HyGuru

STEP 1

# HyGuru

Learn. Integrate. Apply.

## USMLE Step 1 Notes

Created by:
Rahul Damania, MD, David Shafran, MD
& the HyGuru community

CONTACT US:

513 484 5819 rahul@hyguru.com Cleveland, OH www.hyguru.com

| QID | Topic | Educational Objective | HyGuru: A Step Beyond | System | Subject | Repeats |
|---|---|---|---|---|---|---|
| 1491 | Bursitis | A bursa is a fluid-filled synovial sac that serves to alleviate pressure from bony prominences and ↓ friction b/w muscles and tendons. Acute trauma or chronic repetitive pressure can cause injury, leading to localized pain and tenderness. Prepatellar bursitis causes anterior knee pain and is usually due to repetitive or prolonged kneeling. | **Anserine Bursitis**<br>• Medial knee pain<br>• Obesity and athletes | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 1638 | Tibial nerve injury | The tibial nerve may be injured at the lvl of the popliteal fossa due to deep penetrating trauma or knee Sx. Pts typically have weakness on foot plantarflexion, foot inversion, and toe flexion, w/ sensory loss over the sole. | **Tibial Nerve**<br>• Motor to posterior compartment of lower leg and plantar aspect of the foot (runs through tarsal tunnel which is between flexor retinaculum and medial surface of the talus and calcaneus)<br>• Sensory to sole of foot<br>Lesion: weak plantarflexion, inversion and toe flexion (flexor digitorum longus and flexor hallucis longus); loss of sensation over sole of foot<br>Femoral nerve<br>• Sensory to anterior thigh<br>Deep peroneal nerve<br>• Sensory between 1 and 2 toe | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 1682 | Hand injury | The lunate bone is the more med. (ulnar) of the 2 prox. carpal bones that articulate w/ the radius. A FOOSH can cause dislocation of the lunate bone w/ resulting compression of the median nerve (e.g. wrist pain, numbness in the 1st 3.5 digits). | **FOOSH (fall on outstretched hand)**<br>• Scaphoid fx, lunate dislocation or distal radius fx<br>Lunate dislocation<br>• Causes carpal tunnel syndrome<br>• More medial of the 2 bones that articulate with the radius (scaphoid is more lateral)<br>Trapezium<br>• Most lateral of distal carpal bones > articulate with the thumb<br>Capitate<br>• Largest bone of distal row | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 1702 | Clavicle fracture | The clavicle is commonly fractured in children after a fall on an outstretched arm. In a distal clavicle fracture, the deltoid muscle and the weight of the arm cause inferolateral displacement of the distal fragment, whereas the sternocleidomastoid and trapezius muscles cause superomedial displacement of the proximal fragment. | **Clavicular Fx**<br>• Sternocleidomastoid: superioposterior traction of medial fragment of clavicle<br>Trapezius<br>• Pulls lateral fragment down due to gravity<br>• Same with weight of the arm and the pectoralis muscle<br>Major and minor rhomboids<br>• Normal action: scapular retraction<br>Subclavis<br>• Normal action: displaces clavicle inferiorly | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 1704 | Humerus fracture | The deep brachial (profunda brachii) artery and radial nerve run together along the post. aspect of thehumerus. Midshaft fractures of the humerus risk injury to these structures. | **Radial nerve**<br>• C5 T1<br>• Damaged with midshaft humerus fx<br>• Often damaged deep brachial artery as well<br>• Innervates brachioradialis and supinator<br>Axillary and post circumflex humeral art run togther<br>• Surgical neck humeral fx or anterior shoulder dislocation can damage<br>Brachial artery comes from the Axillary artery<br>• Supracondylar fx can damage | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 1730 | Rectus muscle and Valsalva | The Valsalva maneuver ↑ vagal tone and can be used to abolish PSVT. The rectus abdominis is the most important muscle in achieving the ↑ IAP and ITP of the Valsalva maneuver. | **Glut Minimus**<br>• Closest to hip bones<br>• Superior gluteal nerve<br>• Leg abduction | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1924 | Shoulder dislocation | Flattening of the deltoid muscle w/ acromialprominence after a shoulder injury suggests an ant. humerus dislocation. This injury most commonly results from a blow to an ext. rotated and abducted arm. There's often assoc axillary nerve injury, resulting in deltoid paralysis and loss of sensation over the lat. shoulder. | **Shoulder dislocation**<br>• Most commonly anterior<br>• Flattening of deltoid, protrusion of acromion<br>• Damaged axillary nerve<br>Shotgun or rifle related activities have the highest chance of coracoid process fx<br>Midshaft spiral fx of humerus<br>• Radial nerve or deep brachial artery damage | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 1956 | Femoral fracture | The med. FCX artery and its branches provide the majority of the blood supply to the femoral head and neck. Injury to these vessels due to a displaced femoral neck fracture can cause ON of the femoral head. | **Femoral neck fx**<br>• Risk of osteonecrosis due to damage of retinacular branches from the medial circumflex artery<br>Random<br>• Deep femoral art gives rise to medial and lateral femoral circumflex<br>Obturator artergy give rise to artery of ligamentum teres ><br>supplies blood to region of femoral head proximal to epiphyseal growth plate in children<br>• Minimal significance in adults | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 7621 | Iliopsoas muscle | Muscles used when sitting up from the supine position incl the ext. abdo obliques, the rectus abdominis, and the hip flexors. The iliopsoas muscle is the most important of the hip flexors and incls the psoas major, psoas minor, and iliacus. The rectus femoris, sartorius, tensor fascia lata, and the med. compartment of the thigh also contribute to hip flexion. | **Hip muscles**<br>**Flexion**<br>• Iliopsoas (insert into lesser trochanter)<br>• Rectus femoris<br>• Tensor fascia lata<br>Extension<br>• Glut max<br>• Semitendinosus/membranosus<br>• Long head of biceps femoris (ischial tuberosity)<br>Abduction<br>• Glut med and min<br>Adduction<br>• Adductor brevis, longus and magnus<br>Lateral rotation<br>• Obturator externa<br>To sit up<br>• External obliques<br>• Rectus abdominis<br>• Hip flexors (iliopsoas) | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 8579 | Radial head subluxation | Radial head subluxation (i.e. nursemaid's elbow) is the displacement of the annular ligament into the RHJ, classically resulting from sudden axial traction (e.g. pulling) on the arm of a child age <5. Although most patients don't have any obvious swelling or deformity, they avoid moving the arm due to pain and hold it w/ the elbow flexed and forearm pronated. | **Nursemaid's elbow**<br>• Ages 1 4<br>• Annular ligament to tear from its perosteal attachemnt at radial neck > slips over head of radius and slides into the radiohumeral joint<br>• Tx: reduction with full supination followed by full flexion<br>Ulnar collateral ligament injury<br>• Common in pitchers due to intense valgus stress | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 8670 | Scaphoid fracture | A FOOSH may cause fracture of the scaphoid bone. Ex shows tenderness in the anatomical snuffbox. The scaphoid bone is vulnerable to AVN due to its tenuous blood supply. | **Scaphoid fx**<br>• MC carpal bone fx<br>• Tenderness in anatomical snuffbox (between extensor pollicis long [medial] and abductor pollicis long [lateral])<br>• Retrograde bloodflow from radial nerve > avascular necrosis and nonunion<br>Carpal tunnel syndrome<br>• Fall causing dislocation of lunate<br>Dupuytren's contracture<br>• Fibroproliferative disease of palmar fascia drawing fingers into flexion | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8671 | Femoral neuropathy | FNMN can occur due to trauma, compression from a retroperitoneal hematoma or abscess, or injury during Sx or childbirth. Findings incl quadriceps weakness, ↓ patellar reflex, and sensory loss over the ant. and med. thigh and med. leg. | **Spontaneous retropeitoneal hematoma**<br>• Seen with warfarin use (especially in old age, diabetes, HTN and alcoholism)<br>• Fluid collection anterior to psoas muscle > compresses on femoral nerve > weakness with knee extension, decreased patellar reflex, decrease sensory loss over antior and medial thight and medial leg<br>• Acute severe groin, lower abdomen, or back pain | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 11684 | Lateral epicondylitis | Lat. epicondylitis (i.e. tennis elbow) is characterised by overuse of wrist extensor muscles (e.g. extensor carpi radialis, extensor digitorum), leading to angiofibroblastic tendinosis at their attachment on the lat. epicondyle. | **Lateral epicondylitis**<br>• "Tennis elbow"<br>• Attaches extensor carpi radialis brevis, extensor digitorum<br>• Excessive use can result in microtrauma of extensor carpy radialis brevis > angiofibroblastic tendinosis (excess fibroblast and neovascularization)<br>Adduction of fingers<br>• Interosseous muscles attach to metacarpals<br>Forearm flexors<br>• Originate from lateral epicondyle<br>De Quervain tenosynovitis: overuse of abductor pollicis longus and brevis leading to thumb and wrist pain | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 11778 | Thoracic outlet syndrome | Thoracic outlet syndrome (TOS) is most often caused by compression of the brachial plexus as it passes through the scalene triangle, the space bordered by the anterior and middle scalene muscles and the first rib. Symptoms typically include upper extremity numbness, tingling, and weakness that worsen with repetitive overhead arm movements. The presence of an anomalous cervical rib is a risk factor for TOS. | **Thoracic Outlet Syndrome**<br>• Caused by anomalous cervical rib, calene muscle anomalies or hypertrophy (pitchers)<br>• Compression of lower trunk of brachial plexus > especially in ulnar nerve<br>• Compression of subclavian vein > arm swelling<br>• Compression of subclavian art > exertional arm pain<br>• Scalene triangle: ant and mid scalene and first rib<br>• Brachial plexus trunks and subclavian art pass between ant and mid scalene | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 11799 | Ankle trauma | Lat. ankle sprain is due to inversion of a plantar-flexed foot and most commonly involves the ant. talofibular ligament. Stronger forces can cause joint instability by injuring addnal ligaments. | **Anterior Talofibular Ligament**<br>• MC ligament sprained<br>Deltoid ligament<br>• Avulsion fx of medial malleolus | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 11801 | Medial collateral ligament injury | The medial collateral ligament resists force that pushes the knee medially. Increased laxity of the knee with the valgus stress test indicates injury to the medial collateral ligament. | **MCL tear**<br>• Excessive medial expansion with valgus stress<br>**LCL tear**<br>• Excessive lateral expansion with varus stress<br>**ACL tear**<br>• Excessive ant movement of tibial<br>**PCL tear**<br>• Excessive post movement of tibial | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 11819 | Osgood-Schlatter disease | The quadriceps muscle group is connected to the patella, which is attached to the tibial tubercle by the patellar ligament. Repetitive quadriceps contraction (e.g. jumping) in adolescents can result in OSD, which is characterised by focal ant. knee pain and swelling due to chronic avulsion of the tibial tubercle. | **Sartorius**<br>• Longest muscle in body<br>• Ant iliac spine to pes anserinus<br>• Pes anserinus gets bursitis in runners | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 12073 | Spinal stenosis | Spinal stenosis occurs most commonly in the lumbar region and presents w/ posture-dependent lower extremity pain, numbness/paraesthesia, and weakness. The most common cause is degen arthritis of the spine, which results in narrowing of the spinal canal due to intervertebral disc herniation, ligamentum flavum hypertrophy, and osteophyte formation affecting the facet joints. | | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 1 |
