

In-Office Diagnostic Needle Arthroscopy: Understanding the Potential Value for the US Healthcare System

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Abstract

In-office diagnostic needle arthroscopy is a cost-effective and reproducible procedure with potential cost and quality-of-life benefits for commercial payers and patients. Significant value was realized in this 200-patient retrospective review. Minimum savings of \$418 and \$554.62 were realized for noncontrast knee and shoulder magnetic resonance imaging (MRI) scans, respectively, in independent MRI facilities. Those savings more than doubled in hospital-based facilities: \$961.08 and \$1097.62, respectively, for knee and shoulder noncontrast MRI scans.

Patient satisfaction and healthcare costs have taken a leading role in today's health care market. Patient satisfaction, often categorized as the "patient experience," can be measured on numerous levels, such as access to

healthcare professionals and diagnostic testing, wait time for appointments, and timely test results. Furthermore, patients' having a full understanding of their pathology and treatment options may correlate with their overall satisfaction. Some metrics are subjective, but procedure costs are objective.

The algorithm for treating patients who present with knee or shoulder pathology to an orthopedic office involves taking a thorough history, performing a physical examination, and, in many cases, obtaining diagnostic imaging. After arriving at a diagnosis, the physician plans the patient's treatment. In most cases in which magnetic resonance imaging (MRI) is required, the process can take 2 to 3 weeks.¹

Surgical knee arthroscopy is one of the most common procedures in the United States.^{2,3} Worldwide, more than 2 million knee arthroscopies are performed yearly.⁴ For most procedures, the decision to treat is based on physical examination findings, and the diagnosis is confirmed with MRI. MRI has 86% sensitivity and 91% specificity for diagnosing ligamentous and meniscal tears.⁵ However, regular use of MRI has led to increased healthcare expenditures and a larger financial burden for patients, which can delay diagnosis.⁶

Since 2000, MRI use in the United States has risen significantly—by 10% over a 10-year period.⁷ According to a 2013 population analysis, 107 in 1000 US inhabitants had an MRI yearly.⁸

MRI costs vary widely because of several factors, including state/regional consideration, scanning in a hospital or an independent facility, and use of contrast and arthrography. In a 2017

Take-Home Points

- In-office diagnostic needle arthroscopy is a minimally invasive, rapid method for identification of intra-articular joint pathology.
- Cost savings of a significant value can be realized to both the patient and healthcare system via small-bore needle arthroscopy as opposed to MRI.
- Diagnostic needle arthroscopy can lead to quicker identification of pathology than MRI.
- Diagnostic needle arthroscopy can reduce the number of undue "formal" surgical diagnostic arthroscopies.
- Standardization of image quality of small bore arthroscopy may pose benefits to the variable quality of MRI.

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study of the variation in noncontrast MRI costs at 71 hospitals and 26 independent facilities in Iowa, Westermann and colleagues⁹ found that, excluding radiologist interpretation fees, the mean MRI technical component cost to consumers was US \$1874 (SD, \$694; range, \$500-\$4000).

Patient factors may preclude use of MRI (**Table**). In addition, patients with recent or previous surgery on the joint in question may have less than definitive findings on subsequent MRI.¹⁰ Conversely, there are limited situations in which in-office diagnostic arthroscopy is inferior to traditional MRI or magnetic resonance arthrography (MRA) for intra-articular pathology.

Small-bore needle arthroscopy is a cost-effective alternative diagnostic tool with efficacy and accuracy similar to those of MRI and standard arthroscopy for intra-articular pathologies.^{6,11} The procedure is performed with a disposable handpiece equipped with an internal light source and optics; this handpiece attaches to a reusable tablet for ease of transportation and visualization (**Figure 1**). The technical aspects of the procedure are described in the literature.¹² Diagnostic needle arthroscopy with a local anesthetic gives physicians real-time dynamic visualization of anatomy in the office setting—reducing time from injury to intervention by as much as 2 to 3 weeks over traditional MRI.¹

In 2014, Voigt and colleagues⁶ reported a significant net healthcare system cost saving with use of a small-needle arthroscope for diagnostic testing. The saving was estimated at \$115 million to \$177 million for simple isolation of medial meniscus pathology—or, more specifically, for appropriate care after more accurate visualization with the diagnostic needle arthroscope coupled with a decrease in false positives compared with MRI use. Other factors include the economic impact of the patient's lost work hours, often associated with the time off needed for the MRI and for the follow-up visit for review of results.

