The Journal of Foot & Ankle Surgery 58 (2019) 920–929

Contents lists available at ScienceDirect

The Journal of Foot & Ankle Surgery

journal homepage: www.jfas.org

How Does A Structured Review Instrument Impact Learning at Resident Journal Club?

Eric So, DPM, AACFAS[1], Christopher F. Hyer, DPM, MS, FACFAS[2,3], Marcus Richardson, DPM, AACFAS[4], Melissa Younger, DPM, AACFAS[5], Donald S. Malay, DPM, MSCE, FACFAS[6]

[1] *Fellow, The CORE Institute, Phoenix, AZ*
[2] *Residency Program Director, Grant Medical Center, Columbus, OH*
[3] *Fellowship Director, Orthopedic Foot and Ankle Center, Westerville, OH*
[4] *Foot and Ankle Surgeon, Buckeye Foot and Ankle, Marysville, OH*
[5] *Podiatric Research Fellow, Penn Presbyterian Medical Center*
[6] *Director Podiatric Research, Penn Presbyterian Medical Center*

ARTICLE INFO

Level of Evidence: 4

Keywords:
foot and ankle
graduate medical education
residency

ABSTRACT

Journal club article review is an integral aspect of graduate medical education. A structured review instrument (SRI) is a checklist form that serves to guide through critical appraisal of the literature. The goal of this study was to objectively evaluate the effect of an SRI on journal critical appraisal in foot and ankle residency programs. A prospective study evaluated resident critical appraisal of journal club articles at 2 residency sites. Baseline resident critical appraisal scores were obtained the first 5 months of the academic year. The SRI form was then implemented into journal club sessions starting the sixth month until the end of the academic year. Resident critical appraisal scores were then compared. The use of SRI significantly improved resident scores compared with pre-SRI assessment scores ($p < .001$). The SRI tool is easily implemented and makes measurable improvement in resident critical appraisal of the reviewed literature. The use of an SRI tool should be considered in all residency programs to improve resident critical appraisal skills. Further study is warranted to determine specific competencies in which SRI provide the most benefit.

Journal club (JC) article reviews are a commonly used format for instruction in critical appraisal of the medical literature. JC reviews have been used both to encourage physicians to keep current with new advances and to teach research design and analysis. A structured review instrument (SRI) is a checklist or form used to guide the reader through the critical appraisal of a research article. Several authors have described and recommended checklist-based systems to aid residents in analyzing methods and experimental design, use of statistics, data, and conclusions (1–5). The benefit of an SRI in emergency medicine residencies found an increase in resident satisfaction and improved the perceived educational value of JC without increasing resident workload or decreasing attendance (2); thus, the SRI can be used to evaluate a residents knowledge acquisition and to assess the effect of the JC on the overall educational training program (2,6–9).

One recent study defined the role of the JC in the podiatric foot and ankle surgical residency programs (10); however, that study did not assess the utility and potential benefit of an SRI. The purpose of this investigation was to objectively determine whether the use of an SRI to guide residents in their critical review of journal articles improves the participants' understanding of the report. We hypothesized that use of an SRI would result in greater critical appraisal of an article under review, in comparison to critical appraisal measured before use of the SRI.

Materials and Methods

Institutional review board exemption (OhioHealth Grant Medical Center, Columbus, OH) approval was obtained to perform a prospective study evaluating the effect of an SRI for resident JCs at 2 training programs in which regular JCs were already a component of the training programs. The 2 programs were Grant Medical Center (GMC), Columbus, OH, and the Penn Presbyterian Medical Center (PPMC), Philadelphia, PA. GMC conducts one, 1-hour JC session once per month, during which they discuss 3 to 4 articles per session, whereas PPMC conducts 2 to three 1-hour JC sessions per month, during which they discuss 1 article per session. Two of the study investigators conducted the assessments at each study site (M.R. at GMC and M.Y. at PPMC). At the start of the 2017 academic year, residents enrolled in the participating residency programs were administered a

Financial Disclosure: None reported.
Conflict of Interest: D.S.M. is Editor of *JFAS*, and receives research funding from the US National Institutes of Health and the American College of Foot and Ankle Surgeons.
Address correspondence to: Eric So, DPM, AACFAS, The Core Institute, 18444 N 25th Avenue, Suite 310, Phoenix, AZ 18444.
E-mail address: Ericso70@gmail.com (E. So).

