditary
- b. Raynaud's disease
- c. Charcot joint
- d. Remitting seronegative symmetrical synovitis with pitting edema
- e. Multicentric reticulohistiocytosis
- f. Plant thorn synovitis

- g. Intermittent arthritides: palindromic rheumatism, intermittent hydrarthrosis
- h. Arthritic and rheumatic syndromes associated with: sarcoidosis, scurvy, pancreatic disease, chronic active hepatitis, primary biliary cirrhosis, drugs, and environmental agents
- i. Rheumatic disease in the geriatric population
- j. Rheumatic disease in the pregnant patient
- k. Rheumatic syndromes in dialysis patients
- l. IgG4-related disorders

B. Pediatric rheumatic diseases:

Some rheumatic diseases are similar in pathogenesis, presentation, clinical course, and treatment in both adults and children. These diseases (such as systemic lupus, scleroderma syndromes, the systemic vasculitides, and enteropathic arthritides) are not specifically addressed in this section. Other diseases or specific aspects of management that are unique or more prevalent in children are included in this outline of knowledge content. A supplementary section, providing more detailed information and a reading list, is provided in Appendix E.

1. Diagnose the rheumatic diseases that occur primarily in children, and know how they differ from the same, or similar, disease in adults.
 - a. Systemic juvenile idiopathic arthritis (Still's Disease)
 - b. Pauciarticular juvenile idiopathic arthritis
 - c. Polyarticular juvenile idiopathic arthritis
 - d. Juvenile spondyloarthropathy
 - e. Juvenile dermatomyositis
 - f. Kawasaki Disease
 - g. IgA Vasculitis (Henoch-Schonlein Purpura)
 - h. Acute rheumatic fever
 - i. Neonatal lupus syndrome
 - j. CINCA (NOMID)
 - k. PFAPA syndrome (periodic fever, aphthous stomatitis, pharyngitis, and adenitis)
2. Know the major sequelae or life-threatening complications of rheumatic diseases that occur primarily in children:
 - a. Systemic onset JIA
 - 1) Macrophage activation syndrome
 - 2) Cardiac tamponade

- b. Pauciarticular JIA
 - 1) Chronic uveitis
 - c. Juvenile dermatomyositis
 - 1) GI vasculitis
 - 2) Calcinosis
 - d. Kawasaki Disease
 - 1) Aneurysms of coronary and other arteries
 - e. IgA Vasculitis (Henoch-Schonlein Purpura)
 - 1) GI- intussusception, intestinal infarction
 - 2) Renal - chronic nephritis
 - f. Neonatal lupus syndrome
 - 1) Congenital heart block
 - 2) Thrombocytopenia
3. Know the appropriate treatments of the above childhood rheumatic disorders, and complications of treatment.
4. Recognize non-rheumatic disorders in children that can mimic rheumatic diseases:
- a. Infectious or post-infectious syndromes
 - 1) Septic arthritis and osteomyelitis
 - 2) Transient synovitis of the hip
 - 3) Post-infectious arthritis and arthralgia
 - 4) Post-viral myositis
 - b. Orthopedic conditions
 - 1) Legg-Calve-Perthes Disease and other avascular necrosis syndromes
 - 2) Slipped capital femoral epiphysis
 - 3) Spondylolysis and spondylolisthesis
 - 4) Patellofemoral syndrome
 - c. Non-rheumatic pain
 - 1) Benign limb pains of childhood (“growing pains”)

- 2) Benign hypermobility syndrome
 - 3) Pain amplification syndromes including complex regional pain syndrome
- d. Neoplasms
 - 1) Leukemia
 - 2) Lymphoma
 - 3) Primary bone tumors (especially osteosarcoma and Ewing's sarcoma)
 - 4) Tumors metastatic to bone (especially neuroblastoma)
- e. Bone and cartilage dysplasias, and inherited disorders of metabolism
- 5. Know aspects of rheumatic disease and treatments specific to children:
 - a. Disease effects on growth
 - 1) Accelerated or decelerated growth of limbs or digits affected by arthritis
 - 2) Altered growth of mandible in TMJ arthritis
 - 3) Short stature and failure to thrive
 - b. Regular surveillance for uveitis in JIA
 - c. Drugs
 - 1) FDA approved drugs for childhood rheumatic diseases
 - 2) Drug metabolism and dosing different from adults
 - d. Child-specific side effects of chronic corticosteroid treatment
 - 1) Growth retardation
 - 2) Delay of puberty
 - e. Physical and occupational therapy
 - 1) Exercises
 - 2) Splinting
 - f. Psychosocial and developmental issues
 - 1) Peer and sibling interaction
 - 2) Family adjustment
 - 3) School accommodations for disability
 - 4) School and recreational activities
 - 5) Transition to adulthood

C. Therapeutic modalities and strategies

1. Pharmacology: for each medication, 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.
 - a. Nonsteroidal anti-inflammatory drugs
 - b. Glucocorticoids: topical, intra-articular, systemic
 - c. Systemic antirheumatic drugs: antimalarials, sulfasalazine, hydroxychloroquine, methotrexate, leflunomide
 - d. Cytotoxic drugs: azathioprine, cyclophosphamide,
 - e. Immunomodulatory drugs: cyclosporine, mycophenolate mofetil, tacrolimus, tofacitinib, baricitinib, apremilast
 - f. Biologic agents
 - g. Gout drugs: colchicine, allopurinol, sulfapyrazone, probenecid, febuxostat, pegloticase, lesinurad
 - h. Medications for treatment of osteoporosis: bisphosphonates, SERMs, recombinant PTH, PTHrP, RANKL inhibitors, sclerostin inhibitors
 - i. Antibiotic therapy for septic joints
 - j. Narcotic and non-narcotic analgesics
 - k. Tricyclics and other agents used for pain modulation
 - l. Anticholinergics and non-pharmacologic agents used for the treatment of sicca symptoms
 - m. Others: apheresis, ionizing radiation
2. Rehabilitation and disability issues
 - a. Methods of rehabilitation: for each method, understand principles, mechanism of action, indications, precautions and contraindications, potential side effects, and costs.
 - b. Importance of multidisciplinary approaches to rehabilitation and pain control. Appropriate use of and referral/prescription to rehabilitation specialists and pain clinics.
 - c. Exercise: range of motion, strengthening, conditioning, and stretching
 - 1) Rest and splinting
 - 2) Modalities and hydrotherapy: ultrasound, TENS iontophoresis, spa therapy
 - 3) Joint protection and energy conservation techniques
 - 4) Adaptive equipment and assistive devices
 - 5) Job site/home evaluation and adaptation
 - 6) Footwear and orthotics
 - 7) Acupuncture and other alternative modalities
 - 8) Nutritional issues