| 1634 | Ulnar nerve neuropathy | The ulnar nerve can be injured at the med. epicondyle of the humerus ('funny bone') or in Guyon's canal near the hook of the hamate and pisiform bone in the wrist. Pts often have sensory loss over the med. 1.5 digits and hypothenar eminence, and weakness on wrist flexion/adduction, finger abduction/adduction, and flexion of the 4th/5th digits. The hypothenar eminence may flatten due to muscle atrophy. | **Ulnar neuropathy (C8T1)**<br>• Enters wrist between hook of the hamate and pisiform bond through Guyon's canal<br>• Hypothenar eminence flattening and muscular atrophy<br>• Ulnar claw with finger extension<br>Carpal tunnel<br>• Hypothyroid, pregnancy, dialysis, lunate dislocation<br>Random<br>• Musculocutaneous nerve perforates coracobrachialis<br>• Subluxation of radial head can injure radial nerve when it passes through supinator canal | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 2 |
| 1885 | Psoas abscess | The psoas muscle originates from the ant. surface of the transverse processes and lat. surface of the vertebral bodies and fxns 1arily as a hip flexor. Psoas abscess may form due to direct spread of infection from an adjacent structure (e.g. vertebral bodies, appendix, hip joint) or from heme seeding from a distant site. | • Intraabdominal infections can cause psoas abscess (can look like femoral hernia) | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 2 |
| 8710 | Psoas abscess | Psoas abscess presents w/ fever, back or flank pain, an inguinal mass, and difficulty walking. Inflammation of the psoas muscle leads to pain w/ extension at the hip (i.e. psoas sign). Psoas abscess can develop due to heme or lymphatic seeding from a distant site, particularly in pts w/ DM, IVDU, and immsup (e.g. HIV infection). | **Psoas Abscess**<br>• Infection from direct spread: vertebral bodies, appendix and hip joint or hematogenous/lymphatic spread<br>• Risk factor: diabetes, IV drug use, HIV infection<br>• Fever, back or flank pain, inguinal mass and difficult walking<br>• Pain with hip extension (stretched psoas) > pt position themselve in hip flexion to minimize pain<br>Obturator<br>• Externally rotates thigh<br>Quadratus Lumborum<br>• Extension and lateral flexion of vertebral column | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 2 |
| 11727 | Sciatic neuropathy | The piriformis passes through the greater sciatic foramen and is involved w/ external hip rotation. Muscle injury or hypertrophy can compress the sciatic nerve in the foramen, causing piriformis syndrome. | **Piriformis occupies most of the greater sciatic foramen**<br>• Superior gluteal vessels and nerve ABOVE piriformis<br>• Inferior gluteal vessels and nerve, internal pudendal vessels, and sciatic never BELOW piriformis<br>Piriformis syndrome: compression of sciatic nerve<br>• Tender with deep palpation, stretching with adduction and internal rotation<br>Obturator internus: exits lesser sciatic foramen and inserts on great trochanter | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15660 | Hip fracture | The greater trochanter of the femur serves as the site of insertion for the gluteus medius muscle, which is responsible for hip abduction and stabilisation of the pelvis during ambulation. Fractures of the greater trochanter (e.g. fragility fracture from a fall) can disrupt the integrity of the gluteus medius tendon and result in lat. hip pain w/ gait instability and weakness of hip abduction. | | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 2 |
| 1640 | Peripheral neuropathy | Injections given in the superomedial part of the buttock risk injury to the sup. gluteal nerve. Injections into the superomedial, inferomedial, and inferolateral regions of the buttock risk injury to the sciatic nerve. The superolateral quadrant of the buttock is a relatively safe site for intragluteal injections, although the anterolateral gluteal region is preferred. | • Injection in the Superiomedial quadrant of the butt can damage Superior Gluteal nerve which innervates the Gluteus Medius and Minimus leading to Trandelenburg Gait<br>• Superior gluteal nerve exits ABOVE the piriformis muscle Injection in the superiomedial, inferomedial, inferolateral or<br>posterior thigh could hit the Sciatic nerve | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 3 |
| 1732 | Rotator cuff | The supraspinatus muscle assists in abduction of the arm and stabilisation of the GHJ. The supraspinatus tendon is vulnerable to injury due to impingement b/w the acromion and the head of the humerus. Supraspinatus tendinopathy is the most common cause of RCS. | **Supraspinatus tear**<br>• Failed empty can test<br>• Impinged between head of the humerus and acromion preocess | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 3 |
| 1733 | Rotator cuff | The most commonly injured structure in RCS is the tendon of the supraspinatus muscle. B/c the supraspinatus is an abductor of the humerus, injury to its tendon causes pain on abduction of the arm. | **Infraspinatus**<br>• External rotation<br>• Suprascapular nerve<br>• Insert: greater tuberosity | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 3 |
| 1803 | Peroneal neuropathy | The common peroneal nerve is vulnerable to injury where it courses around the neck of the fibula. Fibular neck fractures can injure this nerve, causing weakness of dorsiflexion (deep peroneal nerve) and eversion (superficial peroneal nerve) of the foot as well as loss of sensation over the dorsum of the foot. | **Sciatic nerve gives rise to Common Peroneal nerve and Tibial nerve**<br>**Common Peroneal**<br>• Courses around neck of fibula<br>• Diver to superficial branch (lateral compartment) and deep branch (anterior compartment)<br>• Superficial: everts foot and sensory to dorsum of foot<br>• Deep: dorsiflexion and sensory betwen 1 and 2 toe<br>Common peroneal lesion<br>• Foot drop + lack of sensory over dorsum<br>Tibial nerve<br>• Sensory to post calf, lat foot and sole<br>• Plantarflexion and inversion | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11683 | Carpal tunnel syndrome | The CT is formed by the carpal bones and the transverse carpal ligament (flexor retinaculum). CTS results from compression of the median nerve as it passes thru the CT w/ 9 flexor tendons. Longitudinal incision of the transverse carpal ligament can ↓ pressure w/i the CT, improving pts' SSx. | Carpal Tunnel Syndrome<br>• Transverse carpal ligament (flexor retinaculum)<br>• Attaches hamate and pisiform to trapezium and scaphoid<br>• Flexor digitorum profundus and superficialis, flexor pollicus longus and median nerve all run through it<br>Cubital tunnel<br>• Aponeurosis of flexor carpi ulnar across olecranon to medial epicondyle<br>• Ulner nerve runs through here | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 3 |
| 11776 | Rotator cuff | The RC muscles (supraspinatus, infraspinatus, teres minor, and subscapularis) all insert onto the humeral head, allowing them to stabilise the shoulder joint and move the arm at the shoulder. An infraspinatus injury would result in shoulder pain and weak, painful ext. rotation of the arm against resistance. | **Suprspinatus**<br>• Abduction<br>• Suprascapular nerve<br>Infraspinatus<br>• Ext rotation<br>• Suprascapular nerve<br>Teres minor<br>• Adduction and ext rotation<br>• Axillary nerve<br>Subscapularis<br>• Adduction and med rotation<br>• Subscapular nerve<br>• Only attachement to lesser tuberosity | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 3 |
| 11855 | Radial neuropathy | Supracondylar humeral fractures commonly occur after hyperextension of the elbow as a result of a FOOSH. The radial nerve runs along the anterolateral aspect of the elbow and is the structure most likely to be injured w/ anterolateral displacement of the prox. fracture fragment. The brachial artery runs w/ the median nerve on the anteromedial aspect of the elbow and will usually be spared in these pts (e.g. intact radial pulse). | **Supracondylar fx**<br>• Anterolateral: radial nerve injury<br>• Anteromedial: median nerve and brachial artery injury Basilic vein: anteromedial over elbow (rarely injured)<br>Ulnar nerve: posterior to medial epicondyle<br>• Injured with posterior displacement of proximal humerus | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 3 |
| 15553 | Radiculopathy | Motor and sensory deficits across multi peri upper extremity nerves (e.g. radial and median) indicate a lesion in the brachial plexus prox. to the formation of the terminal branches. In the absence of Hx of trauma or malignancy, the most likely cause is nerve root compression due to cervical spondylosis (cervical radiculopathy). | | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 3 |
| 1697 | Knee trauma | The ACL can be damaged by sudden changes in direction or awkward landings (eg, excessive internal rotation or valgus stress) during sports activity. ACL tears are typically a/w rapid-onset hemarthrosis. PEx shows anterior laxity of the tibia relative to the femur (eg, Lachman test, anterior drawer test). | **ACL**<br>• Lateral femoral condyle and runs anteriorly and medially to insert on anterior intercondylar area of tibia<br>• If torn: excessive anterior movement of tibia<br>• Left index finger (ACL) over right index (PCL) for the left knee<br>PCL<br>• Medial condyle of femur to posterior head of tibia<br>Oblique popliteal ligament: wide fibrous band that connects the posterior distal femur to posterior proximal tibia | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 4 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1968 | Knee trauma | The PCL prevents posterior displacement of the tibia relative to the femur. It originates from the anterolateral surface of the medial femoral condyle and inserts into the posterior intercondylar area of the tibia. Its integrity can be tested in the clinical setting by using the posterior drawer test. | | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 4 |