1067-2516/$ - see front matter © 2019 by the American College of Foot and Ankle Surgeons. All rights reserved.
https://doi.org/10.1053/j.jfas.2019.01.016

Please answer the following questions about yourself.

You will be assigned a reference number for all subsequent assessments. Please remember your number, and use it as your identifier on all upcoming evaluations.

1. Age: _____years
2. Gender: _____male _____female
3. Residency Program: _____OhioHealth _____Penn Presbyterian
4. Post-graduate Year (PGY):
   - ☐ PGY-1
   - ☐ PGY-2
   - ☐ PGY-3
   - ☐ PGY-4
5. Please indicate your level of journal club experience (select all that apply).
   - ☐ I have never participated in a journal club before
   - ☐ I have participated in a journal club before
   - ☐ I have lead a journal club before
6. Please indicate your level of clinical or biomedical research experience.
   - ☐I have never participated in research before.
   - ☐I have participated in research before.

For office use only.
Assigned Reference Number:

Fig. 1. Demographic survey of participating programs.

demographics survey (Fig. 1). This survey was used to compare intrinsic differences between the 2 programs, such as research experience or average postgraduate year. The JC participants were deidentified throughout the data collection process and given an alphanumeric reference number that was used to code all of the evaluations.

The residents at both institutions were administered a Journal Critical Appraisal Assessment Form (JCAAF) (Fig. 2) for each JC session. This was done immediately before the JC session, and then again after independent review of the journal articles. There was no crossover of articles between the 2 locations. Each JCAAF was composed of questions about the articles assigned for the JC session, and every assessment asked if the resident had read the article before commencement of the JC session. The questions were formatted as multiple choice, true or false, or short answer. The questions aimed to evaluate reader critical appraisal of the hypothesis described in the report, study design and methodology, statistical analyses, results, author-stated conclusions, and limitations of the investigation as described by the authors. The JCAAF was administered in association with and before each JC session.

During the first 5 months of the academic year, the JCAAF was administered to assess JC participant performance with the programmatic status quo in effect. From the sixth to tenth months, the SRI (Fig. 3) was implemented into each program's JC process. The investigators (E.S. and M.Y.) conducted a brief (approximately 15 minutes) training session at the beginning of the sixth month to describe the hypothesized rationale for and the use of the SRI. After the training session, the SRIs were distributed in conjunction with the JC articles to be reviewed in the JC sessions conducted over the ensuing 5 months. Residents were encouraged to use the SRI to assist them in critically appraising the articles prior to the scheduled JC sessions. The scores are categorized into 4 Assessment Quadrants. The first (1), from the first 2 months of the observation period, were used as baseline measurements (months 1 and 2); those for the second 3 months (2) were used to measure resident growth as a result of practice and participation in a regularly scheduled JC (months 3 through 5); those for the first 3 months (3) following distribution of the SRI were considered a "learning period" in regard to use of the SRI (months 6 through 8); and those for the final 3 months (4) were considered the "SRI-JC period" in regard to the regular use of the SRI (months 9 through 11) (Table 1). These time segments were chosen to analyze and measure whether the results are a function of the SRI versus learned behavior over time.

Journal critical appraisal and the ability to critically appraise the articles under review were assessed using the JCAAF, and answer keys were designed by the investigators for each article appraised during the JC sessions. The assessments were collected before the start of the JC session and then graded by a single reviewer at each study site (M.R. at GMC, M.Y. at PPMC). The data were collected and managed using Research Electronic Data Capture (available at: https://redcap.vanderbilt.edu/) electronic data capture tools (11). Research Electronic Data Capture is a secure, web-based application designed to support data capture for research studies. It provides an interface for data entry, audit trails for tracking data manipulation and export procedures, automated export procedures for data downloads to common statistical packages, and procedures for importing data from external sources. Close-ended questions were scored using an answer key. The assessors (M.R. and M.Y.) were trained to grade open-ended questions using "keywords" that were assigned to each question and points used to score the participants performance were outlined in the answer key for each article under review.

Statistical Analyses

The main outcome of the study was the changes in participant JC critical appraisal and critical appraisal scores before use of the SRI and then after the instrument was put into use at the 2 foot and ankle surgical training programs. The demographic and program characteristics were described in statistical terms for both programs overall and separately. Categorical variables were reported as frequencies and percentages and continuous variables as medians and interquartile ranges. The mean score was calculated for each segment of the observation period (months 1 and 2, baseline; months 3 through 5,

Comprehension Assessment Example for Foot & Ankle Surgery Residency Journal Club.