- d. Demonstrate understanding of specific rehabilitative techniques/modalities and what modification of these techniques are needed depending on the patient's disease (e.g. osteoarthritis, myositis, etc.), location of symptoms (e.g. back, shoulder, etc.) and other related issues.
- e. Psychosocial aspects of disability: understand the impact that the following factors have on the overall therapy of a patient with rheumatic disease and demonstrate knowledge of what can be done to assist a patient in these areas.
 - 1) Psychological and emotional factors including sexuality
 - 2) Economic and vocational issues: vocational rehabilitation, costs of therapy and monitoring
 - 3) Disability determination: impairment vs disability, evaluation and measurement, social security disability, workers' compensation, other
 - 4) Compliance issues

3. Surgical management

- a. For each procedure, the fellow should possess a working knowledge of indications, preoperative evaluation and medication adjustments, contraindications, complications, postoperative management, and expected outcome.
 - 1) Tissue biopsies including synovium, bone, skin, temporal artery, lung, kidney, minor salivary gland biopsy
 - 2) Arthroscopy
 - 3) Synovectomy of tendons and joints
 - 4) Entrapment neuropathy release
 - 5) Osteotomies: hip, knee
 - 6) Arthrodesis: wrist, other
 - 7) Spine surgery: radiculopathy, stenosis, and instability
 - 8) Reconstructive surgery of hand and foot
 - 9) Total joint replacement: hip, knee, shoulder, other
 - 10) Specific surgical management problems:
 - i. Rheumatoid arthritis patient
 - ii. Infected joint: arthroscopy vs. arthrotomy
 - iii. Infected prosthetic joint
 - iv. Ankylosing spondylitis patient
 - v. Pediatric rheumatic disease patient
 - vi. Prevention and treatment of deep venous thrombosis
 - vii. Perioperative antirheumatic medication management

4. Complementary and alternative medical practices including diet, nutritional supplements, antimicrobials, acupuncture, chiropractic, topicals, homeopathic remedies

- **Diagnostic Testing**

1. Laboratory tests: for each test, understand the biologic rationale, methods for performing, and utility/limitations of specific laboratory tests including but limited to: Erythrocyte sedimentation rate, C-reactive protein, and other acute phase reactants
 2. Rheumatoid factors, cryoglobulins, and circulating immune complexes
 3. Anti-cyclic citrullinated peptide antibodies
 4. Antinuclear antibodies and subtype specificities including anti-dsDNA, anti-Smith, anti-U1 RNP, anti-centromere antibodies, and anti-histone antibodies; and LE cell preparation
 5. Antiribosomal P, anti-topoisomerase 1, and anti-synthase antibodies including anti-Jo-1 and other myositis antibodies
 6. Anti-neutrophil cytoplasmic antibodies including specificities for neutrophil granule constituents [anti-PR3, anti-myeloperoxidase]
 7. Antiphospholipid antibodies including lupus anticoagulant, anticardiolipin and beta-2-glycoprotein I antibodies
 8. Antibodies to formed blood elements including direct and indirect Coombs testing, anti-platelet antibodies, anti-granulocyte antibodies
 9. Assays for complement activity (CH50) and components of the complement cascade
 10. Serum immunoglobulin levels, Serum protein electrophoresis and immunofixation electrophoresis
 11. HLA typing
 12. ASO and other streptococcal antibody tests
 13. Serologic and PCR tests for Lyme disease, HIV, Hepatitis B, Hepatitis C, parvovirus and other infectious agents
 14. Serum and urine measurements for uric acid
 15. Iron studies including ferritin
 16. Flow cytometry studies for analysis of lymphocyte subsets and function
 17. Specific genetic testing
 18. Metabolic bone testing: calcium, phosphorus, 25OH vitamin D, 1,25 dihydroxy vitamin D, bone biomarkers
- A. Diagnostic imaging techniques: understand the basic underlying principles and technical considerations in the use of plain radiographs, computed tomography, magnetic resonance imaging, ultrasonography, bone densitometry and radionuclide scanning of bones, joints, and periarticular and vascular structures.

- B. Synovial fluid analysis: cell count and differential, crystal identification, viscosity, and other special stains/analyses
- C. Test-performance characteristics: principles of sensitivity, specificity, and predictive value

- **Research Principles**

- A. Principles and methods of epidemiological research

- 1. Definitions of incidence and prevalence
 - 2. Basic biostatistics: including major methods of comparative analysis, types of error, likelihood ratios
 - 3. Methods of health services research
 - a. Measurement of health and functional status (RAPID 3).
 - b. Quality of life measurements/assessments
 - c. Components of cost analysis (direct costs, QALY, etc.)

- B. Principles of clinical research

- 1. Major study designs and the limitations and biases associated with each
 - 2. Diagnostic criteria and assessment of disease activity
 - a. Objective assessments, e.g. tender joint count
 - b. Composite indices (ACR composite, DAS, WOMAC, etc.)
 - c. Damage and functional indices (e.g. RAPID3)
 - 3. Clinical trials
 - a. Major design types
 - b. Definitions and uses of clinical trial Phases
 - c. Roles of principal investigator, sponsors, study coordinators, monitors, IRB.

- C. Evidence-based medicine: Data analysis, biostatistics, meta-analysis and medical informatics

- D. Laboratory techniques

- 1. Serologic: ELISA, RIA, RID, nephelometry, immunoblots, protein electrophoresis, circulating immune complex assays.
 - 2. Cellular: lymphocyte proliferation, flow cytometry.
 - 3. Histochemistry and immunofluorescence of biopsied tissues.

