Common MSK Injections & Joint Aspirations

Thomas V Gocke, MS, ATC, PA-C, DFAAPA
President & Founder
Orthopaedic Educational Services, Inc.
Boone, NC
osteojunky@gmail.com
www.orthoedu.com
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Learning Goals

• Review the acute inflammatory response
• Describe role anesthetic agents
• Describe role corticosteroids
• Describe proper technique for providing injections to:
  – Shoulder/Sub-acromial space
  – Olecranon Bursa
  – Trochanteric Bursitis
  – Knee Aspiration/Injection
• Proper procedure documentation for injection/aspiration
• Provide discharge instructions for injection/aspiration
Inflammatory Response
Inflammatory Response*

- As a result of the inflammatory process:
  - redness occurs at the injury site
  - tissue warmth occurs as result of increased cellular activity
  - swelling results from increased fluid
  - pain as a result of tissue injury and stretching of nerve structures
  - The accumulation of fluid/edema at the injury site,
    - can limit the healing process by reducing joint range of motion (ROM)
    - facilitating the formation of scar tissue.

Corticosteroids
Corticosteroids

- Glucocorticoids potent anti-inflammatory capabilities
- Primary anti-inflammatory mechanism
  - inhibits various leukocyte inflammatory events
  - inhibits the two main products of inflammation
    - Prostaglandins
    - Leukotrienes
- Solubility
  - More soluble: less duration: less chance flare
  - Less soluble: longer duration: more chance flare
- Goals
  - Maximize anti-inflammatory effects
  - Minimize adverse effects
# Injectable Corticosteroids

<table>
<thead>
<tr>
<th>Steroid solution</th>
<th>Potency</th>
<th>Half-life</th>
<th>Onset/Duration</th>
<th>Dose/Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrocortisone</td>
<td>low</td>
<td>8-12 hrs</td>
<td>Short/Short</td>
<td>50mg/ml</td>
</tr>
<tr>
<td>(Hydrocortisone)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triamcinolone acet</td>
<td>Interm</td>
<td>12-36 hr</td>
<td>Intrm/Intrm</td>
<td>4mg/ml</td>
</tr>
<tr>
<td>(Kenalog)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triamcinolone</td>
<td>Interm</td>
<td>12-36 hr</td>
<td>Intrm/Intrm</td>
<td>40mg/ml</td>
</tr>
<tr>
<td>(Aristospan)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Methylprednisolone</td>
<td>Interm</td>
<td>12-36 hrs</td>
<td>Intr/long/Intr/long</td>
<td>40 mg/mL</td>
</tr>
<tr>
<td>(Depo-Medrol)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Betamethasone acetate</td>
<td>High</td>
<td>26-54 hr</td>
<td>Longer/Longer</td>
<td>6 mg/mL</td>
</tr>
<tr>
<td>(Celestone)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dexamethasone acetate</td>
<td>High</td>
<td>26-54 hr</td>
<td>Longer/Longer</td>
<td>8 mg/mL</td>
</tr>
</tbody>
</table>
Corticosteroids

• **Risks**
  – Blood sugar elevation
  – Skin pigmentation changes
  – Fat atrophy
  – Infection
  – Articular cartilage loss (AVN)
  – Steroid Flare reaction
  – Tendon rupture
  – Suppress calcium absorption (osteoporosis)
  – Wound healing issues
Corticosteroids

- Seshadri, Coyle & Chu J Arthroscopy & Related Surgery 2009
  - Methylprednisolone & Lidocaine
  - 20-40-80mg/ml & Lidocaine 1%
  - Synergistic effects steroid & Lidocaine
  - Chondrocyte degradation
  - Higher the dose the more the degradation

“This study clearly shows a dose and time dependent decrease in chondrocyte viability after exposure to methylprednisolone treatment and synergistic decrease in chondrocyte survival”

Corticosteroids

Syed, et al; Clinical Orthopaedics October 2011
- Bupivacaine and Triamcinolone
- Single med, combined med (w or w/o buffering)
- Alone or combined Bupivacaine & Triamcinolone showed chondrotoxicity