Please answer the following questions about the article(s) you read for today's journal club.

Feuerstein CA et al, Static Versus Dynamic Musculoskeletal Ultrasound for Detection of Plantar Plate Pathology. Foot Ankle Spec. 2014;7(4).

Nery et al. Prospective Evaluation of Protocol for Surgical Treatment of Lesser MTP Joint Plantar Plate Tears. Foot Ankle Int. 2014;35(9)876-885..

Prissel et al. Plantar Plate Repair Using a Direct Plantar Approach: An Outcomes Analysis. J Foot Ankle Surg. 2017;56:434-439.

Yamada et al. Second and Third Metatarsophalangeal Plantar Plate Tears: Diagnostic Performance of Direct and Indirect MRI Features Using Surgical Findings as the Reference Standard. Am J Roentgenol. 2017;209:W100-108.

Did you read the article entitled, "Static Versus Dynamic Musculoskeletal Ultrasound for Detection of Plantar Plate Pathology"?.

☐ Yes
☐ No

Did you read the article entitled, "Prospective Evaluation of Protocol for Surgical Treatment of Lesser MTP Joint Plantar Plate Tears"?

☐ Yes
☐ No

Did you read the article entitled, "Plantar Plate Repair Using a Direct Plantar Approach: An Outcomes Analysis"?

☐ Yes
☐ No

Did you read the article entitled, "Second and Third Metatarsophalangeal Plantar Plate Tears: Diagnostic Performance of Direct and Indirect MRI Features Using Surgical Findings as the Reference Standard?"

☐ Yes
☐ No

---

1. In the 2014 Feuerstein study, what was the reference standard?
    a) MRI
    b) Positive lachman test
    c) Intraoperative findings
    d) Clinic resolution of pain

Fig. 2. Journal critical appraisal assessment tool.

2. What was one major finding of the 2014 Feuerstein study?

_____

_____

_____

3. According to Feuerstein 2014, MRI is generally accepted as the standard however has which of the following drawbacks?
    (a) Costly
    (b) Uncomfortable
    (c) Not always available
    (d) All of the above

4. According to the 2014 Nery study, all of the following were listed weaknesses of the study except?
    a) The coexistence of different deformities in the majority of patients
    b) Lack of validated clinical parameters
    c) A considerable amount of statistical bias
    d) Limited follow-up time

5. According to the 2014 Nery study, which grade tears presented inferior results? Select all that apply (may be more than one answer)
    a) Grade 0
    b) Grade I
    c) Grade II
    d) Grade III
    e) Grade IV

6. Select all that apply: in the 2014 Nery study, which of the following were used as clinical parameters?
    a) Toe purchase
    b) Ground-touch test
    c) Joint stability
    d) Manual muscle strength

7. In the 2017 Prissel study, how were patient outcomes recorded?
    a) Satisfaction questionnaire
    b) Foot Function Index
    c) A and B

8. What is the main finding in the 2017 Prissel study?
    a) The dorsal approach to plantar plate repair yields excellent relief in pain, function, and associated disability.
    b) The plantar approach to plantar plate repair yields excellent relief in pain, function, and associated disability.

Fig. 2. (*Continued*)

c) There are greater wound complications with the plantar approach

9. What was the most common reported complication of the 2017 Prissel study?
   a) Wound problems
   b) Recurrence
   c) Revision
   d) Neuritis

10. In Yamada et al's study, which of the following direct MRI features were found to be most sensitive and accurate?
   a) Plantar plate morphology and signal intensity changes
   b) Loss of congruence with any degree of dorsal dislocation of the proximal phalanx
   c) Nonvisualization of the plantar plate
   d) Partial or complete discontinuity of the plantar plate with fluid interposition

11. What is the principle finding in the Yamada et al. study?
   a) The presence of any morphologic change in the plantar plate and the presence of some indirect features exhibit good to excellent accuracy.
   b) Diagnostic arthroscopy should be performed to confirm diagnosis of plantar plate tears
   c) Plantar plate tears are often associated with intermetatarsal neuroma
   d) MRI is useful in determining the grade of plantar plate tears