4. Molecular: Northern, Southern and Western blot analysis polymerase chain reaction; gene sequencing; genomics techniques (SNP, RFLP analysis, microarray techniques)
5. Hybridoma and monoclonal antibody production
6. Transgenic and gene knock-out animals

E. Bioethics of clinical and basic research

F. Critical literature review

Methods for Acquisition

The fund of knowledge obtained through this curriculum should serve as the foundation for understanding the pathogenesis, diagnosis, and treatment of the rheumatic diseases. The methods and resources for acquiring the body of medical knowledge include, but are not limited to:

- Didactic teaching - conferences, lectures, or discussions
- Independent study - recommended textbooks, journal articles and various digital and print resources available through Dana Medical Library
- Clinical laboratory experience
- Research experience
- Attendance at regional and national meetings and conferences

Performance Markers

The fellow is expected to know and apply basic and clinical science relevant to rheumatology and should demonstrate an analytic and investigatory approach to clinical situations.

Basic Science – The fellow should be able to demonstrate understanding of anatomy, basic immunology, cell biology and metabolism pertaining to the rheumatic diseases in both didactic and clinical settings.

Clinical Science – The fellow demonstrates understanding of pathogenesis, epidemiology, clinical expression, treatments and prognosis of the full range of rheumatic and musculoskeletal disease in both didactic and clinical settings.

Diagnostic Testing – The fellow displays an understanding of the biological and physical and basis of the range of diagnostic testing in rheumatology and the clinical test characteristics of these procedures.

Research Principles: The fellow should be able to:

- A. Demonstrate an understanding of the essential components of clinical study design, patient assessment and data analysis.
- B. Exhibit familiarity with the common experimental approaches used in laboratory, clinical and epidemiology research.
- C. Exhibit familiarity with the principles of the ethical conduct of research and the ability to apply these principles in the conduct of their own research during fellowship.

Evaluation Methods

- Faculty performance rating – with regard to medical knowledge
- American College of Rheumatology In-Training Exam (ACR ITE) Annual
- Mentor evaluation of fellow's research and QI performance

Suggested Reading List and Resources

1. Major textbooks of rheumatology (including Rheumatology Secrets, Kelley's Textbook of Rheumatology,
2. Rheumatology by Hochberg and a Primer on Metabolic Bone Disease published by ASBMR).
3. American College of Rheumatology educational materials and resources including CARE modules, Image Bank, Publications/Journals (www.rheumatology.org)
4. Various digital and print research and review articles available through Dana Medical Library

SECTION III

PROFESSIONAL LEARNING, EXPERIENCE AND SKILLS

Rheumatology fellows pursue various career paths upon graduation from a training program. Many go into private practice, others academic medicine and/or research, and some go into industry. To make an informed choice and prepare the fellow for his/her future profession, the specific knowledge outlined below will be provided.

Fellows participate in the teaching program, and have responsibility for the instruction of junior clinicians, e.g. residents and medical students. Fellows also present regularly at conferences and journal clubs, and are expected to make at least one presentation on their research. The fellow's ability to transmit information and educate patients about their disease is observed directly in the outpatient department and at the bedside.

The fellow must be able to communicate in writing. Written and dictated notes on patients are evaluated and critiqued by attendings. Fellows are expected to learn the principles of manuscript preparation and submission, and those fellows who are interested in academic careers learn about grant preparation.

Fellows attend rheumatology conferences and monthly staff and faculty/fellow meetings where practice issues are frequently discussed. Fellows are expected to attend at least one American College of Rheumatology meeting per year, where they can participate in mentoring sessions about career choices in private practice, academia, and the pharmaceutical industry.

- A. Teaching and presentation skills
 - 1. Teaching skills: understand principles of effective teaching and their application with respect to learning objectives, format (e.g. lecture, group discussion, etc.), and assessment.
 - 2. Presentation skills: poster, podium, slide and computer-generated visual aids
 - 3. Patient education
- B. Writing skills: understand principles of how to write grants, manuscripts, and/or consultation reports.
- C. Practice management: be familiar with types of practice, equipment, insurance, economics, personnel, ethical aspects, quality assurance, and managed care issues relating to the practice of rheumatology.
- D. The fellow should be familiar with the history of rheumatology, American College of Rheumatology, Arthritis Foundation, and Association of Rheumatology Health Professionals.
- E. The fellow should be familiar with the influence on rheumatology of the American Medical Association, Food and Drug Administration, and other governmental agencies involved in health care legislation, Peer Review organizations.

SECTION IV

RESEARCH

An important component of the Rheumatology Training program is that fellows learn the principles of research and investigative medicine. This objective is important regardless of whether the fellow's final career path is clinical practice or academic medicine. Understanding research principles, allows the fellow to be able to critically read the literature, keep current with new developments, and provides the base for career-long learning and scholarship.

Research information that the fellow is expected to learn includes:

1. Principles of epidemiology and health services research
2. Design of experimental protocols, clinical trials, and outcomes research.
3. Data analysis, biostatistics, meta-analysis and medical informatics
4. Health status, disease activity, accumulated damage, functional, and quality of life measurements/assessments
5. Bioethics of basic research and clinical trials
6. Critical literature review

All fellows are expected to participate in a basic or clinical research study or scholarly quality improvement project. At the monthly staff and/or faculty and fellows meetings, proposed or planned projects are discussed, and updates of current projects are given.

Involvement in a laboratory-based research project provides the fellow with an understanding and appreciation of basic research. It is recognized that some fellows may not have an interest or proclivity for laboratory investigation. Therefore, fellows may choose a clinical research project or scholarly quality improvement project that is not laboratory-based.

During the first year, fellows are expected to meet with rheumatology or other College of Medicine faculty, to begin to develop plans for their research or QI project. Each fellow is expected to choose at least one mentor, and to have a written outline for at least one original research or scholarly QI project. This study/project plan needs to be reviewed and approved by the Program Director and faculty.

During the first and second year, fellows are expected to perform their study/project. By the end of their second year they should complete and present their study/project to the faculty and to the Department of Medicine on Fellowship Research Day.

Fellows spend approximately 10-20% of their time during the first and second years involved in research and/or scholarly QI work. The amount of time spent depends upon the interest and the ultimate career path of the fellow.

SECTION V

ROTATIONS

CURRICULUM FOR INPATIENT CONSULTATION

Description of Rotation:

The educational purpose of inpatient consultation is to develop and refine the knowledge base and skills essential for the clinical evaluation and management of hospitalized patients with rheumatic diseases. A wide variety of patients will be seen as UVM Medical Center is a large tertiary hospital with teaching and non-teaching internal medicine subspecialties and services, obstetrics/gynecology, surgical subspecialties, neurology, and a comprehensive rehabilitation care unit (at Fanny Allen hospital). There are also facilities for psychiatry and pediatrics where, on occasion, our services are requested.

