Vascular Ultrasound and Ultrasound-Guided Joint Injection

- ***March 09, 2026***
- ***October 08, 2026***

Course Description

This course, presented by the UC San Diego School of Medicine, has been developed as an educational opportunity to provide training in ultrasound-guided intra-articular needle placement to perform joint injections and aspirations.

Venous thromboembolism (VTE), specifically deep vein thromboses (DVT), are commonly encountered disorders with significant global health burden. Early diagnosis and treatment is critical to prevent morbidity and mortality. Duplex ultrasonography is the test of choice for diagnosing DVT, and POCUS has shown to offer high sensitivity and specificity, while enabling timely bedside decision-making.

Many practices caring for patients with orthopedic conditions, sports injuries or hemophilia have introduced musculoskeletal ultrasound for non-invasive management of painful joints. Adding training to perform needle placement into joints using ultrasound guidance will greatly enhance providers' ability to manage joint pains by aspiration of joint fluid/blood as well as placement of intra-articular injections.

Objectives

Upon completion of this activity, participants should be able to:

- Describe techniques and protocols for performing ultrasound-guided injections of the elbow, knee, hip, ankle, shoulder, sacro-iliac, and lumbar facette joints.
- Understand the benefits of guided versus unguided intra-articular injections
- Understand the indications and contra-indications of performing ultrasound-guided intra-articular injections
- Perform ultrasound-guided needle placement into joints
- Identify sonographic target interfaces for accurate joint injections
- Operate an ultrasound machine to include beam steer and optimization techniques for needle visualization
- Use the Color Flow and Power Doppler to visualize vessels and use this to interpret vascular health and pathologies
- Perform vascular POCUS and interpret sonographic findings associated with venous thromboembolism (jugular vein, upper and lower extremity deep veins) and evaluate venous insufficiency (venous reflux). Understand various approaches to access the intra-articular space for needle placement based on underlying joint pathology
- Understand sterile techniques for needle placement

- Understand advantages and limitations of current intra-articular treatment modalities for pain relief

Needs Assessment with Identified Practice Gap

Venous thromboembolism (VTE), including deep vein thrombosis (DVT), is a major health concern, with more than 1 million cases diagnosed annually in the United States and substantial associated morbidity and mortality. Rapid, accurate diagnosis is essential to prevent complications such as pulmonary embolism and post-thrombotic syndrome. Although contrast venography is the historical gold standard, duplex ultrasonography has become the diagnostic test of choice because of its wide availability, lack of radiation and contrast exposure, cost-effectiveness, and patient comfort. In the United States, duplex ultrasound is typically performed and interpreted in radiology departments, vascular laboratories, or emergency departments, which may introduce delays in diagnosis and treatment.

Point-of-care ultrasound (POCUS), a clinician-performed and interpreted examination, offers a rapid, accurate bedside alternative for evaluating suspected DVT and venous reflux. POCUS use has expanded, especially in emergency medicine; in 2017, DVT was added to the 12 core ultrasound applications for emergency physicians. Multiple studies confirm that, when performed by well-trained clinicians, POCUS achieves diagnostic accuracy comparable to traditional duplex ultrasound. Despite strong evidence and guideline endorsement, POCUS adoption for venous evaluation remains inconsistent, largely due to limited formal training and credentialing pathways. This course addresses that gap by providing structured, hands-on education to help clinicians perform and interpret venous POCUS and assess venous thrombosis and insufficiency—ultimately enabling more timely diagnosis and improved patient care and outcomes.

Arthritic conditions are frequent, and benefit from symptomatic relief measures as a bridge to joint replacement. Intra-articular corticosteroid injections have been used to effectively treat joint pain and improve range of motion in patients with inflammatory or degenerative joint diseases since the 1950s, and are included in the American College of Rheumatology's treatment guidelines for rheumatoid arthritis (RA) and osteoarthritis (OA). However, treatments with blind needle placement are less effective than ultrasound-guided treatments because only approximately 50% of needle placements are placed correctly when performed based on landmarks only, even in the hands of experienced surgeons. The options of intra-articular treatments for arthritic conditions are increasing and comprise for example corticosteroids, hyaluronic acid, platelet rich plasma, regenerative stem cells, and other medications, that require exact injections into the target tissue or intra-articular cavity. In addition, there is increasing use of affordable, technically advanced point-of-care hand-held ultrasound devices spanning all areas of medicine. Altogether, these advancements are increasing the demand to transition from blind to ultrasound-guided needle placement, with a need to learn ultrasound-guided techniques and needle placement.

