Washington State Health Care Authority

Hip surgery procedures for treatment of femoroacetabular impingement syndrome – re-review

Clinical Expert

Mia S. Hagen, MD

Assistant Professor, Department of Orthopaedics and Sports Medicine, University of Washington Medical Center

Surgical Director, Sports Medicine Center at Husky Stadium

Team physician, University of Washington Husky Athletics

Mia Smucny Hagen, M.D.

Orthopaedic Surgery, Sports Medicine, Hip Preservation
941 West Emerson St, Seattle WA 98119
(510) 896-5973 | smia@uw.edu | mia.smucny@gmail.com

EDUCATION

Orthopaedic Sports Medicine Fellowship, Cleveland Clinic Foundation 8/2016 – 7/2017
Cleveland, OH

Orthopaedic Surgery Residency, University of California San Francisco (UCSF) 7/2012 – 7/2016
San Francisco, CA

Internship in General Surgery, UCSF 7/2011 – 6/2012
San Francisco, CA

Doctor of Medicine, UCSF 8/2007 – 5/2011
San Francisco, CA

Bachelor of Arts, History of Science, History of Medicine, Yale University 8/2002 – 5/2006
New Haven, CT
Graduated with *Magna Cum Laude* honors and Honors in History of Science, History of Medicine

WORK EXPERIENCE

Surgical Director, UW Sports Medicine Clinic at Husky Stadium 1/2019 – present
Responsibilities include management of clinic operations as related to surgical practice and creating measures for quality improvement and enhanced patient satisfaction.

Assistant Professor, Department of Orthopaedics and Sports Medicine, University of Washington (UW) 10/2017 – present
Seattle, WA

Content Development Expert, Journal of Bone & Joint Surgery Clinical Classroom 4/2017 – 12/2018
Contributed more than 75 questions and learning resources to the Sports module of an online adaptive learning platform hosted by the New England Journal of Medicine Knowledge+ application and the Journal of Bone and Joint Surgery. Edited all Sports module question and remediation text.

Academic Coordinator, Yale MBA for Executives: Leadership in Healthcare 6/2006 – 8/2007
New Haven, CT
Full-time position to coordinate curricular and operational aspects of the healthcare executive MBA program of the Yale School of Management

MEDICAL LICENSURES & CERTIFICATIONS

American Board of Orthopaedic Surgery, Board Certified Expires 10/31/2029
Washington State Department of Health, Physician & Surgeon License Expires 2/7/2020
United States Department of Justice Drug Enforcement Administration, Expires 2/28/2020
Practitioner Controlled Substance Registration Certificate

NOTABLE COURSEWORK

Orthopaedic Research Society (ORS) Clinical Scholar Career Development Program — September 2019
Program held with support from American Academy of Orthopaedic Surgery (AAOS) and Orthopaedic Research and Education Foundation (OREF), Rosemont, IL

Introduction to Clinical Research Boot Camp — July 2019
Institute of Translational Health Sciences, Seattle WA

51st Annual AAOS Course for Orthopaedic Educators — November 2018
Rosemont, IL

HONORS, AWARDS, & GRANT SUPPORT

Co-investigator, University of Washington Department of Orthopaedics Seed Grant — 5/2019
Medical Grade Compression Bracing to Reduce Swelling and Improve Outcomes after ACL Reconstruction: A Pilot Randomized Controlled Trial.

Sub-investigator, USA Department of Defense — 1/2019
STaR Trial: Multiple Ligament Knee Injuries. A randomized clinical trial on Surgical Timing and Rehabilitation (STaR) after multiligamentous knee injury. This is a multicenter trial sponsored by the University of Pittsburgh, NCT03543098. UW is a participating site.

Co-investigator, University of Washington CLEAR Center Pilot & Feasibility Program — 5/2018
Investigating use of blood flow restriction after ACL reconstruction

Manning Award for Outstanding Resident Paper, UCSF Department of Orthopaedic Surgery 61st Annual LeRoy C. Abbott Scientific Program and 37th Annual Verne T. Inman Lectureship — 5/2016

Top 10 Poster, Arthroscopy Association of North America Annual Meeting — 4/2015
Los Angeles, CA

James O. Johnston Resident Research Grant — 5/2014
Awarded $5000 to study the effect of postoperative rehabilitation on patient outcomes following reverse total shoulder replacement

Global Health Clinical Scholar, UCSF — 7/2013 – 7/2014

Dean's Summer Research Fellowship, UCSF School of Medicine — 6/2008
Awarded $3500 for a project utilizing the Scoliosis Research Society database

Yale College Dean's Research Fellowship — 6/2005
Awarded $4000 to research the impact of western medicine on traditional healthcare in Korea

National Merit Finalist — 2/2002

TEAM COVERAGE EXPERIENCE

University of Washington Athletics, NCAA DI — 10/2018 – present

Cleveland Cavaliers, NBA — 10/2016 – 7/2017

Cleveland Indians, MLB — 8/2016 – 7/2017

Mahoning Valley Scrappers, Short-Season A Minor League Baseball — 8/2016 – 9/2016
Niles, OH

Baldwin Wallace University, NCAA DIII Berea, OH	8/2016 – 7/2017
Senate Conference high school football Cleveland, OH	8/2016 – 7/2017
UCSF Annual PlaySafe Cardiac Physicals	4/2013 – 5/2016
UCSF PlaySafe Program high school football	9/2012 – 10/2015
Golden Gate Rugby Club San Francisco, CA	1/2013 – 4/2014
San Francisco Marathon	7/2009, 7/2010

LEADERSHIP & ADMINISTRATIVE EXPERIENCE

Clinical Expert, Washington State Health Technology Clinical Committee Review of femoroacetabular impingement syndrome	9/1/2019 – present
Residency Program Evaluation Committee Member, UW Department of Orthopaedics and Sports Medicine	9/2019 – present
Orthopaedic Committee Member, UWMC Epic Destination: 1	1/2019 – present
Board Member, Washington State Orthopaedic Association	10/2018 – present
Faculty Director, UW Medical School Orthopaedic Surgery and Sports Medicine Interest Group	8/2018 – present
President, Alpha Omega Alpha Honor Society, UCSF School of Medicine	5/2011

VOLUNTEER SERVICE

Abstract Reviewer, American Orthopaedic Society for Sports Medicine (AOSSM)	Term 9/2019 – 7/2022
Musculoskeletal Director, UWMC Doctor for a Day Seattle, WA	7/2019 – present
Reviewer, Clinical Orthopaedics and Related Research	10/2018 – present
Reviewer, Journal of Hip Surgery	2/2018 – present
Mentor, UW Orthopaedic Surgery and Sports Medicine Interest Group	10/2017 – present
Mentor, Perry Initiative Outreach Program San Francisco, CA; Cleveland, OH	7/2010 – 7/2017
Mentor, UCSF School of Medicine Surgery Interest Group	9/2014 – 7/2016

PEER-REVIEWED PUBLICATIONS

Somerson JS, Isby I, **Hagen MS**, Kweon C, Gee A. "The menstrual cycle may affect anterior knee laxity and the rate of anterior cruciate ligament rupture: A systematic review and meta-analysis." *Journal of Bone and Joint Surgery Reviews,* September 2019 (Epub ahead of print).

Hagen M, Pandya N. "Achilles Tendon Ruptures in Young Female Basketball Players: A Case Series." *JAAOS Global Research and Reviews,* 2019; 3 (6): e016.

Kweon C, **Hagen MS**, Gee A. "What's new in sports medicine." *Journal of Bone and Joint Surgery,* 2019; 101 (8): 669-674.

Cleveland Clinic Sports Knee Group, Bessette MC, Westermann RW, Davis A, Farrow L, **Hagen MS**, Miniaci A, Nickodem R, Parker R, Rosneck J, Saluan P, Spindler KP, Stearns K, Jones MH. "Predictors of pain and function before knee arthroscopy." *Orthop J Sports Medicine*, 2019; 7 (5): 2325967119844265.

Hagen MS, Westermann RW, Lynch TS, Rosneck J. "Rehabilitation for femoroacetabular impingement: conservative care and postoperative practice." *Journal of Hip Surgery,* 2018; 2 (4): 189-193.

Sonnenfeld J, Trofa DP, Westermann RW, **Hagen MS**, Rosneck J, Lynch TS. "Outcomes measures in hip arthroscopy." *Journal of Hip Surgery,* 2018; 2 (4): 167-175.

Brown M, Westermann RW, **Hagen MS**, Strnad GJ, Rosneck J, Spindler KP, Lynch TS. "Validation of a novel surgical data capturing system following hip arthroscopy." *Journal of the American Academy of Orthopaedic Surgeons,* Feb 2019 (Epub ahead of print).

Hagen, MS. "CORR Insights: Acetabular retroversion and decreased posterior coverage are associated with sports-related posterior hip dislocation in adolescents." *Clinical Orthopaedics and Related Research,* 2019; 477 (5): 1109-1110.

Slattery CA, Kweon CY, **Hagen MS,** Gee AO, Williamson RV. "Comparison of medial and lateral posterior femoral condyle articular cartilage wear patterns." *The Knee,* 2018; 25 (6): 1165-1170.

Westermann RW, Hu J, **Hagen MS**, Willey M, Lynch TS, Rosneck JR. "Epidemiology and detrimental impact of opioid use in patients undergoing arthroscopic treatment of femoroacetabular impingement syndrome." *Arthroscopy,* 2018; 34 (10): 2832-2836.

Kweon C, **Hagen MS**, Gee A. "What's new in sports medicine." *Journal of Bone and Joint Surgery,* 2018; 100 (8): 712-718.

Smucny M, Miniaci A. "Pre-shaped allograft for glenoid reconstruction in anterior shoulder instability". *Arthroscopy Techniques*, 2018; 7(4): e343-348.

Smucny M, Westermann RW, Schickendantz MS. "Non-operative management of ulnar collateral ligament injuries in the throwing athlete." *The Physician and Sportsmedicine*, 2017; 45(3): 234-238.

Smucny M, Miniaci A. "A new option for glenoid reconstruction in recurrent anterior shoulder instability." *American Journal of Orthopaedics*, 2017; 46(4): 199-202.

Smucny M, Kolmodin J, Saluan P. "Shoulder and elbow injuries in the adolescent athlete." *Sports Medicine and Arthroscopy Review* 2016; 24(4): 188-194.

Smucny M, Shin EC, Zhang AL, Feeley BT, Gajiu T, Hall SL, Ma CB; MOON shoulder group. "Poor agreement on classification and treatment of subscapularis tears." *Arthroscopy* 2016; 32(2): 246-251.

Smucny M, Parikh SN, Pandya NK. "Consequences of single sport specialization in the pediatric and adolescent athlete." *Orthopaedic Clinics of North America* 2015; 46(2): 249-58.

Smucny M, Menendez ME, Ring D, Feeley BT, Zhang AL. "Inpatient surgical site infection after shoulder arthroplasty." *Journal of Shoulder and Elbow Surgery* 2015; 24(5): 747-53.

Lattanza LL, Goldfarb CA, **Smucny M**, Hutchinson DT. "Clinical presentation of posterolateral rotatory instability of the elbow in children." *Journal of Bone and Joint Surgery* 2013; 7(95): e105-7.

Edwards SG, Cohen MS, Lattanza LL, Iorio ML, Daniels C, Lodha S, **Smucny M**. "Surgeon perceptions and patient outcomes regarding proximal ulna fixation: a multicenter experience." *Journal of Shoulder and Elbow Surgery*. 2012, 21(12): 1637-43.

Diab M, **Smucny M**, Dormans JP, Erickson MA, Ibrahim K, Lenke LG, Sucato DJ, Sanders JO. "Use and outcomes of wound drain in spinal fusion for adolescent idiopathic scoliosis." *Spine*, 2012, 37(11): 966-73.

Smucny M, Lubicky JP, Sanders JO, Carreon LY, Diab M. "Patient self-assessment of appearance is improved more by all pedicle screw than by hybrid constructs in surgical treatment of adolescent idiopathic scoliosis." *Spine*, 2011, 36(3): 248-254.

Smucny M, Forman HP. "How to think about insurance: the economics of risk and how it may affect our practice." *Journal of the American College of Radiology*, 2006, 3(12): 914-917.

POSTERS & PRESENTATIONS

Yao JJ, Cook TB, Brewer EG, Gee AO, Kweon CY, **Hagen MS.** "Hip Survival Following Arthroscopy: Analysis of 12733 Patients." Resident Award Nominee and Podium at Western Orthopaedic Association Annual Meeting in Monterey, CA, August 2019.

Yao JJ, Slattery CA, **Hagen MS**, Gee AO, Kweon CY. "Cost Data for Nonsurgical Treatments in Sports Medicine are Lacking." Podium at Western Orthopaedic Association Annual Meeting in Monterey, CA, August 2019.

Slattery CA, **Hagen MS**, Cook TB, Wolff EM, Gee AO, Kweon CY. "Factors Associated with Delay in Diagnosis of ACL Injuries." Podium at Western Orthopaedic Association Annual Meeting in Monterey, CA, August 2019.

Thayer JH, Liechty A, Slattery CA, LaCourse M, Kweon CY, Gee AO, **Hagen MS.** "Natural History of Subacromial Shoulder Pain: Analysis of 474 Cases." Podium at Western Orthopaedic Association Annual Meeting in Monterey, CA, August 2019.

Hagen MS, Saluan Q, Hu J, Westermann RW, Goodwin R, Lynch TS, Rosneck JR. "How Well Does MRI Predict Chondral Lesions in Patients with Femoroacetabular Impingement? An Analysis of 550 Cases." Podium at the 23rd Biennial Meeting of the Cleveland Clinic Warthog Foundation, Durham NC, June 21, 2019.

Hagen MS, Cody Tipton**.** "Hip Impingement in 2019: Where are We?" UW Department of Orthopaedic Surgery & Sports Medicine Grand Rounds, Seattle WA, June 5, 2019.