Consultation for patients on these services is initiated in a number of ways: directly by phone or face to face contact, by beeper request, secure chat within the electronic medical record, and by recognition of patients that we follow that have been admitted to the hospital. The call schedule is posted and known to the provider access service (PAS). PAS is a well-known service to providers at UVM Medical Center as well as providers in the community that enables and facilitates provider to provider contact for all providers who wish to contact a provider within UVM Medical Center by beeper and/or by telephone.

It is expected that the fellow obtains a complete history, perform a thorough physical examination and review pertinent information from the chart, outside records, radiology, laboratory and referring physicians. Medical records of the initial consultation will be available in the electronic health record. A thoughtful assessment and differential diagnosis is expected; recommendations for further evaluation and management should be appropriate for the level of training. The attending physician will review the evaluation and recommendations and make changes and/or additions as necessary. Supervision of these patient encounters will comply with the resident supervision and attending practitioner responsibilities required by CMS for billing purposes. The attending physician always sees the patient and reviews the fellow's history and physical examination on initial consultations. Continued patient management, including assessment of testing requested, will be done in a timely fashion with direct communication with the team in charge of patient care. Aspiration and/or injection of joints or soft tissues will be performed as indicated under supervision of the attending physician. Documentation (patient log) of procedures will be kept for credentialing purposes and to allow evaluation by the attending physician.

Results of laboratory tests ordered will be available in the electronic health record; radiographs will be available online through a Web-based imaging system and whenever possible, reviewed with the musculoskeletal radiologist. Pathologic specimens will be reviewed with the attending physician, and whenever possible, the pathologist or cytologist, including synovial fluid analysis, surgical pathology specimens, and, when possible, autopsy specimens.

A log of inpatient consultations should be maintained to provide a source for relocating interesting patient cases for scholarly study/publication in the future.

Ongoing feedback may occur at each patient encounter as well as after notes are reviewed and approved. Formal evaluation will be done to assess the competencies of patient care, medical knowledge, interpersonal and communication skills, professionalism, system-based practice and

practice-based learning. Mid-year and end of year reviews will address these formally, but they will have been discussed on a continuous basis throughout the year.

Particular goals for achievement of general competencies during this rotation

Months 1-6

Medical Knowledge

- Understand the differential diagnosis of inflammatory arthritis.
- Understand the differential diagnosis of fever with arthritis.
- Recognize rheumatologic emergencies and the complexities of patients ill with rheumatologic disease.
- Understand the use of laboratory tests used in evaluation of rheumatologic diseases: RF, anti-CCP, ANA, ANA subsets, anti-DNA, ANCA, urinalysis, CPK, complement, cryoglobulins.
- Understand the pharmacology and use of immunosuppressives, corticosteroids, narcotic analgesics and NSAIDs.

Patient care

- Obtain a comprehensive history and physical examination and present to the attending in logical fashion. Differentiation between regional joint disorders and systemic diseases should be recognized. Exam elements for specific joints should include understanding findings of instability, deformity, inflammation, repair, proliferative synovitis and effusion. Similarly, spinal radicular distribution should be understood (e.g. EHL is supplied by L5).
- Review all imaging studies to be able to present to the attending the positive and negative findings of the investigation.
- Examine all synovial fluids obtained and be able to estimate WBC and differential and also begin to differentiate MSU and CPPD crystals (using polarized microscopy).
- Demonstrate skill in aspiration/injection of shoulders and knees to point where could be independent in performing these.

Practice based learning and improvement

- Interact with the attending on rounds to discern why a particular course of action is taken. Look up literature/other information to support treatment decisions
- Prepare for patient case conference by addressing (through the literature) particular clinical questions and problems encountered.

Systems based learning

- Develop an understanding of how to function as a consultant to a great many different services in the hospital.
- Learn when it is appropriate to consult physical medicine/rehabilitation.

- Determine cost-effectiveness of alternative proposed interventions.
- Identify problems in delivery of optimal patient care and propose corrective actions.

Interpersonal communication skills

- Demonstrate the ability to interact with patients in an empathic and understandable manner and to reliably and accurately communicate the patient's and their family's views and concerns to the attending.
- Develop rapport with other members of the consult team as well as with services requesting consultation.
- Write an effective consultation note – addressing both the requested information as well as pertinent discussion of other rheumatologic issues the patient may have. In your impression and plan you should explain your thought process and critical reasoning that led you to a specific diagnosis or need for specific testing.

Professionalism

- Be prompt for rounds; if time appointed for rounds does not allow sufficient time for information review, attempt to reschedule a later time.
- Demonstrate the understanding of the importance of patient primacy, patient privacy, patient autonomy, informed consent, and equitable respect and care to all.
- Demonstrate humanistic qualities in interactions with patients, staff and colleagues.
- Demonstrate ethical behavior by reporting back to the team key clinical findings, by following through on clinical questions, laboratory testing and other patient care issues, and recognizing potential conflicts of interest.

Months 7-12

All of the above noted goals should be continually improved upon over time. In addition, the following can be achieved over time.

Medical knowledge

- Understand bone and joint anatomy and how it pertains to the physical examination.
- Understand immunopathophysiology that leads to abnormalities detected by rheumatologic lab testing (e.g. RF, ANA, etc).
- Understand the pharmacology of the entire range of medications used in rheumatologic practice. Particular attention should be placed on drug-drug interactions and possible adverse effects of medications used.
- Understand the complexities of patients admitted with active SLE, scleroderma, vasculitis.
- Understand potential complications of rheumatologic patients admitted for surgical procedures.

Patient Care

- Demonstrate an understanding and competency in the indications and interpretation of imaging and laboratory studies (including pathologic specimens).

- Demonstrate competency in arthrocentesis of small joints (in addition to large joints); be able to demonstrate aspiration/injection of knee and shoulder to other practitioners.
- Demonstrate competency in synovial fluid analysis, being able to consistently identify MSU and CPPD crystals.
- Demonstrate the ability to reassess the patient over time and alter the treatment plan accordingly.