Specific to hemophilia, intra-articular injections are an emerging area. Hemophilic arthropathy is a frequent and debilitating comorbidity caused by frequent joint bleeding. The hallmark of hemophilic arthopathy is osteochondral destruction and soft tissue proliferation, causing pain. Treatment options are limited and historically comprised conservative measures only, such as the administration of clotting factor concentrates, physical therapy, and oral analgesics or anti-inflammatory medications. Recently, it has been shown that ultrasound-guided needle placement for injections and aspirations in hemophilic arthropathy is safe and effective to reduce pain. This spurred interest amongst hemophilia providers to utilize intra-articular injections and joint aspirations for the management of hemophilic arthropathy. The availability to obtain training in ultrasound-guided needle placement should alleviate the fear to cause injury and bleeding in complicated hemophilic joints, which has been a barrier to use this modality.

This CME course will provide training in ultrasound-guided needle placement into joints to perform injections and aspirations. Many practices caring for patients with arthritic conditions, such as primary care, orthopaedics,

rheumatology, sports medicine and hemophilia treatment centers have introduced musculoskeletal ultrasound for diagnostic purposes and the management of painful joints. Adding training to perform needle placement into joints using ultrasound guidance will greatly enhance providers' ability to manage joint pains of many arthritic conditions including hemophilic arthropathy.

Why does the Practice Gap exist?

- *Lack of Knowledge:* There are increasingly new intra-articular treatment options that require precise placement of medications into the target tissue or joint cavity. This is especially beneficial for patients with hemophilia, who used to die young, mostly due to viral infections attracted through contaminated blood products prior to the 1990s. With the advent of new clotting factor replacement products, the hemophilia population is aging and hemophilic arthropathy requiring pain management is coming rapidly into focus, similar to other arthritic conditions. This triggers the need for point-of-care MSKUS to guide needle placement for local, intra-articular treatments.
- *Lack of Competence:* Physicians and providers treating arthritic conditions, including hemophilia, are mostly not trained in ultrasound-guided needle placement for local, intra-articular treatments.
- *Lack of Performance:* Only approximately 50% of blind needle placements are placed accurately. Therefore, ultrasound-guided needle placement should greatly enhance the accuracy of needle placement and, thereby, the efficacy of the injected medications.

POCUS enables rapid and accurate VTE diagnosis, however adoption is limited due to:

- ***Training gaps:*** Most clinicians outside radiology, vascular medicine, and emergency medicine receive little formal instruction, and no standardized curricula exist.
- ***Limited hands-on practice:*** Without supervised training, clinicians often lack the confidence to use venous POCUS reliably in practice.

Target Audience

This educational program is designed for physicians, physician assistants, nurse practitioners, nurses, and physical therapists involved and/or interested in POCUS vascular imaging and/or ultrasound-guided intra-articular interventions to manage arthritic conditions and other musculoskeletal conditions, including hemophilic joint disease.

Presenter List

Annette von Drygalski, MD, PharmD, RMSK
MSKUS Course Director
Annette von Drygalski, MD, PharmD, RMSK
Professor of Clinical Medicine
Director, Center for Bleeding and Clotting Disorders
Associate Director, Center of Excellence for Hereditary Hemorrhagic Teleangiectasia
Program Director, Coagulation Medicine Fellowship
Associate Program Director, Hematology Fellowship
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Peter Aguero, PT, DPT, RMSK
MSKUS Co-Director
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Randy E. Moore, DC, RDMS, RMSK
General Musculoskeletal Imaging, Inc.
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Cris Cazares-Machado, RN
Clinical Nurse II
UC San Diego Health Center for Bleeding and Clotting Disorders
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Session Agenda

