

Arthroscopy Patients in Medicare Population Became Sicker While Reimbursement Decreased From 2013 to 2020



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Purpose: To assess surgeon reimbursement for common arthroscopic procedures, including arthroscopic meniscal debridement and arthroscopic rotator cuff repair, in patients with differing risk profiles within the Medicare population. **Methods:** A publicly available Medicare database was used to identify all cases of arthroscopic meniscal debridement and arthroscopic rotator cuff repair procedures billed to Medicare from 2013 to 2020. The surgeon reimbursement from Medicare was collected and adjusted for inflation. All procedure episodes were split into 2 cohorts; those with a hierarchical condition category (HCC) risk score ≥ 1.5 , and those with patient HCC risk scores < 1.5 . Reimbursement rates were compared between groups. **Results:** From 2013 to 2020, a total of 624,077 meniscal debridement procedures and 567,794 arthroscopic rotator cuff repairs were billed to Medicare Part B. During this time, the mean adjusted surgeon reimbursement for arthroscopic rotator cuff repair decreased by 9.2% from 2013 to 2020. During the same time period, the adjusted mean surgeon reimbursement for arthroscopic both compartment meniscal debridement and single compartment meniscal debridement decreased by 7.9% and 9.9%, respectively. Throughout the study period, the mean HCC risk score increased from 1.19 in 2013 to 1.31 in 2020 ($P < .001$). Across all years in the study, the sicker cohort had a significantly greater rate of all comorbidities and a greater mean body mass index ($P < .001$ for all variables). The mean reimbursement across this cohort was lower for both rotator cuff repair ($P = .037$) and meniscal debridement procedures ($P < .001$) compared with the healthier cohort. **Conclusions:** This study demonstrates that from 2013 to 2020, inflation-adjusted surgeon reimbursement for arthroscopic rotator cuff repair and meniscal debridement decreased while patient complexity increased. Further, mean surgeon reimbursement was lower among patients with more complexity in comparison with their healthier counterparts for such procedures. **Level of Evidence:** Level III, retrospective cohort study.

Intra-articular pathology is common in the aging patient, as it is estimated that among patients aged 65 years and older, more than 50% have a symptomatic meniscal tear and more than 40% have a symptomatic rotator cuff tear.¹⁻⁴ As the U.S. population continues to age, patients are wanting to remain more active and functional into their later years.⁵ As such, the demand

for surgical treatment of common pathology such as meniscal tears and rotator cuff tears among aging patients is increasing. When such patients have concomitant arthritis, arthroplasty has been successful for reducing pain and regaining function. However, in the active aging patient with meniscal or rotator cuff pathology in the absence of arthritis, arthroscopic debridement or repair offers excellent outcomes, and more than 100,000 arthroscopic rotator cuff repairs and arthroscopic meniscal debridement surgeries, respectively, are performed in patients older the age of 65 years in the United States annually.^{6,7}

Given the growing demand for such procedures, there has been increased focus on payment reform for arthroscopy as a whole within the United States. As with all surgical procedures, the Center for Medicare and Medicaid Services (CMS) along with the American Medical Association and their Relative Value Scale Update Committee work in concert to determine

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reimbursement for arthroscopic procedures within the United States for the Medicare and Medicaid system.⁸ These evaluations set forth by CMS serve as the market standard for reimbursement, and commercial reimbursements and policy are structured from these CMS evaluations. As such, Medicare policy is largely reflective of the overall market, and it is vital that surgeons have an adequate understanding of this.

For the past decade, there has been increasing focus on value within health care in the United States. One central aspect of this development has revolved around maintaining patient access and equity in access to high-quality care. Specifically, there has been extensive literature and advocacy surrounding risk adjustment for reimbursement. Such studies cite concerns that unadjusted payment models may result in inequitable reimbursement and incentive structures that favor healthy patients and ultimately threaten access for patients with significant health problems or those who require more complex care.⁹⁻¹³ As a result, the CMS has introduced increasingly sophisticated risk-adjustment structures for hospital and ambulatory surgical center payments.¹⁴ This allows for toggling such payments on the basis of patient-specific comorbidities and factors that affect costs of care. Despite this progress for risk adjustment within reimbursement for hospitals and surgery centers, there has been very little advocacy efforts or attention surrounding similar risk-adjustment structures specifically for surgeon fees or reimbursement for the operating surgeon within arthroscopy.