Methods

We retrospectively reviewed the patient charts for 200 in-office knee and shoulder diagnostic needle arthroscopies performed by 5 surgeons over a 12-month period and examined the costs. Medicare, Medicaid, worker's compensation, self-pay, and motor vehicle cases were excluded to provide uniformity across commercial insurance payers. Only the reimbursement amounts for *Current Procedural Terminology* codes 29870 (diagnostic

Table. When MRI May Be Contraindicated or May Not Provide Definitive Information for Pathology of Affected Joint

Non-MRI candidates	Claustrophobia Pacemaker Internal defibrillator Neurostimulator Metal implants (unsafe for MRI) Anxiety Obesity
Other considerations	Previous surgery on affected joint Continued pain with "negative" MRI Second-look evaluations after cartilage procedure

Abbreviation: MRI, magnetic resonance imaging.



Figure 1. Diagnostic needle arthroscope (mi-eye 2; Trice Medical) consists of a disposable 14-gauge needle equipped with a camera and light source that attaches to the digital tablet for viewing. Arthroscope offers 120° field of view at 0° angle of visualization. Photo courtesy of Trice Medical, Inc.

knee arthroscopy) and 29805 (diagnostic shoulder arthroscopy) were examined. Geographical differences in commercial payer reimbursements were considered. The 5 surgeons who submitted data for this study practice in different parts of the United States—the Northeast, the Mid-Atlantic, the Southeast, the Midwest, and the West Coast. Similarly, the costs of outpatient and inpatient MRI and MRA were reported by each physician based on regional rates. MRI reimbursement was considered only if the MRI magnet was 1.5 Tesla or stronger.

Results

We reviewed 200 (175 knee, 25 shoulder) in-office diagnostic needle arthroscopies of patients with commercial insurances. Average reimbursement

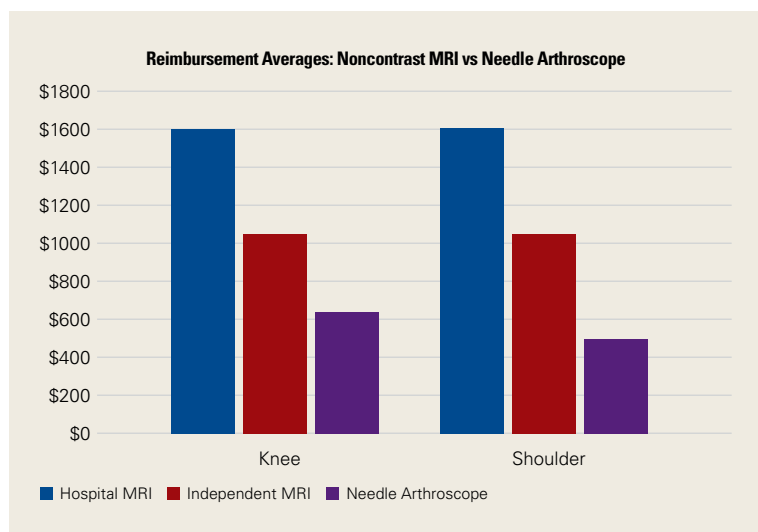


Figure 2. Average overall reimbursements for needle arthroscopy of the knee and shoulder were compared with the average reimbursements/costs of hospital-based and independent-facility noncontrast MRI. Average cost savings with knee arthroscopy was \$418 (vs hospital MRI) and \$961 (vs independent facility MRI), and average cost savings with shoulder arthroscopy was \$554 (vs hospital MRI) and \$1097 (vs independent facility MRI).

Abbreviation: MRI, magnetic resonance imaging.