Practice-based learning and improvement

Self-evaluation of practice by searching and retrieving appropriate medical literature and applying this information to the care of the patient.

Systems-based practice

Learn how to transition ongoing rheumatologic care from the inpatient to outpatient practice with careful attention to costs of medications and testing, availability of outpatient groups (Arthritis Foundation, Lupus Foundation, etc.) and arranging optimal time and place of follow up appointments.

Interpersonal and communication skills

The fellow should be the primary communicator for the consultation team for both written and verbal information. This includes: a) clearly delineating risk benefit and consent concerns to the patient, b) teaching others including colleagues, c) communicating recommendations to the physicians requesting consultation. The fellow may enhance teaching others including colleagues by providing pertinent literature and placing this literature on the chart.

Months 13-24

When consultation is provided as a second year fellow, it is expected the above goals have been accomplished. During the second year of fellowship, the fellow is expected to increase the depth and breadth of medical knowledge to more effectively discuss salient features of the history and physical examination, differential diagnosis, alternative plans of management and provide sound decision-making rationale for the course recommended. This includes the ability to critically evaluate the medical literature and apply learned findings to individual patients. In addition, the fellow should become an effective teacher and a consultation team leader; being able to set the tone for and pace of the activities of the consultation team.

CURRICULUM FOR OUTPATIENT ROTATION

Description of Rotation

The educational purpose of outpatient consultation is to develop and refine the knowledge base and skills essential for the clinical evaluation and management of outpatients with rheumatic diseases. UVM Medical Center serves as a tertiary referral center for the entire state of Vermont as well as upstate New York. Therefore, the Division of Rheumatology and Clinical Immunology at UVM Medical Center sees a wide-ranging and diverse mix of patients and diseases. Fellows have their own schedule and follow their own patients in the outpatient setting. In a typical half-day clinic, fellows see one new patient and 3-4 follow-up patients.

Fellows will not only see patients referred with chronic rheumatic complaints, but also may see patients referred urgently the same day or within a few days of the referral request for acute rheumatic complaints. Fellows may assist with coverage by seeing established patients of another fellow or attending that need to be seen emergently when the fellow is on call.

Fellows spend approximately 4 to 5 half-day sessions per week in the outpatient setting for the first 6 to 12 months of training. In this way the fellow builds up a cohort of patients for whom they will provide continuity care through the duration of their training. In the second year of training, fellows spend between 2-4 half-day sessions per week in the outpatient setting. The precise number of sessions varies and depends upon the fellow's research commitment and the amount of time needed to complete their research project.

For the duration of their fellowship, fellows provide regular follow up for evaluation and management of outpatients with chronic rheumatic diseases. They also manage the administration of intravenous immunosuppressive, immunomodulatory and cytotoxic therapies in the outpatient setting. Thus, they learn how to provide continuity care to patients with chronic rheumatic diseases.

Although UVM Medical Center is an academic medical center with a large tertiary referral base, it is also the community health center for almost 200,000 people. Thus in the outpatient setting, patients are referred for both common and rare rheumatologic conditions. The following is a list of some of the outpatient problems commonly seen:

- Rheumatoid arthritis including extra-articular features
- Systemic lupus erythematosus and mixed connective tissue disease
- Vasculitis
- Spondyloarthropathies
- Osteoarthritis
- Scleroderma
- Raynaud's phenomenon
- Inflammatory myopathies
- Crystalline arthropathies (includes gout and pseudogout)
- Sjogren's syndrome
- Osteoporosis and metabolic bone disease
- Fibromyalgia, chronic myofascial pain and central sensitization syndromes
- Spinal stenosis and radiculopathies
- Carpal tunnel syndrome and other nerve entrapment syndromes
- Polymyalgia rheumatica and giant cell arteritis
- Bursitis, tendonitis, tenosynovitis, and other regional musculoskeletal disorders
- Chronic pain syndromes
- Shoulder pain, back pain, neck pain, foot pain
- Abnormal laboratory values
- Musculoskeletal symptoms related to metabolic disease
- Diagnostic puzzles
- Paraneoplastic syndromes

It is expected that the fellow obtain a complete history, perform a thorough physical examination and review pertinent information from the chart, outside records, radiology, laboratory and referring physicians. Medical records of the initial consultation will be available in paper form and/or in the electronic health record. A thoughtful assessment and differential diagnosis is expected; recommendations for further evaluation and management should be appropriate for the level of training. The attending physician will review the evaluation and recommendations and make changes and/or additions as necessary. Supervision of these patient encounters will comply with the resident supervision and attending practitioner responsibilities required by CMS for billing purposes. The attending physician always sees the patient and reviews the fellow's history and physical examination. Aspiration and/or injection of joints or soft tissues will be performed as indicated under supervision of the attending physician. Documentation (patient log) of procedures will be kept for credentialing purposes and to allow evaluation by the attending physician.

Results of laboratory tests ordered will be available in the electronic health record (or from outside laboratories if the patient prefers to do them elsewhere); radiographs will be available online through a web-based imaging system and whenever possible, reviewed with the musculoskeletal radiologist as well as with the attending rheumatologist. Pathologic specimens will be reviewed whenever possible with the attending physician, pathologist or cytologist, including synovial fluid analysis and surgical pathology specimens.

Ongoing feedback may occur at each patient encounter as well as after notes are reviewed and approved. Formal evaluation will be done to assess the competencies of patient care, medical knowledge, interpersonal and communication skills, professionalism, systems-based practice and practice-based learning. Mid-year and end of year reviews will address these formally, but they will have been discussed on a continuous basis throughout the year. Mini-clinical evaluation exercises are performed at intervals, as are 360° evaluations, patient evaluations, and portfolio evaluations.

Particular goals for achievement of general competencies during this rotation

Months 1-6

Medical Knowledge

- Understand the differential diagnosis of inflammatory arthritis.
- Understand the differential diagnosis of joint and muscle pain.
- Recognize rheumatologic emergencies and the complexities of patients ill with rheumatologic disease.
- Understand the chronic nature of many rheumatologic illnesses with the potential adverse impact on activities of daily living over time.
- Understand the use of laboratory tests used in evaluation of rheumatologic diseases: RF, anti-CCP, ANA, ANA subsets, anti-DNA, ANCA, urinalysis, CPK, complement, cryoglobulins.