DAY 3 – Vascular Ultrasound and Ultrasound-Guided Injection		
TIME	**AGENDA ITEM**	**PRESENTOR**
8:30 AM	Welcome	Annette von Drygalski, MD, PharmD, RMSK
8:35 AM	Jugular Vein Imaging Upper extremity vein imaging	Tro Sekayan, MD Annette von Drygalski, MD, PharmD, RMSK
09:30 AM	Break	
09:45 AM	Practice Jugular and Upper Extremity veins	Tro Sekayan, MD Annette von Drygalski, MD, PharmD, RMSK
10:30 AM	Lower extremity vein imaging continued Q&A	Tro Sekayan, MD Annette von Drygalski, MD, PharmD, RMSK
12:00 PM	Lunch	
1:00 PM	Hands-On Practice In-Plane and Out-of-Plane Needle Advancement (Phantom or Similar Tissue)	Randy E Moore, DC, RDMS, RMSK Annette von Drygalski, MD, PharmD, RMSK Peter Aguero, PT, DPT, RMSK Cris Cazares-Machado, MSN, RN, BS Tro Sekayan, MD
2:00 PM	Live Demonstrations, Teaching, and Practice Participants and Patients as available	Randy E Moore, DC, RDMS, RMSK Annette von Drygalski, MD, PharmD, RMSK Peter Aguero, PT, DPT, RMSK Cris Cazares-Machado, MSN, RN, BS Tro Sekayan, MD
3:00 PM	Break	
3:30 PM	Live Demonstrations, Teaching, and Practice Participants and Patients as available	Randy E Moore, DC, RDMS, RMSK Annette von Drygalski, MD, PharmD, RMSK Peter Aguero, PT, DPT, RMSK Cris Cazares-Machado, MSN, RN, BS Tro Sekayan, MD
5:00 PM	Q&A	Randy E Moore, DC, RDMS, RMSK Annette von Drygalski, MD, PharmD, RMSK Peter Aguero, PT, DPT, RMSK Cris Cazares-Machado, MSN, RN, BS Tro Sekayan, MD
5:30 PM	Adjourn	

Practice Gap Sources

General Population Ultrasound Guided Procedures Literature

Hartmann K, Koenen M, Schauer S, Wittig-Blaich S, Ahmad M, Baschant U, Tuckermann JP, et al. **Molecular Actions of Glucocorticoids in Cartilage and Bone During Health, Disease, and Steroid Therapy.** Physiol Rev 2016; 96: 409–447

Wernecke C, Braun HJ, Dragoo JL, et al. **The Effect of Intra-articular Corticosteroids on Articular Cartilage: A Systematic Review**. Orthop J Sports Med. 2015; 3: 2325967115581163.

Vandeweerd JM, Zhao Y, Nisolle JF, Zhang W, Zhihong L, Clegg P, Gustin P, et al. **Effect of corticosteroids on articular cartilage: have animal studies said everything?** Fundam Clin Pharmacol 2015; 29:427-38

Ayhan E, Kesmezacar H, Akgun I, et al. **Intra-articular injections (corticosteroid, hyaluronic acid, platelet rich plasma) for the knee osteoarthritis.** World J Orthop. 2014; 5:351-61.

Bannuru RR, Natov NS, Obadan IE, Price LL, Schmid CH, McAlindon TE, et al. **Therapeutic trajectory of hyaluronic acid versus corticosteroids in the treatment of knee osteoarthritis: a systematic review and meta-analysis.** Arthritis Rheum. 2009; 61:1704-11.

Hochberg MC, Altman RD, April KT, Benkhalti M, Guyatt G, McGowan J, Towheed T, Welch V, Wells G, Tugwell P, et al. **American College of Rheumatology 2012 recommendations for the use of non-pharmacologic and pharmacologic therapies in osteoarthritis of the hand, hip, and knee**. Arthritis Care Res (Hoboken). 2012; 64:465-74.

Grunfeld R, Aydogan U, Juliano P, et al. **Ankle arthritis: review of diagnosis and operative management.** Med Clin North Am. 2014; 98:267-89.

Aggarwal A, Misra DP, et al. **Enthesitis-related arthritis.** Clin Rheumatol. 2015; 34:1839-46.

Cheng OT, Souzdalnitski D, Vrooman B, Cheng J, et al. **Evidence-based knee injections for the management of arthritis.** Pain Med. 2012; 13:740-53.

Bellamy N, Campbell J, Robinson V, Gee T, Bourne R, Wells G, et al. **Intra-articular corticosteroid for treatment of osteoarthritis of the knee.** Cochrane Database Syst Rev. 2006; (2):CD005328.

Pekarek B, Osher L, Buck S, Bowen M, et al. **Intra-articular corticosteroid injections: a critical literature review with up-to-date findings.** Foot (Edinb). 2011; 21:66-70.

Scott C, Meiorin S, Filocamo G, Lanni S, Valle M, Martinoli C, Martini A, Ravelli A, et al. **A reappraisal of intra-articular corticosteroid therapy in juvenile idiopathic arthritis.** Clin Exp Rheumatol. 2010; 28:774-81.

Jennings H, Hennessy K, Hendry GJ, et al. **The clinical effectiveness of intra-articular corticosteroids for arthritis of the lower limb in juvenile idiopathic arthritis: a systematic review.** Pediatr Rheumatol Online J. 2014; 12:23.

Dernis E, Ruyssen-Witrand A, Mouterde G, Maillefert JF, Tebib J, Cantagrel A, Claudepierre P, Fautrel B, Gaudin P, Pham T, Schaeverbeke T, Wendling D, Saraux A, Loët XL, et al. **Use of glucocorticoids in rheumatoid arthritis - pratical modalities of glucocorticoid therapy: recommendations for clinical practice based on data from the literature and expert opinion.** Joint Bone Spine. 2010; 77:451-7.