| 1969 | Knee trauma | The PCL prevents post. displacement of the tibia relative to the femur when the knee is flexed. It attaches to the post. part of the intercondylar area of the tibia and the ant. part of the lat. surface of the med. epicondyle of the femur. | **ACL**<br>• Medial portion of lat femoral condyle to medial intercondylar tibia<br>PCL<br>• Lateral portion of medial femoral condyle to lateral intercondylar tibia<br>• Cross index fingers (Left on top of Right) and this is left knee<br>MCL<br>• Medial femoral epicondyle to medial condyle of tibia | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 4 |
| 11659 | Knee trauma | Patella fractures are most commonly due to a direct impact to the anterior aspect of the knee. Signs include an acutely swollen knee, focal patella tenderness, inability to extend the knee against gravity, and a palpable gap in the extensor mechanism. | **Patellar Fx**<br>• Largest sesamoid bone<br>• Inability to extend knee<br>PCL<br>• Excessive posterior movement of tibia<br>MCL<br>• Excessive widening with valgus<br>ACL<br>• Excessive anterior movement of tibia | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 4 |
| 1812 | Brachial plexus | Dissection of the axillary LNs can injure the LTN. This results in weakness of the serratus ant. w/ winging of the scapula and impaired abduction of the shoulder past the horizontal. | **Long thoracic Nerve (C5 C7)**<br>• Supplies Serratus Anterior<br>• Stabilizes and rotates scapula<br>• Injury: winged scap and inability to abduct air over horizontal (lack of scapular rotation)<br>• Injured with axillary lymph node dissection or chest tube placement<br>Clavicular fx<br>• Supraclavivular nerve or subclavian vessel damage<br>Thyroidectomy<br>• Recurrent laryngeal nerve damage<br>Erbs Palsy<br>• Shoulder adduction, elbow extension, forearm pronation | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 6 |
| 11679 | Brachial plexus | The latissimus dorsi is a large thoracolumbar muscle that originates from the iliac crest and lumbar fascia to the spinous processes of T7-12 and lower ribs, and inserts at the bicipital groove of thehumerus. It's innervated by the TDN. 1° fxns incl extension, adduction, and med. rotation of the humerus. | **Latissimus Dorsi**<br>• T7 to 12 spinous process to bicipital groove<br>• Innervated by thoracodorsal nerve (C6 C8)<br>Infraspinatus<br>• Innervated by suprascapular nerve<br>• External rotation | Rheumatology, Orthopedics & Sports (RH) | Anatomy (Anat) | 6 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 361 | snRNP function | Small nuclear RNA (SARNA) is synthesized by RNA polymerase II in the nucleus and complexes with specific proteins to form small nuclear ribonucleoproteins (snRNPs). SnRNPs are an essential component of spliceosomes, which remove introns from pre-mRNA to form mature mRNA. Patients with systemic lupus erythematosus can have autoantibodies directed against snRNPs (eg, anti-Smith antibody). | **Anti Smith Ab**<br>• SLE<br>• Smith = snRNPs<br>snRNPs<br>• Made by RNA poly 2<br>• snRNPS form spliceosomes to which remove introns<br>Poly A tail<br>• Help mRNA exit nucleus<br>DNA poly Delta<br>• Eukaryotic synthesis of okazaki fragments | Rheumatology, Orthopedics & Sports (RH) | Biochemistry (Bioc) | 1 |
| 1250 | Marfan syndrome | Marfan syndrome is due to a defect in fibrillin-1, an extracellular glycoprotein that acts as a scaffold for elastin. It is abundant in the zonular fibers of the lens, periosteum, and aortic media. Aortic root dilation with dissection and rupture is a common cause of death. | **Ehlers Danlos**<br>• Defect in collagen | Rheumatology, Orthopedics & Sports (RH) | Biochemistry (Bioc) | 2 |
| 1503 | Alkaptonuria | Alkaptonuria is an autosomal-recessive disorder caused by a deficiency of homogentisic acid dioxygenase, an enzyme involved in tyrosine metabolism. Excess homogentisic acid causes diffuse blue-black deposits in connective tissues. Adults have sclerae and ear cartilage hyperpigmentation along with osteoarthropathy of the spine and large joints. | **Alkaptonuria**<br>• Tyr to Fumarate<br>• Homogentisic acid dioxygenase deficiency (Homogentisate > maleylacetoacetate)<br>• Severe arthritis in adulthood, ankylosis, motion restriction<br>• AR<br>• Pigmented CT and urine (due to oxidization of homogentisic acid) | Rheumatology, Orthopedics & Sports (RH) | Biochemistry (Bioc) | 2 |
| 2090 | Gout | Gout occurs with increased frequency in patients with activating mutations involving phosphoribosyl pyrophosphate synthetase due to increased production and degradation of purines. | **PRPP synthetase**<br>• Purine and Pyrimidine metabolism<br>• If mutation causes constant activation > elevated urate > gout | Rheumatology, Orthopedics & Sports (RH) | Biochemistry (Bioc) | 11 |
| 2091 | Gout | Nonsteroidal anti-inflammatory drugs (NSAIDs) are first-line therapy for treating acute gouty arthritis. They inhibit cyclooxygenase and exert a broad anti-inflammatory effect that includes inhibition of neutrophils. When NSAIDs are contraindicated (eg, peptic ulcer disease, renal impairment), colchicine is useful in the acute management of gout as it inhibits neutrophil chemotaxis and phagocytosis by preventing microtubule formation. | **Gout**<br>• Neutrophils are the primary cells responsible for the intense inflammatory response<br>• Neutrophils phagocytose urate crystals causes release of cytokines<br>• NSAID are first line<br>• Colchicine (2nd line): impaired microtubules so neutrophils can't migrate and decreases tyrosine phosphrylation decreasing neutrophil activation | Rheumatology, Orthopedics & Sports (RH) | Biochemistry (Bioc) | 11 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 756 | Myasthenia gravis | Myasthenia gravis is associated with abnormalities of the thymus (e.g. thymoma, thymic hyperplasia). The thymus and inferior parathyroid glands arise from the 3rd pharyngeal pouch. | **MG**<br>• Often associated with thymic hyperplasia or thymoma<br>Pouches<br>• Epithelium of middle ear and auditory tube<br>• Pharyngel membrane: tympanic membrane<br>• Pharyngeal groove: epithelium of external ear canal<br>• Epithelium of palantine tonsils<br>• Thymus + Inf Parathyroid tonsils<br>• Sup Parathyroid tonsils, ultimobranchial body | Rheumatology, Orthopedics & Sports (RH) | Embryology (Embr) | 10 |
| 1935 | Mitochondrial disorders | The presence of lactic acidosis and ragged skeletal muscle fibers histologically suggests a mitochondrial myopathy. Variable clinical expressions in affected family members can occur due to heteroplasmy, which is the coexistence of distinct versions of mitochondrial genomes in an individual cell. | **Mitochondrial encephalomyopathy**<br>• Neuromuscular lesions, ragged red fibers, lactic acidosis<br>• Heteroplasmy: different mitochondrial genomes with a single<br>cell > severity of mitochondrial disease is often directly related to the proportion of abnormal mitochondira the offspring inherits<br>Anticipation<br>• Triucleotide amplification during gametogenesis | Rheumatology, Orthopedics & Sports (RH) | Genetics (Gene) | 4 |
| 1159 | Osteocyte connections | Osteocytes have long intracanalicular processes that extend through the ossified bone matrix. These cytoplasmic processes send signals to and exchange nutrients and waste products with the osteocytes within neighboring lamellae via gap junctions. Osteocytes can sense mechanical stresses and send signals to modulate the activity of surface osteoblasts, thereby helping to regulate bony remodeling. | **Haversian System**<br>• Central canal surrounded by concentric rings full of osteocytes<br>• Canaliculi radiate from lacunae to lacunae > exchange nutrient via gap junctions<br>• Osteocyte: maintain structure of mineralize matrix and control short term release and deposition of calcium, modulate osteoblast activity<br>• Controlled by Ca status and stress<br>Zonula Adherens: belt desmosome Macula Adherens: spot desmosome | Rheumatology, Orthopedics & Sports (RH) | Histology (Hist) | 1 |
| 1734 | Muscle structure & physiology | A single sarcomere is defined as the distance between two Z lines. Thin (actin) filaments in the band are bound to structural proteins at the Z line, whereas thick (myosin) filaments in the Aband are bound to structural proteins at the M line. | ` | Rheumatology, Orthopedics & Sports (RH) | Histology (Hist) | 8 |
| 298 | Apoptosis | The Fas receptor acts to initiate the extrinsic pathway of apoptosis. Mutations involving the Fas receptor or Fas ligand can prevent apoptosis of autoreactive lymphocytes, thereby increasing the risk of autoimmune disorders such as systemic lupus erythematosus. | **FAS**<br>• Extrinsic apop pathway<br>• FAS binds FASr > receptor trimerize > death domain binds Fas associated death domain > activates caspase 8 and 10 > activates caspase 3 and 6 | Rheumatology, Orthopedics & Sports (RH) | Immunology (Immu) | 4 |
| 538 | Primary immunodeficiency disorder | Leukocyte adhesion deficiency is due to absence of CD18 antigens necessary for the formation of integrins. Clinical features are caused by failure of leukocyte chemotaxis and include recurrent skin and mucosal infections without purulence, delayed separation of the umbilical cord, and persistent leukocytosis. | **Deficient T cell mediated immunity**<br>• Infection following live vaccine | Rheumatology, Orthopedics & Sports (RH) | Immunology (Immu) | 7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 741 | Serum sickness | Serum sickness is a type III hypersensitivity reaction to nonhuman proteins characterized by vasculitis resulting from tissue deposition of circulating immune complexes. Clinical findings include fever, pruritic skin rash, arthralgias, and low serum C3 and C4 complement levels. | **Monoclonal Ab, nonhuman Ig, penicillin, cefaclor, TMP/SMX**<br>• Causes serum sickness (type 3 HSN)<br>• Fever, pruritic skin rash, arthralgias 7• 14 days after exposure (takes time to make Ab as opposed to arthus rxn which has premade Ab)<br>• Causes fibrinoid necrosis and neutrophilic infiltration<br>• IgG, IgM and C3,4 will deposit in vessel walls<br>• C5a causes neutropenia due to pulling neutrophils into tissue<br>• Mild low platelet<br>Type 1 HSN<br>• Edema and inflammation, NOT fibrinoid necrosis | Rheumatology, Orthopedics & Sports (RH) | Immunology (Immu) | 1 |