- Understand the pharmacology and use of immunosuppressive medications, corticosteroids, narcotic analgesics and NSAIDs.

Patient care

- Obtain a comprehensive history and physical examination and present to the attending in logical fashion. Differentiation between regional joint disorders and systemic diseases should be recognized. Exam elements for specific joints should include understanding findings of instability, deformity, inflammation, repair, proliferative synovitis and effusion. Similarly, spinal radicular distribution should be understood (e.g. EHL is supplied by L5).
- Review all imaging studies to be able to present to the attending the positive and negative findings of the investigation.
- Examine all synovial fluids obtained and be able to estimate WBC and differential and also begin to differentiate MSU and CPPD crystals (using polarized microscopy).
- Demonstrate skill in aspiration/injection of shoulders and knees to point where could be independent in performing these.

Practice based learning and improvement

- Interact with the attending to discern why a particular course of action is taken. Look up literature/other information to support treatment decisions
- Prepare for patient case conference by addressing (through the literature) particular clinical questions and problems encountered.
- Begin maintaining portfolio

Systems based practice

- Develop an understanding of how to function as a consultant to providers in the community.
- Learn when it is appropriate to consult other specialties, including physical medicine/rehabilitation, neurology, pulmonology, cardiology, gastroenterology, dermatology, endocrinology and surgery (including orthopedics), and recognize the importance of working with the referring and/or primary care provider in this matter.
- Determine cost-effectiveness of diagnostic tests and alternative proposed interventions.
- Identify problems in delivery of optimal patient care and propose corrective actions.
- Recognize that clinic staff (e.g. nurses, pharmacists, medical assistants, pre-certification and scheduling) may have valuable input/opinions regarding optimizing patient care and learn how to function as part of a team in the outpatient setting.
- Attend and be involved in scheduled monthly staff meetings in which all staff meet to review and work on systems issues in the outpatient rheumatology clinic

Interpersonal communication skills

- Demonstrate the ability to interact with patients in an empathic and understandable manner and to reliably and accurately communicate the patient's and their family's views and concerns to the attending.

- Develop rapport with nursing and other support staff as well as with referring providers.
- Write an effective consultation note – addressing both the requested information as well as pertinent discussion of other rheumatologic issues the patient may have. In your impression and plan you should explain your thought process and critical reasoning that led you to a specific diagnosis or need for specific testing.
- Develop skills in teaching, including presentations at rheumatology rounds and journal club as well as teaching rotating residents/medical students and nurses/support staff (e.g. nursing in-service rounds).

Professionalism

- Be prompt for clinic; if a patient needs to be seen urgently be flexible regarding scheduling the patient to be seen.
- Be readily available by beeper, phone or e-mail to nursing triage staff that require assistance with patients calling in with questions or concerns.
- Demonstrate understanding of the importance of patient primacy, patient privacy, patient autonomy, informed consent, and equitable respect and care to all.
- Demonstrate humanistic qualities in interactions with patients, staff and colleagues.
- Demonstrate ethical behavior by reporting back in a timely fashion to the patient and referring provider key clinical findings, diagnoses and recommendations, by following through on clinical questions, laboratory testing and other patient care issues, and recognizing potential conflicts of interest.
- Review and sign dictated notes in a timely manner.

Months 7-12

All of the above noted goals should be continually improved upon over time. In addition, the following can be achieved over time.

Medical knowledge

- Understand bone and joint anatomy and how it pertains to the physical examination.
- Understand immunopathophysiology that leads to abnormalities detected by rheumatologic lab testing (e.g. RF, ANA, etc).
- Understand the pharmacology of the entire range of medications used in rheumatologic practice. Particular attention should be placed on drug-drug interactions and possible adverse effects of medications used, and newer therapies including biological drugs.
- Understand the complexities of patients with chronic autoimmune diseases, including increased potential for infections, as well as for other non-rheumatic complaints commonly seen in conjunction with autoimmune rheumatic disease (e.g. atherosclerotic disease and thyroid disease)
- Understand indications for and potential complications of surgery in rheumatologic patients, particularly elective orthopedic surgery.
- Expand and refine knowledge of the large variety of autoimmune diseases, particularly the connective tissue diseases, and of the non-autoimmune rheumatologic conditions such

as degenerative and crystalline arthritis and myofascial pain syndromes. Learn evolution, natural history and prognosis of rheumatic diseases.

Patient Care

- Demonstrate an understanding of and competency in the indications and interpretation of imaging and laboratory studies (including pathologic specimens).
- Demonstrate competency in arthrocentesis of small joints (in addition to large joints); be able to demonstrate aspiration/injection of knee and shoulder to other practitioners.
- Demonstrate competency in synovial fluid analysis, being able to consistently identify MSU and CPPD crystals.
- Demonstrate the ability to reassess the patient over time and alter the treatment plan accordingly.
- Refine history and physical examination skills and begin to recognize and/or elicit subtle findings.
- Learn about support systems that can be provided to outpatients through outside health care agencies.

Practice-based learning and improvement

Self-evaluation of practice by searching and retrieving appropriate medical literature and applying this information to the care of the patient. This may include taking the initiative to contact other physicians who are considered national or international experts in the various specialized areas of rheumatology (e.g. via internet or telephone using information from American College of Rheumatology database). Continue to maintain and add to portfolio, and review portfolio to determine any gaps or weaknesses in training.

Systems-based practice

Learn and refine already acquired knowledge of drug costs, as well as indications for biological drugs and other therapies used off label for various rheumatologic conditions. Apply this knowledge to efforts at pre-certification of drugs required by medical insurance companies. The fellow may develop and/or work upon quality improvement project.

Interpersonal and communication skills

The fellow should be the primary communicator for the patient and referring provider. This includes: a) communicating with patients on an ongoing basis regarding diagnosis, further required workup and management, b) clearly delineating risk benefit and consent concerns to the patient, b) communicating recommendations to the referring provider and c) providing support staff (nurses and others) with timely and helpful feedback for their concerns and questions regarding patient care.

Professionalism

The fellow should serve as a patient advocate, helping to obtain pre-certification for medications as well as providing other services (e.g. completing disability forms) and facilitating interdisciplinary care for patients with complex diseases or multiple medical conditions. The fellow may be involved in community events such as the Arthritis Walk, Lupus Walk, or give lectures to community providers or to lay persons at the request of

professional organizations (e.g. Arthritis Foundation, Lupus Foundation.)