12. Which indirect finding was found to exhibit the best performance (highly accurate and sensitive)?
   a) Pseudoneuroma sign
   b) Interosseous tendon-collateral ligament complex abnormality
   c) Flexor tenosynovitis
   d) Intermetatarsal bursitis

Fig. 2. (*Continued*)

regular JC participation; months 6 through 8, SRI learning period; months 9 through 11, SRI-JC period) for each resident participant. If a resident missed 1 or 2 months during any distinct time period, then the average of the remaining month within each time segment was used. The differences in critical appraisal between the different time segments of the observation period were assessed using Wilcoxon matched-pair signed-rank test, and a p value $\leq .05$ was considered statistically significant. The statistical analyses were completed using SAS Enterprise Guide, version 7.1 (SAS Institute, Cary, NC). Statistical analyses were performed by a biostatistician.

Results

There were total of 27 foot and ankle surgery residents, 11 (40.74%) from GMC and 16 (59.2%) from PPMC. Of the 27 residents, 25 (92.6%) were assessed at baseline before the start of the first JC session. Overall, 24 (88.9%) residents underwent final assessment during the post-SRI JC period. Resident participants with missing critical appraisal scores were not excluded from the analysis. The demographic and program characteristics of the participating residents are described in Table 2. Overall, a greater proportion of the residents in both programs were male (74.1%). All of the residents had some level of JC experience before participating in the study. The monthly change in pre-JC critical appraisal scores without and with the SRI are plotted in Fig. 4. The baseline, pre-SRI, and SRI learning period median scores between GMC and PPMC were statistically significant ($p = .002$, $p \leq .001$, and $p = .001$, respectively). The mean pre-JC critical appraisal scores for assessment quadrants overall and by residency program are described in Table 3. Comparison of critical appraisal scores between assessment quadrants is described in Table 4. The introduction of the SRI was associated with a statistically significant increase in post-SRI JC critical appraisal scores compared with pre-SRI critical appraisal scores ($p < .001$) (Table 4). The introduction of the SRI was associated with a statistically significant increase in the learning curve period of post-SRI JC critical appraisal scores compared with pre-SRI JC appraisal scores ($p = .039$). Continued use of SRI did not affect pre-JC critical appraisal scores as evidenced from comparison of scores between the SRI learning period and post-SRI implementation assessment period ($p = .245$) (Table 4).

Discussion

JC article review is an important aspect of graduate medical education. Its use as an academic training tool is ubiquitous across various medical specialties (12–17). Despite the established role of JCs, the optimal curriculum has yet to be established. In 1 report in foot and ankle

Structured Review Instrument

Title

Hypothesis

Method/Study Design

☐ Retrospective ☐ Prospective ☐ Cadaveric ☐ Literature Review ☐ Cross-Sectional

☐ Therapeutic ☐ Prognostic ☐ Diagnostic ☐ Economic and Decision Analyses

☐ Level I ☐ Level II ☐ Level III ☐ Level IV ☐ Level V

Inclusion Criteria: Exclusion Criteria:

Number: Mean follow-up:

Statistics

Continuous variables:

Parametric ☐ t-test ☐ ANOVA ☐ Simple Linear Regression ☐ other

Nonparametric ☐ Kruskal-Wallis ☐ Mann-Whitney ☐ Wilcoxon signed rank test ☐ other

Categorical variables:

☐ x^2 ☐ Fisher exact ☐ other

Results

List the primary findings.

List the secondary findings.

Fig. 3. Structured review instrument.

Structured Review Instrument

List any complications.

Conclusion

Is the conclusion justified based on the results?

Is the conclusion generalizable?

What is the clinical significance of the conclusion?

How does this article contribute to the medical literature?

Limitations

What are the limitations to this study?

What are ways to improve this study?

Was there bias in the study? If so, which type?

☐ Design Bias ☐ Selection Bias ☐ Measurement Bias ☐ Analysis Bias ☐ Publication Bias

☐ Other

Fig. 3. (*Continued*)

Table 1
Schematic of the 4 statistical subsets into assessment quadrants

Time Frame	SRI Status	Assessment Quadrant	Outcomes Measurement
A: Months 1–2	Preintervention	Baseline measurement	NA
B: Months 3–5	Preintervention	Improvement resulting from journal club practice/participation	A vs B
C: Months 6–8	Postintervention	SRI learning period	NA
D: Months 9–11	Postintervention	Improvement resulting from SRI implementation	B vs C vs D

Abbreviations: NA, not available; SRI, structured review instrument.