Hagen MS. "Hip Impingement: Real or Just Fake News." UW Roosevelt Grand Rounds, Seattle WA, March 5, 2019.

Hagen MS. "Demystifying the Sports Hernia." UW Sports Medicine Grand Rounds, Seattle WA, October 24, 2018.

Westermann RW, Hu J, **Smucny M**, Willey M, Lynch T, Rosneck JR. "The Detrimental Impact of Preoperative Opiate Use on Hip Pain and Function in Patients Undergoing Arthroscopic Treatment for Femoroacetabular Impingement." Podium at American Academy of Orthopaedic Surgeons Annual Meeting in New Orleans, LA, March 2018.

Wong S, Feeley B, **Smucny M**, Pandya N. "Complications after Pediatric Anterior Cruciate Ligament Reconstruction: A Meta-Analysis." Poster at American Academy of Orthopaedic Surgeons Annual Meeting in New Orleans, LA, March 2018.

Hagen MS, Westermann RW, Hu J, Lynch TS, Saluan Q, Goodwin R, Rosneck J. "How Well Does MRI Predict Chondral Lesions in Patients with Femoroacetabular Impingement? An Analysis of 545 Cases." Poster at the International Society for Hip Arthroscopy Annual Meeting in Santiago, Chile, October 2017.

Westermann RW, Lynch TS, Hu J, Willey M, **Smucny M**, Rosneck J. "Symptom Duration and Surgical Delay in FAI: How Long is Too Long to Wait for Surgery?" Podium at the International Society for Hip Arthroscopy Annual Meeting in Santiago, Chile, October 2017.

Westermann RW, Hu J, **Smucny M**, Willey M, Lynch TS, Rosneck J. "The Detrimental Impact of Preoperative Opiate Use on Hip Pain and Function in Patients Undergoing Arthroscopic Treatment for Femoroacetabular Impingement." Poster at the International Society for Hip Arthroscopy Annual Meeting in Santiago, Chile, October 2017.

Westermann RW, Hu J, Saluan Q, **Smucny M**, Lynch TS, Rosneck J. "Multiple Patient-Reported Allergies are Associated with Worse Hip Pain and Physical Function in Patients with Femoroacetabular Impingement." Poster at the International Society for Hip Arthroscopy Annual Meeting in Santiago, Chile, October 2017.

Smucny M, Westermann RW, Hettrich C, Bessette M, Messner W, Strnad G, Spindler KP, Jones M. "Does Mental Health Status Predict Shoulder Function at the Time of Shoulder Instability Surgery?" Podium at Cleveland Clinic Orthopaedic Surgery Department Research Day in Cleveland, Ohio, June 2017.

Smucny M, Zhang AL, Feeley BT, Cashman N, Ma CB, "A Randomized Single-Blinded Trial of Early Rehabilitation versus Immobilization after Reverse Total Shoulder Arthroplasty." Podium at American Academy of Orthopaedic Surgeons Annual Meeting in San Diego, CA, March 2017.

Smucny M, Zhang AL, Feeley BT, Cashman N, Currie C, Ma CB, "A Single-Blinded Randomized Study on the Effect of Postoperative Rehabilitation on Patient Outcome Following Reverse Total Shoulder Replacement." Podium at the UCSF Department of Orthopaedic Surgery 61st Annual LeRoy C. Abbott Scientific Program and 37th Annual Verne T. Inman Lectureship, San Francisco CA, May 2016**.**

Smucny M, The Perry Initiative Medical School Outreach Program, "Case Studies: Femoral Shaft Fractures." Podium at the American Academy of Orthopaedic Surgeons Annual Meeting in Orlando, FL, March 2016.

Smucny M, Shin EC, Zhang AL, Feeley BT, Gajiu T, Hall SL, Ma CB; MOON shoulder group. "Poor agreement on classification and treatment of subscapularis tears." Podium at the UCSF Department of Orthopaedic Surgery 60th Annual LeRoy C. Abbott Scientific Program and 36th Annual Verne T. Inman Lectureship, San Francisco CA, May 2015**.**

Smucny M, Shin EC, Zhang AL, Feeley BT, Gajiu T, Hall SL, Ma CB; MOON shoulder group. "Poor agreement on classification and treatment of subscapularis tears." Poster at the Arthroscopy Association of North America Annual Meeting in Los Angeles, CA, April 2015.

Smucny M. "The History of Anterior Cruciate Ligament Reconstruction." UCSF Department of Orthopaedic Surgery Grand Rounds, San Francisco CA, March 11, 2015.

Diab M, **Smucny M**, Dormans JP, Erickson MA, Ibrahim K, Lenke LG, Sucato DJ, Sanders JO. "Use and outcomes of wound drain in spinal fusion for adolescent idiopathic scoliosis." Podium at the UCSF Department of Orthopaedic Surgery 57th Annual LeRoy C. Abbott Scientific Program and 33rd Annual Verne T. Inman Lectureship, San Francisco CA, May 2012**.**

Diab M, **Smucny M**, Dormans JP, Erickson MA, Ibrahim K, Lenke LG, Sucato DJ, Sanders JO. "Outcomes and use of wound drain in spinal fusion for adolescent idiopathic scoliosis." Poster at the UCSF Pathways to Careers in Clinical and Translational Research Student Research Symposium, San Francisco CA, May 2010.

Smucny M, Muthulingam D, Ward V. "The Arc of San Francisco: Healthcare for Adults with Developmental Disabilities." Poster at the UCSF Department of Family Medicine Annual Colloquium, San Francisco CA, May 2010.

Smucny M, Lubicky JP, Sanders JO, Carreon LY, Diab M. "Patient self-assessment of appearance is improved more by all pedicle screw than by hybrid constructs in surgical treatment of adolescent idiopathic scoliosis." Podium at the Pediatric Orthopaedic Society of North America Annual Meeting in Boston, MA, May 2009.

Smucny M, Lubicky JP, Sanders JO, Carreon LY, Diab M. "Patient self-assessment of appearance is improved more by all pedicle screw than by hybrid constructs in surgical treatment of adolescent idiopathic scoliosis." Poster at the UCSF 22nd Annual Medical Student Research Symposium, San Francisco CA, January 2009.

Smucny M, Lubicky JP, Sanders JO, Carreon LY, Diab M. "Patient self-assessment of appearance is improved more by all pedicle screw than by hybrid constructs in surgical treatment of adolescent idiopathic scoliosis." Poster at the Scoliosis Research Society 16th International Meeting on Advanced Spine Techniques in Vienna, Austria, July 2009.

Smucny M. "One Doctor Opens One Country: Horace Newton Allen, the First Medical Missionary to Korea, 1884". Senior thesis presented at the Phi Alpha Theta Southern New England Regional Undergraduate History Conference in New Haven, CT, April 2006.

BOOK CHAPTERS

Westermann RW, **Hagen MS**, Mansell B, Parker RD. "Endoscopic Hamstring Anterior Cruciate Ligament Reconstruction." In *Illustrated Tips and Tricks in Sports Medicine Surgery, 1st ed.* Frederick M. Azar, ed., Philadelphia: Wolters Kluwer (2018), p 339-350.

Smucny M, Hettrich CM, Westermann RW, Spindler KP. "Basic Science of Graft Tissue in Sports Medicine." In *Delee & Drez's Orthopaedic Sports Medicine: Principles and Practice, 5th ed.* Mark D. Miller and Stephen R. Thompson, eds., Philadelphia: Elsevier (2019), p 30-35.

Smucny M, Spindler KP. "Time-Based Return to Play: The MOON Experience." In *Return to Play in Football: An Evidence-Based Approach.* Volker Musahl, Werner Krutsch, Joao Espregueira-Mendes, Jon Karlsson, Bert R. Mandelbaum, and Pieter d'Hooghe, eds., Springer (2018), eBook, p 247-253.

Miniaci A, **Smucny M**. "Treatment of the Unstable Shoulder with Humeral Head Bone Loss." In *Operative Techniques: Shoulder & Elbow Surgery, 2nd ed.* Donald H. Lee and Robert J. Neviaser, eds., Philadelphia: Elsevier (2018), p 232-243.

PROFESSIONAL AFFILIATIONS

Alpha Omega Alpha Honor Medical Society
American Academy of Orthopaedic Surgeons
American Orthopaedic Society for Sports Medicine
Arthroscopy Association of North America
International Society for Hip Arthroscopy
Phi Alpha Theta National History Honor Society
Washington State Orthopaedic Association

HOBBIES & INTERESTS

Cello

- Selected to perform in the UCSF Chancellor's Concert 4/30/2015
- Founding member of the UCSF Chamber Music Society 9/2013 – 6/2016
- Recorded *Cello, Celli!* (Naxos, released 2005) as a member of the Yale School of Music's "Yale Cellos"

Ultimate Frisbee (semi-professional)

- Gold medalist representing USA, World Ultimate Club Championships 7/2018
- Quarter finalist, USA Ultimate National Championships 10/2014, 2016, 2018
- Competitor, USA Ultimate National Championships 10/2012, 2015

LANGUAGE FLUENCY

Spanish (Fair)

Applicant Name Mia S. HAGEN

Address

1. Business Activities

(a) If you or a member of your household was ***an officer or director of a business*** during the immediately preceding calendar year and the current year to date, provide the following:

Title	Business Name & Address	Business Type

(b) If you or a member of your household ***did business under an assumed business name*** during the immediately preceding calendar year or the current year to date, provide the following information:

Business Name	Business Address	Business Type

2. Honorarium

If you ***received an honorarium of more than $100*** during the immediately preceding calendar year and the current year to date, list all such honoraria:

Received From	Organization Address	Service Performed

3. Sources of Income

(a) Identify ***income source(s) that contributed 10% or more of the combined total gross household income*** received by you or a member of your household during the immediately preceding calendar year and the current year to date.

Source Name & Address	Received By	Source Type
UWMC / UWP	Mia HAGEN	SALARY
FACEBOOK	ANDREW HAGEN	SALARY

(b) Does any income source listed above relate to, or could it reasonably be expected to relate to, business that has, or may, come before the Committee?

☑ Yes ☐ No

If "yes", describe:
I DO HIP ARTHROSCOPY PROCEDURES FOR FAI

(c) Does an income source listed above have a legislative or administrative interest in the business of the Committee?

☐ Yes ☑ No

If "yes", describe: _____

4. Business Shared With a Lobbyist

If you or a member of your household ***shared a partnership, joint venture, or similar substantial economic relationship with a paid lobbyist***, were employed by, or employed, a paid lobbyist during please list the following:

(Owning stock in a publicly traded company in which the lobbyist also owns stock is not a relationship which requires disclosure.)

Lobbyist Name	Business Name	Type Business Shared

Provide the information requested in items 5, 6, and 7 below only if:
(a) Your response involves an individual or business if you or a member of your household did business with, or reasonably could be expected to relate to business that has or may come before the Health Technology Clinical Committee.
(b) The information requested involves an individual or business with a legislative or administrative interest in the Committee.

5. Income of More Than $1,000

List each source (***not amounts***) of income over $1,000, other than a source listed under question 3 above, which you or a member of your household received during the immediately preceding calendar year and the current year to date:

Income Source	Address	Description of Income Source
HTCC		PAYMENT FOR REVIEW OF CAL MATERIALS

6. Business Investments of More Than $1,000

(Do not list the amount of the investment or include individual items held in a mutual fund or blind trust, a time or demand deposit in a financial institution, shares in a credit union, or the cash surrender value of life insurance.)

If you or a member of your household had a personal, beneficial interest or investment in a business during the immediate preceding calendar year of more than $1,000, list the following:

Business Name	Business Address	Description of Business

7. Service Fee of More Than $1,000

(Do not list fees if you are prohibited from doing so by law or professional ethics.)

List each ***person for whom you performed a service for a fee of more than $1,000*** in the immediate preceding calendar year or the current year to date.

Name	Description of Service

****

I certify that I have read and understand this Conflict of Interest Form and the information I have provided is true and correct as of this date.

Print Name

Check One: ☒ Committee Member ☐ Subgroup Member ☐ Contractor

[redacted]

11/14/19
Date

Washington State Health Care Authority

Agency medical director comments

FEMOROACETABULAR IMPINGEMENT (FAI)

Shana Johnson, MD
Clinical Quality - Care Transformation
Health Care Authority

November 22, 2019

Washington State Health Care Authority

Timeline - Hip Surgery for FAIS

September 2011	Original review
December 2016	Literature Update
February 2018	Literature Update
November 2019	Re-review

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Washington State Health Care Authority

Hip Surgery for Femoroacetabular Impingement Syndrome (FAI)

Washington State Health Care Authority — Health Technology Assessment - HTA

Health Technology Clinical Committee
Findings and Coverage Decision
Topic: Hip Surgery for Femoroacetabular Impingement Syndrome (FAI)
Meeting Date: September 16th, 2011
Final Adoption: November 18th, 2011

Number and Coverage Topic

20110916B – Hip Surgery for Femoroacetabular Impingement Syndrome (FAI)

HTCC Coverage Determination

Hip Surgery for Femoroacetabular Impingement Syndrome (FAI) **is not a covered benefit**

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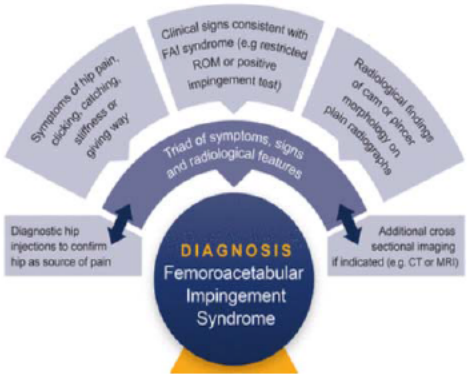
Washington State Health Care Authority

The Warwick Agreement (2016)



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Femoroacetabular Impingement Morphology

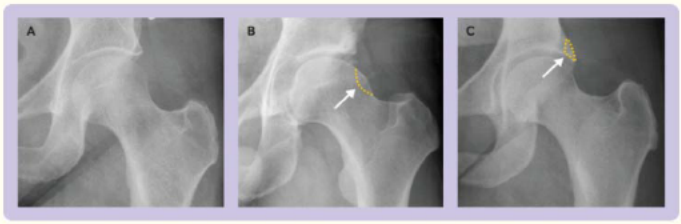

Fig 1

Anteroposterior radiographs showing (A) normal morphology, (B) cam morphology, and (C) pincer morphology. Dashes represent abnormal morphology that predisposes to femoroacetabular impingement, and which is excised with a burr during arthroscopic surgery to prevent impingement

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Femoroacetabular Impingement

- The prevalence of FAI morphology is high and is observed in about one fifth (20%) of the general population.