| 752 | Ankylosing spondylitis | The seronegative spondyloarthropathies include ankylosing spondylitis, reactive arthritis, psoriatic arthritis, and arthritis associated with inflammatory bowel disease. Individuals expressing HLA B27 are at increased risk for the seronegative spondyloarthropathies. | **Ankylosing Spondylitis**<br>• Sacroiliac joints always effects and usually fuse<br>• Bamboo spine<br>• HLa B27 > codes for MHC1<br>HLa DP, DQ, Dr<br>• MHC2<br>C1• C4 def<br>• SLE | Rheumatology, Orthopedics & Sports (RH) | Immunology (Immu) | 2 |
| 754 | Rheumatoid arthritis | Rheumatoid arthritis results from an immune response directed against autoantigens in the joints. Infiltrating CD4+ T cells secrete cytokines that promote inflammatory synovitis. They also stimulate B cells to produce rheumatoid factor (IgM antibody specific for Fc component of IgG) and anti citrullinated protein antibodies that contribute to chronic inflammation and joint destruction. | **RA**<br>• Rheumatoid factor: IgM against Fc portion of IgG<br>• Morning stiffness, cervical instability, DIP and 1st MCP<br>sparing, osteopenia, erosions, joint space narrowing, swan neck or ulnar deviation<br>• Theorized that CD4 get sensitized against some component of cartilage<br>Random<br>Primary biliary cirrhosis: anti mitochondria CREST: anti centromere<br>Mono: anti heterophile<br>Antiphospholipid: paradoxial PTT prolongation | Rheumatology, Orthopedics & Sports (RH) | Immunology (Immu) | 9 |
| 646 | Osteomyelitis | Hematogenous osteomyelitis is predominantly a disease of children that most frequently affects the long bones. Staphylococcus aureus is implicated in most cases secondary to a bacteremic event. Streptococcus pyogenes (group A streptococcus) is the second most common cause of hematogenous osteomyelitis. | **Osteomyelitis**<br>• Metaphysis in kids<br>• Epiphysis in adults Child: S aureus then GAS<br>Sickle cell: salmonella then S aureus Pott: TB<br>Diabetes and IV drug user: pseudomonas<br>Vertebral after UTI: enterococcus<br>• Bone pains develops as abscess expands in bone > bone necrosis > periosteal disruption | Rheumatology, Orthopedics & Sports (RH) | Microbiology (Micr) | 4 |
| 1395 | Clostridial myonecrosis | Lecithinase, also known as alpha toxin, is the main toxin produced by Clostridium perfringens. Its function is to degrade lecithin, a component of cellular phospholipid membranes, leading to membrane destruction, cell death, and widespread necrosis and hemolysis. | **C Perfringens**<br>• Lecithinase: splits phospholipid molecules<br>• Make gas | Rheumatology, Orthopedics & Sports (RH) | Microbiology (Micr) | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8857 | Necrotizing soft tissue infections | Necrotizing fasciitis is a severe infection of the subcutaneous tissue and deep fascia that is a surgical emergency. The infection is often polymicrobial, but monomicrobial cases due to Streptococcus pyogenes (group A strep) can also occur. S pyogenes is a pyrrolidonyl arylamidase (PYR)-positive, beta-hemolytic, Gram-positive cocci that grows in chains. | **Strep A**<br>• Spreads via hyaluronidase<br>• M protein (major virulence) | Rheumatology, Orthopedics & Sports (RH) | Microbiology (Micr) | 1 |
| 11868 | Osteomyelitis | Vertebral osteomyelitis should be suspected in patients with new or worsening back pain, fever, and recent endocarditis or bacteremia (especially Staphylococcus aureus). It should also be suspected if there are new neurologic findings and fever with or without back pain. MRI of the spine is preferred for diagnosis. | **Osteomyelitis**<br>• Blood Cx and MRI of the spine<br>CT myelogram<br>• Diagnoses spinal stenosis or vertebral pathology (more invasive so do MRI for osteomyelitis | Rheumatology, Orthopedics & Sports (RH) | Microbiology (Micr) | 4 |
| 239 | Rheumatic fever | The 1° cause of morbidity in ARF is HF from severe pancarditis. MS develops yrs or decades after the original illness. Joint involvement is usually transient. | Rheumatic Fever<br>• Anti GAS Ab attack CNS and cardiac tissue<br>• Acute: migratory arthritis, pancarditis, sydenham chorea<br>• Myocarditis is MCC of death during acute attack<br>• Chronic: MR > MS<br>• Tx: penicillin<br>Septic arthritis<br>• S Aurues | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 5 |
| 316 | Osteonecrosis | ON (AVN) occurs due to impaired blood supply to a segment of bone. The femoral head is the most common location. Common causes incl SCD, GC therapy, vasculitis, and alcoholism. | **Avascular necrosis**<br>• Thrombotic/embolic occlusion: sickle cell, caisson's<br>• Steroids<br>• Vascular inflam/injury: vasculitis, radiation, SLE<br>• Alcohol abuse<br>• Traumatic fx<br>• Pain on weight berring with decreased ROM<br>• No swelling or warmth<br>• Wedge shaped necrosis<br>• Dead bony trabeculae with empty lacunae<br>• Necrosis of surrounding adipocytes | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 1 |
| 340 | Systemic sclerosis | CREST syndrome (limited scleroderma) MFx w/ calcinosis, Raynaud's phenomenon, oesophageal dysmotility, sclerodactyly, and telangiectasias. Anti-centromere Abs are found in about 40% of pts w/ CREST syndrome. Anti-DNA topoisomerase I (Scl-70) Abs are highly specific for systemic sclerosis. | **SLE**<br>• Anti Smith (snRNP) Ab | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 3 |
| 450 | Giant cell arteritis | GCA is char by granulomatous inflammation of the media and predominantly involves medium to smaller branches of the carotid artery, esp. the temporal artery. The resulting SSx respond promptly to GC therapy. | **Giant Cell arteritis**<br>• HA, jaw claudication, vision issues, polymyalgia rheumatica<br>• High ESR and CRP<br>• Intimal thickening, elastic fragmentation and multinucleated giant cells in temporal art<br>• Tx: glucocorticoids to prevent blindness<br>Polyarteritis Nodosa<br>• Abdominal pain, peripheral neuropathy, renal insufficiency and sever HTN | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 457 | Polyarteritis nodosa | PAN is a multisystem vasculitis char by episodic ischemic SSx in various organs w/ sparing of the lungs. Bx shows segmental, transmural inflammation w/ fibrinoid necrosis. PAN is commonly a/w hepB. | **PAN**<br>• Medium vessels<br>Renal: glomerulonephritis, HTN Nervous: peripheral neuropathy<br>• GI: mesentteric ischemia and melena<br>MSK: myositis, arthritis<br>Dx<br>• ANCA negative<br>• Assocaited with Hep B<br>• Biopsy: transmural inflammation, fibrinoid necrosis<br>Microscopic polyangiitis | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |
| 461 | Giant cell arteritis | GCA is char by granulomatous inflammation of the media, w/ fragmentation of the internal elastic lamina of medium and small branches of the carotid artery. Irreversible blindness is a severe complication of GCA, and pts w/ suspected GCA req immediate GC therapy. | **Giant Cell Arteritis**<br>• HA<br>• Jaw claudication<br>• Visual disturbance (ischemic optic neuropathy)<br>• Polymyalgia rheumatica<br>• High ESR and CRP<br>• Multinucleated giant cells on biopsy<br>• Tx: steroids | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 5 |
| 629 | Osteoporosis | Initially in OP, bone loss predominantly affects trabecular bone, leading to trabecular thinning and perforation w/ loss of interconnecting bridges. Over time, cortical bone, which composes most of the appendicular skeleton, also becomes involved. | **Vit D def**<br>• Increased deposition of unmineralized osteoid | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 10 |
| 630 | Vitamin D deficiency | Rickets is char by an excess of un-mineralised osteoid matrix and epiphyseal cartilage due to vitD defic. CFx incl frontal bossing, craniotabes, CCJ deformity ('rachitic rosary'), and bowed legs. | **Rickets**<br>• Excess unmineralized osteoid matrix<br>Risks<br>• Exclusive breastfeeding<br>• Inadequate sun<br>• African American<br>• Maternal Vit D def Symptoms<br>• Craniotabes<br>• Delayed fontanel closure > front bossing<br>• Rachitic rosary<br>• Widening and thickening of wrist (epiphyseal plate widening and cupping)<br>• Femoral and tibial bowing<br>Osteosarcoma<br>• Excessive mineralized bone (chinese letters)<br>Pagets<br>• Excessive osteoclast > mixed > osteoblast<br>Achondroplasia<br>• Inhibited cartilage proliferation | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 4 |
| 667 | Churg-Strauss syndrome | Eosinophilic GPA (CSS) is a small to medium vessel vasculitis char by late-onset asthma, rhinosinusitis, and eosinophilia. Mononeuritis multiplex due to involvement of the epineural vessels of peri nerves is common. | **Chrug Strauss (Eosinophilic Granulomatosis with Polyangiitis)**<br>• Asthma<br>• Eosinophilia<br>• Granulomas in medium sized vessels<br>• Mononeuritis multiplex > vasculitis affecting epineural vessel > wrist drop<br>• Transient/migratory lung infiltrates<br>• p ANCA<br>ABPA<br>• CF and Asthma<br>Scleroderma<br>• Anti ScL 70 (topoisomerase 1<br>• Anti RNA poly 3 | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 702 | Osteogenesis imperfecta | OI results from defective synthesis of type I collagen by osteoblasts. CFx incl a Hx of MTFs, blue sclerae, and small, malformed teeth. In most pts, OI is transmitted by AD inheritance. | **OI Type 1**<br>• AD<br>• Def or abnormal type 1 collagen<br>• Blue sclera (choroid veins)<br>• Small teeth<br>Osteomalacia<br>• Defective bone mineralization<br>Endochondral ossification<br>• Mesenchymal cells differeniate into chondroblasts > secret cartilage matrix > cartilage calcifies > degrades after osteoblasts make bone around it<br>Intramembranous ossification<br>• Differentiate directly into osteoblasts and make bone WITHOUT cartilage | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 1 |
| 721 | Osteomyelitis | heme OM is most common in children and usually affects the metaphysis of long bones due to the slower blood flow and cap fenestrae in this region. W/o proper Tx, the infection can progress to chronic suppurative OM. | **Flat bones**<br>• Skull, sternum pelvis<br>• Infection due to mastoiditis or dental abscess | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 4 |
| 914 | Giant cell arteritis | ESR and CRP have very high sensitivity for GCA. Pts w/ suspected GCA who have an ↑ ESR or CRP lvl should be referred for temporal artery Bx to confirm the Dx. | **Giant Cell Arteritis**<br>• High ESR, CRP<br>• Dx: biopsy<br>• Tx: glucocorticoids<br>• Amaurosis fugax: transient monocular visional loss<br>• Associated with TIA, stroke, MI | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 5 |