Table 2
Demographic characteristics of the respondents, overall and by program

	Overall (N = 27)	Grant Medical Center (n = 11)	Penn Presbyterian (n = 16)	*p* Value*
Gender, n (%)				
Male	20 (74.1)	9 (81.8)	11 (68.7)	.662
Female	7 (25.9)	2 (18.2)	5 (31.2)	
PGY level, n (%)				
PGY-1	9 (33.3)	5 (45.4)	4 (25.0)	
PGY-2	8 (29.6)	4 (36.4)	4 (25.0)	.264
PGY-3	6 (22.2)	2 (18.2)	4 (25.0)	
PGY-4	4 (14.8)	–	4 (25.0)	
Level of journal club experience				
Never participated, n (%)†	–	–	–	
Participated previously, n (%)†	16 (59.3)	11 (100)	5 (31.2)	<.001
Led journal club previously, n (%)†	16 (59.3)	4 (36.4)	12 (75.0)	.061
Level of clinical or biomedical research experience, n (%)				
Never	9 (33.3)	5 (45.4)	4 (25.0)	.411
Participated before	18 (66.7)	6 (54.6)	12 (75.0)	

Abbreviation: PGY, postgraduate year.
* Fisher's exact test *p* value.
† Not mutually exclusive.

surgery residency programs, the 2 most important goals of JCs are to (1) affect clinical decision-making and (2) improve critical appraisal skills (10). A recent survey performed in a plastic surgery residency program found significant obstacles to resident education (18). They found a lack of experience or foundation in critical appraisal on entering residency, a deficiency of formal teaching on the topic of critical appraisal as a platform for further learning, and the absence of a tool provided to guide inexperienced individuals in analysis of the literature (18). In the current study, the primary finding is that the implementation of SRIs into JCs improved resident scores in critical appraisal of JC articles. This supports the theory that SRI can streamline the educational process by providing an avenue through which residents can focus on the pertinent aspects of JC articles (18). The SRI contains questions about hypothesis, study design and methods, statistical analysis, outcomes, author conclusions, and limitations. This can serve as an education modality to gain, or improve, critical appraisal skills; thus, in being more critical of the literature, residents may see improvement in clinical reasoning and surgical decision-making skills.

In the current study, there is an important distinction between critical appraisal and comprehension. The SRI is intended to improve critical appraisal skills, which refers to the ability to carefully and systematically assess the outcome of scientific evidence and therefore judge its merits, value, and relevance in a particular context. The SRI is not intended to improve comprehension, which implies acquiring an