Syed HM, Green L, Bianski B, Jobe CE, Wongworawat MD: Bupivacaine and Triamcinolone May Be Toxic to Human Chondrocytes: A Pilot study; Clinical Orthopaedics and Related Research, October 2011, 469:10: 2941-2947
Local Anesthetic Agents
Local Anesthetic Agents

Local anesthesia

– General goal to reduce pain perception
– Can be use for nerve block causing paralysis/paresthesia
– Actions:
  • Local anesthetics are sodium membrane stabilizing drugs
  • Act mainly inhibiting sodium influx thru sodium ion channels in the nerve cell membrane
  • Sodium channel gets blocked and impulse stops
  • Decrease the rate of depolarization and repolarization of excitable membranes (nociceptors)
## Injectable Anesthetic Agents*, **

<table>
<thead>
<tr>
<th>Anesthetic Agent</th>
<th>Onset</th>
<th>Duration</th>
<th>Max Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lidocaine 1-2%</td>
<td>&lt;2min</td>
<td>1-2 hrs</td>
<td>4mg/kg(30ml)*</td>
</tr>
<tr>
<td>(Xylocaine)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mepivacaine 1%</td>
<td>3-5 min</td>
<td>1-2hrs</td>
<td>4mg/kg(50ml)**</td>
</tr>
<tr>
<td>(Carbocaine)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prilocaine 1%</td>
<td>&lt;2min</td>
<td>&gt;1 hr</td>
<td>7mg/kg(28ml)**</td>
</tr>
<tr>
<td>(Citanest)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bupivacaine 0.25%</td>
<td>5min</td>
<td>2-12hrs</td>
<td>2.5mg/kg(50ml)**</td>
</tr>
<tr>
<td>(Marcaine 0.125%, 0.25%, 0.5%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Etidocaine 0.5%, 1%</td>
<td>5min</td>
<td>2-3 hrs</td>
<td>4mg/kg</td>
</tr>
<tr>
<td>(Duranest)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total milliliter (ML) max dose based on 70kg patient*,**


Local Anesthetic Agents

- Allergies 2\textsuperscript{nd} to preservatives less likely 2\textsuperscript{nd} to true allergy
- Concentrations & Epinephrine
  - Higher concentration leads to increased risk toxicity
    - 4mg/kg max dose Lidocaine
  - Epinephrine holds meds in tissue longer
  - \textbf{Avoid Epinephrine} with intraarticular injections
- Bicarbonate
  - buffers ph
  - reduces burning
  - decreases duration of anesthetic & effectiveness
Local Anesthetic Agents

- Dragoo et al: AJSM 2012 Single dose local anesthetic agents
  - Lidocaine & Bupivacaine & Ropivacaine
  - 1%, 0.25 % & 0.5%
  - Bupivacaine 0.25% over 6-12 hrs no significant chondrocyte injury
  - Lidocaine 1% & 2% chondrotoxic
  - Lidocaine 0.5, Bupivacaine 0.25%, Ropivacaine 0.5% no chondrotoxicity

Injections & Aspirations:
Therapeutic vs. Diagnostic
Injection considerations:

- 1 injection Q 3-4 months (3-4 times/yr.)
  - One injection vs. multiple injections

- Exceptions to rule
  - Age
  - Arthritic changes
  - Co-morbid conditions
  - Inability to participate other therapies

- Steroid solutions similar to anesthetic agents
  - Onset vs. Duration

- Multi-dose Vial vs. Single dose vial *
  - Storage
  - Security- Room vs. Central storage

*Kirschke, Jones, Stratton, Barnett & Schaffner: Outbreak of Joint and Soft-Tissue Infections Associated with Injections from Multiple-dose medication Vials; Clinical Infectious Disease; Jan 2003, 36(11);1369-1373
Injection Procedures Checklist

• Patient positioning
• Skin evaluation
• Injection/Aspiration Landmarks
• Assemble Injection solutions/materials
• Sterile Skin Prep
• Procedure
  – Confirm Injection/Aspiration Landmarks
  – Anesthetize skin (Xylocaine vs. Vapocoolant spray
  – Needle position
• Post Injection Instructions