| 940 | Polymyositis and dermatomyositis | DM is char by prox. muscle weakness (similar to PM) and dermal MFxs (e.g. heliotrope rash, Gottron papules). Lab testing shows ↑ muscle enzymes (e.g. CK) and auto-Abs (e.g. antinuclear, anti-Jo-1). Initial Tx incl systemic GCs and eval for potential underlying malignancy. | **Dermatomyositis**<br>• Anti Jo1<br>• Gottron papules<br>• Heliotrope rash<br>• Shaw sign<br>• Mechanic hands<br>• Myopathy: elevated CK and aldolase<br>• Perimysial lymphocyte infiltratio<br>• 15% of the time arises with malignancy (especially adenocarcinoma) | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 5 |
| 1265 | Duchenne dystrophy | DMD is an XLR myopathy that MFx w/ prox. muscle weakness and enlargement of the calf muscles in boys age 2-5. It most often results from frameshift deletions affecting the dystrophin gene. Dystrophin provides a stabilising interaction b/w the sarcolemma and the intracellular contraction apparatus, and disruption of the protein results in membrane dmg and myonecrosis. | **Duchennes**<br>• X chromosome p21<br>• Frameshift mutation<br>• Dystrophin links actin to transmembrane proteins (alpha and beta dystrophiglycan) that are connected to extracellular matrix<br>• Variable muscle fiber size and angulated fibers<br>Charcot Marie Tooth<br>• Mutation in myelin synthesis<br>• Weakness of dorsiflexion due to involved common peroneal nerve<br>Endomysial: polymyositis Perifascicular: dermatomyositis Endoneural: guillain barre | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |
| 1266 | Duchenne dystrophy | DMD MFx w/ prox. muscle weakness and atrophy. True hypertrophy of the dist. muscle is noted early in the disease as dist. muscles compensate for weak prox. ones. Muscle fibres of the dist. extremities are later replaced by fat and CT (pseudohypertrophy). | **Duchenne MD**<br>• x linked recessive<br>• Onset between 2• 5 years of age<br>• Pelvic girdle affected first > lower extremities, back and shoulder girdle soon after<br>• Calf pseudohypertrophy: calf muscles replaced with fibrofatty tissue<br>• Muscle do initially hypertrophy but very early in disease<br>• Paraspinal weakness leads to kyphoscoliosis<br>• Wheelchair bound by 12<br>CPT1 def<br>• Lipid accumulation in muscle fibers | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1451 | Pseudogout | Synovial fluid analysis showing rhomboid-shaped Ca-PPi crystals is Dx of pseudogout. These crystals are (+) birefringent under pol light. The knee joint is involved in >50% of cases. | **Calcific tendonitis**<br>• Ca hydroxyapatite crystals in tendons<br>• Usually in the rotator cuff tendon | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 1 |
| 1771 | Osteoarthritis | OA of the hands is char by osteophyte formation leading to hard bony enlargement of the dist. IPJs (Heberden nodes) and prox. IPJs (Bouchard nodes). Brief morning stiffness may be present. | **RA**<br>• 40 60, often younger<br>• MCP, PIP and wrists<br>• Worst in morning > improves with use<br>• Fever, fatigue and weight loss<br>• Soft/spongy, warm joints | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |
| 1835 | Septic arthritis | A high synovial fluid leucocyte count (>100k/mm3) and absent crystals on micro Ex strongly suggest bacterial joint infection. SA req Abx Tx to prevent joint destruction, OM, and sepsis. | **Septic arthritis**<br>• Decreased ROM<br>• Synovium with over 100,000 leukocytes<br>• Gonoccous is common in sexual active pt<br>• Tx: antibiotics<br>Gout and Pseudogout<br>• Leukocytes under 100,000 | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 4 |
| 1874 | Wound healing | During wound healing, excessive MMP activity and myofibroblast accumulation in the wound margins can result in contracture. Contractures produce deformities of the wound and surrounding tissues, most often on the palms, soles, ant. thorax, or at serious burn sites. | **Matrix Metalloporteinase**<br>• Secreted by fibroblasts, macrophages, neutrophils, synovial cells<br>• Degrade collagen<br>• Causes myofibroblast accumulation at wound edge and helps with scar tisuee remodeling<br>• Unusually high MMP = would contracture<br>• MC on palms, soles, ant thorax and burns<br>Wound dehiscence<br>• Rupture of previously closed wound<br>• Insufficient granulation tissue, inadequate wound contraction<br>Ulceration of wound<br>• Inadequate vascularization<br>Keloid<br>• Excessive type 3 collagen | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 1 |
| 1896 | Parvovirus | PVB19 causes erythema infectiosum (5th disease) in children and arthritis in adults. PV arthritis can mimic RA but is usually self-resolving. | **Parvo B19**<br>• Naked, ssDNA<br>• Normal child: erythema infectiosum<br>• Normal adult: acute symmetric arthropathy (PIP, metacarpals, knees and ankles)<br>• Chronic hemolytic anemia: transient asplastic crisis | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 3 |
| 1900 | Lambert-Eaton myasthenic syndrome | LEMS is a NM disorder char by auto-Abs against presynaptic v-gated Ca2+channels. It causes progr prox. muscle weakness and ↓ DTRs that improve w/ exercise (post-exercise facilitation); CN involvement and autonomic SSx may also occur. LEMS is strongly a/w SCLC. | **Lambert eaton myasthenic syndrome**<br>• Proximal muscle weakness<br>• Diplopia, ptosis, dysarthria and dysphagia<br>• Can present with dry mouth or impotence<br>• Paraneoplastic syndrome of small cell lung cancer 50% of the time<br>• Hyporeflexia or areflexia<br>ALS<br>• Hyperreflexia, spasticity and atrophy, fasciculations | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |
| 7556 | Osteoarthritis | OA is char by progr fissuring and erosion of articular cartilage. RFs incl advancing age, obesity, joint trauma, and repetitive stress. Pts may have mild effusion and crepitus on PEx, but SSx of synovitis (e.g. redness, warmth) are less prominent than in the classic inflammatory arthritic disorders. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11653 | Hip fracture | MAS is char by the triad of fibrous dysplasia of the bone, endocrine abns, and café-au-lait spots. The condition results from an activating mut in the G protein/cAMP/adenylate cyclase signalling pathway. | **McCune Albright**<br>• Mosaic somatic mutation of GNAS gene encoding for alpha subunit of G protein<br>• Adenylate cyclase always on<br>• Cafe au lait spots (stimulated melanocytes)<br>• Coast of Maine<br>• Precocious puberty and hyperthyroid<br>• Fibrous dysplasia of femoral heads (increased IL 6, osteoclast activation and fibroblast like cell porliferation)<br>Legg Calve Perthes<br>• Idiopathic osteonecrosis of femoral head<br>NF1<br>• Cafe au lait spots<br>• Coast of Cali<br>• Cutaneous neurofibromas<br>• Tibial bowing | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |
| 11798 | SLE | SLE is char by loss of immune self-tolerance w/ production of auto-Abs against nuclear Ags. Binding of auto-Abs to self Ags leads to deposition of ICs in tissues and consumption of complement. | **SLE**<br>• Malar or discoid rash, oral mucosal ulcers<br>• Joint, renal, serosal or neuro involvement<br>• Anemia, leukopenia, thrombocytopenia<br>• Positive ANA, anti dsDNA, anti Smith<br>• Low complement levels (C3 and C4)<br>• Increase risk with low C1• C4 (espcially C2)<br>Random<br>RA: anti cyclic citrullinated peptide (CCP)<br>Primary biliary cirrhosis: anti mitochondrial<br>• Pruritus, jaundice, xanthomas<br>Disseminated gonococcal: fever, migratory polyarthritis, skin pustules<br>PAIR: HLa B27 | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 7 |
| 11818 | Septic arthritis | Synovitis is char by pain, erythema, swelling, and ↓ ROM in a joint. Acute synovitis may represent serious path (e.g. SA), esp. if accompanied by fever or leucocytosis; it should be eval urgently w/ synovial fluid analysis. | **Pt has acute joint pain, swelling, and erythema > tap it and analyze synovial fluid (arthrocentesis)**<br>• Can be infectious, gout, hemarthrosis, rheumatic disease<br>Radionuclide bone scan<br>• Used to finds mets and infectious bone disorders | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 4 |
| 11821 | Rheumatoid arthritis | RA causes progr joint destruction involving the hands, wrists, elbows, and knees. Cervical spine involvement can lead to spinal instability and cord compression. | **RA**<br>• Spares DIP and 1 MCP<br>• Ulnar deviation of PIP<br>• Cervical spine involvement: risk or subluxation and cord compression<br>• Anti CCP Ab<br>• High ESR and CRP (correlate to disease state)<br>• x ray: soft tissue swelling, joint space narrowing and bony erosions | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 9 |
| 12255 | Leukocytoclastic vasculitis | CSVV is a/w Rx (e.g. penicillins, cephalosporins) use and typically presents w/ palpable purpura in the lower extremities. Char histopath findings incl marked perivascular inflammation of the small blood vessels w/ fibrinoid necrosis and a predominance of neutrophils and fragmented neutrophilic nuclei (LCV). | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15596 | Sjogren syndrome | SS is an AI disorder char by inflammation of exocrineglands. Bx of the labial salivaryglands shows periductal lymphocytic infiltrates (focal lymphocytic sialadenitis), often w/ germinal centres; the glandular tissue is typically atrophic and fibrotic. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |
| 15597 | Sjogren syndrome | SS is an AI disorder char by lymphocytic inflammation in exocrine glands (e.g. lacrimal, salivary glands). It presents w/ dry eyes (keratoconjunctivitis sicca) and dry mouth (xerostomia). Chronic B-cell proliferation in pts w/ SS ↑ the risk of devel NHL. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 2 |
| 15627 | Rheumatoid arthritis | Joint destruction in RA is char by synovial hyperplasia, an inflammatory infiltrate, and synovial angiogenesis. The joint space often becomes replaced by pannus, an invasive mass composed of fibroblast-like synovial cells, granulation tissue, and inflammatory cells that can erode into the articular cartilage and underlying bone. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 9 |
| 15629 | Rheumatoid arthritis | RA is char by synovial hyperplasia w/ inflammatory infiltrates. The accelerated meta rate of the inflamed synovium causes local hypoxia, which leads to synovial angiogenesis. As the disease progresses, the joint space is replaced by a rheumatoid pannus (an invasive mass of fibroblast-like synovial cells, granulation tissue, and inflammatory cells) which can destroy the articular cartilage and underlying subchondral bone. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 9 |
| 15636 | Bone tumor | OS is the most common 1° bone tumour in children and young adults and typically arises near the metaphyses of long bones. Pts usually have slowly worsening pain and soft-tissue swelling. XR typically reveals a lytic bone lesion, and Bx classically shows pleomorphic, spindle-shaped tumour cells that generate osteoid and thin trabeculae of neoplastic bone. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 3 |