Months 13-24

As a second year fellow, it is expected the above goals have been accomplished, but that the fellow will become more confident and independent as they continue to refine their knowledge and skills and become more competent at caring for patients with rheumatic diseases. During the second year of fellowship, the fellow is expected to increase the depth and breadth of medical knowledge to more effectively discuss salient features of the history and physical examination, differential diagnosis, alternative plans of management and provide sound decision making rationale for the course recommended. This includes the ability to critically evaluate the medical literature and apply learned findings to individual patients. In addition, the fellow should become an effective teacher and an involved and vital member of the outpatient clinic team, including recognition as such by referring providers. The fellow should continue to work upon and if possible complete quality improvement project.

CURRICULUM FOR METABOLIC BONE ROTATION

Goals and Objectives:

1. Allow rheumatology fellows to enhance their medical knowledge of the pathophysiology, clinical features, diagnosis and management of metabolic bone diseases through supervised care in an outpatient setting **(MK, PL)**
2. To enable fellows to learn how to diagnose and manage metabolic bone diseases and side effects of medications for those diseases **(PC)**
3. To enable fellows to diagnose and prevent disease-related and treatment-related complications that lead to long term morbidity and/or mortality (e.g. fractures of spine and hip) **(PC)**
4. To enable fellows to recognize the impact of metabolic bone diseases on quality of life as well as the close relationship of these diseases with rheumatic diseases (e.g. association of osteoporosis with systemic inflammatory disease); also recognize that metabolic bone disease may arise as a side effect of drugs used to treat rheumatic diseases (e.g. corticosteroids) **(MK, PC)**
5. To enable fellows to enhance their interpersonal and communication skills when interacting with patients and referring providers, as well as enhance their teaching skills via presentations at scheduled metabolic bone conference lectures **(PL, IC)**
6. To enable fellows to develop and refine humanistic qualities and ethical behavior in interactions with patients as well as with referring providers, staff and colleagues involved in the care of patients with metabolic bone disease **(PF)**
7. To allow fellows to function as part of a specialized team acting as advocates to improve care for patients with metabolic bone disease; this is accomplished via a specialized system of care in the form of an outpatient clinic dedicated specifically to the care of patients with metabolic bone disease **(PC, SBP)**

8. To learn about systems-based practice issues that contribute to the betterment or detriment of health care of patients with metabolic bone disease (e.g. that patients on corticosteroids must be treated prophylactically for osteoporosis and monitored for osteoporosis; that post-menopausal patients along with older men should be screened for osteoporosis) Fellows may be involved in pre-certification efforts for specialized or expensive therapies for metabolic bone disease and learn the practice of evidence based cost effective care **(MK, PC, SBP)**
9. To involve fellows in ongoing research studies in metabolic bone disease, including research ethics, and the consent process. **(MK, PF)**

Timeline:

End of Year 1. Fellows should have acquired extensive knowledge of the pathophysiology and clinical features of metabolic bone disease, the methods used to diagnose and to follow patients with metabolic bone disease, and the medical therapies for metabolic bone disease and their side effects. Fellows will also have first- hand knowledge of the impact of metabolic bone disease on patients and their families, the obstacles to providing optimal health care for this population and the systems available to help overcome these issues. Fellows will also effectively communicate with referring providers as well as other specialists to optimize management for patients with metabolic bone disease. These skills will have employed all of the general competencies.

End of Year 2. Fellows should be able to independently and comprehensively evaluate and manage the care of patients with metabolic bone disease. Such care includes recognition of and attention to the common occurrence of metabolic bone disease in both the healthy population and in those with other systemic diseases, such as chronic kidney disease and systemic inflammatory diseases. This care may also include attention to the multidisciplinary care required, and the psychological support systems needed by these patients.

Core Competency Acquisition in Metabolic Bone Disease Rotation

Competency	Activity
Patient Care (PC)	SCE, DID, SDL, DEM
Medical Knowledge (MK)	SCE, DID, SDL, DEM
Practice Based Learning and Improvement (PL)	SCE, DID, SDL
Interpersonal and Communication Skills (IC)	SCE, DID
Systems Based Practice (SBP)	SCE, DID
Professionalism (PF)	SCE

Abbreviations:

SCE: supervised clinical experience

DID: didactics (case conferences, lectures, meetings)

SDL: self-directed learning (literature reviews)

DEM: demonstrations (infusion of parenteral bisphosphonates)

CURRICULUM FOR PEDIATRIC RHEUMATOLOGY ROTATION**Goals and Objectives:**

1. Allow rheumatology fellows to enhance their medical knowledge of the pathophysiology, clinical features, diagnosis and management of rheumatic diseases in a pediatric population through supervised care in an outpatient setting (MK, PL)
2. To enable fellows to learn how to diagnose and manage rheumatic diseases and side effects of medications in a pediatric population (PC)
3. To enable fellows to diagnose and prevent disease-related and treatment-related complications that lead to long term morbidity such as osteoporosis and growth retardation (PC)
4. To enable fellows to enhance their interpersonal and communication skills when interacting with pediatric patients and their families (IC)
5. To enable fellows to develop and refine humanistic qualities and ethical behavior in interactions with pediatric patients and their families, as well as with staff and colleagues involved in the care of pediatric patients (PF)
6. To instruct fellows on systems-based practice issues including external and internal systems such as school systems that contribute to the betterment or detriment of the health care of pediatric patients and the practice of evidence-based cost effective care (SP)
7. To develop practice-based learning skills in fellows that will help them deal with the complicated diagnostic and therapeutic challenges presented by pediatric patients with rheumatic disease (PL)

Timeline:

End of Year 1. Fellows should have acquired knowledge of the pathophysiology and clinical features of rheumatic diseases affecting pediatric patients, the methods used to diagnose these diseases and evaluate disease activity, the therapies for these diseases and their side effects. Fellows will have first-hand knowledge of the impact of these illnesses on patients and their families, the obstacles to providing optimal health care for this population and the systems available to help overcome these obstacles. These skills will have employed all of the general competencies.