  Frank JM, Harris JD, Erickson BJ, et al. Prevalence of Femoroacetabular Impingement Imaging Findings in Asymptomatic Volunteers: A Systematic Review. Arthroscopy 2015;31:1199-204

- Less than 25% of those affected develop pain (FAI syndrome) or osteoarthritis.

  Agricola R, Waarsing JH, Arden NK, et al. Cam impingement of the hip: a risk factor for hip osteoarthritis. Nat Rev Rheumatol 2013;9:630-Less

- **High rate of asymptomatic occurrence of FAI**

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Agency Medical Director Concerns Femoroacetabular Impingement

SAFETY = Medium

EFFICACY = High

COST = High

7

Current State Agency Policy: FAI

HTCC Coverage Determination

Hip surgery for Femoroacetabular Impingement Syndrome (FAI) is **not a covered benefit**.

Agency	Status
PEBB/UMP	Implemented
Medicaid	Implemented
Labor and Industries	Implemented

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2015 – 2018
Utilization: FAI

Labor and Industries, PEBB (No Medicare), and Medicaid FFS incurred less than the minimum allowable utilization required for public reporting, therefore the claims are excluded from reporting

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Washington State Health Care Authority

Insurer's Coverage Policies on FAIS and Surgery

Insurer	Policy
CMS (Centers for Medicare and Medicaid Services)	No national or local coverage decisions
Aetna	Covered with conditions
Regence	Covered with conditions

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BMJ. 2019; 364: l185.
Published online 2019 Feb 7. doi: 10.1136/bmj.l185
PMCID: PMC6365841
PMID: 30733197

Arthroscopic hip surgery compared with physiotherapy and activity modification for the treatment of symptomatic femoroacetabular impingement: multicentre randomised controlled trial

Antony J R Palmer, NIHR academic clinical lecturer in trauma and orthopaedics,[1] Vandana Ayyar Gupta,

Table 3
Primary and supporting analyses

Analyses	Physiotherapy programme*		Arthroscopic surgery		Arthroscopic surgery v physiotherapy programme: adjusted† treatment effect (95% CI)	P value
	Mean (SD)	No of patients	Mean (SD)	No of patients		
Primary analysis: HOS ADL 8 months post-randomisation	69.2 (19.1)	88	78.4 (19.9)	100	10.0 (6.4 to 13.6)	<0.001
Analysis A: multilevel mixed effects model‡	-		-		10.5 (6.4 to 14.6)	<0.001
Analysis B: additional adjustment§	69.0 (19.5)	77	80.1 (18.7)	83	11.7 (9.4 to 14.1)	<0.001
Analysis C: per protocol population¶	69.7 (18.6)	81	80.5 (18.9)	79	11.9 (6.2 to 17.5)	0.002
Analysis D: post-intervention analysis**	69.2 (19.3)	87	80.4 (19.6)	91	12.0 (7.3 to 16.7)	<0.001
Multiple imputation analysis	68.0 (20.4)	110	78.2 (20.6)	112	10.0 (5.3 to 14.7)	0.004

- MCID- 9 met, wide CI
- Outcomes - 8 mo
- Bias- low

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Key Findings

- **MCID HOS ADL ≥ 9 points**
  - 51% (41% to 61%) surgery vs 32% (22% to 42%) physiotherapy
  - RR 1.6 (1.1 to 2.3)
- **Patient acceptable symptomatic state (PASS) score > 87 points**
  - 48% (38% to 58%) surgery vs 19% (11% to 28%) physiotherapy
  - RR 2.5 (1.5 to 4.0)
- **Time interval: eight months post-randomization**

Palmer AJR, et al. Arthroscopic hip surgery compared with physiotherapy and activity modification for the treatment of symptomatic femoroacetabular impingement: multicentre randomised controlled trial. BMJ (Clinical research ed) 2019;364:l185.

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Surgical Interventions

Table 2

Details of participants commencing allocated intervention. Values are numbers (percentages) of participants unless stated otherwise.

Surgical intervention		
Labral procedure only‡	9 (9)	–
Femoral osteochondroplasty	66 (67)	–
Acetabular osteochondroplasty (rim-trim)	5 (5)	–
Femoral osteochondroplasty+acetabular osteochondroplasty (rim-trim)	19 (19)	
No labral procedure	4 (4)	
Labral repair	70 (70)	
Labral debridement	25 (25)	–
No microfracture	90 (90)	–
Microfracture	9 (9)	–

- Most had a labral repair or labral debridement

Palmer AJR, et al. Arthroscopic hip surgery compared with physiotherapy and activity modification for the treatment of symptomatic femoroacetabular impingement: multicentre randomised controlled trial. BMJ (Clinical research ed) 2019;364:l185.

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Hip arthroscopy versus best conservative care for the treatment of femoroacetabular impingement syndrome (UK FASHIoN): a multicenter randomized controlled trial

Damian R Griffin, Edward J Dickenson, Peter D H Wall, Felix Achana, Jenny L Donovan, James Griffin, Rachel Hobson, Charles E Hutchinson, Marcus Jepson, Nick R Parsons, Stavros Petrou, Alba Realpe, Joanna Smith, Nadine E Foster, on behalf of the UK FASHIoN Study Group*

	Hip arthroscopy (n=171)		Personalised hip therapy (n=177)		Unadjusted difference	Adjusted difference (95% CI)	p value
	Mean (SD)	n	Mean (SD)	n			
IHOT-33							
6 months	46·6 (25)	161	45·6 (23)	154	1·0	−0·7 (−5·2 to 3·7)	0·743
12 months*	58·8 (27)	158	49·7 (25)	163	9·1	6·8 (1·7 to 12·0)	0·0093
EQ-5D-5L (utility)							
6 months	0·544 (0·26)	144	0·573 (0·23)	147	−0·029	−0·042 (−0·088 to 0·005)	0·081
12 months	0·615 (0·25)	152	0·578 (0·24)	147	0·037	0·020 (−0·027 to 0·067)	0·397
EQ-5D VAS							
6 months	67·8 (19·3)	145	70·3 (19·3)	145	−2·5	−2·1 (−5·7 to 1·4)	0·241
12 months	71·9 (20·7)	150	69·2 (19·4)	145	2·7	2·6 (−1·2 to 6·4)	0·180
SF-12 PCS							
6 months	43·4 (7·0)	146	44·2 (6·6)	142	−0·8	−0·7 (−2·1 to 0·7)	0·304
12 months	45·1 (6·3)	145	44·2 (6·4)	132	1·0	1·1 (−0·2 to 2·5)	0·099
SF-12 MCS							
6 months	42·1 (7·3)	146	42·1 (7·2)	142	−0·1	−0·1 (−1·5 to 1·3)	0·929
12 months	43·2 (7·1)	145	42·6 (6·9)	132	0·6	0·4 (−1·2 to 2·0)	0·589

iHOT-33=International Hip Outcome Tool. VAS=visual analogue score. PCS=physical component score. MCS=mental component score. *Primary outcome.

Table 2: **Patient-reported outcome measures**

- MCID 6.1
- Baseline:3 years sx
- Intervention: cartilage and labral damage can be resected, repaired, or reconstructed-most patients

Evidence Report

Pertinent Limitations

- Asymptomatic presence of FAI morphology is high
- Less than 25% of those affected develop pain (FAIS) or osteoarthritis.
- High quality definition of FAI/FAIS as a distinct entity (versus FAI with labral tear) is unclear
- Key studies--most had a procedure to address a labral injury
- Evidence not clearly generalizable to FAIS given most had labral procedures

Pertinent Positives

- Palmar and Griffin--Good quality trials
- Outcomes at 8 months, 12 months
- Palmar HOS-ADL met MCID
- Griffin-Met IHOT-33 MCID
- Effect size: small
- Studies support hip arthroscopy with mechanical symptoms, most of which had a labral procedure

15

Current Hip Arthroscopy Clinical Policy

- **Diagnostic hip arthroscopy** medically necessary when there is joint pain, locking, give away, pain with ROM, limited ROM, non-diagnostic imaging, and failure of conservative care
- **Surgical hip arthroscopy** medically necessary for joint symptoms and clinical signs following failure of conservative care and includes: debridement or repair of labral tear, joint exploration, joint lavage/aspirate, address osteochondral lesion or loose body, synovectomy. Does not include repair FAI.

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Hip Surgery and FAIS

- Hip impingement is a clinical diagnosis based on mechanical symptoms. Underlying pathology is complex due to high asymptomatic rates of cam/pincer morphology & labral tears on imaging
- Key studies performed arthroscopy on those w/ clinical impingement; met the pre-specified MCID in 2 quality RCTs

- Hip impingement from cam/pincer morphology is unclear as a distinct clinical entity
- Key studies, most patients had a labral procedure
- No good quality study showing treating a cam/pincer lesion improves outcomes
- Current policy covers arthroscopy for mechanical symptoms after failure of conservative care

AMDG Recommendations

Hip Surgery for Femoroacetabular Impingement Syndrome (FAI) is not considered medically necessary.

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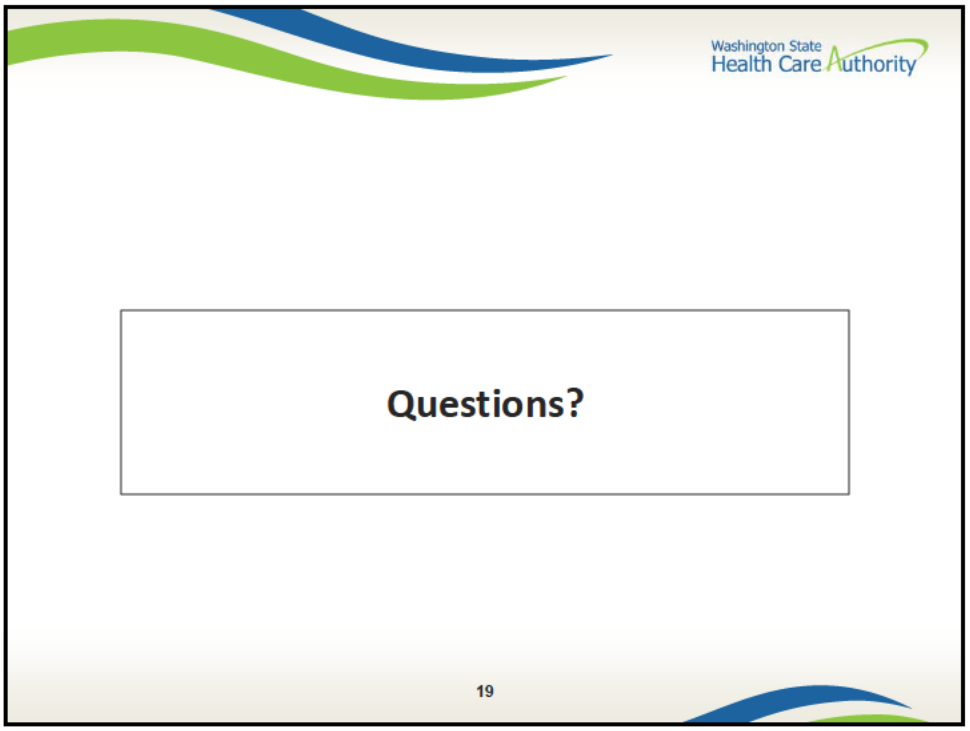
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Questions?
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Order of scheduled presentations:

Hip surgery procedures for treatment of femoroacetabular impingement syndrome

	Name
1	
2	
3	
4	
5	
6	

No requests were received to provide public comment on this technology assessment.