Polishcuk A: Skin Sterility after Application of Ethyl Chloride Spray, JBJS Jan 2012, 94:118
Shoulder
Shoulder Anatomy

Musculoskeletal Images are from the University of Washington "Musculoskeletal Atlas: A Musculoskeletal Atlas of the Human Body" by Carol Teitz, M.D. and Dan Graney, Ph.D."
Shoulder Anatomy

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by Carol Teitz, M.D. and Dan Graney, Ph.D."
Rotator Cuff Syndrome

Rotator Cuff Tendonitis
Sub-acromial Bursitis
Sub-acromial Impingement Syndrome
Subacromial Injection

• Determine if appropriate
• Medical problems
  – Diabetes: rescue therapy/monitor blood sugar
  – Document conversation
• Skin check
• Select injection solution
  – Bupivacaine, Lidocaine
  – Corticosteroid
• Identify landmarks
• Sterile Technique
• Post - injection instructions
Injection Danger Areas

- Skin tattoos
- Cellulitis
- Folliculitis
- Psoriasis/Eczema
- Abrasions/Lacerations

Photo courtesy TGocke, PA-C
Subacromial Injections

**Lateral Approach**

- Beginners frequently give intramuscular injection
- More frequent post-injection pain
- Sitting position arm dependent
- Identify lateral edge of acromion
- 1-2cm inferior to lateral edge acromion
- Slight superior angle to hit sub-acromial space

- **3ML 0.25% Bupivacaine and 2 ml Kenalog 40mg/ml 21/22 gauge needle**

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Subacromial Injections

Posterior Approach:

- Posterolateral arthroscopy portal region
- Sitting position with arm dependant
- Identify posterior rim acromion spine
- Slight cephalad angle
- Aim towards coracoid
- Select analgesic & steroid preparation

- 3ML 0.25% Bupivacaine and 2 ml Kenalog 40mg/ml 21/22 gauge needle
Lateral Epicondylitis
Lateral Epicondylitis

- General:
  - Overuse wrist extensor / Supinator muscle group (ECRB)
- Not always a tennis problem
- New moms-baby carriers
- Construction
- Tennis related
  - Overplay
  - Men = women
  - 35 - 55 yrs
  - Racquet size, weight, string tension
Lateral Epicondylitis

Musculoskeletal Images are from the University of Washington "Musculoskeletal Atlas: A Musculoskeletal Atlas of the Human Body" by Carol Teitz, M.D. and Dan Graney, Ph.D."
Lateral Epicondylitis

• Symptoms
  – Pain lateral elbow
  – Resistive wrist ext/supination w/ elbow extended
  – pain with torque activities
  – grip strength weakness
  – grasping difficulties
  – localized pain lateral elbow
  – no sensory changes
Lateral Epicondylitis

- **Steroid injection reminders**
  - Localize ECRB & Lat. Epicondyle
  - End flexed elbow crease
  - “Go to the bone”
    - Inject tissue/bone interface
    - *1ML 0.25% Bupivacaine and 1 ml Kenalog 40mg/ml 26 gauge needle*

- **Post Injection Concerns**
  - Localized numbness sensory radial nerve
  - Ice for pain relief
  - Caution activity
  - Resume therapy
  - Discharge Instructions

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Olecranon Bursitis
Olecranon Bursitis

- “Water on the Elbow”
- Olecranon bursa lies between bony olecranon & skin
- Very superficial bursa and easily traumatized
- Acts to decrease friction between bone and skin
- Inflammation results from overuse, trauma or infection
- Chronic disease states can cause inflammation
  - Gout
  - Pseudogout (CPPD)
  - RA
- Repetitive stress positions can cause inflammation
  - Results for constant contact pressure on bursa
  - Forward leaning position
Aspiration/Injection

- Suspect infection
- Plan to aspirate first and inject based on fluid aspirated
- Select Aspiration point
  - Inferior-Lateral location helps drainage
- Patient supine position
- 30 or 60 ml syringe – aspirate
- 18 gauge needle – aspirate
- Lidocaine vs. Ethyl Chloride
- Prepare for infection labs