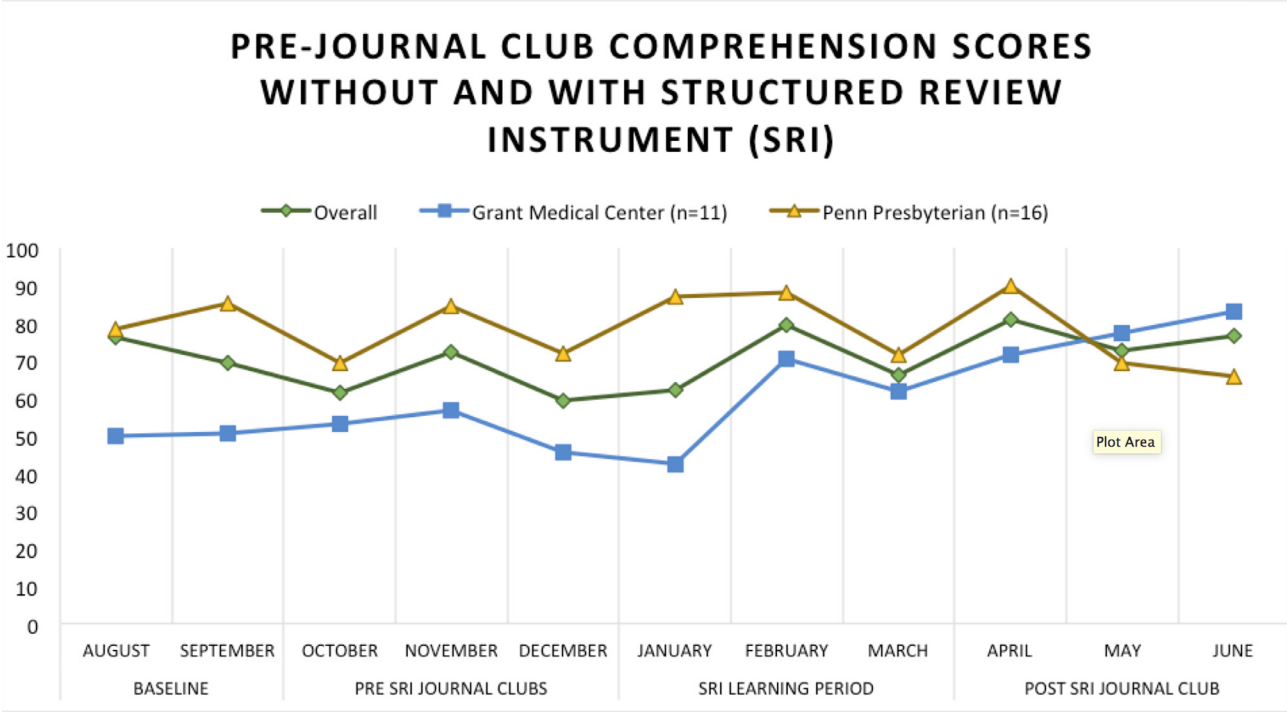

Fig. 4. Trend in change of prejournal club critical appraisal scores without and with the structured review instrument.

Table 3
Mean average critical appraisal scores for assessment quadrants, overall and by residency program

	Overall (N = 27)	Grant Medical Center (n = 11)	Penn Presbyterian (n = 16)	*p* Value*
Baseline				
N	25	11	14	.002
Median (IQR)	75 (42, 85)	42 (33, 62.5)	82.5 (80, 90)	
Pre-SRI journal clubs				
N	25	11	14	<.001
Median (IQR)	66.5 (53, 78.3)	52.6 (44.3, 61.3)	77.8 (75, 81.7)	
SRI learning period				
N	25	11	14	<.001
Median (IQR)	75 (61, 85)	58.5 (50, 69.3)	83.3 (80, 95)	
Post-SRI Journal clubs				
N	24	11	13	.772
Median (IQR)	78.7 (71.3, 81.6)	80.3 (71, 83.3)	77.5 (71.6, 80.7)	

Abbreviations: IQR, interquartile ratio; SRI, structured review instrument.
* Wilcoxon rank sum test.

understanding and grasp of the concepts to construct meaning of the information. Although related, these 2 concepts are distinguished in the current study.

Burstein et al (2) has documented the benefit of these checklist systems in improving the value of JCs as an educational tool. They found that SRI increased resident satisfaction and improved the perceived educational value of a JC without increasing residents' workload or decreasing attendance. However, they state that an objective comparison of residents' knowledge of research design, biostatistics, or epidemiology before and after the introduction of the SRI may show improvement in these areas (2). Markert et al (9) used a stimulus sheet as a guide to presenting articles and concluded it to be useful to foster better understanding of the articles reviewed and research concepts involved. The strength of this study is that we assessed the objective comparison of resident knowledge of research design, biostatistics, epidemiology, and methodology before and after the introduction of the SRI. Furthermore, this study provides validation to the current SRI that is appropriately detailed for the JC setting, providing organization to article review and JC discussion. The study was multi-institutional, which provides additional merit to the study findings. In a small observational study conducted among 17 obstetrics and gynecology resident physicians in a single institution, a statistically significant improvement in objectively tested knowledge or resident self-assessment of knowledge related to study design and interpretation after the text was implemented into a structured JC curriculum was not found (19). They concluded that a multi-institutional, multispecialty study conducted over multiple years of training would better clarify the utility of the SRI (19).

There are limitations with the current study. This study is limited by its small sample size. Future studies may be better able to assess specific competencies gained in a larger group of residents over a longer time. The demands of off-service rotations led to incomplete and inconsistent attendance of residents. We acknowledge that residents may improve critical appraisal skills simply because of repetition and practice over time, which may have inflated the post-SRI results. Although we were unable to mitigate this phenomenon from our study, we attempted to measure its impact. By comparing time frame A versus B and C versus D, we did not find a statistical significance in this learned behavior; therefore, it is reasonable that the effect of repetition and practice had minimal effect over the course of 1 academic year. This is most likely because each JC session covers different topics, study types, and has varying resident attendance. Nonetheless, this effect should not be neglected and remains a limitation to the current study. We were not able to determine specific competencies in which SRIs provided the most benefit. Future studies may be better able to assess specific competencies gained in a larger group of residents over a longer time course. Additionally, there may have been uncontrolled differences between the 2 study sites regarding formulating assessment questions. We did not measure the difficulty in assessments, nor was the number of question types (multiple choice versus short answer vs true or false) compared between the 2 study sites. Last, the study of 2 residency programs may not be a general representation of residency training.