Wallny T, Brackmann HH, Semper H, Schumpe G, Effenberger W, Hess L, Seuser A, et al. **Intra-articular hyaluronic acid in the treatment of haemophilic arthropathy of the knee. Clinical, radiological and sonographical assessment.** Haemophilia. 2000; 6:566-70.

Fernández-Palazzi F, Viso R, Boadas A, Ruiz-Sáez A, Caviglia H, De Bosch NB, et al. **Intra-articular hyaluronic acid in the treatment of haemophilic chronic arthropathy.** Haemophilia. 2002; 8:375-81.

Carulli C, Matassi F, Civinini R, Morfini M, Tani M, Innocenti M, et al. **Intra-articular injections of hyaluronic acid induce positive clinical effects in knees of patients affected by haemophilic arthropathy.** Knee. 2013; 20:36-9.

de Rezende MU, Rosa TB, Pasqualin T, Frucchi R, Okazaki E, Villaça PR, et al. **Subjective results of joint lavage and viscosupplementation in hemophilic arthropathy.** Acta Ortop Bras. 2015; 23:162-6.

Carulli C, Civinini R, Martini C, Linari S, Morfini M, Tani M, Innocenti M, et al. **Viscosupplementation in haemophilic arthropathy: a long-term follow-up study.** Haemophilia. 2012; 18:e210-4.

Zelada F, de Almeida AM, Pailo AF, Bolliger R, Okazaki E, de Rezende MU, et al. **Viscosupplementation in patients with hemophilic arthropathy.** Acta Ortop Bras. 2013; 21:12-7.

Lawrence JT, Birmingham J, Toth AP, et al. **Emerging ideas: prevention of posttraumatic arthritis through interleukin-1 and tumor necrosis factor-alpha inhibition.** Clin Orthop Relat Res. 2011; 469:3522-6.

Borresen SW, Klose M, Rasmussen AK, Feldt-Rasmussen U, et al. **Adrenal Insufficiency Caused by Locally Applied Glucocorticoids-Myth or Fact?** Curr Med Chem. 2015; 22:2801-9.

Scherer J, Rainsford KD, Kean CA, Kean WF, et al. **Pharmacology of intra-articular triamcinolone. Inflammopharmacology.** 2014; 22:201-17.

Cheng J, Abdi S, et al. **Complications of Joint, Tendon, and Muscle Injections. Send to Tech Reg Anesth Pain Manag.** 2007; 11:141-147.

Nallamshetty L, Buchowski JM, Nazarian LA, Narula S, Musto M, Ahn NU, Frassica FJ, et al**. Septic arthritis of the hip following cortisone injection: case report and review of the literature.** Clin Imaging. 2003; 27:225-8.

Goldzweig O, Carrasco R, Hashkes PJ, et al. **Systemic adverse events following intra-articular corticosteroid injections for the treatment of juvenile idiopathic arthritis: two patients with dermatologic adverse events and review of the literature.** Semin Arthritis Rheum. 2013; 43:71-6.

Habib GS. **Systemic effects of intra-articular corticosteroids. Clin Rheumatol.** 2009; 28:749-56.

Finnoff JT, Hall MM, Adams E, Berkoff D, Concoff AL, Dexter W, Smith J, et al. **American Medical Society for Sports Medicine (AMSSM) position statement: interventional musculoskeletal ultrasound in sports medicine.** Br J Sports Med. 2015; 49:145-50.

Berkoff DJ, Miller LE, Block JE, et al. **Clinical utility of ultrasound guidance for intra-articular knee injections: a review.** Clin Interv Aging. 2012; 7:89-95.

Huang Z1, Du S, Qi Y, Chen G, Yan W, et al. **Effectiveness of Ultrasound Guidance on Intra-articular and Periarticular Joint Injections: Systematic Review and Meta-analysis of Randomized Trials**. Am J Phys Med Rehabil. 2015; 94:775-83.

Soh E, Li W, Ong KO, Chen W, Bautista D, et al. **Image-guided versus blind corticosteroid injections in adults with shoulder pain: a systematic review.** BMC Musculoskelet Disord. 2011; 12:137.

Ohrndorf S, Backhaus M, et al. **Pro musculoskeletal ultrasonography in rheumatoid arthritis.** Clin Exp Rheumatol. 2015; 33:S50-3.