Femoroacetabular Impingement Syndrome: Re-Review

Presentation to

Washington State Health Care Authority

Health Technology Clinical Committee

Erika D. Brodt, BS
November 22, 2019

Report prepared by:
Andrea C. Skelly, PhD, MPH
Erika D. Brodt, BS
Mark Junge, BS
Shelby Kantner, BA

1

Update of 2011 Report

- **2011 Report**: Systematic review and budget impact analysis
- **Rationale:** Newly available published evidence
- **Objective**: Update the 2011 HTA on hip surgery procedures for the treatment of femoroacetabular impingement syndrome (FAIS) by systematically reviewing, critically appraising and analyzing new research evidence on the safety and efficacy of operative procedures for the treatment of FAI/FAIS compared with non-operative treatments. Information on case definition/diagnostic criteria for FAI/FAIS and validated outcomes measures from the original report were updated as contextual questions.
- **Consistent with the 2011 report, studies comparing *operative vs. non-operative* treatment are the focus of the update.**

2

Background: FAI/FAIS

- First described by Ganz et al. in the early 2000's
- Rapidly evolving field of orthopedics
  - Between 2006 and 2010, over 600% increase in number of arthroscopic hip surgeries for FAI (American Board of Orthopaedic Surgery database)
  - From 2011 to 2014, femoroplasty, acetabuloplasty, and labral repair increased in frequency by 60%, 11%, and 54%, respectively (Humana Claims database)
- Increasingly diagnosed in younger, more active populations

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Background: Mechanism of FAI/FAIS

- Motion-related disorder of the hip involving abnormal contact between the proximal femur and acetabulum, particularly during flexion and internal rotation
- Due to morphological irregularities of the hip
- Thought to result in labral tears, chondral lesions, and progression to osteoarthritis (OA)

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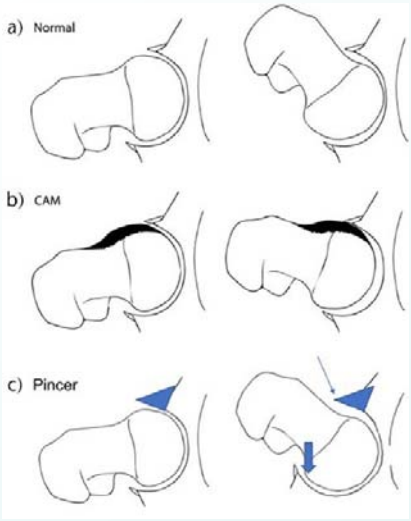
Background: Classification of FAI



Cam-type impingement

- Non-spherical femoral head or abnormality at the head-neck junction
- Results in increased femoral head radius leading to abnormal contact with the acetabular rim in full flexion

Pincer-type impingement

- Functionally deep or retroverted acetabulum
- Results in overcoverage of the femoral, or global head (relative anterior, focal anterior overcoverage)

➢ Many patients present with a combination of the two, or **"mixed-type impingement"**

5

Background: Terminology

- "**FAI syndrome (FAIS)":** based on the 2016 Warwick agreement; denotes the need for symptoms to be present
  - ➢ Defined as a triad of *symptoms*, *clinical signs* and *imaging findings*, all of which must be present to diagnose FAIS
- Authors make distinction between patients with FAI morphology but no clinical disorder

6

Background: Treatment

Non-operative

- Education, watchful waiting
- Pharmacologic (NSAIDs, steroid injections)
- Lifestyle and activity modification
- Pelvic postural retraining
- **Exercise, rehabilitation and manual therapies**
  - **Goals:** improve hip stability, neuromuscular control, strength, ROM, and movement patterns; *no standardized, FAIS-specific protocol*

Operative

- **Arthroscopy**
- Open hip dislocation
  - **Goals:** remove abnormal outgrowth of bone; repair damage to the labrum, articular cartilage; achieve impingement-free motion

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Background: Treatment, cont.

- No high-level evidence to support choice of a definitive treatment for FAIS:
  - **2016 Warwick Agreement**: all options should be considered; suggests informed multidisciplinary approach to treatment decision-making
  - **2019 Consensus Guideline for Arthroscopy** (Lynch): recommends 3 months non-operative care (not specified); contraindications and pre-, intra- and post-operative recommendations presented (Table 2)
- No consensus regarding standardized PT or non-operative treatment for FAI; methods poorly described in the literature.
  - **RCTs:** based on study team consensus and existing literature or considered "standard of care" (basis unclear)

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Background: FAI Prevalence

➢ **True prevalence of FAI morphologies, FAIS difficult to assess**

Type	General Population/Non-Athletes		Athletes
	Symptomatic	Asymptomatic	*primarily* Asymptomatic
Cam	**49%** (1 SR, N=3472, 35 studies)	**22% to 23%** (2 SRs, N=607 to 1158, 29 studies)	**48% to 75%** (3 SRs, N=607 to 1158, 52 studies)
Pincer	**29%** (1 SR, N=3472, 35 studies)	**57% to 74%** (2 SRs, N=1507 to 4140, 20 studies)	**50% to 51%** (2 SRs, N=607 to 1158, 22 studies)
Mixed	**40%** (1 SR, N=3472, 35 studies)	**9%** (1 SR, N=NR, 10 studies)	**57%** (1 SR, N=NR, 2 studies)
Labral injury	**97%** (1 study, N=100 w/ FAIS)	**73%** (1 SR, N and studies NR; "volunteers" w/ imaging suggestive of FAI)	**65%** (1 SR, N=607, 7 studies; "volunteers" w/ imaging suggestive of FAI)

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Background: Etiology, Natural History

Uncertainty regarding etiology and natural history of FAI/FAIS

- **Etiology**: idiopathic; possible familial link; associations with high intensity physical activity, secondary to prior trauma/procedures
- **Frequency, progression, severity and symptom development** poorly understood; patient factors and mental health may play role
- **Progression to OA**: inconsistent evidence; study designs, potential for bias make inference challenging

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Contextual Questions

1. Is there updated information published subsequent to the 2011 report regarding a consistent or agreed upon **case definition** for FAI/FAIS? What is the evidence of **reliability and validity** of these case definitions?
2. Are there additional/new **validated outcomes measurement instruments** used for evaluation of function or pain in FAIS patients in the updated evidence base? Is there information on **clinically meaningful improvement** for new validated measures used in the evidence base?

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Key Questions

1. What is the evidence of **efficacy and effectiveness** of hip surgery (open or arthroscopic) compared with non-operative for FAI/FAIS? Including consideration of short-term (≤5 years) intermediate-term (>5 years to <10 years) and long-term (≥10 years) outcomes.
2. What is the evidence of the **safety** of hip surgery for FAI/FAIS compared with non-operative treatment?
3. What is the evidence that hip surgery for FAI/FAIS compared with non-operative treatment has **differential efficacy or safety in subpopulations** (e.g. age, sex, psychological or psychosocial comorbidities, baseline characteristics, deformity type, degree of osteoarthritis or cartilage damage, provider type, payer type)?
4. What is the **cost-effectiveness** of surgery for FAI/FAIS compared with non-operative treatments in the short and long term?

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PICO Scope: Inclusion Criteria

- **Population**: Adults and children undergoing primary/initial treatment for FAI (symptomatic or asymptomatic):
  - Excluded: patients presenting for revision surgery, congenital hip dysplasia, slipped capital femoral epiphysis, Legg-Calve-Perthes
- **Interventions:** Operative treatment for FAI/FAIS (arthroscopic, open or combination)
- **Comparators**: Focus on non-operative treatment (may include, but not limited to, exercise, rehabilitation and manual therapies, activity modification, NSAIDs, injections, etc.)
  - Comparisons of operative interventions (e.g. arthroscopic vs. open, labral repair vs. labral debridement) were included for completeness and to provide information regarding safety primarily (note: SOE not done for these comparisons)
- **Primary Outcomes (SOE):** Function (to include ADLs) and pain using validated measures; conversion to THA; complications and adverse events (to include revision or additional surgery other than THA); and cost-effectiveness outcomes (QALY, ICER)

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PICO Scope: Inclusion Criteria

Study Design:

- KQ1-3: **focus on high quality (low risk of bias) comparative studies (e.g., RCT, comparative observational studies**); case series were considered but were not the primary focus of evaluation
- KQ2: case series in adults with ≥40 patients that were designed to evaluate safety or comprehensive SRs specifically on safety were considered
- KQ4: full formal economic analyses

Publication: Full-length studies published in English in peer-reviewed journals; studies published subsequent to the 2011 report. (EXCLUDED – meeting abstracts, white papers, editorials, letters; model policies were not within report scope)

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Individual Studies: Risk of Bias

Criteria
• Random sequence generation (RCT) • Statement of allocation concealment (RCT) • Intent-to-treat analysis (RCT) **RCTs and observational studies*** • Blind, independent assessment of outcomes/analysis • Complete follow-up of >80% • <10% difference in follow-up between groups • Controlling for possible confounding   • Multivariate analysis, matching (including propensity) *case series are considered at high risk of bias

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Strength of Evidence (SOE) Criteria – Appendices D, E

Overall *body of evidence* for primary outcomes:

- **Risk of bias (one criterion)**: the extent to which majority of included studies protect against bias
- **Consistency:** degree to which estimates are similar in terms of range and variability.
- **Directness:** evidence directly related to patient health outcomes.
- **Precision**: level of certainty surrounding the effect estimates.

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Systematic Review Process

Studies meeting eligibility criteria
Efficacy: RCTs; Effectiveness: Observational studies
Harms: RCTs, Observational studies
Full Economic studies

Risk of Bias Appraisal (Study)
Low, Moderately Low,
Moderately High, High
Synthesis/Analysis

Overall Strength of Evidence Determination (GRADE/AHRQ)
Across **comparative studies** reporting primary outcomes

Strength of Evidence Ratings	
High	Very confident that effect is true.
Moderate	Moderately confident.
Low	Limited confidence.
Insufficient	No evidence or no confidence in effect.

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SOE – Application of criteria (see report methods)

- RCT evidence initially considered “High”; Observational evidence is initially considered “Low”.
- RoB of individual RCTs *only one* component of SOE
  - 2 moderately low and 1 moderately high RoB (Mansell)
  - Inability to blind patients and providers
  - Mansell: high cross-over to surgery (70%); loss to follow-up >80%
- SOE: outcomes most commonly downgraded for imprecision; **small sample size and/or confidence interval includes both negligible effect and appreciable benefit or harm with the intervention.** Inconsistency was noted for some outcomes.

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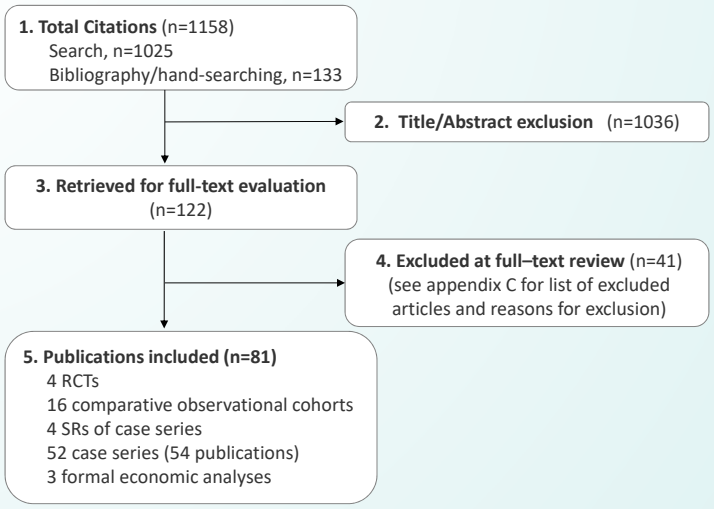
Literature Search Results



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Evidence Base – 2011 vs. 2019 report

	2011 Report	2019 Report
Operative vs. Non-operative (Focus)	• No RCTs • 1 poor quality comparative cohort (historical controls)	• 3 RCTs • 2 poor quality comparative cohort (1 in adolescents)
Operative vs. Operative	• No RCTs • 6 poor quality comparative cohorts • 40 case series (1 in adolescents)	• 1 RCT • 14 (mostly poor quality) comparative cohorts • 52 case series (13 in adolescents)

➢ Consistent with previous report, all short-term follow-up (≤5 years)

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CONTEXTUAL QUESTIONS

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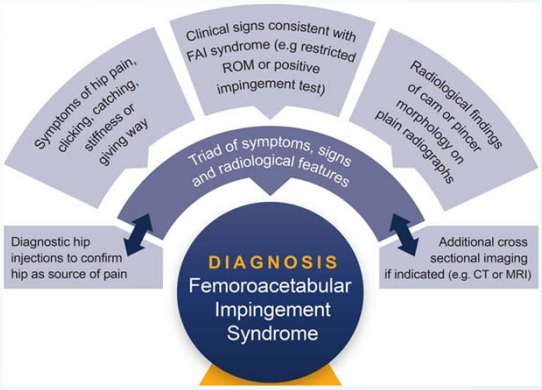
Contextual Question 1:
Case definition and diagnostic criteria



2016 Warwick Agreement – expert consensus on the definition, diagnosis and general treatment options for FAIS;

- Acknowledges paucity of high quality data on which to base recommendations
- No agreed upon thresholds for imaging; symptoms and clinical tests may not be specific to FAIS
- Experts consider it a dynamic diagnosis

Included RCTs: FAIS defined as hip or groin pain (or "symptomatic") and positive imaging signs; clinical assessments specified in only 1 RCT

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Contextual Question 1:
Accuracy and Reliability of Diagnostic Criteria

Accuracy/Validity (surgery referent)

- No high quality prospective studies identified (2011 or 2019 reports); insufficient evidence for the validity of diagnostic criteria.
  - **Symptoms, clinical tests**: 1 retrospective study: combination of these may be sensitive (>90%), but not specific (0%); Pain most sensitive (87%) and specific (100%)
  - **Imaging (MRI/MRA, CT):** Specific to FAI diagnosis, a range of sensitivity (71%–91%), specificity (60%–89%) and predictive values based SRs of retrospective studies with high pre-test FAI prevalence
  - **Hip injection**: no prospective studies

Reliability

- **Symptoms, clinical tests**: No high quality studies correcting for chance agreement
- **Imaging:** interrater reliability varied from slight (κ = 0.06) to substantial agreement (κ or ICC >0.61) across 4 studies; most frequently fair to moderate across most parameters

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Contextual Question 2: Assessment of OA

- 2 classifications, both based on presence of joint space narrowing, osteophyte formation, sclerosis and bony deformity

Tönnis (grades 0-3)

- 2 new studies
- Inter-rater reliability: slight to fair (κ = 0.173–0.397)
- Intra-rater reliability: fair to moderate (κ = 0.364–0.472)
- Reproducibility not adequate (both studies).
- No validation studies in FAI patients were identified.

Kellgren Lawrence (grades 0-4)

- 1 new, general population-based study
- Substantial inter-observer reliability (κ = 0.68, 95% CI 0.44–0.92)
- Construct validity and predictive validity for future THA were considered good.