Description:

Fellows have an 8-week rotation during fellowship. The fellow sees patients in the outpatient pediatric rheumatology clinic and is supervised by the pediatric rheumatology attending (PC, MK). Fellows meet and evaluate new and established patients and their families and formulate plans for evaluation and management of these patients (PC, IC). Fellows address complex patient management issues and assist in the coordination of care of these patients (SP, PC, IC). Fellows must interact with the families (parents) of patients as well as other health care providers involved in the care of these patients to help provide care to patients (IC, PF). Fellows must research the literature regarding diagnostic and therapeutic dilemmas in pediatric rheumatology patients (PL)

Core Competency Acquisition in Pediatric Rotation:

Competency	Activity
Patient Care (PC)	SCE, DID, SDL
Medical Knowledge (MK)	SCE, DID, SDL
Practice Based Learning and Improvement (PL)	SCE, DID, SDL
Interpersonal and Communication Skills (IC)	SCE, DID
Systems Based Practice (SBP)	SCE, DID

Abbreviations:

SCE: supervised clinical experience
DID: didactics (case conferences, lectures, meetings)
SDL: self-directed learning (including literature reviews)

CURRICULUM FOR MUSCULOSKELETAL ULTRASOUND ROTATION

Goals and Objectives:

1. Allow rheumatology fellows to learn the indications and benefits of point of care musculoskeletal ultrasound in an adult rheumatology population (MK, PL)
2. To enable fellows to learn the function and operation of an ultrasound machine including basic ultrasound physics, “knobology”, image generation, image optimization, color Doppler and recognition of common artifacts (MK, PL)

3. To enable fellows to learn appropriate ultrasound scan techniques, patient positioning, transducer probe selection, transducer placement over site to be imaged and use of color Doppler when indicated (MK, PL, PF, PC).
4. To enable fellows to enhance their knowledge of normal musculoskeletal anatomy when visualizing articular and peri-articular structures around the shoulder, elbow, wrist, hand, hip, knee, ankle and foot (MK, PL)
5. To enable fellows to recognize the normal sonographic appearance of various tissues including skin, subcutaneous adipose tissue, fascia, muscles, tendons, ligaments, bones, vessels, nerves, cartilage and joints (MK, PL)
6. To enable fellows to recognize sonographic appearance of abnormalities of bone, joint, tendon and bursa structures seen in degenerative and inflammatory rheumatic diseases in an adult population (MK, PL, PC)
7. To enable fellows to learn to use ultrasound to assist in performing procedures including aspiration and injection of joints, tendon sheaths and bursae (MK, PC, PL)
8. To enable fellows to learn to appropriately label, save, transfer and securely store sonographic images (PC, PL, IC, SBP)
9. To enable fellows to learn to document sonographic findings within the medical record, generate an ultrasound report and learn appropriate billing codes for various musculoskeletal ultrasound procedures (IC, SBP)
10. To enable fellows to enhance their interpersonal and communication skills while performing musculoskeletal ultrasound on adult patients and discussing findings and/or forwarding ultrasound report to referring physician (IC, SBP)
11. To enable fellows to develop and refine humanistic qualities and ethical behavior in interactions with patients, staff and colleagues involved in the care of patients undergoing musculoskeletal ultrasound (PF)
12. To enable fellows to understand the limitations of musculoskeletal ultrasound, its relevance and relation to other imaging modalities and decide when to proceed with alternate imaging modalities instead (MK, SBP).
13. To enable fellows to recognize the importance and contributions of sub-specialists such as radiologists who are part of a multidisciplinary team approach to care for patients with rheumatic diseases (SBP)

Timeline:

End of Year 1. Fellows should have acquired the basic knowledge of indications, benefits, risks and utility of musculoskeletal ultrasound in adult rheumatology patients.

End of Year 2. Fellows should be able to recognize the sonographic appearance of normal structures and know the normal anatomy of peripheral joints of the upper and lower extremities including shoulder, elbow, wrist, MCP, PIP, DIP, hip, knee, ankle and MTP joints, adjacent tendons and bursae. Fellows should have an enhanced understanding of the indications, risks, benefits and utility of using point of care musculoskeletal ultrasound in an outpatient adult rheumatology population. Fellows should know how to operate the ultrasound machine, select appropriate transducer probe for site/joint being imaged, make appropriate image settings for image optimization and obtain a quality image to help answer underlying clinical question. Fellows should have acquired the ability to recognize common abnormalities of peripheral joints

and adjacent soft tissues of upper and lower extremities including effusions or synovial/tenosynovial proliferation around joints, tendons and bursae, evidence of abnormal Doppler activity, bony erosions or abnormalities of tendons. Fellows will be able to use musculoskeletal ultrasound to assist in needle placement for aspiration/injection procedures.

Description:

Fellows attend approximately 12 clinics spread throughout year two of their fellowship. The fellow sees patients in the outpatient rheumatology musculoskeletal ultrasound clinic and is supervised by the rheumatology attending (PC, MK). Fellows will perform sonographic evaluation of various joints and may perform ultrasound guided arthrocentesis/injection procedures and thereby assist in the care of these patients (SBP, PC, IC). Fellows will also be able to use ultrasound at any time during their continuity outpatient clinic in addition to the above dedicated musculoskeletal ultrasound clinics (PC, MK, PL, IC). Fellows must interact with patients as well as other health care providers involved in the care of these patients to help provide care to patients (IC, PF, SBP). Fellows must maintain a log of the various scans performed and a separate log of the ultrasound guided procedures performed. Fellows will be provided didactic sessions on musculoskeletal ultrasound during year one and two of their fellowship. Fellows must research the literature regarding use of musculoskeletal ultrasound, normal anatomy and abnormal musculoskeletal findings (PL). Fellows may elect to take educational courses on musculoskeletal ultrasound including those offered (some specifically for fellows) by the American College of Rheumatology or the Ultrasound School of North American Rheumatologists (MK, PL, IC, SBP).

Core Competency Acquisition in Musculoskeletal Ultrasound Rotation

Competency	Activity
Patient Care (PC)	SCE, SDL
Medical Knowledge (MK)	SCE, SDL
Practice Based Learning and Improvement (PL)	SCE, SDL
Professionalism (PF)	SCE, SDL
Interpersonal and Communication Skills (IC)	SCE, SDL
Systems Based Practice (SBP)	SCE, SDL

Abbreviations:

SCE: supervised clinical experience

SDL: self-directed learning (including didactics/courses and literature reviews)