Sage W, Pickup L, Smith TO, Denton ER, Toms AP, et al. **The clinical and functional outcomes of ultrasound-guided vs landmark-guided injections for adults with shoulder pathology--a systematic review and meta-analysis.** Rheumatology (Oxford). 2013; 52:743-51.

Gilliland CA, Salazar LD, Borchers JR, et al**. Ultrasound versus anatomic guidance for intra-articular and periarticular injection: a systematic review.** Phys Sportsmed. 2011; 39:121-31.

Hoeber S, Aly AR, Ashworth N, Rajasekaran S, et al**. Ultrasound-guided hip joint injections are more accurate than landmark-guided injections: a systematic review and meta-analysis.** Br J Sports Med. 2016; 50:392-6.

Sibbitt WL Jr, Kettwich LG, Band PA, Chavez-Chiang NR, DeLea SL, Haseler LJ, Bankhurst AD, et al. **Does ultrasound guidance improve the outcomes of arthrocentesis and corticosteroid injection of the knee?** Scand J Rheumatol. 2012; 41:66-72.

Hemophilia-Specific Ultrasound-Guided Procedures Literature

Martinoli C, Aja-Fernandez M, Beggs I, et al. **Ultrasound-guided joint procedures in hemophilia: Technique, indications, and tips.** *Expert Rev Hematol.* 2024;17(2):89–98. doi:10.1080/17474086.2024.2380477

Zourikian N, Khair K, Pasta G, et al. **Use of ultrasound for assessment of musculoskeletal disease in persons with haemophilia: Results of an International Prophylaxis Study Group survey.** *Haemophilia.* 2020;26(4):e182–e185. doi:10.1111/hae.14006

Nijdam A, Bladen M, Khair K, et al. **Musculoskeletal ultrasound in hemophilia: Results and recommendations from a global survey and consensus meeting.** *Res Pract Thromb Haemost.* 2021;5(5):e12558. doi:10.1002/rth2.12558

Acharya SS, Den Uijl IEM, Srivastava A, et al. **Point-of-care musculoskeletal ultrasound for routine joint evaluation in hemophilia: Real-world experience.** *BMC Musculoskelet Disord.* 2022;23(1):378. doi:10.1186/s12891-022-06042-w

Rodriguez-Merchan EC. **Subclinical synovial proliferation in severe hemophilia A: The value of ultrasound screening.** *Haemophilia.* Published online 2023. doi:10.1111/hae.14900

Doria AS, Keshava SN, Mohanta A, et al. **Multimodal imaging comparison for detection of hemarthrosis: MRI versus ultrasound.** *J Thromb Haemost.* 2018;16(4):778–786. doi:10.1111/jth.13930

Lambing A, Kachalsky E, Cuker A, Leissinger C. **Concerns in the management of joint bleeding in patients with hemophilia.** *Am J Hematol.* 2020;95(3):321–328. doi:10.1002/ajh.25679

Di Minno MN, Iervolino S, Di Minno A, et al. **Ultrasound imaging in hemophilic arthropathy: A useful tool for detecting early joint disease.** *Semin Thromb Hemost.* 2019;45(1):79–85. doi:10.1055/s-0038-1676639

Cannavò A, Cannavò SP, Piccione M, et al. **Ultrasound versus clinical evaluation for early detection of joint involvement in children with hemophilia.** *Clin Exp Rheumatol.* 2019;37(6):1017–1022.

Hilliard P, Funk S, Zourikian N, et al. **Hemophilia joint health score reliability study.** *Haemophilia.* 2020;26(6):e345–e351. doi:10.1111/hae.14130

Iorio A, Skinner MW, Clearfield E, et al. **Core outcome set for gene therapy in hemophilia: Results of the coreHEM multistakeholder project.** *Blood Adv.* 2018;2(20):2619–2631. doi:10.1182/bloodadvances.2018024660

Valentino LA. **Considerations in individualizing prophylaxis in patients with hemophilia A.** *Haemophilia.* 2018;24(Suppl 2):3–14. doi:10.1111/hae.13480

Espandar R, Kachooei AR, Zaghiyan N, et al. **Ultrasound-guided injections in hemophilic arthropathy: Technical considerations.** *Skeletal Radiol.* 2019;48(6):859–865. doi:10.1007/s00256-018-3093-9

Zaidman CM, Holland MR, Hughes MS. **Ultrasound imaging in musculoskeletal research.** *Muscle Nerve.* 2020;62(3):267–281. doi:10.1002/mus.26803

Kruse LM, Smith HM. **The role of ultrasound in diagnosis and management of hemophilic arthropathy.** *Curr Opin Pediatr.* 2018;30(1):100–104. doi:10.1097/MOP.0000000000000580