It is known that patients with more complexity require increased resources for their care and often require more time and effort from surgeons both within and outside the operating room.^{15,16} Despite this, the current insurance market in the United States pays orthopaedic surgeons largely the same regardless of on whom they operate. As a result, this may disadvantage those surgeons who spend increased time and energy for patients who are sicker or with more complexity without adjusted remuneration for such efforts. Further, vast recent literature demonstrates that the Medicare payment structure has been consistently decreasing surgeon reimbursement in the last several decades, including more than a 30% adjusted decrease in arthroscopy over the past 20 years.⁸ Despite this, there is no previous literature regarding the complexity of patients undergoing arthroscopic procedures and how this complexity or risk relates to eventual surgeon reimbursement. As such, the purpose of this study was to assess surgeon reimbursement among patients undergoing common arthroscopic procedures including arthroscopic meniscal debridement and arthroscopic rotator cuff repair with differing risk profiles within the Medicare population. The authors hypothesized that there would be no difference in reimbursement between risk groups.

Methods

Data Source

The publicly available “Medicare Physician and Other Provider” files from 2013 to 2020 were used for this study. Mean patient demographics and comorbidity profiles were collected for all patients in the database. This included mean age, body mass index, and the complete comorbidity profile of all patients, composed by the rates of atrial fibrillation, Alzheimer disease, congestive heart failure, chronic kidney disease, chronic obstructive pulmonary disease, depression, diabetes, ischemic heart disease, history of seizures, and history of stroke among patients. In addition, the mean patient hierarchical condition category (HCC) risk score was collected for all patients, which is a standardized metric accounting for patient comorbidities and is normalized to 1.0 for a standard patient. Data were linked to all arthroscopic rotator cuff repairs and arthroscopic partial meniscectomies billed to Medicare using the Medicare “Physician and Other Provider - By Procedure” file by filtering for Current Procedural Terminology codes 29880 (arthroscopic medial and lateral partial meniscectomy, i.e., both-compartment meniscal debridement), 29881 (arthroscopic medial or lateral partial meniscectomy, i.e., single-compartment meniscal debridement), and 29827 (arthroscopic rotator cuff repair). The ZIP code and corresponding Rural Urban Commuting Area (RUCA) codes were collected for all patients. RUCA codes are used by the government to define urban versus rural areas and proximity to metropolitan resources. The Medicare surgeon reimbursement was likewise collected for all episodes. All reimbursement values were adjusted to 2020 U.S. dollars (USD) using the United States Consumer Pricing Index, a measure of annual inflation.

Data Analysis

Descriptive statistics were performed for all data in the study. All procedures were separated into 2 cohorts, those with mean HCC risk score ≥ 1.5 and those with mean HCC risk score < 1.5 . The score of 1.5 was chosen as a cutoff as it represents patients who are more than 1 standard deviation above average in terms of risk and represents patients who carry significantly more risk from a health standpoint than a standard patient.¹⁷ Variables were averaged for each cohort and compared using Student *t* tests, and χ^2 analysis to compare rates of comorbidities. Mean reimbursement adjusted for inflation was calculated for each year for each procedure, as well as the percent difference in reimbursement over time. All monetary data were adjusted to year 2020 USD using the consumer price index for each year in the study. The change over time in reimbursement and mean HCC risk score was visually represented in graph form. All analysis and data

recording were performed in SPSS, version 23, software (IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0; IBM Corp., Armonk, NY), with a P value $< .05$ indicating significance.

This study was exempt from institutional review board approval, as no identifiable patient information was used. All data in this study were publicly available, deidentified information.