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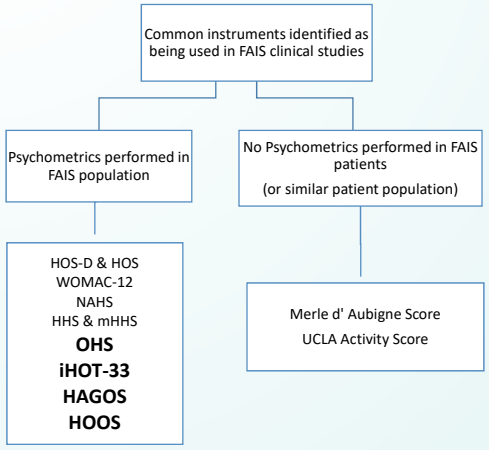
Contextual Question 2: Patient and Clinical Reported Outcomes



4 new measures identified:

- **Content validity**: adequate or good for iHOT-33, HAGOS (not measured: OHS, HOOS)
- **Construct validity, Reliability:** adequate for all 4 measures
- **Internal consistency**: inadequate or poor for iHOT-33, HOOS

Additional psychometric evaluation since previous report:

- HOS, NAHS and mHHS
- Most properties adequate

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Contextual Question 2: Patient and Clinical Reported Outcomes, cont.

MCIDs (measures in included RCTs):

- **iHOT-33** – adults: 6.1, 10 points; pediatric: 10.7 points
- **HOS-ADL and Sport –** adults: 8.3 and 14.5 points; pediatric: 9.8 and 12.1 points
- **HAGOS** (adults only) –
  - **Pain:** 6 points
  - **Symptoms:** 10 points
  - **ADL, Sport, QoL**: 9 points
  - **Physical activity:** 1 point
- **OHS** (adults only) – 5.2 points

Patient Acceptable Symptomatic State (PASS)

- **HOS-ADL**: ≥87 points
- **HOS-Sport**: ≥75 points
- **mHSS**: ≥75 points

➢ **Only 1 RCT (Palmer) reported MCID and PASS (for HOS-ADL)**

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RESULTS: RESEARCH QUESTIONS

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Overview of Evidence Base

	Operative vs. Non-operative	Operative vs. Operative	Operative: Case Series/SRs of Case Series
KQ1 (Efficacy, Effectiveness)	3 RCTs; 2 cohorts (1 in adolescents)	1 RCT; 12 cohorts	25 case series (26 pubs)*; 2 SRs of case series*
KQ2 (Safety)	3 RCTs	12 cohorts	40 case series (42 pubs)*; 4 SRs of case series (1 in adolescents)
KQ3 (Differential Efficacy, Safety)	2 RCTs	-----	-----
KQ4 (Economic Analyses)	3 CUAs	-----	-----
TOTAL	**8 studies** (3 RCTs; 2 cohorts; 3 CUAs)	**15 studies** (1 RCT, 14 cohorts)	**56 studies (58 pubs)** (52 case series, 54 pubs; 4 SRs)

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* For case series, limitations were placed on adults (N≥40, for efficacy, OA/THA only w/ ≥5 years follow-up; no restrictions on pediatrics

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KQ1 (Efficacy and Effectiveness):
Operative vs. Non-operative

Primary Focus

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RCTs: Patient Demographics

	Griffin 2018		Mansell 2018		Palmer 2019	
	Arthroscopy (n=171)	**PT (n=177)**	**Arthroscopy (n=40)**	**PT (n=40)**	**Arthroscopy (n=112)**	**PT (n=110)**
Mean age	35 years	35 years	31 years	30 years	36 years	36 years
Male (%)	58%	64%	65%	53%	34%	34%
Sx duration	3.1 years	3.3 years	>2 years: 55%	>2 years: 53%	NR	NR
Cam/pincer/ mixed FAI	75%/8%/ 17%	75%/8%/ 17%	NR	NR	91%/1%/ 6%	94%/0%/ 6%
Pre-existing OA	No (excluded: Tonnis >1; <2mm joint space)		No (excluded: <2mm joint space)		No (excluded: KL ≥2; 80% grade 0)	
Hip dysplasia	NR		NR		No (excluded: center edge angle <20°	
Failed prior PT	Unclear		No (excluded if PT w/in prior 6 mos.)		No (excluded if PT w/in prior 12 mos.)	
Prior surgery	No (excluded)		No (excluded)		No (excluded)	

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RCTs: Treatment Characteristics

➢ Arthroscopy

	Griffin 2018	Palmer 2019	Mansell 2018*
Any osteoplasty	98%	91%	% NR
Femoroplasty	74%	67%	% NR
Acetabuloplasty	6%	5%	% NR
Femoro- and Acetabuloplasty	18%	19%	-----
Labral procedure	89%	96%	% NR
Chondral procedure	27%	% NR	-----
Post-op PT, median no. sessions	[Yes–no details]	4 (IQR 2.5–6)	[Yes–no details]

➢ Individualized, supervised PT

- **Griffin:** education, progressive PT-lead rehabilitation, pain relief (intra-articular SI prn); 6-10 sessions over 6 mos. (≥6 sessions: 64%)
- **Palmer:** goal-based PT (core muscle strengthening and movement control), activity modification; max 8 sessions over 5 mos. (median 6, range 1–8)
- **Mansell:** joint/hip mobilizations, therapeutic exercise (strength, cardio, motor control), soft tissue mobility, stretching, other txs per physician; 12 sessions over 1.5 mos. + home exercise

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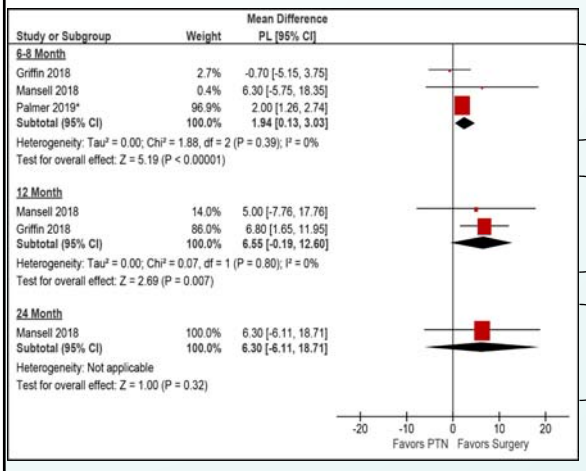
KQ 1 (Efficacy): Operative vs. Non-operative

Function, short-term: iHOTT-33



SOE: MODERATE, small improvement with arthroscopy (clinical meaningful?)
✓ Inconsistency across trials

SOE: MODERATE, no clear difference
✓ Imprecision (wide CI)

SOE: INSUFFICIENT, no difference
✓ Single, small trial with serious methodological flaws
✓ Imprecision (wide CI)

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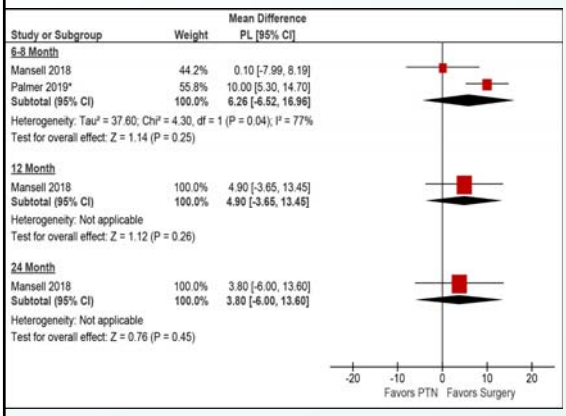
KQ 1 (Efficacy): Operative vs. Non-operative

Function, short-term: HOS-ADL subscale



SOE: LOW, no difference
- ✓ Inconsistency across trials
- ✓ Imprecision (wide CI)

SOE: INSUFFICIENT, no difference
- ✓ Single, small trial with serious methodological flaws
- ✓ Imprecision (wide CI)

1 RCT, N=188 (Palmer), Arthroscopy vs. PT
- MCID (≥9 points): 51% vs. 32%; RR 1.6 (1.1 to 2.3)
- PASS (score >87 points): 48% vs. 19%; RR 2.5 (1.5 to 4.0)

SOE: MODERATE

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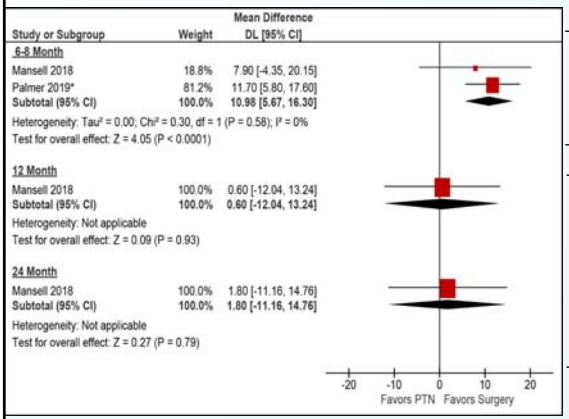
KQ 1 (Efficacy): Operative vs. Non-operative

Function, short-term: HOS-Sport subscale



SOE: MODERATE, improvement with arthroscopy, may be clinically important
- ✓ Imprecision (wide CI)

SOE: INSUFFICIENT, no difference
- ✓ Single, small trial with serious methodological flaws
- ✓ Imprecision (wide CI)

- **1 RCT** (Palmer): improvement in function following arthroscopy vs. PT at 8 months on **HAGOS, OHS, NAHS, UCLA**; clinical relevance is unclear

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KQ 1 (Efficacy): Operative vs. Non-operative

Pain, short-term

Outcome	Studies, Year, N, Follow-up	Reason for Downgrade	Arthroscopy vs. PT Effect estimate (95% CI)	Conclusion Quality (SoE)
HAGOS pain subscale (0-100)	Palmer 2019 (N=180) RCT 8 months	Consistency Unknown; Serious Imprecision[4] (-1)	adj. MD 12.7 (8.1–17.2)	Improvement in pain w/ arthroscopy; may be clinically important but CI is wide. ⊕⊕◯◯ LOW
Pain on hip assessment (%)			Flexion: 47% vs. 66%; RR 0.72 (0.56–0.93) Adduction: 31% vs. 46%; RR 0.67 (0.46–0.97) FAbER test: 44% vs. 62%; RR 0.71 (0.53–0.94)	Fewer arthroscopy vs. PT patients had pain on hip flexion, adduction and FAbER test; NS on other assessments*; clinical relevance unclear. ⊕⊕◯◯ LOW
Prescription opiate pain medication	Mansell 2018 (N=79) RCT 24 months	Serious RoB[1] (-1); Consistency Unknown; Serious Imprecision[4] (-2)	No. of days' supply: MD 6.5 (–98.4 to 111.4); No. unique prescriptions: MD –0.8 (–7.0 to 5.4) Days to last prescription: MD –116.7 (–258.1 to 24.7)	No differences between groups. Small sample size, wide CIs precluding firm conclusions. ⊕◯◯◯ INSUFFICIENT

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*hip extension, abduction, internal/external rotation, and the FAdIR test

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KQ 1 (Efficacy): Operative vs. Non-operative

Conversion to THA, short-term

Outcome	Studies, Year, N, Follow-up	Reason for Downgrade	Arthroscopy vs. PT Effect estimate (95% CI)	Conclusion Quality (SoE)
Conversion to THA (%)	Griffin 2018 Mansell 2018 (N=363) 2 RCTs 12, 24 months	Serious Imprecision[4] (-2)	1.0% (2/203) vs. 0% (0/160)	No difference between groups. Sample size, follow-up may impact ability to capture this event. ⊕⊕◯◯ LOW

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KQ 1 (Efficacy): Operative vs. Non-operative

Secondary Outcomes, short-term (no SOE)

- Greater improvement w/ arthroscopy vs. PT (1 RCT, Palmer 2019; 8 months F/U):
  - **Depression** (HADS-D): adjusted MD –1.3 (95% CI –2.2 to –0.4)
  - **ROM** (flexion): adjusted MD 4.8 (95% CI 0.5 to 9.1)

- No difference between groups over 8 to 24 months:
  - **QOL** (various measures, 3 RCTs); **Anxiety** (HADS-A, 1 RCT); **GRC** (1 RCT); **ROM** (extension, ab/adduction, internal/external rotation, 1 RCT); **Return to work** (active duty, 1 RCT)
  - **Progression to OA** (1 RCT, 24 months): 13% (arthroscopy) vs. 8% (PT); RR 1.7 (95% CI 0.4 to 6.7)

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KQ 1 (Effectiveness): Operative vs. Non-operative

2 poor-quality, nonrandomized cohorts (mean F/U 27 months):

- *NS differences between groups on any measure reported*
- *Pain, conversion to THA, progression to OA not reported*

	Adults (age 45 years)	Adolescent athletes (age 15 years)
	Ketatpure 2017 (N=97, 102 hips) Arthroscopy vs. activity modification/NSAIDs	**Pennock 2018 (N=76, 93 hips)** Arthroscopy* vs. SI only vs. formal PT/ activity modification
Primary Outcomes: ***Function*** (all 0-100 scales)	**mHHS**: 95.7 vs. 95.8 **NAHS**: 93.7 vs. 95.7 **WOMAC**: 91.8 vs. 90.1	**mHHS**: 68.4 ± 9.4 vs. 68.3 ± 12.2 vs. 69.9 ± 13.9 **NAHS**: 86.7 ± 13.1 vs. 86.3 ± 10.4 vs. 87.1 ± 14.3; MCID (≥8 pts.): 85% vs. 80% vs. 67%
Secondary Outcomes	NR	**Return to Sport:** *Total*: 47% vs. 50% vs. 57% *Same sport*: 27% vs. 40% vs. 46% *Quite sport due to pain*: 20% vs. 10% vs. 17%

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KQ1 (Efficacy and Effectiveness): **Operative vs. Operative**

No SOE

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KQ 1 (Efficacy): Operative vs. Operative

1 RCT (N=36, age 39 years, 100% female; Krych 2013), moderately low RoB, mean F/U 32 months

		Arthroscopic labral repair (N=18)	Arthroscopic labral debridement (N=18)	MD or RR (95% CI)
HOS-ADL (0-100); mean (range)	**Baseline**	68.2 (26.6–92.6)	60.2 (23.5–91.2)	
	F/U	91.2 (73.3–100)	80.9 (42.6–100)	MD 10.3 (NR), p<0.05
HOS-Sport (0-100); mean (range)	**Baseline**	47.5 (0–80.6)	40.6 (0–97.2)	
	F/U	88.7 (28.6–100)	76.3 (28.6–100)	MD 12.4 (NR), p<0.05
Patient subjective outcome	**Baseline** *(severely abnormal/abnormal)*	72% (13/18)	72% (13/18)	
	F/U *(normal)*	72% (13/18)	8% (5/18)	RR 2.6 (1.2, 5.8)

- Both groups showed improvement from baseline with significantly greater improvement following labral repair vs. debridement

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KQ 1 (Effectiveness): Operative vs. Operative – Cohorts

12 observational cohort studies

- Various comparisons, predominately *arthroscopy vs. open hip dislocation* and *labral repair vs. labral debridement* (5 studies each, primarily mixed type FAIS)
- Ranges: N, 23 to 201; age, 19.4 to 41 years; female, 18% to 100%.
- All patients had radiographic evidence of FAI, were symptomatic; other FAIS diagnostic criteria: + impingement test (3 studies), injection (1 study)
- Primarily poor quality (2 moderately high and 10 high RoB); weaknesses: lack of assessor blinding and control for confounding, ↑ attrition

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KQ 1 (Effectiveness): Operative vs. Operative – Cohorts

Function (12 cohort studies) and Pain (7 cohort studies):

- Results across studies and across the functional (mHHS, NAHS, HOS-ADL, HOS-Sport, WOMAC, MAP) and pain (VAS pain, WOMAC pain) outcome measures they reported varied.
- Generally, function and pain improved with surgery and results were comparable between operative groups;
- When statistically different, arthroscopy favored vs. open, labral repair favored vs. debridement
- Some of the differences may be clinically meaningful.