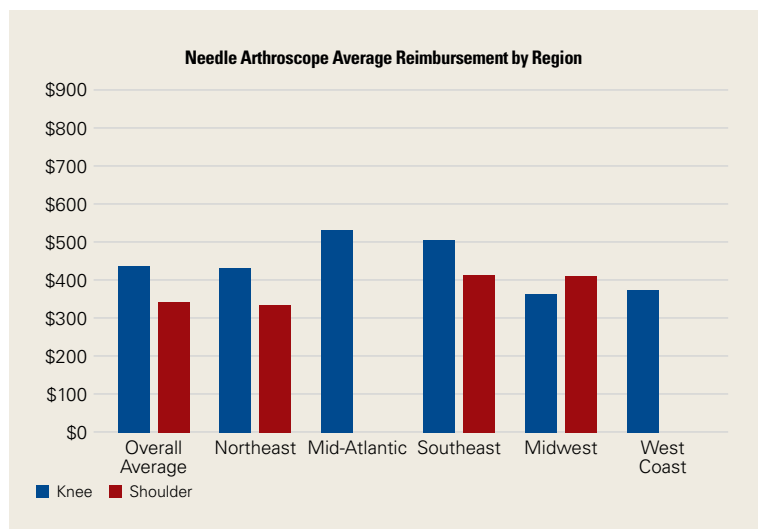


Figure 3. Average reimbursement for diagnostic arthroscopy by US region. During review, Mid-Atlantic and West Coast patients who underwent diagnostic needle arthroscopy of the shoulder did not meet study inclusion criteria.

was calculated across all commercial payers for both knee and shoulder arthroscopies (**Figure 2**).

For in-office diagnostic needle arthroscopy of the knee, average reimbursement was \$628.92 (range, \$340-\$1391). For in-office diagnostic needle arthroscopy of the shoulder, average reimbursement was \$492.38 (range, \$471-\$593). Outpatient MRI without contrast of the knee or shoulder averaged \$1047 (range, \$565-\$2100) (**Figure 3**). MRA

increased this average by about \$100 to \$325. Hospital-based MRI within the 5 regions surveyed averaged \$1590, with the addition of arthrography ranging from \$100 to \$350. Radiologist interpretation fees were on average \$204 for standard MRI and \$362 for MRA. These fees typically were bundled into the MRI cost. There were no statistically significant regional differences in charges associated with diagnostic needle arthroscopy (**Figure 3**), but there were variations in MRI fees (**Figure 4**).

Discussion

Over the past decade, the combination of health and economics has often driven patient care and consumer demand. With rising deductibles and variations in secondary insurance carriers, patients often base healthcare decisions on their financial impact. Conversely, physicians are often in the difficult position of treating patients who are hesitant to obtain medical imaging out of financial concern. In addition, physicians and patients routinely are concerned about delays in care and timely reporting of test results. A patient's ability to quickly obtain test results and start a course of definitive treatment may affect the patient's perception of the overall healthcare experience with the physician, as has been noted in popular healthcare polls, such as Press-Ganey.¹³

Diagnostic needle arthroscopy performed in an office can yield a cost saving over MRI. Our review revealed in-office needle arthroscopy of the knee provided an average cost saving of \$418.08 over standard MRI performed in an outpatient facility (**Figure 3**). That saving more than doubled, to \$961.08, when MRI was performed in a hospital. Similarly, in-office needle arthroscopy of the shoulder provided an average cost saving of \$554.62 over standard MRI. This saving also increased substantially, to \$1097.62, over hospital MRI. An additional cost saving of \$100 to \$350 was found for knee or shoulder diagnostic needle arthroscopy over MRA.

Other factors affect the economic benefit of diagnostic needle arthroscopy over standard MRI. Having the procedure performed the same day as the presenting office visit can save the patient time and allow the physician to create a medical treatment plan sooner. In addition, the patient (and the insurance company) can save costs by avoiding a later office visit for review of MRI findings. Time spent going to MRI follow-up visits potentially can be analyzed as lost wages or as time lost from other segments of life. For the patient,

this time can be defined as *value hours*. Last, there is a cost saving in avoiding nonoperative treatments in cases in which the initial definitive diagnosis would have called for surgical intervention. Accordingly, for patients who cannot undergo MRI, obtaining information on intra-articular pathology in the office may also decrease unnecessary “traditional” diagnostic arthroscopy in the operating room. Therefore, patients who do not require true formal arthroscopy to determine lack of pertinent intra-articular pathology can avoid unnecessary anesthesia, time off work, and associated healthcare expenses.

This study had several limitations. First, evaluating more cases would have increased the strength of the findings. Second, the large number of knee cases relative to shoulder cases may have been a by-product of the practice makeup of the surgeons rather than a matter of preference with this relatively new technology. However, the significant gap in cost savings between needle arthroscopy and MRI cannot be discounted, and it provides a window on the potential cost savings the healthcare system can realize. Furthermore, analysis of payments made by the commercial payers in each state may have revealed a reimbursement fluctuation. The largest challenge in this study was the extreme variation in MRI costs. According to the literature, MRI of the upper or lower extremity ranges in cost from \$500 to \$4000.⁴ In addition, this cost is often negotiated between the patient and the MRI facility if the patient is willing to work outside insurance, which potentially can alter the overall average MRI cost.