Results

Descriptive Statistics

From 2013 to 2020, a total of 624,077 arthroscopic meniscal debridement procedures and 567,794 arthroscopic rotator cuff repairs were billed to Medicare. This totaled 1,191,871 procedures, all of which were included in this analysis. When adjusting for inflation to 2020 USD, the mean surgeon reimbursement for arthroscopic rotator cuff repair decreased by 9.2% ($-\$110.55$) from $\$1,200.67$ in 2013 to $\$1,090.12$ in 2020. During the same time period, the adjusted mean surgeon reimbursement for arthroscopic both-compartment meniscal debridement and the mean surgeon reimbursement for arthroscopic single-compartment meniscal debridement decreased by 7.9% ($\$630.81$ in 2013 to $\$581.27$ in 2020) and 9.9% ($\$611.59$ in 2013 to $\$551.21$ in 2020), respectively (Fig 1, Table 1). There was no difference in rate of reimbursement change for any procedure between sick or healthy study cohorts. Finally, the annual case volume billed to Medicare for arthroscopic rotator cuff repair increased from 2013 to 2020 (60,912 procedures in 2013, 66,902 procedures in 2020) and decreased for the 2 meniscal debridement procedures included in the

study (95,857 procedures in 2013, and 48,250 procedures in 2020).

In terms of comorbidities, 134,731 patients had an HCC score ≥ 1.5 (11.3%) and constituted the sicker cohort, and the remaining 1,057,140 patients had an HCC score < 1.5 and constituted the healthy cohort. The mean HCC risk score increased throughout the study, with a mean of 1.19 ± 0.06 in 2013 and 1.31 ± 0.08 in 2020 ($P < .001$) (Fig 2).

Comorbidities and Demographics

Across all years of the study and all patients, among the sicker patient cohort with a mean HCC risk score ≥ 1.5 , these patients had a significantly greater rate of atrial fibrillation (21.2% among the sick cohort vs 9.5% among the healthy cohort), Alzheimer disease (18.4% among the sick cohort vs 6.8% among the healthy cohort), congestive heart failure (34.6% among the sick cohort vs 12.3% among the healthy cohort), chronic kidney disease (37.8% among the sick cohort vs 16.5% among the healthy cohort), chronic obstructive pulmonary disease (27.6% among the sick cohort vs 7.3% among the healthy cohort), depression (32.1% among the sick cohort vs 22.2% among the healthy cohort), diabetes (45.2% among the sick cohort vs 18.7% among the healthy cohort), ischemic heart disease (44.5% among the sick cohort vs 20.6% among the healthy cohort), history of seizure (4.2% among the sick cohort vs 1.3% among the healthy cohort), and history of stroke (5.9% among the sick cohort vs 1.1% among the healthy cohort) compared with the cohort with HCC risk score < 1.5 ($P < .001$ for all variables, Table 1). In addition, the mean age of the sicker cohort was greater at 71.2 versus 67.1 in the healthy cohort ($P < .001$). Likewise, the ethnicity profiles of the 2 cohorts

Fig 1. Mean Medicare reimbursement by procedure type from 2013 to 2020. (adjusted for inflation to 2020 U.S. dollars).