Picture courtesy TGocke PA-C
Aspiration/Injection

- Patient supine position
- Betadine vs Hibiclens skin prep
- Ethyl Chloride
- Lidocaine/skin prep 2\textsuperscript{nd} time
- Sterile gloves
- Pinch skin at injection site
- Aspirate Fluid
  - Synovial (lemonade)
  - Pus (milkshake)

- **INFECTED STOP**
  - NO STEROID
  - Not infected: 3ML 0.25% Bupivacaine and 2 ml Triamcinolone 40mg/ml 21/22 gauge needle

Picture courtesy TGocke PA-C
<table>
<thead>
<tr>
<th></th>
<th>Septic Bursitis</th>
<th>Non-Septic Bursitis</th>
<th>Crystals</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fluid Appearance</strong></td>
<td>Purulent</td>
<td>Straw-Serous</td>
<td>Straw-Serous-Bloody</td>
</tr>
<tr>
<td><strong>Leukocytes per uL</strong></td>
<td>1.500 – 300,000 Mean # 75,000</td>
<td>50-11,000 Mean 1,100</td>
<td>1-6,000 Mean 2,900</td>
</tr>
<tr>
<td><strong>CBC/Differential</strong></td>
<td>&gt;10,000 Polymorphonuclear cells</td>
<td>&lt;1,000 Mononuclear cells</td>
<td>&lt;1,000 Variable</td>
</tr>
<tr>
<td><strong>Glucose Ratio</strong></td>
<td>&lt; 50% blood glucose</td>
<td>&gt;50% blood glucose</td>
<td>?</td>
</tr>
<tr>
<td><strong>Gram Stain</strong></td>
<td>+ &gt; 70%</td>
<td>Negative</td>
<td>Negative (?)</td>
</tr>
<tr>
<td><strong>Crystals</strong></td>
<td>None (?)</td>
<td>None</td>
<td>Monosodium urate crystals- Gout</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Calcium pyrophosphate or hydroxyapatite crystal- Pseudogout</td>
</tr>
<tr>
<td><strong>Culture</strong></td>
<td>Staph Aerus &amp; Epidermiidis (90%) Streptococcal species</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

McAfee JH, Smith DL: Olecranon and Pre-patellar Bursitis: Diagnosis & Treatment, Western Journal Medicine Nov 1988, 149:5;607-610
Ganglion Cysts
Wrist Anatomy

Musculoskeletal Images are from the University of Washington
by Carol Teitz, M.D. and Dan Graney, Ph.D.

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Ganglion Cysts

- Most common soft-tissue tumors of the hand
- Modified synovial cells
- Connected to joints or tendon sheaths
- Occurs as a result of a tear in the joint capsule and allows synovial tissue to herniate out of the joint
- Commonly occur dorsal wrist, volar wrist (radial), fingers (dorsal finger DIP – Mucous cyst)
- Transilluminate
- Transient presentation
- Size Fluctuates
Ganglion Cysts

Dorsal Wrist

Volar Wrist (radial)

Pictures courtesy TGocke, PA-C
Ganglion Cysts

Treatment

– Isolate Dorsal wrist Ganglion
– Prep skin
– Anesthetize skin with “freeze spray”
  2 ml Lidocaine
– Use 18 or 20 gauge needle to aspirate
– Do not remove aspiration needle
– Change syringe for injection
  • 1 ml Bupivacaine 0.25% & 1 ml Triamcinolone 40mg/ml

Inform Pt ganglion will probably come back
HIP & PELVIS
Hip Anatomy

- Anatomy:
  - Femoral Head
  - Femoral neck
  - Trochanters
  - Acetabulum
  - Iliac Crest
  - Tensor Fascia Lata

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Trochanteric Bursitis

- **Clinical Presentation:**
  - Mechanism of injury
    - Variable trauma
    - Sedentary
    - Change activity
  - Symptoms
    - Start-up pain
    - Sitting
    - Side sleeping position
    - Isolated lateral hip pain

*Groin or Butt pain think something else*

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Trochanteric Bursitis Injection