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For details, see Tables 25-31 in full report

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KQ 1 (Effectiveness): Operative vs. Operative – Cohorts

Conversion to THA (6 cohort studies)

Author, year	Mean F/U	Intervention % (n/N)	Comparator % (n/N)	RR (95% CI) p-value
Roos 2017*	36 mos.	3% (1/40)	13% (2/16)	RR 0.2 (0.02 to 2.1)
Anwander 2017†	149 mos.	6% (2/35 hips)	12% (3/25 hips)	RR 0.5 (0.1 to 2.6)
Cetinkaya 2016†	45 mos.	6% (2/33)	3% (1/33)	RR 2.1 (0.2, 21.7)
Larson 2012†	42 mos.	1.9% (1/52)	0% (0/44)	NS
Schilders 2011†	29 mos.	0% (0/69 hips)	0% (0/32 hips)	-----
Redmond 2015‡	24 mos.	1.2% (1/85 hips)	0% (0/105 hips)	NS

- Difference NS; some differences may be clinically meaningful
- Regardless of operative approach: range, 0% to 13% over 2 to 12 years

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KQ 1 (Effectiveness): Operative Case Series – Adults

➢ Conversion to THA

	Frequency in patients		Frequency in hips	
13 case series (10 arthroscopy, 3 open)	2%–34%	9 studies; N range, 41–466; F/U range, 69–132 mos.	3%–17%	4 studies; N range, 65–327 hips; F/U range, 61–132 mos.
2 SRs of cases series (arthroscopy)	-----	-----	6.3%–6.5%*	2 SRs (N range, 7241–1981 hips)*

➢ Progression to OA

- 3 case series (N= 50 to 97); 1 arthroscopy, 2 open surgery
- Frequency ranged from **8% to 12%** over 84 to 132 months follow-up

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KQ 1 (Effectiveness): Operative Case Series – Pediatrics/Adolescents

- **Function** (12 case series; N range, 18–108; age range, 14–17.6 years) and **Pain** (3 case series; N range, 28–43; age range, 16–17 years):
  - Improvement from baseline to F/U on mHHS (11 studies), HOS-Sport subscale (5 studies), HOS-ADL subscale and NAHS (3 studies each), i-HOTT (2 studies), and HOOS (1 study) over 1.5 to 50.4 months; and on VAS pain over 31 to 50 months
- **Return to Sport** (5 case series; N range, 21–116; age range, 15.5–17 years) ranged from 86% to 100% over 14 to 40 months
- No cases of **conversion to THA** over 40 months; 1 small case series (N=28, 37 hips; mean age 16 years)

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KQ 2 (Safety)

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KQ 2 (Safety): Operative vs. Non-operative – RCTs

Outcome	Studies, Year, N, Follow-up	Reason for Downgrade	Arthroscopy vs. PT Effect estimate (95% CI)	Conclusion Quality (SoE)
Serious- and treatment-related adverse events	Griffin 2018 Mansell 2018 (N=479) 2 RCTs 8, 12 months	Consistency unknown; Serious Imprecision[4] (-1)	• **Serious, treatment-related AEs (2 RCTs):** 2.1% (5/237)† vs. 0% (0/242) *1 RCT (Griffin N=284):* • **No treatment-related deaths** • **Other, potentially treatment-related AEs**: 5.8% (8/138) (9 events) vs. 0.7% (1/146); RR 8.5 (95% CI 1.1, 66.8)	Infrequent, more common w/ arthroscopy; sample size, follow-up may preclude identification of rare events. ⊕⊕◯◯ Low

Other complications reported by Griffin et. al 2018, NS difference between groups:

- Total complications: 72.5% vs. 69.9%; RR 1.0 (95% CI 0.9, 1.2)
- Muscle soreness: 42.0% vs. 47.3%; RR 0.9 (95% CI 0.7, 1.2)
- Hip pain or stiffness: 9.4% vs. 5.5%; RR 1.7 (95% CI 0.7, 4.0)
- Unscheduled hospital visits: 9.4% vs. 4.1% RR 2.3 (95% CI 0.9, 5.9)

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KQ 2 (Safety): AEs associated with operative treatment – **Adults** (SOE: Low for all)

Adverse event	SRs of case series	RCTs	Cohorts	Case series*
Heterotopic Ossification	0.5%–0.8%; 2 SRs (N=7241, 1981 hips)	1.5%; 1 RCT (1/65)	0%–1%†; 4 cohorts (N=23 to 198)	0.6%–4.7%; 4 case series (N=360 to 1870)
Avascular Necrosis	0%; 1 SR (0/7241)	0%; 1 RCT (0/65)	0%; 4 cohorts (N=23 to 96)	0.4%; 1 case series (8/1870)
Femoral Fracture	0.01%–0.05%; 2 SRs (N=7241, 1981 hips)	0.5%; 1 RCT (1/203)	0%; 3 cohorts (N=23 to 96)	0%–1%; 6 case series (N=317 to 14,495 [hips])
Nerve injury (transient)	0.01%–0.4%; 2 SRs (N=7241, 1981 hips)	2.1%; 1 RCT (5/237)	0%–9%†; 5 cohorts (N=23 to 198)	0.1%–18.8%†; 4 case series (N=317 to 1615 [hips])
Revision surgery	1.9%–3.2%; 2 SRs (N=7241, 1981 hips)	7.7%; 1 RCT (5/65)	0%–12%; 10 cohorts (N=23 to 201)	1.2%–6.5%; 3 case series (N=314 to 1870)
Additional, non-revision surgery	-----	-----	1%–5% arthroscopy; 2 cohorts (N=20, 102)	-----

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KQ 2 (Safety): AEs associated with operative treatment – Adults, cont. (SOE: Low for all)

Adverse event	SRs of case series	RCTs	Cohorts	Case series*
Superficial infection	0.2%–0.3%; 2 SRs (N=7241, 1981 hips)	4.2%; 2 RCTs (10/237)	0%–6%; 3 cohorts (N=23 to 198)	1% in both; 2 case series (N=414, 1615 [hips])
Deep infection	0.01%; 1 SR (1/7241)	-----	0%; 2 cohorts (N=23 to 56)	0.1%; 1 case series (1/1615 hips)
Pulmonary embolism (PE)	0.6%; 1 SR (N=4577 hips)	-----	-----	0.1%; 1 case series (1/1615 hips)
Deep vein thrombosis (DVT)	1.2%; 1 SR (N=4577 hips)	0%; 2 RCTs (0/203)	0%–3%; 3 cohorts (N=23 to 198)	0.1%–0.2%; 2 case series (N=414 to 1615 [hips])
PE or DVT	0%; 1 SR (8/7241)	-----	-----	-----

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KQ 2 (Safety): AEs associated with operative treatment – Pediatrics/Adolescents (SOE: Low for all)

Adverse event	SRs of case series	Case series
Heterotopic Ossification	0% arthroscopy (0/354), 1.2% open (1/81); 1 SR (N=435)	2.3% for both; 2 case series (N=43, 44)
Avascular Necrosis	0%; 1 SR (N=435)	0%; 4 case series (N=18 to 108)
Femoral Fracture	0%; 1 SR (N=435)	0%; 1 case series (N=44) (open)
Nonunion greater trochanter	-----	0%; 1 case series (N=44) (open)
Nerve injury	0.6% arthroscopy (2/354), 0% open (0/81); 1 SR (N=435)	1.9%–8.3%; 5 case series (N=24 to 108)
Superficial infection	0%; 1 SR (N=435)	0%–2.7%; 3 case series (N=34, 44)
Revision surgery	4.0% arthroscopy (13/354), 0% open (0/81); 1 SR (N=435)	0% to 5.9% arthroscopy, 8 case series (N=18 to 108); 13.6% open, 1 case series (6/44)
Additional surgery (other than revision)	-----	2.3%–11%; 2 case series (N=18, 43)
Physeal arrest, growth disturbance	0%; 1 SR (N=435)	0%; 4 case series (N=18 to 108)
Acute iatrogenic SCFE; iatrogenic instability; various*	0%; 1 SR (N=435)	0%; 2 case series (N=34, 108) [for SCFE, instability]

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KQ 3 (Differential Efficacy and Safety)

2 RCTs, arthroscopy vs. PT; Griffin 2018 (N=358) and Palmer 2019 (N=222); SOE Insufficient

- **Age** modified treatment effect in 1 trial (Palmer) but not the other
  - Function (HOS-ADL) may be greater and in favor of arthroscopy compared with PT for younger patients with the effect decreasing with increasing age
- *No interaction* for the following:
  - Type of FAI (e.g., cam, pincer, mixed); 2 RCTs
  - Sex, Kellgren-Lawrence grade, study site, and baseline HOS-ADL scores; 1 RCT (Palmer)

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KQ 4 (Cost-effectiveness)

	Griffin 2018 UK, QHES 79/100
Population	Hip pain, radiographic cam or pincer; no OA; age 35.3 years, 39% female (N=348)
Arthroscopy vs.	Personalized Hip Therapy (12–24 weeks), best conservative care
Clinical data	RCT (head-to-head)
ICER (perspective, time horizon)	PT Dominates; Surgery additional $3,184/-0.02 QALY (societal, 12 months)
SA	• At WTP = $67,114, probability surgery cost-effective = 8% • Unadjusted model: slightly favored surgery • Adjusted model: surgery significantly more expensive
Funding:	National Institute of Health Research (UK)
Authors' conclusions	Personalized hip therapy was more cost-effective than arthroscopy at 12 months. Cross over to surgery increases costs of PT group and makes surgery increasingly cost-effective; longer-term data needed
Limitations	• Short, 12 month time horizon • Inadequate time to evaluate long-term outcomes and need for additional intervention • Unclear indirect cost methods and modeling of patient cross-over • UK system; generalizability to US unclear

KQ 4 (Cost-effectiveness), cont.

	Shearer 2012 US, QHES 65/100
Population	Average of ages across 5 surgical outcomes case series of "symptomatic FAI", 2008 to 2010; Age 36 years
Arthroscopy vs.	Observation followed by THA if end stage OA progression
Clinical data	Case series (arthroscopy); costs from recent cases (N=10)
ICER	Arthroscopy Dominates; $21,700/QALY (Unclear perspective – payer or hospital, lifetime)
SA	• If benefit duration <13 months ICER < $50,000/QALY w/o OA impact; ICER = $19,200/QALY if OA delayed 3 years • If arthroscopy cost is $27,300 the ICER = $50,000/QALY • Probabilistic simulations: ICER <$50,000 in 85% of trials <$100,000 in 97%
Funding:	Unclear; not reported
Authors' conclusions	Although data are limited, model suggests that arthroscopy in FAIS patients without OA may have a favorable ICER vs. other interventions. Uncertainty remains regarding the QoL, duration of benefits and effect on subsequent THA.
Limitations	• Clinical data, assumptions about OA progression, utilities, etc. from case series • Limited data on non-op patients; components not described • Uncertainty regarding input parameters (e.g. OA progression, unknown) for treated vs. untreated FAI) • Unvalidated utility methods • Extrapolation to lifetime horizon

KQ 4 (Cost-effectiveness), cont.