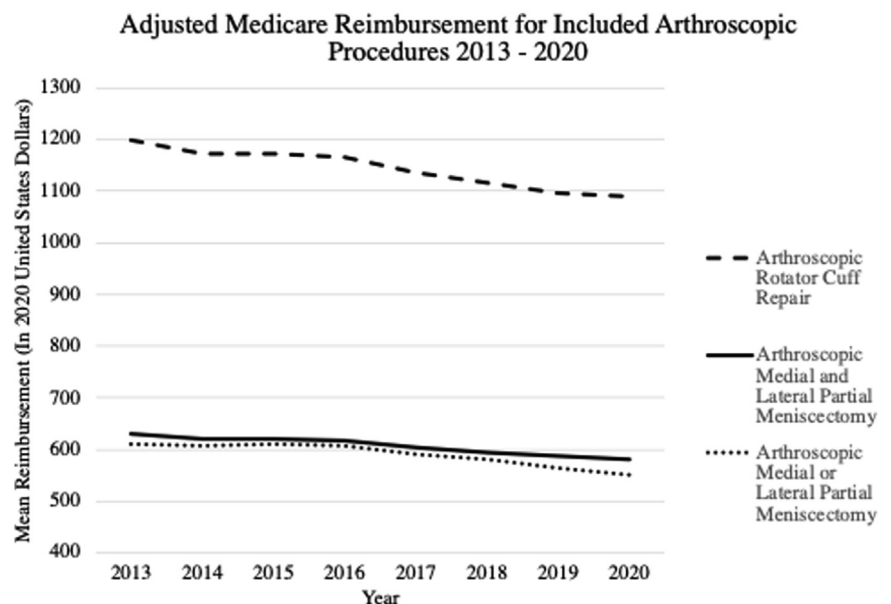


Table 1. Mean Reimbursement and Surgical Volume by Year for Each Procedure

Year	RCR	Meniscal Debridement (Both Compartments)	Meniscal Debridement (Single Compartment)
2013	\$1,200.67; 60,912 procedures	\$630.81; 52,559 procedures	\$611.59; 43,295 procedures
2014	\$1,170.97; 64,948 procedures	\$618.55; 47,868 procedures	\$606.35; 39,909 procedures
2015	\$1,173.19; 68,364 procedures	\$620.75; 47,899 procedures	\$610.14; 38,648 procedures
2016	\$1,165.13; 72,166 procedures	\$616.32; 47,988 procedures	\$605.23; 38,738 procedures
2017	\$1,135.51; 75,286 procedures	\$603.06; 43,160 procedures	\$589.82; 35,630 procedures
2018	\$1,116.14; 78,591 procedures	\$594.08; 40,900 procedures	\$580.13; 32,756 procedures
2019	\$1,097.14; 80,625 procedures	\$587.99; 37,277 procedures	\$565.41; 29,200 procedures
2020	\$1,090.12; 66,902 procedures	\$581.27; 26,858 procedures	\$551.21; 21,392 procedures
Total change mean reimbursement (\$, percent change)	-\$110.55 (-9.2%)	-\$49.54 (-7.9%)	-\$60.38 (-9.9%)

NOTE. All monetary values adjusted to 2020 U.S. dollars.
RCR, rotator cuff repair.

were significantly different, with 10.2% of the sicker cohort being patients who are Black, compared with 4.6% in the healthier cohort, and 7.1% of the sicker cohort being Hispanic, compared with 3.1% in the healthy cohort. In addition, the sicker cohort had a greater proportion of patients who lived in a small town or rural area, as defined by RUCA locality code >6. Specifically, 11.1% of the sicker cohort versus 7.4% of the healthier cohort lived in a small town (RUCA 7-9), whereas 4.4% of the sicker cohort versus 2.8% of the healthy cohort lived in a rural area (RUCA 10). These differences were both statistically significant, with $P < .001$ based on χ^2 analysis.

Reimbursement Versus Risk

Finally, when adjusting to 2020 USD, the mean surgeon reimbursement across the sicker cohort from 2013 to 2020 was lower for all 3 procedures included, at \$1,132.89 for arthroscopic rotator cuff repair, \$581.23 for arthroscopic single-compartment meniscal debridement, and \$599.29 for both-compartment meniscal debridement compared with the mean reimbursement among the healthier cohort of \$1,144.45, \$595.98, and \$612.31 for the same procedures, respectively. This difference was significant ($P < .01$ for both types of meniscal debridement and $P = .037$ for rotator cuff repair) (Table 2).

Discussion

This study demonstrates that mean surgeon reimbursement was significantly lower for commonly performed arthroscopic procedures among greater-risk patients in comparison with their healthier

counterparts. In addition, these greater-risk patients had a significantly more severe comorbidity profile and also comprised a greater percentage of minority patients compared with the healthier cohort of patients in this study. These greater-risk patients were also more commonly from a small town or rural area.

There have been studies evaluating general reimbursement and monetary trends within arthroscopy. One such study from Moore et al.⁹ demonstrates that mean Medicare reimbursement for common arthroscopic procedures decreased nearly 30% from 2000 to 2019. The authors of this study call for increased awareness, particularly as alternative payment models are increasingly being promulgated by CMS, stating that decreases in reimbursement may threaten access to

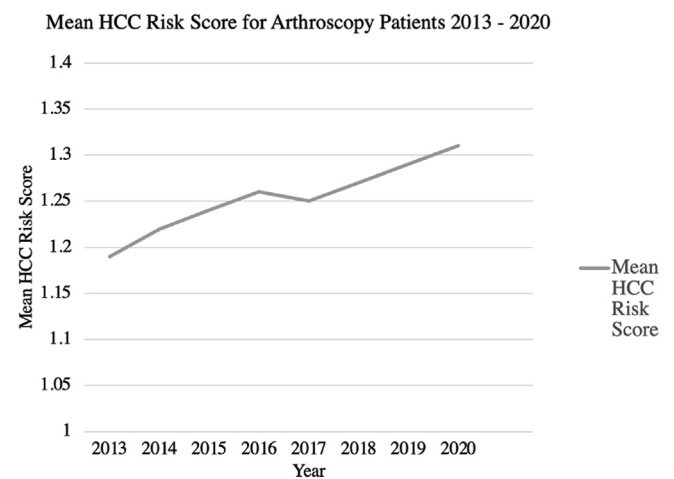


Fig 2. Mean HCC risk score for patients undergoing arthroscopy from 2013 to 2020. (HCC, hierarchical condition category.)