• Consider other problems vs. Trochanteric bursitis:
  – Lumbar radiculopathy
  – Sacroiliac (SI) joint dysfunction
  – Gluteal Muscle/tendon – Quadratus laborium
  – Dysplastic hip disease
  – Femoroacetabular Impingement (FAI)
  – Hip Osteoarthritis

• Medical problems
  – Diabetes: rescue therapy/monitor blood sugar
  – Document conversation
Trochanteric Bursitis

• **Procedure:**
  – Confirm Trochanteric bursitis
  – Lateral decubitus position
  – Identify point of maximal tenderness
  – Skin prep (Betadine vs. Hibiclens)
  – Ethyl Chloride
  – Injection solution

• **3ml Bupivacaine/ 2 ml Lidocaine & 1-2 ml Triamcinolone 40mg/ml**
  • Spinal needle 22 gauge vs. 1 ½ inch needle
Knee Anatomy

Musculoskeletal Images are from the University of Washington "Musculoskeletal Atlas: A Musculoskeletal Atlas of the Human Body" by Carol Teitz, M.D. and Dan Graney, Ph.D.
Knee Injection

• Injection has its purpose
  – Know your patient
    • Most want “rescue” therapy for pain
    • Hx OA or knee problems
  • TKA- Danger close with aspiration/injection
    • Any uncertainty abort injection
  – Effusion: best if aspirated before injection
Corticosteroid Injection

Technique

- Sitting position or supine leg off table
- Knee flexed 90 degrees.
- Palpate the lateral joint line & inferior-lateral aspect of the patella.
- Dimple or window in lateral joint space (same medial)

- Skin Prep: Betadine vs Hibiclens
- Ethyl Chloride
Corticosteroid Injection Technique

- Sterile glove(s)
- Using a 21/22 gauge, 1.5 inch needle
- Aim for Femoral notch
  - 45 degrees medially, level of the joint line.
- Resistance or you feel bone:
  - Redirect needle
- Injection Meds:
  - 3ml Bupivacaine 0.25% & 2ml Triamcinolone 40mg/ml, 21/22 gauge needle
Prepatellar Bursitis
Infrapatellar Bursitis
Pre-patellar Bursitis

Symptoms

• Gradual onset to sudden onset
• Start-up symptoms
  – Hx. Prolonged kneeling
    • Nursemaids knee
    • Clergymen’s knee
    • Carpet layer’s knee
  – Inflammation anterior knee
  – Single or repetitive motion
  – Redness/warmth
  – Variable pain locations
Infrapatellar Bursitis

**Symptoms**

- Gradual onset to sudden onset
- Start-up symptoms
  - Stiffness getting better after some motion
  - Swelling
  - Redness/warmth
  - Variable pain locations
  - Weakness/giving out
  - Catching/locking

![Picture courtesy TGocke, PA-C](image1)

![Picture courtesy TGocke, PA-C](image2)
Pre-patella/Infra-patella Bursitis

Aspiration & Injection Procedure:

- Confirm bursitis location
- Leg extended position/bump under knee
- Identify inferior point for dependent drainage
- Sterile prep: Betadine vs. Hibiclens
- Ethyl Chloride & 3 ml Lidocaine subq
- Aspiration: 20-30 ML syringe & 18 gauge needle
  - check Fluid type
  - INFECTED STOP NO STEROID INJECTED
- NO INFECTION
  - Sterile change hub syringe
- Injection solution
  - 3ml Bupivacaine 0.25%, 2 ml Triamcinolone (40mg/ml)
Knee Aspiration
Knee Aspiration

**Positioning Pointers**

- Supine position
- Bump under knee
- Patella border
- Lateral joint line
- Measure 1cm north patella then down 1cm
  - Thumb nail
- Under lateral portion Quad tendon & above ITB

Courtesy TGocke PA-C
Knee Aspiration

Supine position

- Skin prep: Betadine vs. Hibiclens
- Anesthetic: Ethyl Chloride & 10ml 1% Lidocaine
- 2nd sterile prep
- Sterile glove(s)
- Use 18 gauge needle and 60cc syringe for aspiration