The last points to consider are the reliability of users and the reproducibility of in-office diagnostic needle arthroscopy. Much as with true surgical arthroscopy and other diagnostic imaging practices, this procedure has a learning curve. We know that the number of successful diagnoses will increase with training and repetition, but so far there are no data on the number of procedures needed for proficiency. However, diagnostic needle arthroscopy images are of high quality and are static across users (**Figures 5A, 5B**). By contrast, the quality of MRI in the United States varies with the quality of the magnets used in individual facilities. Poor-quality MRI may compromise a physician’s ability to adequately diagnose pathology or may necessitate repeat MRI. Having an inconclusive MRI scan require more MRI testing potentially increases healthcare system costs. In this study, MRI cost was considered only if the MRI system had a

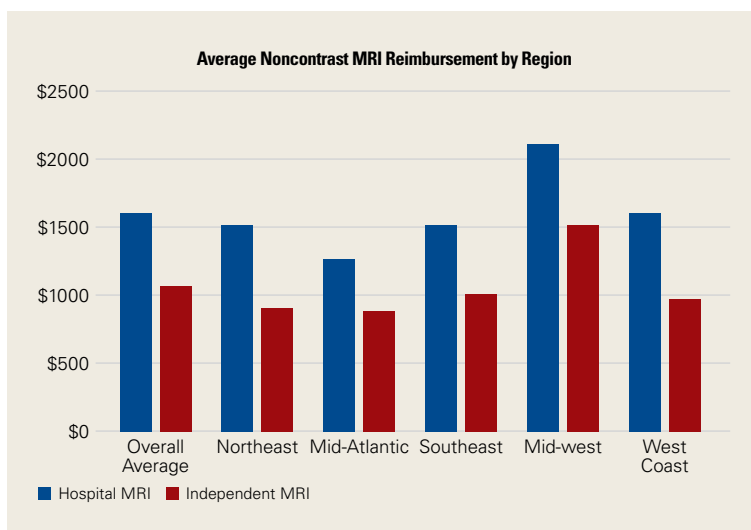


Figure 4. Average cost reimbursement comparison for hospital-based and independent facility noncontrast MRI of the knee and shoulder based on 5 regions participating in the study.

Abbreviation: MRI, magnetic resonance imaging.

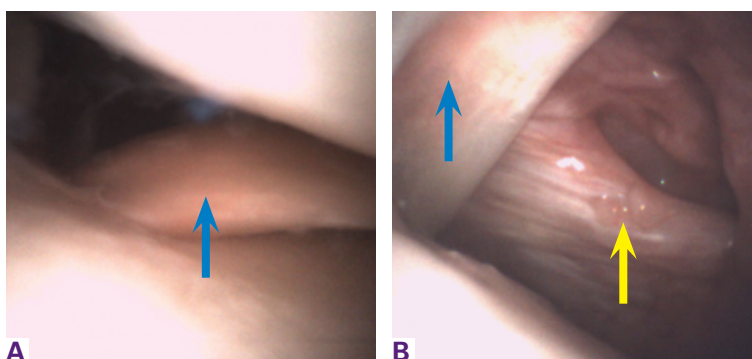


Figure 5. (A) The medial meniscus (blue arrow) and root of a right knee visualized through the camera of the needle arthroscope. Also visualized are the medial femoral condyle and tibial plateau. (B) Intra-articular view of a right shoulder from posterior to anterior shows the biceps (blue arrow) and subscapularis tendons (yellow arrow) visualized through the needle arthroscope.

magnet of 1.5 Tesla or stronger and if commercial insurance was used.

Conclusion

In-office diagnostic needle arthroscopy is a cost-effective and reproducible procedure with potential cost and quality-of-life benefits for commercial payers and patients. Although further study of long-term cost savings for the health care system is needed, significant value was realized in this 200-patient retrospective review. Minimum savings of \$418 and \$554.62 were realized for noncontrast knee and shoulder MRIs, respectively, in independent facilities. Those cost savings more than doubled in hospital-based facilities: \$961.08

and \$1097.62, respectively, for knee and shoulder noncontrast MRIs.

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