Table 2. Rate of Comorbidities and Mean Surgeon Reimbursement Across Study Cohorts for RCR and Meniscal Debridement Separated by HCC Risk Score for All Patients From 2013 to 2020

HCC Risk Score Cohort	AF Rate	Alzheimer Rate	CHF Rate	Diabetes Rate	IHD Rate	CKD Rate	Mean BMI	Mean Surgeon Reimbursement for RCR and Meniscal Debridement
Score \geq 1.5 (134,731 patients)	21.2%	18.4%	34.6%	45.2%	44.5%	37.8%	32.2	\$1,132.89 for RCR \$581.23 for meniscal debridement (lateral OR medial) \$599.29 for meniscal debridement (lateral AND medial)
Score $<$ 1.5 (1,057,140 patients)	9.5%	6.8%	12.3%	18.7%	20.6%	26.5%	26.7	\$1,144.45 for RCR \$595.98 for meniscal debridement (lateral OR medial) \$612.31 for Meniscal debridement (lateral AND medial)
<i>P</i> value of comparison between groups	<i>P</i> $<$.001	<i>P</i> $<$.001	<i>P</i> $<$.001	<i>P</i> $<$.001	<i>P</i> $<$.001	<i>P</i> $<$.001	<i>P</i> $<$.001	<i>P</i> = .037 (RCR) <i>P</i> $<$.01 (meniscal debridement, both compartments) <i>P</i> $<$.01 (meniscal debridement, single compartment)

NOTE. All monetary values adjusted to 2020 U.S. dollars.

AF, atrial fibrillation; BMI, body mass index; CHF, congestive heart failure; CKD, chronic kidney disease; HCC, hierarchal condition category; IHD, ischemic heart disease; RCR, rotator cuff repair.

quality arthroscopic care in the United States. Our present study corroborates this trend of decreasing reimbursement, with mean reimbursement in the present study decreasing nearly 10% for all included procedures from 2013 to 2020. As reimbursement continues to decline, it is possible that surgeons may increasingly deny care to at-risk patients. This is particularly evident, given the present study's finding that there is no monetary incentive to care for more complex patients, as these patients often generate less reimbursement on average.

There is limited previous literature regarding risk-adjustment in arthroscopy. However, CMS has introduced broad, basic risk-adjustment for facility and surgery center payments in recent years, which applies to all surgical procedures, including arthroscopy.¹⁴ Meanwhile, surgeon fees remain unadjusted for patient factors and are only adjusted for geographic locality. In addition to the risk adjustment that now applies to facility and hospital payments, it is known that hospital and facility reimbursement has continued to increase in relation to surgeon reimbursement within arthroscopy. LaPrade et al.¹⁵ demonstrated that from 2005 to 2014, unadjusted hospital reimbursement for arthroscopic rotator cuff repair increased by more than 120%, whereas surgeon reimbursement only increased 3% throughout this time. In a similar analysis of arthroscopic partial knee meniscectomies, the same

authors found that adjusted surgeon reimbursement decreased more than 15%, whereas hospital reimbursement increased by more than 36% from 2005 to 2014.¹⁶ This would imply that hospitals and facilities may have more lobbying power and efforts related to reimbursement and policy than surgeons, and it is important that in light of these discrepancies that surgeons remain engaged in policy discussion. Hospitals have continued to demonstrate strong lobbying and introduction of new legislation such as risk-adjusted payments, which may result in a widening disparity between surgeon and hospital reimbursement moving forward.