- Check fluid:
  - INFECTED STOP NO STEROID
  - SEND FLUID TO LAB FOR ANALYSIS
Knee Aspiration & Injection

- Assess fluid
- Suspicion for injection
  - ? Infection Stop - no steroids
- Change syringe at hub – sterile
- Inject Cortisone solution
  - 3ml Bupivacaine 0.25%
  - 1-2 ml Triamcinolone 40mg/ml
- Sterile bandage
- Compression wrap x 24 hours
- Ice 2-3 time/day- 30 min/
- Discharge Instructions
<table>
<thead>
<tr>
<th></th>
<th>Septic knee</th>
<th>Non-Septic knee</th>
<th>Acute Gouty Flare</th>
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<td>Purulent</td>
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<tr>
<td><strong>WBC count (mm3)</strong></td>
<td>&gt;50,000 suspicious</td>
<td>2,000-&lt;50,000</td>
<td>2,000 - &lt;50,000</td>
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<td>&gt; 100,000 infection</td>
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<td><strong>Polymorphonuclear</strong></td>
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<td>&lt;50%</td>
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<td>Streptococcal species</td>
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PROCEDURE DOCUMENTATION
Risks & Benefits:
“I discussed with the patient today the risks and benefits regarding knee joint aspiration and injection to include but limited to: improvement of pain, worsening of pain, failure of the injection/aspiration to relieve their pain, reaccumulation of fluid, flare reaction, facial flushing, injection site soreness, skin pigment changes, fat atrophy, tendon rupture, joint surface injury and infection. I also discussed with the patient concerns regarding elevation of blood sugar. They are advised to follow the rescue guidelines provided by their Primary Care Provider for elevations of blood sugar beyond their safety threshold. If this does not resolve their elevated blood sugar, they are advised to contact their Primary Care Provider immediately or go to the closest Emergency Department for further treatment. The patient is aware of these possible reactions/adverse effects and choses to proceed with the procedure.”

Tom Gocke, MS, ATC, PA-C, DFAAPA
Procedure Documentation

“The Shoulder is identified and examined with findings as describe in the physical examination. The posterior/anterior/lateral injection site portal was identified and prepped with Betadine/Hibiclens/Alcohol in the usual sterile fashion. Under sterile technique (Aseptic technique), X ml of 0.25% Bupivacaine and X ml of Kenalog 40mg/ml was injected into the subacromial/Glenohumeral space. The patient tolerated the procedure well and was able to move the affected shoulder without pain or difficulty. “

“Discharge instructions were reviewed and provided to the patient prior to discharge. The patient was instructed to apply an ice pack to the affected shoulder 2 times today for 20mins each session. Their questions were answered prior to discharge. They will have XXX restrictions for the next XXX days then resume XXX activity level. They will follow up with me in XXXX days.”
Discharge Instructions
Discharge instructions:

- **Apply ice pack** to injection site three (3)x daily for 20-30 min for next 3 days to reduce pain & swelling.

- **Anti-inflammatory medication or pain medications** if you need something for injection site soreness.

- **Allergic Reaction symptoms**: Hives, rashes, difficulty breathing, facial swelling or anaphylactic symptoms go to the closest Emergency room or call 911 IMMEDIATELY.

- **Infection**: If you get a red swollen knee, run a fever >101.5 for 24 hours after the injection call our office 000-000-0000

- **Limit activity** for the next 3 days following injection/aspiration to help reduce pain & help reduce inflammation.

- **Follow up appt**: 

- **Call office 000-000-0000 if you have questions**
Injections & Aspirations

**Discharge instructions:**
- **Elevated Blood Sugar** – follow rescue instructions PCP
- **Flare reaction** – increased pain & swelling, 24-36 hrs response
- Injection site pain
- Redness- (face)
- Headache
- Jittery
- Skin Pigment Changes
- Loss of Fatty Tissue
- Infection
- Tendon Rupture
Key Take Home Points

• Know your medications
• Manage Pt expectations
• Landmarks and Performance of procedures
• Know what fluid colors mean
• Be suspicious
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