	Mather 2018 US, QHES 67/100
Population	"Noncontroversial indications for surgery"; Tönnis grade 0,1; hip dysplasia (<20% angle); >6 weeks non-operative tx prior to arthroscopy; Age 33 years, 70% female
Arthroscopy vs.	NSAIDs, activity modification, PT, steroid injection
Clinical data	Case series; expert opinion; patient survey (retrospective, selected arthroscopy patients). Expert opinion regarding transition probabilities (e.g. success and symptom recurrence for non-op treatment, symptom progression)
ICER	Arthroscopy Dominates (societal, 10 year model)
SA	• All variables robust at WTP of $100,000 • Probabilistic SA: arthroscopy CE in 99% of trials • Time horizon, cost of surgery and post-surgery productivity most sensitive
Funding	Mitek Sports Medicine, Stryker Orthopedics, Smith & Nephew, Inc.; authors report COI
Authors' conclusions	Arthroscopy greatly reduces the economic cost of FAI while contributing to improved QoL in patients with 6 to 12 weeks of nonoperative treatment before surgery.
Limitations	• Clinical data from case series, patient surveys, heavy reliance on expert opinion • Non-op patient characteristics, outcomes not defined; data from patient recall of pre-op status vs. directly from those receiving non-op tx; Unvalidated utility methods • Patient selection from high-volume hip arthroscopists; Generalizability is unclear

SUMMARY

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Summary: Contextual Question 1 – Case definition

2011 Report SOE: INSUFFICIENT	2019 Report (SOE: not formally assessed for contextual questions)
Most consistent definition based on inclusion/exclusion criteria in prospective studies of treatment effectiveness: hip/groin pain, positive clinical impingement test, and an α-angle >50-55º	• No new prospective evidence identified. • Consensus documents acknowledge the paucity of high-quality prospective and comparative studies on which to base FAIS diagnosis and treatment recommendations. • **2016 Warwick Consensus Agreement**: triad of symptoms, clinical signs and imaging findings – all must be present. Thresholds for radiographic parameters not specified. • **Inclusion/exclusion criteria:** 4 included RCTs, generally consistent with Warwick. • **Surgical criteria/indications:** SRs suggest inconsistency regarding specific criteria for FAIS surgery/application of Warwick; A 2019 consensus guideline suggests selection criteria and contraindications to surgery to ↓ variability

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Summary: Contextual Question 1 – Diagnostic Accuracy (Validity) and Reliability

2011 Report SOE: INSUFFICIENT	Contextual question #1 2019 Report (SOE: not formally assessed for contextual questions)
Clinical Exam No evidence that diagnosis can be obtained from clinical exam: Impingement sign had PPV and NVP of 86% and 79% in 1 small study w/50% FAI prevalence; in another study, reliability was only moderate. **Imaging** α-angle showed moderate to high interrater reliability in several studies; it had poor diagnostic value in identifying FAI. Other imaging tests assessing abnormalities of the femur and acetabulum had variable degrees of reliability, but no others were tested for diagnostic validity.	• **No high quality prospective studies of diagnostic accuracy (validity) (surgery referent) were identified for diagnostic criteria described in the Warwick agreement**. • **2016 Warwick Agreement:** criteria imprecise, utility unclear; pain, symptoms and + clinical tests seen in other conditions. FAIS considered to be a complex interaction, during motion, between the acetabulum and femoral neck. • **Symptoms and clinical tests**: o Accuracy (surgery referent): Retrospective studies suggest pain, impingement tests and combinations of them may be sensitive but not specific; no studies of diagnostic injection. o Reliability: No studies correcting for chance agreement were identified. • **Imaging** o Accuracy (surgery referent): Specific to FAI diagnosis, range of sensitivity, specificity, and predictive values in retrospective studies with high pre-test FAI prevalence o Reliability: Interrater reliability varied from slight to substantial; agreement most frequently fair to moderate across most parameters.

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Summary: Contextual Question 2

KQ 2, 2011 Report SOE: INSUFFICIENT	Contextual question #2, 2019 Report (SOE: not formally assessed for contextual questions)

Assessment of OA
 	
• Tönnis classification: No validity studies found ; intra- , inter-observer reliability moderate (1 study)
 	
Patient , clinician reported outcomes
 	
• 7 outcomes measures used in FAI patients; psychometric analysis in FAI (HOS-D, M-WOMAC) or young hip-pain (HOS, NAHS) populations.
• Only NAHS was adequately tested for validity in a young hip-pain patient population.
• Reliability inadequately tested for all three
• MCIDs: 9 points for ADL subscale and 6 points for the sports subscale of the HOS-D in FAI patients. The MCID in FAI or young hip-pain patients not defined for others
	Assessment of OA
	• Tönnis classification: Reliability considered inadequate (2 new studies); No validation studies in FAI patients identified.
	
	• Kellgren Lawrence grading system: substantial interobserver reliability (1 population-base study); Good construct validity and predictive validity for future THA
	
	Patient and clinician reported outcomes
	• Validity, reliability and consistency in FAIS/young hip pain patients generally appear to be adequate for most measures
	  • 4 new measures psychometrically tested: iHOT-33, HAGOS, HOOS and OHS; MCIDs reported
	  • Additional psychometric testing in FAIS/young hip pain patients for HOS, NAHS, mHHS
	
	• Updated MCIDs in patients with hip pain and/or hip related procedures for measures were identified (see report)
	
	• Patient acceptable symptomatic state (PASS) thresholds from one prospective case series were identified.

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General Evidence SUMMARY

- Focus of 2011 and 2019 reports: comparative studies of **operative vs. non-operative** treatment
  - 2011: 1 poor quality comparative cohort study
  - 2019: Comparative evidence base remains sparse w/ 3 RCTs due to heterogeneous methods, comparators, populations
- Still no intermediate- (>5 years to <10 years) or long-term (≥10 years) comparative data
- Systematic reviews of arthroscopic management primarily case series/retrospective cohorts
- Surgical studies primarily retrospective

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Summary: KQ1 – Efficacy, Op vs. Non-Op

KQ 3, 2011 Report SOE: N/A (NO EVIDENCE)	Key Question #1, 2019 Report
Efficacy, short-term (≤5 years): • No evidence	**Efficacy, short-term (≤5 years):** • 3 RCTs of arthroscopy vs. PT in adults (age 35 years) over short-term (to 24 months) were identified. Procedures to address labral tears done in >90%. **Function** • 6-8 months: improvement w/ arthroscopy vs. PT for iHOT-33 (3 RCTs) and HOS-Sport subscale (2 RCTs) (SOE: moderate), but not HOS-ADL subscale (2 RCTs) (SOE: low); only HOS-Sport difference is likely clinically important. o More arthroscopy vs. PT patients achieved MCID (≥9 points) and PASS (score >87 points) on HOS-ADL at 8 months (SOE: moderate). • 12-24 months: no clear difference between groups on any measure (SOE: moderate for i-HOT-33 at 12 months [2 trials]; insufficient for i-HOT-33 at 24 months, HOS-ADL and -Sport subscales at 12 and 24 months [1 trial]). **Pain** • 1 RCT: pain improvement (HAGOS) w/ arthroscopy vs. PT at 8 months (may be clinically important, but wide CI); inconsistency with regard to pain improvement on other assessment (SOE: low). **Conversion to THA** • 2 RCTs: 2 arthroscopy patients (1.0%) vs. 0 in PT required THA (to 24 months); sample size, short follow-up may impact ability to adequately capture this event (SOE: low). **Progression OA:** not reported.

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➢ ***No intermediate (>5 to <10 years) or long-term (≥10 years) evidence to date***

Summary: KQ1 – Effectiveness

KQ 3, 2011 Report SOE: INSUFFICIENT	Key Question #1, 2019 Report (SOE not assessed)
Effectiveness, short-term (≤5 years): • No evidence that one specific treatment resulted in better outcomes than another • Several case series reported improvement in pain, hip outcome scores, patient satisfaction and return to normal activities following FAI surgery. However, whether this improvement is a result of the surgery, or the postoperative rehabilitation, or the change in activity subsequent to the surgery or placebo is not known. • ~ 8% of FAI patients who undergo surgery in published series go on to have a THA within 3 years. **Effectiveness, intermediate (>5 to <10 years) or long-term (≥10 years):** • No evidence of effectiveness of operative vs. non-operative treatment for FAI • No data to test the hypothesis that FAI surgery prevents or delays OA or the need for THA	Effectiveness, short-term (≤5 years): • **Op vs. Non-Op**: 2 poor-quality cohorts: insufficient evidence of short-term effectiveness of arthroscopy vs. PT in adults (1 study) or adolescents (1 study) with FAIS. • **Op vs. Op** (12 cohorts): o Generally, function and pain improved with surgery and results were comparable b/w operative groups; statistical differences favored arthroscopy vs. open surgery and labral repair vs. debridement. o THA frequency: 0%–13% (6 cohorts) over 61 to 132 mos.; NS differences b/w various operative groups; some differences may be clinically important o OA progression: 8%–12% (3 small case series) over 84 to 132 mos. Effectiveness, intermediate (>5 to <10 years) or long-term (≥10 years): • No evidence of effectiveness of operative vs. non-operative treatment for FAIS • Based on included studies, there is still insufficient evidence to test the hypothesis that FAI surgery prevents or delays hip OA or the need for THA.

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Summary: KQ2 – Safety

KQ 4, 2011 Report SOE: INSUFFICIENT	Key Question #2, 2019 Report
• The risk of reoperation (other than conversion to THA) occurred in 4% (arthroscopy and open dislocation) and 9% of the patients (mini-open). • There was only one reported head-neck fracture (0.1%) and no reports of AVN, osteonecrosis or trochanteric nonunion. • Heterotopic ossification occurred in 2%–3% (arthroscopy or mini-open) and 6% (open dislocation). • Neurological complications (nerve palsy, paresthesia, and neuropraxia) were rare with arthroscopy or open dislocation; however, they occurred in 22% of 258 hips undergoing a mini-open procedure. Most were transient in nature.	• No deaths; serious and non-serious treatment-related AEs infrequent but more common following arthroscopy vs. PT. (SOE: low; 2 RCTs) • Frequency of most serious surgical complications may be low (<3%) (SOE: low; RCTs, SRs of case series, comparative surgery cohorts, additional case series in adults and adolescents) • Surgical complications in *adults* included transient nerve injury (0% to 19%; 0% to 9% excluding outliers) and revision surgery (0% to 8%). In *adolescents*, no cases of physeal arrest/growth disturbance, femoral fracture, greater trochanter nonunion, AVN, acute iatrogenic slipped capital femoral epiphysis, or iatrogenic instability were seen (SOE: low).

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Summary: Key Question 3 – Differential Efficacy and Safety

KQ 5, 2011 Report SOE: N/A (NO EVIDENCE)	Key Question #3, 2019 Report
• No evidence	• 2 RCTs, arthroscopy vs. PT • Insufficient evidence to draw conclusions regarding whether age, FAI type, sex, Kellgren Lawrence grade and study center modify the treatment effect.

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Summary: Key Question 4 – Cost-effectiveness

KQ 5, 2011 Report SOE: N/A (NO EVIDENCE)	Key Question #3, 2019 Report
• No evidence	• Conclusions regarding the cost-effectiveness of hip arthroscopy compared with non-op care were inconsistent across 3 CUAs. • Only 1 CUA (moderate quality) based on RCT data: personalized PT more effective and less costly than arthroscopy at 1 year from the U.K. NHS perspective. Short-term time horizon precluded evaluation of OA development or conversion to THA. • 2 poor-quality CUAs from the U.S.: arthroscopy more cost-effective than non-op care from a societal perspective over 10 years, more cost-effective than observation from a hospital cost perspective for a lifetime. ➢ Primary data sources: case series, expert opinion and retrospective survey of arthroscopy patients. Both used an unvalidated method for determining utility.

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Evidence gaps, remaining questions

- Characterization, specification of FAIS as a distinct pathologic entity with discrete diagnostic criteria remains unclear;
- Benefits of arthroscopy vs. non-operative care remain unclear;
  - Inconsistency, some effect sizes small/of unclear clinical importance
  - Is improvement with surgery due to the surgery, post-op rehab, post-surgical activity modification or placebo effect?
  - Different approaches to non-op care; lack of standardize non-op care
  - >90% of surgical patients had labral tear procedures: Do labral/cartilage procedures without changes in bone morphology result in similar relief? Extent to which labral pathology w/FAI is due to bone morphology vs. another cause unclear. Does changing bone prevent future tears?
  - Only short-term comparative evidence; no long-term evidence
- Op vs. non-op impact on progression to OA, THA is unclear;
- Natural history of FAI/FAIS remains unclear

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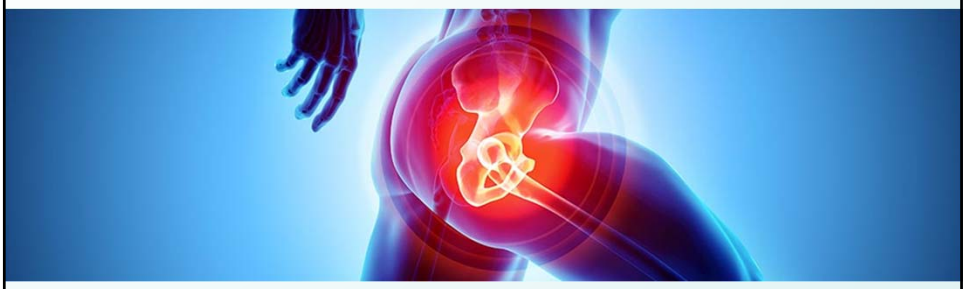
Questions?



https://demanddeborah.org/wp-content/uploads/2018/09/banner-hip.jpg

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HTCC Coverage and Reimbursement Determination
Analytic Tool

HTA's goal is to achieve *better health care outcomes* for enrollees and beneficiaries of state programs by paying for proven health *technologies that work*.

To find best outcomes and value for the state and the patient, the HTA program focuses on three questions:

1. Is it safe?
2. Is it effective?
3. Does it provide value (improve health outcome)?

The principles HTCC uses to review evidence and make determinations are:

Principle One: Determinations are evidence-based

HTCC requires scientific evidence that a health technology is safe, effective and cost-effective[1] as expressed by the following standards[2]:

- Persons will experience better health outcomes than if the health technology was not covered and that the benefits outweigh the harms.
- The HTCC emphasizes evidence that directly links the technology with health outcomes. Indirect evidence may be sufficient if it supports the principal links in the analytic framework.
- Although the HTCC acknowledges that subjective judgments do enter into the evaluation of evidence and the weighing of benefits and harms, its recommendations are not based largely on opinion.
- The HTCC is explicit about the scientific evidence relied upon for its determinations.