When assessing how patient complexity relates to reimbursement, it is first important to understand how orthopaedic surgeons are currently reimbursed within Medicare. Put simply, surgeon reimbursement from Medicare follows a predetermined fee schedule, which is based on a summation of different types of relative value units (RVUs) assigned to all procedures performed. The predetermined RVU assignment for each procedure is updated annually by the CMS Relative Value Scale Update Committee. The total RVU amount for each procedure is then multiplied by a conversion factor, ultimately determining a final surgeon reimbursement. Finally, this surgeon payment is adjusted by a geographic locality multiplier, which is meant to adjust for cost of living in each locality.¹⁸

Given this mechanism, it is not all that surprising that surgeon reimbursement is relatively similar between cohorts in this study, although there was a statistically significant larger average reimbursement among healthier patients. However, this relatively small monetary difference will likely not directly or immediately influence surgeon behavior, but it is possible that the current mechanism is holding a slight reimbursement advantage for treating healthier patients, in addition to these patients already having an inherent advantage of less complicated delivery of care. When evaluating the discrepancy in reimbursement between the 2 risk cohorts in this study, it is likely that geographic adjustment was the reason for this discrepancy. Many of the geographic localities that have a lower geographic adjustment factor are smaller towns or are more rural, which may have sicker, more complex, and potentially underserved patients. This is supported by the fact that the sicker cohort in the present study does contain a greater proportion of patients from rural areas. This study implies that orthopaedic surgeons in such communities may potentially be undervalued by the Medicare system, as they are caring for a more complex and underserved patient population yet still experiencing decreased adjustments to their reimbursement as the result of their geographic location, without any positive adjustment for the increased complexity and worsened health status of their patients.

Currently, the only mechanism for surgeons to increase reimbursement on the basis of case complexity is via the 22 billing modifier for complex cases. This billing modifier can be submitted by surgeons for challenging procedures that require more work and allows for increased reimbursement in cases when it is accepted. There is limited study regarding the 22 modifier, although it seems to rarely be accepted, as a previous study demonstrated the modifier led to increased reimbursement in just 3 of 90 cases for which it was appropriately submitted for patients undergoing hip and knee arthroplasty.¹⁹ Use of the modifier also results in delays to reimbursement, which potentially questions whether use of the 22 modifier is worth the additional effort.¹⁹

To understand the ramifications of this study, it is imperative to consider that most surgeons hold strong moral obligations to treat the diverse patients of their community despite the monetary environment in which they find themselves. However, reimbursement policy that does not account for the unique differences between patients may disproportionately incentivize surgeons to have a preference for treating a healthier cohort. Further, our analysis also revealed that these complex patients are proportionately more likely to be of minority status or living in rural communities, each of which are factors associated with decreased access to care.¹⁷ Altogether, equitable reimbursement may be

pivotal in maintaining access to sports medicine care for this vulnerable group. As such, equity in health care delivery within arthroscopy may be improved with payment models that directly address this discrepancy. Further, compared with large hospital systems, surgeons often have less time and resources to advocate for change on their behalf. Therefore, it is vital that orthopaedic surgeons are considered and advocated for within future payment model discussions.

The data within the present study do not conclude definitively that the Medicare system needs to risk-adjust surgeon reimbursement for patient complexity within arthroscopy. However, this study does demonstrate that within the current policy environment, orthopaedic surgeons are not receiving any additional remuneration for treating patients who are more medically complex. This study may serve as a driver for increased and informed advocacy moving forward to help properly incentivize and assure equitable access to high-quality sports medicine surgical care for medically complex and underserved patients.

Limitations

There are limitations to this study. First, we exclusively used publicly available Medicare data, which may not be completely representative of the arthroscopy market. However, as previously mentioned, CMS decisions greatly influence private insurance reimbursement rates and market trends overall, and this study's findings still hold large-scale application and are representative of current practice trends and a potential need for widespread risk adjustment for surgeon fees in both private and public reimbursement models. Further, as with any study using a large database, the data are assumed to be accurate and complete. As the data source is curated directly from CMS claims data, any errors in the data are likely minimal.

Conclusions

This study demonstrates that from 2013 to 2020, inflation-adjusted surgeon reimbursement for arthroscopic rotator cuff repair and meniscal debridement decreased while patient complexity increased. Further, mean surgeon reimbursement was lower among more complex patients in comparison to their healthier counterparts for such procedures.

Disclosures

All authors (J.M.H., J.C.B., E.L., S.V.T, K.S.M., K.A.P., and A.C.) declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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