| 15665 | Lipoma | Lipomas are common, benign tumours that arise from the subcutaneous fat and present as soft, mobile masses that're stable or enlarge slowly over time. The Dx is usually made clinically, but histopath shows well-diffiated, matureadipocytes w/ a fibrous capsule. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 15666 | Osteomyelitis | M. tuberculosisspondylitis (Pott's disease) is usually the result of heme seeding of vertebrae from 1° pulm infection. MFxs typically arise mos or yrs later (due to reactivation) and incl chronic, progr back pain, fever, and radiographic evidence of vertebral bone destruction and fluid collection. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 4 |
| 15677 | Paget disease of bone | PDB is Chx by disordered bone formation. Involvement of long bones can lead to bone pain, bowing, fracture, or arthritis of adjacent joints. Serum ALP is ↑ due to ↑ production of new bone, but Ca and P levels remain normal. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 4 |
| 15696 | Paget disease of bone | PDB is char by excessive and disordered bone formation. It commonly affects the skull, long bones, and vertebral column. The ↑ formation of new bone is a/w an ↑ serum ALP lvl. Radiographs shows lytic or mixed lytic-sclerotic lesions, thickening of cortical and trabecular bone, and bony deformities. | | Rheumatology, Orthopedics & Sports (RH) | Pathology (Path) | 4 |
| 295 | Atrophy | Pathologic atrophy can be caused by ↓ physical workload, loss of innervation, ↓ blood supply, inadequate nutrition, absent endo stimulation, aging, or mechanical pressure. | **Hyperplasia**<br>• Estrogen on endometrium | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 1 |
| 640 | Osteoporosis | The receptor activator of nuclear factor kappa B (RANKY/RANK ligand (RANK-L) interaction is essential for the formation and differentiation of osteoclasts. Osteoprotegerin blocks binding of RANK-L to RANK and reduces formation of mature osteoclasts. Low estrogen states cause osteoporosis by decreasing osteoprotegerin production, increasing RANK-L production, and increasing RANK expression in osteoclast precursors. | **Osteoclast differentiation**<br>• m CSF (hematopoietic stem cell) to osteoclast precusor<br>• PTH stimulates osteoblasts via NFKB to secrete RANKL which binds RANK causing differentiation of the osteoclast<br>• Osteoprotegerin inhibits RANk RANKL binding preventing osteoclast differentiation<br>• Estrogen increases osteoprotegerin secretion and prevents osteoblast apoptosis<br>Denosumab: RANKL ab<br>Low estrogen<br>• Increased VEGF production | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 10 |
| 700 | Achondroplasia | Unlike the process of intramembranous ossification that forms flat bones, endochondral ossification proceeds along a cartilage template and is responsible for the formation of long bones. Achondroplasia is characterized by an exaggerated inhibition of chondrocyte proliferation in the growth plates of long bones and manifests with proximal limb shortening, midface hypoplasia, and macrocephaly. | **Achondroplasia**<br>• FGFR3 gene mutation > always active > inhibits chondrocyte proliferation preventing endochondral ossification<br>• Rhizomelia: proximal limb shortening<br>• Brachydactyly: short fingers<br>• Associated with advanced paternal age<br>Lack of GH<br>• All bones are small<br>Osteoid osteoma<br>• Pain relieved with NSAID<br>Osteoblastoma<br>• Pain not relieved with NSAID | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 2 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 740 | Myasthenia gravis | Myasthenia gravis results from an autoimmune type II (antibody-mediated) hypersensitivity reaction against skeletal myocyte surface acetylcholine receptors. Goodpasture syndrome similarly involves autoantibodies against basement membrane collagen in the renal glomeruli and lung alveoli. | **MG**<br>• IgG Ab to ACh receptor (Type 2 HSN)<br>• Acetylcholinesterase activity decreases at low temp (ice packs will help)<br>Atopic dermatitis (eczema)<br>• Type 1 HSN<br>Contact dermatitis<br>• Type 4 HSN<br>Hypersensitivity pneumonitis<br>• IgG against Ag<br>• Type 3 HSN<br>• Interstitial alveolitis and bronchiolitis | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 10 |
| 748 | Polymyositis and dermatomyositis | Polymyositis causes symmetric proximal muscle weakness. Muscle biopsy reveals inflammation, necrosis, and regeneration of muscle fibers. Over-expression of major histocompatibility complex class I proteins on the sarcolemma leads to infiltration with CD8+ T lymphocytes and myocyte damage. | **Polymyositis**<br>• Symmetric prox muscle weak<br>• Elevated CK and aldolase<br>• Anti Jo 1<br>• Endomysial lymphocytic infiltrate with patchy necrosis<br>• Interstitial lung disease and myocarditis<br>• Possible viral cause<br>• Increased MHC1 expression on sarcolemma leading to presentation of autoantigen to CD8<br>PAN<br>• Intermittent abdominal pain, peripheral neuropathy, renal insufficiency, severe HTN<br>• Transmural inflammation w/ fibrinoid | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 5 |
| 753 | Ankylosing spondylitis | Ankylosing spondylitis is characterized by stiffness and fusion of axial joints (ankylosis) and inflammation at the site of insertion of tendons into bone (enthesitis). Involvement of the thoracic spine and costovertebral and costosternal junctions can limit chest wall expansion, leading to hypoventilation. | **Akylosing Spondylitis**<br>• Peripheral arthritis and enthesitis (pain, tenderness, and swelling at site of tendon insertion into bone)<br>Respiratory<br>• Costovertebral and costosternal junction limits chest wall expansion > monitor for disease progression Cardiovascular<br>• Aoritis > AR Eye<br>• Anteior uveitis (pain, blurred vision, photophobia, and conjunctival erythema)<br>RA<br>• Use hand mobility test to assess severity<br>Diabetes and SLE<br>• Monitor urine protein | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 2 |
| 867 | Fibromyalgia | Fibromyalgia occurs most commonly in women age 20-55 and presents with diffuse musculoskeletal pain, fatigue, and neuropsychiatric disturbances. It is characterized by abnormal central processing of painful stimuli. Although initially painful, aerobic exercise helps to improve pain and functioning in these patients. | **Fibromyalgia**<br>• Widespread musculoskeletal pain<br>• Fatigue<br>• Psychiatric disturbances<br>• Symptoms over 3 months<br>• No inflammaion<br>• Normal ESR, CRP<br>• Women 20• 55<br>• Abnormal central processing of painful stimuli<br>• Exercise improves symptoms<br>• TCA and SNRI<br>Polymyalgia Rheumatic<br>• Over 50<br>• Shoulder and hip pain | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 1 |
| 982 | Osteoporosis | Patients with osteoporosis have low bone mass, resulting in increased susceptibility to fragility fractures (ie, those occurring with minimal or no trauma). In primary osteoporosis (not caused by a medical disorder), serum calcium, phosphorus, and parathyroid hormone levels are typically normal. | **Renal failure of low Vit D**<br>• High PTH and low Ca | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 10 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 987 | Paget disease of bone | Bone pain and elevated alkaline phosphatase level in an elderly patient can occur with osteoblast metastases and Paget disease of bone (PDB). Biopsy showing a mosaic pattern of lamellar bone is diagnostic for PDB. The initial phase in PDB is characterized by an increase in osteoclastic activity. | **Paget's Disease**<br>• Gene mutation effecting RANK or Osteoprotegerin causing excess RANK signaling and Nf KB activation<br>Phases<br>• Osteolytic: abnormally large osteoclasts with oxcessive # of nuclei<br>• Mixed: new bone has disorganized lamellar and woven appearance<br>• Osteosclerotic: continued osteoblast activities resulting in mosaic pattern with prominent cement lines<br>• Increased vascularity results in AV shunting > high output HF<br>• Increased risk for osteosarcoma | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 4 |
| 1450 | Gout | Gout results from the deposition of monosodium urate crystals in the joints and soft tissues. Under polarized light, urate crystals appear needle-shaped and negatively birefringent. Conditions that increase uric acid production or decrease uric acid clearance can increase the risk of gout. | • Urate crystal uptake by neutrophils leads to ROS, cytokine production and joint inflammation | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 11 |
| 1600 | Reactive arthritis | Reactive arthritis is a spondyloarthropathy associated with HLA-B27 that can occur following infection with Chlamydia, Campylobacter, Salmonella, Shigella, or Yersinia. It presents with sterile arthritis due to deposition of immune complexes. | **Reactive Arthritis**<br>• HLa B27<br>• GU: chlamydia<br>• GI: Salmonella, shigella, yersinia, campylobacter, c diff<br>• Asymmetric oligoarthritis<br>• Enthesitis<br>• Dactylitis<br>• Conjunctivits or ant uveitis<br>• Urethritis<br>• Keratoderma blennorrhagicum (golden crust rash) | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 2 |
| 8802 | Rheumatoid arthritis | Rheumatoid arthritis is characterized by symmetric polyarthritis (involving the metacarpophalangeal and proximal interphalangeal joints) with prolonged morning stiffness and associated fatigue. Antibodies to citrullinated peptides/proteins have a high specificity for the condition. | **SLE**<br>• Ant dsDNA Ab | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 9 |
| 11646 | Polymyositis and dermatomyositis | Polymyositis and dermatomyositis are characterized by symmetric proximal muscle weakness and are associated with antinuclear and anti-tRNA synthetase (anti-Jo-1) autoantibodies. Biopsy in polymyositis shows patchy endomysial inflammatory infiltrate (ie, direct invasion of individual muscle fibers), whereas dermatomyositis causes perifascicular inflammation (ie, localized around blood vessels and the septa between muscle fascicles). | **Polymyositis**<br>• Proximal muscle weakness (climbing stairs, getting up from a chair)<br>• High CK and aldolase<br>• Ant Jo 1 (histidyL tRNA synthetase) Ab<br>• Endomysial mononuclear infiltrate, patchy necrosis<br>• Associated with interstitial lung disease, myocarditis and malignancy (especially adenocarcinoma)<br>Random<br>Anticardiolipin: antiphospholipid Ab syndrome Anti desmoglein 1 or 3: pemphigus vulgaris Antimitochondrial: primary biliary cirrhosis Anti smooth muscle: autoimmune hepatitis | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 5 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 11770 | Giant cell arteritis | Cell-mediated immunity is the primary mechanism underlying giant cell arteritis. The production of cytokines, in particular interleukin-6, is an important driver of this process and closely correlates with the severity of symptoms. | **Giant Cell arteritis**<br>• CelL mediate process predominantly<br>• CD4 predominant > IL 6 is very important<br>• Tocilizumab: Ab against IL 6<br>B cell activating factor<br>• Cytokine of the tumor necrosis factor ligand family<br>• Def lead to immunodeficiency<br>• Excess leads to autoimmune disease (SLE) | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 5 |