Principle Two: Determinations result in health benefit

The outcomes critical to HTCC in making coverage and reimbursement determinations are health benefits and harms[3]:

- In considering potential benefits, the HTCC focuses on absolute reductions in the risk of outcomes that people can feel or care about.
- In considering potential harms, the HTCC examines harms of all types, including physical, psychological, and non-medical harms that may occur sooner or later as a result of the use of the technology.
- Where possible, the HTCC considers the feasibility of future widespread implementation of the technology in making recommendations.
- The HTCC generally takes a population perspective in weighing the magnitude of benefits against the magnitude of harms. In some situations, it may make a determination for a technology with a large potential benefit for a small proportion of the population.

[1] Based on Legislative mandate: See RCW 70.14.100(2).

[2] The principles and standards are based on USPSTF Principles at: http://www.ahrq.gov/clinic/ajpmsuppl/harris3.htm

[3] The principles and standards are based on USPSTF Principles at: http://www.ahrq.gov/clinic/ajpmsuppl/harris3.htm

- In assessing net benefits, the HTCC subjectively estimates the indicated population's value for each benefit and harm. When the HTCC judges that the balance of benefits and harms is likely to vary substantially within the population, coverage or reimbursement determinations may be more selective based on the variation.
- The HTCC considers the economic costs of the health technology in making determinations, but costs are the lowest priority.

Using evidence as the basis for a coverage decision

Arrive at the coverage decision by identifying for Safety, Effectiveness, and Cost whether (1) evidence is available, (2) the confidence in the evidence, and (3) applicability to decision.

1. Availability of evidence:

Committee members identify the factors, often referred to as outcomes of interest, that are at issue around safety, effectiveness, and cost. Those deemed key factors are ones that impact the question of whether the particular technology improves health outcomes. Committee members then identify whether and what evidence is available related to each of the key factors.

2. Sufficiency of the evidence:

Committee members discuss and assess the evidence available and its relevance to the key factors by discussion of the type, quality, and relevance of the evidence[4] using characteristics such as:

- Type of evidence as reported in the technology assessment or other evidence presented to committee (randomized trials, observational studies, case series, expert opinion);
- The amount of evidence (sparse to many number of evidence or events or individuals studied);
- Consistency of evidence (results vary or largely similar);
- Recency (timeliness of information);
- Directness of evidence (link between technology and outcome);
- Relevance of evidence (applicability to agency program and clients);
- Bias (likelihood of conflict of interest or lack of safeguards).

Sufficiency or insufficiency of the evidence is a judgment of each clinical committee member and correlates closely to the GRADE confidence decision.

Not Confident	Confident
Appreciable uncertainty exists. Further information is needed or further information is likely to change confidence.	Very certain of evidentiary support. Further information is unlikely to change confidence

[4] Based on GRADE recommendation: http://www.gradeworkinggroup.org/FAQ/index.htm

3. Factors for Consideration - Importance

At the end of discussion a vote is taken on whether sufficient evidence exists regarding the technology's safety, effectiveness, and cost. The committee must weigh the degree of importance that each particular key factor and the evidence that supports it has to the policy and coverage decision. Valuing the level of importance is factor or outcome specific but most often include, for areas of safety, effectiveness, and cost:

- Risk of event occurring;
- The degree of harm associated with risk;
- The number of risks; the burden of the condition;
- Burden untreated or treated with alternatives;
- The importance of the outcome (e.g. treatment prevents death vs. relief of symptom);
- The degree of effect (e.g. relief of all, none, or some symptom, duration, etc.);
- Value variation based on patient preference.

Clinical committee findings and decisions

Efficacy considerations

- What is the evidence that use of the technology results in more beneficial, important health outcomes? Consider:
  - Direct outcome or surrogate measure
  - Short term or long term effect
  - Magnitude of effect
  - Impact on pain, functional restoration, quality of life
  - Disease management
- What is the evidence confirming that use of the technology results in a more beneficial outcome, compared to no treatment or placebo treatment?
- What is the evidence confirming that use of the technology results in a more beneficial outcome, compared to alternative treatment?
- What is the evidence of the magnitude of the benefit or the incremental value?
- Does the scientific evidence confirm that use of the technology can effectively replace other technologies or is this additive?
- For diagnostic tests, what is the evidence of a diagnostic tests' accuracy?
  - Does the use of the technology more accurately identify both those with the condition being evaluated and those without the condition being evaluated?
- Does the use of the technology result in better sensitivity and better specificity?
- Is there a tradeoff in sensitivity and specificity that on balance the diagnostic technology is thought to be more accurate than current diagnostic testing?
- Does use of the test change treatment choices?

Safety

- What is the evidence of the effect of using the technology on significant morbidity?
    - Frequent adverse effect on health, but unlikely to result in lasting harm or be life-threatening, or;
    - Adverse effect on health that can result in lasting harm or can be life-threatening?
- Other morbidity concerns?
- Short term or direct complication versus long term complications?
- What is the evidence of using the technology on mortality – does it result in fewer adverse non-fatal outcomes?

Cost impact

- Do the cost analyses show that use of the new technology will result in costs that are greater, equivalent or lower than management without use of the technology?

Overall

- What is the evidence about alternatives and comparisons to the alternatives?
- Does scientific evidence confirm that use of the technology results in better health outcomes than management without use of the technology?

Next step: Cover or no cover

If not covered, or covered unconditionally, the chair will instruct staff to write a proposed findings and decision document for review and final adoption at the following meeting.

Next step: Cover with conditions

If covered with conditions, the committee will continue discussion.

1) Does the committee have enough information to identify conditions or criteria?
    - Refer to evidence identification document and discussion.
    - Chair will facilitate discussion, and if enough members agree, conditions and/or criteria will be identified and listed.
    - Chair will instruct staff to write a proposed findings and decision document for review and final adoption at next meeting.
2) If not enough or appropriate information, then Chair will facilitate a discussion on the following:
    - What are the known conditions/criteria and evidence state
    - What issues need to be addressed and evidence state

The chair will delegate investigation and return to group based on information and issues identified. Information known but not available or assembled can be gathered by staff ; additional clinical questions may need further research by evidence center or may need ad hoc advisory group; information on agency utilization, similar coverage decisions may need agency or other health plan input; information on current practice in community or beneficiary preference may need further public input. Delegation should include specific instructions on the

task, assignment or issue; include a time frame; provide direction on membership or input if a group is to be convened.

Clinical committee evidence votes

First voting question

The HTCC has reviewed and considered the technology assessment and information provided by the administrator, reports and/or testimony from an advisory group, and submissions or comments from the public. The committee has given greatest weight to the evidence it determined, based on objective factors, to be the most valid and reliable.

Discussion document: What are the key factors and health outcomes and what evidence is there? (Applies to the population in the PICO for this review)

Safety outcomes	Importance of outcome	Safety evidence/ confidence in evidence
Heterotopic ossification		
Avascular necrosis		
Femoral fracture		
Nerve injury		
Revision surgery		
Infections		
Embolism		
Revision surgery		
Thrombosis		

Efficacy – effectiveness outcomes	Importance of outcome	Efficacy / Effectiveness evidence
Function- (iHOTT 33, HOS subscales etc.)		
Pain		
Conversion to THA		
Depression		
Range of Motion		
Quality of Life		
Return to work		
Progression to Osteoarthritis		

Cost outcomes	Importance of outcome	Cost evidence
Cost		
Cost effectiveness		

Special population / Considerations outcomes	Importance of outcome	Special populations/ Considerations evidence
Age		
Race		
Gender		
Ethnicity		

For safety:

Is there sufficient evidence that the technology is safe for the indications considered?

Unproven (no)	Less (yes)	Equivalent (yes)	More in some (yes)	More in all (yes)

For efficacy/ effectiveness:

Is there sufficient evidence that the technology has a meaningful impact on patients and patient care?

Unproven (no)	Less (yes)	Equivalent (yes)	More in some (yes)	More in all (yes)

For cost outcomes/ cost-effectiveness:

Is there sufficient evidence that the technology is cost-effective for the indications considered?

Unproven (no)	Less (yes)	Equivalent (yes)	More in some (yes)	More in all (yes)

Discussion

Based on the evidence vote, the committee may be ready to take a vote on coverage or further discussion may be warranted to understand the differences of opinions or to discuss the implications of the vote on a final coverage decision.

- Evidence is insufficient to make a conclusion about whether the health technology is safe, efficacious, and cost-effective;
- Evidence is sufficient to conclude that the health technology is unsafe, ineffectual, or not cost-effective
- Evidence is sufficient to conclude that the health technology is safe, efficacious, and cost-effective for all indicated conditions;
- Evidence is sufficient to conclude that the health technology is safe, efficacious, and cost-effective for some conditions or in some situations

A straw vote may be taken to determine whether, and in what area, further discussion is necessary.

Second Vote

Based on the evidence about the technologies' safety, efficacy, and cost-effectiveness, it is

_____Not covered _____ Covered unconditionally _____ Covered under certain conditions

Discussion item

Is the determination consistent with identified Medicare decisions and expert guidelines, and if not, what evidence is relied upon.

Next step: proposed findings and decision and public comment

At the next public meeting the committee will review the proposed findings and decision and consider any public comments as appropriate prior to a vote for final adoption of the determination.

1) Based on public comment was evidence overlooked in the process that should be considered?
2) Does the proposed findings and decision document clearly convey the intended coverage determination based on review and consideration of the evidence?

Next step: final determination

Following review of the proposed findings and decision document and public comments:

Final vote

Does the committee approve the Findings and Decisions document with any changes noted in discussion?

If yes, the process is concluded.

If no, or an unclear (i.e., tie) outcome chair will lead discussion to determine next steps.

Medicare Coverage and Guidelines

[From page 26 of Final Evidence Report]

Medicare and Representative Private Insurer Coverage Policies

Currently there are no national or local coverage determinations or policies for The Centers for Medicare and Medicaid Services (CMS) regarding the surgical treatment of FAI syndrome.

[From page 15 of Final Evidence Report]

Table 1. Summary of Expert Consensus Documents

Guideline	Evidence Base	Recommendation	Strength of Recommendation
The Warwick Agreement	Expert opinion based on selected systematic reviews and seminal literature (explicit inclusion/exclusion criteria or critical appraisal process not described).	• FAIS definition: FAIS is a motion-related clinical disorder of the hip with a triad of symptoms, clinical signs, and imaging findings. It represents a symptomatic premature contact between the proximal femur and the acetabulum. • FAIS diagnosis: Symptoms, clinical signs and imaging findings must be present in order to diagnose FAI syndrome. • Treatment of FAIS: FAI syndrome can be treated by conservative care, rehabilitation or surgery. Conservative care may involve education, watchful waiting, and lifestyle and activity modification. Physiotherapy led rehabilitation aims to improve hip stability, neuromuscular control, strength, range of motion and movement patterns. Surgery, either open or arthroscopic, aims to improve the hip morphology and repair damaged tissue. The good management of the variety of patients with FAI syndrome requires the availability of all of these approaches. No specific criteria or indications for surgery for FAIS are described. • Management of asymptomatic FAIS patients: It is not known which individuals with cam or pincer morphologies will develop symptoms, and therefore FAI syndrome. Preventive measures may have a role in higher risk populations, but it is rarely indicated to offer surgery to these individuals.	NR

Guideline	Evidence Base	Recommendation	Strength of Recommendation
Lynch 2019	Based on a systematic review [138]conducted to assess risk factors and outcomes related to arthroscopic management of FAI and a survey of 24 questions administered to the development group of 15 hip arthroscopists.	<u>Preoperative</u> 1. Patients should receive education regarding FAI 2. Conservative treatment should include a standard minimum duration of 3 months, including: a. Trial of rest b. Trial of NSAIDs c. Activity modification or restriction d. Physical therapy e. No opioids 3. Permit less than the full duration of conservative treatment with the following clinical history: a. Professional athletes or out-of-season athletes b. Patients who are undergoing PT with no or marginal improvement as deemed by the surgeon and physical therapist c. High baseline mental health (per the VR-12 questionnaire) d. Successful surgery on the contralateral side 4. Assess joint parameters for proceeding with surgery before completing the full duration of conservative tx: a. High Alpha angle b. Low Tonnis grade c. Large cam-type deformity in the absence of osteoarthritic changes d. Large combined deformity in the absence of osteoarthritic changes e. Large ROM limitations with pain 5. Obtain an MRI in the setting of a previous hip scope with intra-articular pain <u>Contraindications to hip arthroscopy</u>: • Joint space narrowing (<2 mm anywhere along the lateral and/or middle sourcil) or OA • Tonnis grade ≥2 • Severe femoral retro or anteversion with gait abnormality	NR

Guideline	Evidence Base	Recommendation	Strength of Recommendation
		• Pain not localizing to the hip, or out of proportion due to psychosocial issue • Obesity to where access cannot be obtained • Broken Shenton's line <u>Not considered to be contraindications to surgery</u>: • Hypermobility (Beighton hypermobility score ≥5) • Skeletal immaturity are not contraindications† <u>Surgical Recommendations</u> <u>Guide bone resection by</u>: • Plain preoperative radiographs • Visualization of the femoral head-neck contour & re-establishing the slope/junction • Conducting a dynamic exam assessing areas of impingement • Intraoperative fluoroscopy • Including any hard, sclerotic bone • In patients with labral tears, perform a labral repair, rather than debridement only • Labral reconstruction (vs. repair) should be done in a revision surgery with a labral deficiency • Surgery for bilateral FAI should generally be completed via a staged approach • A nonprofessional athlete or young patient is not an indication for a concomitant procedure • Perform capsular plication in ligamentous laxity (Beighton Score ≥5, Ehlers–Danlos) • Perform capsular plication during hip arthroscopy in the setting of a patient with borderline dysplasia • Address both femoral and acetabular pathology in combined lesions	

FAIS=Femoroacetablular Impingement Syndrome; NR=Not Reported