| 11805 | Polymyositis and dermatomyositis | Dermatomyositis is characterized by proximal muscle weakness resembling polymyositis, with additional inflammatory features involving the skin (heliotrope rash, Gottron papules). Both dermatomyositis and polymyositis may occur alone or as a paraneoplastic syndrome associated with an underlying adenocarcinoma (eg, ovary, lung, pancreas). | **Dermatomyositis**<br>• Proximal muscle weakness<br>• Heliotrope rash (peri oribtal area and cheeks)<br>• Gottron's papules<br>• Mononuclear perimysial infiltration, PERIfascicular atrophy and pathy necrosis<br>• Can occur alone or as a PARANEOPLASTIC syndrome underlying malignancy (most commonly ovarian, lung, colorectal, NHL)<br>Whipple dz<br>• Tropheryma Whippelii<br>• Arthritis, diarrhea, fever, CNS issues, cardiac anomalies | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 5 |
| 14677 | Rheumatoid arthritis | The pathogenesis of rheumatoid arthritis involves early activation of CD4+ T cells (especially Th1 and Th17 subsets) with release of cytokines such as tumor necrosis factor-alpha and IL-1 that cause destruction of cartilage and bone. Monoclonal antibodies that inhibit tumor necrosis factor-alpha or IL-1 receptors can slow progression of the disease. | | Rheumatology, Orthopedics & Sports (RH) | Pathophysiology (Patp) | 9 |
| 716 | COX 2 inhibitor | Selective cyclooxygenase 2 (COX 2) inhibitors relieve pain with lower risk of bleeding and gastric ulceration than nonselective nonsteroidal anti-inflammatory drugs. | • COX1: always active<br>• COX2: active at sites of inflammation<br>• COX1 inhibition can lead to PUD, and increased bleeding | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 1 |
| 718 | Rheumatoid arthritis | Methotrexate is the preferred disease-modifying treatment for patients with moderate to severe rheumatoid arthritis. Significant adverse effects include stomatitis, bone marrow suppression, and liver function abnormalities. | **RA**<br>• Methotrexate DOC<br>• Adverse: oral/GI ulcers, alopecia, pancytopenia, hepatotoxic, pulmonary fibrosis, increased risk of infection<br>Hydroxychloroquine<br>• RA and SLE<br>• Adverse: irreversible retinopathy<br>Minocycline<br>• Adverse: photosensitivity<br>Steroids<br>• Initial tx and acute flares of RA<br>• Short term: insomnia and hyperglycemia<br>• Long term: weight gain, osteoporosis, increase risk of GI ulcers with NSAIDs | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 9 |
| 719 | Rheumatoid arthritis | The foundation of management for rheumatoid arthritis is disease-modifying antirheumatic drugs, which alleviate pain and inflammation and reduce long-term joint destruction. However, the response to treatment may take several weeks. Nonsteroidal anti-inflammatory drugs and glucocorticoids can provide rapid symptom relief in the interim. | **RA**<br>• Methotrexate: first line<br>• Sulfasalazine<br>• Hydroxychlorquine<br>• Minocycline<br>• Infliximab<br>• Glucocorticoid will provide fast symptomatic relief<br>• Inhibit Phospholipase A2 > decreased inflammation and immune response | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 9 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 720 | Biologic agents | Tumor necrosis factor-alpha (TNF-α) inhibitors impair cell-mediated immunity. All patients beginning treatment with TNF-α inhibitors should be evaluated for latent tuberculosis. | **Etanercept**<br>• Decoy receptor (made from Fc portion of IgG1 and TNF receptor 2) to TNFalpha<br>• Check PPD<br>**Doxorubicin**<br>• Check echo<br>Methotrexate, amio, bleomycin, nitrofurantoin, busulfan<br>• Check PFTs<br>Hydroxychloroquine<br>• Check ophthalmologic exam | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 2 |
| 858 | Gout | Colchicine is used for treatment of acute gouty arthritis in patients who cannot take nonsteroidal anti inflammatory drugs. It inhibits leukocyte migration and phagocytosis by blocking tubulin polymerization. Significant side effects of colchicine include nausea and diarrhea. | **Gout Acute tx**<br>• NSAID<br>• Containdicated with PUD<br>• Colchicine<br>• Inhibts microtubular polymerization preventing cytoskeletaL dependent chemotaxis, phagocytosis and degranulation<br>• Reduces level of LTB4<br>• Adverse: GI issues<br>• Contraindicated in elderly and renal dysfunction<br>• Steroids<br>(Inhibit Phospholipase A2) | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 11 |
| 859 | Gout | Colchicine inhibits tubulin polymerization into microtubules and can be used for acute treatment and prophylaxis of gout. Important side effects of colchicine include nausea, abdominal pain, and diarrhea. | **Acute Gout Tx**<br>• NSAIDS<br>• Contraindicated in PUD<br>• Colchicine<br>• Binds tubulin inhibiting its polymerization into microtubules > disrupts neutrophil chemotaxis and phagocytosis<br>• Adverse: GI issues<br>• Avoid in elderly and those with renal dysfunction | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 11 |
| 860 | Gout | Nonsteroidal anti-inflammatory drugs are the first-line treatment for acute gouty arthritis. They inhibit cyclooxygenase and therefore decrease prostaglandin synthesis and exert a broad anti-inflammatory effect that includes inhibition of neutrophils. | **Gout**<br>• 1 MTP joint or knee<br>• Exquisite tenderness<br>• Needle shaped, negatively birefringent crystal, yellow on parallel polarized light monosodium urate<br>• Phagocytosis of crystal by neutrophil causes inflammation<br>• Acute tx: • NSAID • Colchicine • Steroids<br>• Check for PUD, liver or renal dz before giving NSAID<br>• Chronic tx: allopurinol, probenecid, febuxostat<br>Random<br>Zileuton: lipoxygenase inhibit for asthma | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 11 |
| 861 | Gout | Chronic uric acid-lowering therapy is recommended for patients with gout who have frequent gouty attacks, uric acid kidney stones, tophi, or chronic joint destruction from gout. Xanthine oxidase inhibitors are the preferred treatment. | **Gout**<br>Acute therapy: NSAID, colchicine, steroids Chronic therapy: allopurinol and febuxostat<br>• Decrease urate production<br>• Probenecid: chronic treatment<br>• MOA: increase urate excretion in urine<br>Zileuton: lipoxygenase inhibitor | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 11 |
| 993 | Thiazides | Thiazide diuretics increase calcium absorption in the distal convoluted tubules within the nephron. Thiazides are associated with increased bone mineral density and are recommended for treatment of hypertension in patients at risk for osteoporosis. Loop diuretics increase urinary calcium loss. | **Thiazides**<br>• Block Na/Cl in DCT<br>• Also cause decreased peripheral vascular resistance<br>• Reduce risk of fx and Ca kidney stones<br>Phenytoin, carbamazepine, phenobarbital<br>• Increased risk of fx<br>Loops<br>• Worsen osteoporosis<br>Lansoprazole (PPI)<br>• Increase risk of fx | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1168 | Gout | Colchicine is a 2nd-line agent for treating acute gouty arthritis. It inhibits tubulin polymerization and microtubule formation in leukocytes, ↓ neutrophil chemotaxis and emigration to sites inflamed by tissue deposition of monosodium urate crystals. GI mucosal fxn is also impaired by microtubule disruption, leading to diarrhea and, less commonly, nausea, vomiting, and abdominal pain. | **Acute gout**<br>• NSAIDs are DOC but contraindicated for pt with renal failure, PUD or aspirin intolerance<br>• Colchinice in 2nd line<br>• Inhibit tubulin polymerization into microtubules (impairing leukocyte migration)<br>• Adverse: diarrhea, N/V and abdominal pain<br>• Steroids also used<br>Probenecid: increased urate excretion for chronic use only | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 11 |
| 1253 | SLE | DILE is Chx by abrupt onset of lupus SSx (eg, fever, arthralgias, pleuritis) w/ (+) anti-histone Abs. It has been linked to Rx metabolized by N-acetylation in the liver (eg, procainamide, hydralazine, INH). Genetically predisposed individuals who are slow acetylators are at greater risk for developing DILE. | **DILE**<br>• Abrupt onset of fever, fatigue, arthralgias, arthritis, rash, serositis<br>• Increased risk with slow acetylators<br>• Anti histone Ab<br>• Drugs: procainamide, hydralazine, INH, minocycline, etanercept<br>Liver metabolism<br>Phase 1: CYP450 and slightly water soluble<br>• Lost with age<br>Phase 2: MGAS and very water soluble<br>• Not lost with age | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 7 |
| 1773 | Corticosteroids | Osteoporosis is a common cause of fragility fractures, which occur in the absence of significant trauma. Chronic, systemic use of glucocorticoids such as prednisone promotes osteoporosis and increases the risk of fractures. | **Meds causing osteoporotic fx**<br>• CYP450 inducers (metabolized Vit D)<br>• Aromatase inhibits (low estrogen)<br>• GnRH agonist (low estrogen)<br>• PPI (low Ca absoprtion<br>• Glucorticoids, unfractionated heparin, Thiazolidinedione (Low bone formation)<br>• Hyperthyroidism<br>Glucocorticoids<br>• Stim osteoclast, inhib osteoblast, decrease Vit d absorption in GI, increase PTH | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 3 |
| 1795 | Osteoporosis | Selective estrogen receptor modulators exhibit estrogen antagonist and agonist properties in a tissue-specific manner. Raloxifene has estrogen agonist activity on bone, which decreases bone resorption and improves bone density. Raloxifene has an estrogen antagonist effect on breast tissue and can decrease the risk of breast cancer; it also acts as an estrogen antagonist in the uterus, and does not increase the risk of endometrial cancer. | **Raloxifene**<br>• Agonist on bone<br>• Antagonist on breast and endometrium<br>Tamoxifen<br>• Agonist on bone and endometirum (increased risk of endometrial CA)<br>• Antagonist on breast<br>Leuprolide<br>• GnRH analog<br>Oral medroxypregesterone reduces incidence of endometrial hyperplasia but can decrease bone density | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 10 |
| 1897 | Lyme disease | Early Lyme disease causes flu-like symptoms and erythema chronicum migrans. The second stage of Lyme disease may involve atrioventricular block and facial palsy. Late Lyme disease can cause chronic asymmetric large joint arthritis and encephalopathy. Lyme disease is easily treated with doxycycline or penicillin-type antibiotics (eg, ceftriaxone). | **Borrelia > Lyme dz**<br>• Flu like symptoms and erythema chronicum migrans<br>• Bilateral facial nerve palsy and heart block<br>• Asymmetric arthritis and subacute encephalopathy<br>Tx:<br>• Doxycycline early<br>• Ceftriaxone late<br>Rando Lamivudine: NRTI<br>Mefloquine: malaria (especially resistant strains) | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 3 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7792 | NSAIDs | Cyclooxygenase-2 (COX-2) is an inducible enzyme upregulated during inflammation by interleukin-1 and TNF-α. Selective COX-2 inhibitors (eg, celecoxib) decrease inflammation by inhibiting COX-2 production of pro-inflammatory arachidonic acid metabolites. Because they do not affect COX-1, they have minimal gastroduodenal toxicity. | **COX1**<br>• Constitutively active<br>**COX2**<br>• Inducible during inflammation<br>• Celecoxib<br>• Minimizes GI toxicity; increases risk of thrombi Colchicine: binds tubulin preventing microtubule formation<br>Infliximab: Ab against TNFalpha | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 4 |
| 10930 | Osteoporosis | Long-term acid suppression with proton pump inhibitors may be associated with an increased risk of osteoporotic fractures, possibly due to decreased calcium absorption. Other medications associated with an increased risk of osteoporosis include glucocorticoids, aromatase inhibitors, and anticonvulsants that induce cytochrome P450. | **Meds that increase risk of fx**<br>• Phenobarbitl, phenytoin, carbamazepine<br>• Vit D catabolism<br>• Aromatase inhibitors, Medroxyprogesterone<br>• Low estrogen<br>• GnRH agonists<br>• Low testosterone and estrogen<br>• PPI<br>• Low Ca absorption<br>• Glucocorticoids<br>• Unfractioned heparin<br>• Thiazolidinediones<br>• Low bone formation | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 10 |
| 11564 | Osteoporosis | Bisphosphonates have a chemical structure similar to that of pyrophosphate and attach to hydroxyapatite binding sites on bony surfaces to inhibit bone resorption by osteoclasts. | **Bisphosphonates**<br>• Inhibits mature osteoclast mediated bone resorption, induce osteoclast apoptosis, and decrease development/recruitment of osteoclast precurosr cells.<br>• Similar structurally to pyrophosphate<br>• Attaches to hydroxyapatite<br>Teriparatide: recombinant PTH<br>• Stimulates maturation of pre osteoBLASTS<br>• Increase Ca absorption in GI and PCT<br>Raloxifene<br>• Inhibits osteoclast DIFFERENTIATION<br>Denosumab<br>• Ab against RANKL | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 10 |
| 11749 | Gout | Xanthine oxidase (XO) catalyzes 1 of 2 major azathioprine-inactivating pathways. Allopurinol competitively inhibits XO, which results in increased conversion of azathioprine to its active | **Xanthine Oxidase**<br>• Converts Azathioprine to 6thioguanine<br>• If inhibited with allopurinol > severe myelosuppression and decreased leukocyte count | Rheumatology, Orthopedics & Sports (RH) | Pharmacology (Phar) | 11 |
| 628 | Osteoporosis | Regular exercise leads to increased peak bone mass, a reduced rate of bone loss, and a decreased risk of osteoporosis. | **Modifiable**<br>• Physical activity, weight, Ca and Vit D levels, alcohol, smoking, steroid use<br>Osteoporosis<br>• •5 SD less than peak bone density | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 10 |
| 638 | Bone remodeling | Bone-specific alkaline phosphatase levels correlate with osteoblast activity. Other markers of osteoblast activity include N-terminal propeptide of type 1 procollagen, which is released during post translation cleavage of type 1 procollagen. | **Bone remodeling: breaking down and rebuilding of bone**<br>• Osteoblast: measure Alk Phos<br>• Bone specific Alk Phos is easily denature by heat while hepatic is not<br>Calcitonin: measured for medullary carcinoma of the thyroid<br>Urinary deoxypyridinoline (pyridinoline covalently crosslinks callagen) can be used to measure osteoclasts<br>Urinary hydroxyproline measures osteoclasts (not good because meat products contain this) | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 1 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 639 | Paget disease of bone | Osteoclasts originate from hematopoietic progenitor cells. Macrophage colony-stimulating factor and receptor for activated nuclear factor kappa-B ligand (RANK-L) play an important role in osteoclast differentiation. Paget's disease of bone is characterized by increased numbers of abnormal osteoclasts, excessive bone turnover and disorganized bone remodeling. | **Osteoclasts**<br>• Originate form mononuclear phagocytic cells<br>• Precursors are multinucleated<br>• 100's of nuclei in Paget's disease<br>• Requires Receptor for Activated Nuclear facor Kappa B Ligand (RANk L) produced by osteoblasts + m CSF to differentiate<br>• Osteoprotegerin (OPG) is a decoy to RANk RANk L<br>• Loss of OPG > juvenile Paget's<br>• Denosumab: Ab inhibits RANk RANk L<br>FGF<br>• Induce osteoblast differentiation<br>• Achondroplasia<br>IGf 1<br>• Increase osteoblast replication<br>• Decreases MMp 13 | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 4 |
| 824 | Muscle structure & physiology | Transverse tubules (T-tubules) are invaginations of the sarcolemma that transmit depolarization signals to the sarcoplasmic reticulum to trigger the release of calcium and induce muscle contraction. The uniform distribution of T-tubules in striated muscle fibers ensures that each myofibril contracts at the same time, which is necessary for efficient contraction. | **Function**<br>• Transmit depolarization from sarcolemma to sarcoplasmic reticulum in rapid and uniform manner<br>• Contains voltage gated Ca channels > stimulated release of Ca from SR<br>• Lack of t tubules results in uncoordinated contration | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 8 |
| 1381 | Resting membrane potential and action potential | When a specific ion channel opens, the respective ions will flow across the membrane in a direction that brings the resting membrane potential closer to that ion's equilibrium potential. | **Ion flow Extracellular**<br>• Na (equil at +60), CL (equil at 75), Ca (equil at +125)<br>Intracellular<br>• K (equil at 90)<br>Thus only K will exit cell at RMP | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 5 |
| 1382 | Resting membrane potential and action potential | The resting membrane potential is the difference in the electrical charges across the cell membrane under steady-state conditions. The ions that are most permeable to the cell membrane make the largest contribution to the resting membrane potential. In general, a high potassium efflux and some sodium influx are responsible for the value of the resting potential, which is typically about -70 mV. | **Resting membrane potential**<br>• K+ efflux is moderate<br>• Na+ influx is minimal<br>• This is what sets the RMP | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 5 |
| 1558 | Muscle structure & physiology | During skeletal muscle contraction, calcium is released from the sarcoplasmic reticulum and binds troponin C, thereby allowing the binding of actin to myosin. | **Muscle contraction**<br>• Ca binds troponin C moving tropomyosin revealing active site on actin<br>• Myosin head binds to active site of actin and pulls, ATP causes release of myosin head | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 8 |
| 1664 | Muscle structure & physiology | The H band is the region of the sarcomere that contains only thick (myosin) filaments. The H band is the part of the Aband (which is on either side of the M line) where thick filaments have no overlapping thin (actin) filaments. | **Sarcomere**<br>• H band: only myosin<br>• A band: full length of mysoin (has some actin)<br>• Always stays the same length M line: where myosin attaches Z line: anchor thin filaments<br>I band: only thin filaments | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 8 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1665 | Muscle structure & physiology | During the skeletal muscle contraction cycle, ATP binding to myosin causes release of the myosin head from its binding site on the actin filament. | **Muscle contraction**<br>• Ca binds troponin C<br>• Troponin moves tropomyosin exposing active site of actin<br>• Myosin binds actin and contracts<br>• ATP detaches myosin from actin<br>• No ATP > constant contraction (rigor mortis)<br>Random<br>• Myosin light chain kinase: phosphorylates myosin light chain > activates myosin to bind actin in Smooth Muscle | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 8 |
| 1858 | Muscle structure & physiology | Postural skeletal muscles such as the soleus and paraspinal muscles contain predominantly Type I slow twitch, red muscle fibers that derive ATP primarily from oxidative (aerobic) metabolism. | **Slow Twitch (type 1)**<br>• Postural<br>• Aerobic metabolism, high myoglobin, high mitochondrial, low glycogen<br>Fast Twitch (type 2)<br>• Type2b: ATP from anaerobic glycogenolysis<br>• Type2a: hybrid of 2b 1<br>• Rapid force<br>• Low myoglobin, high glycogen<br>• Think of aerobic to anaerobic 1 > 2a> 2b (it goes in order)<br>Radial Nerve: pierces supinator muscle | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 8 |
| 7592 | Muscle structure & physiology | The contractile mechanism in skeletal muscle depends on proteins (myosin II, actin, tropomyosin, and troponin) as well as calcium ions. | **Muscle contraction**<br>• Thick filament (myosin) binds to actin and causes contraction<br>• Thin filament (2 actin moles)<br>• Tropomyosin: covers active sites<br>• Troponin: connect tropomyosin<br>• Tropo T: binds tropomyosin<br>• Tropo I: binds actin<br>• Tropo C: binds Ca2+ | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 8 |
| 8266 | Muscle structure & physiology | The muscle spindle system is a feedback system that monitors and maintains muscle length, while the Golgi tendon system is a feedback system that monitors and maintains muscle force. GTOs are exquisitely sensitive to increases in muscle tension but are relatively insensitive to passive stretch. | **GTO**<br>• Junction between muscle and tendon (in series)<br>• Innervated by group 1b sensory axons > synapse of inhibitory interneurons >synapse on alpha motor neurons (causing relaxation when tension is too high)<br>• Recognizes tensions<br>Muscle spindles<br>• Intrafusal fibers (in parallel)<br>• Innervated by group 1a and 2 sensory<br>• Detect stretch can cause myotatic reflex<br>AlphaDelta: myelinated detecting temperature and nociception Pacinian<br>• Rapid adapting to vibration<br>Ruffini<br>• Slow adapting | Rheumatology, Orthopedics & Sports (RH) | Physiology (Phys) | 8 |