In conclusion, the primary finding was that the implementation of an SRI did improve resident critical appraisal of selected JC articles. SRIs provide a streamlined avenue to direct residents in being more critical of the published literature. Future studies may be better able to assess specific competencies gained in a larger group of residents.

Table 4
Comparison of critical appraisal scores between assessment quadrants

	p Value*
(A) Baseline vs (B) pre-SRI journal clubs	.556
(B) Pre-SRI journal clubs vs (D) post-SRI journal clubs	<.001
(B) Pre-SRI journal clubs vs (C) SRI learning period	.039
(C) SRI learning period vs (D) post-SRI journal clubs	.245

Abbreviation: SRI, structured review instrument.
* Wilcoxon matched-pair signed-rank test.

Acknowledgment

The authors acknowledge the support of the Nirav Patel, MBBS, MPH; Chelsea Blessing, PhD; and OhioHealth Research and Innovation Institute.

References

1. Thurnau GR, Fishbrune JI. Format of an obstetrics and gynecology journal club and four years' experience. Am J Obstet Gynecol 1989;160:313–316.
2. Burstein JL, Hollander JE, Barlas D. Enhancing the value of journal club: use of a structured review instrument. Am J Emerg Med 1996;14:561–563.
3. Woods JR, Winkel CE. Journal club format emphasizing techniques of critical reading. J Med Educ 1982;57:799–801.
4. Brautigan MW. A systematic approach to research curricula for emergency medicine residencies. J Emerg Med 1984;1:459–464.
5. Krough CL. A checklist system for critical review of medical literature. Med Educ 1985;19:392–395.
6. Dirschl DR, Tornetta P, Bhandari M. Designing, conducting, and evaluating journal clubs in orthopedic surgery. Clin Orthop Relat Res 2003;413:146–157.
7. Spillane AJ, Crowe PJ. The role of the journal club in surgical training. Aust NZ J Surg 1998;68:288–291.
8. Seifer DB, Adelson MD, Abdul-Karin RW, Baggish MS. Appraising a clinical journal article in obstetrics and gynecology. Am J Obstet Gynecol 1989;160:198–201.

9. Markert RJ. A research methods and statistics journal club for residents. Acad Med 1989;64:223–224.
10. So E, Hyer CF, Richardson MP, Thomas R. What is the current role and factors for success of the journal club in podiatric foot and ankle surgery residency training programs? J Foot Ankle Surg 2017;56:1009–1018.
11. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap) – a metadata-driven methodology and workflow process for providing translational research informatics supports. J Biomed Inform 2009;42:37–81.
12. Sidorov J. How are internal medicine residency journal clubs organized, and what makes them successful? Arch Intern Med 1995;155:1193–1197.
13. Greene WB. The role of journal clubs in orthopaedic surgery residency programs. Clin Orthop Relat Res 2000;373:304–310.
14. Moberg-Wolff EA, Kosasih JB. Journal clubs: prevalence, format, and efficacy in PM&R. Am J Phys Med Rehabil 1995;74:224–229.
15. Rajpal S, Resnick D, Raskaya M. The role of journal club in neurosurgical training. Neurosurgery 2007;61:397–403.
16. Jouriles NJ, Cordell WH, Martin DR, Wolfe R, Emerman CL, Avery A. Emergency medicine journal clubs. Acad Emerg Med 1996;3:872–878.
17. Crank-Patton A, Fisher JB, Toedter J. The role of the journal clubs in surgical residency programs: a survey of APDS program directors. Curr Surg 2001;58:101–104.
18. Hryciw N, Knox A, Arneja J. How well are we doing at teaching critical appraisal skills to our residents? A needs assessment of plastic surgery journal club. Plastic Surg 2017;25:261–267.
19. Lenthscer J, Batig A. Appraising medical literature: the effect of a structured journal club curriculum using the *Lancet Handbook of Essential Concepts in Clinical Research* on resident self-assessment and knowledge in milestone-based competencies. Mil Med 2017;182:e1803–e1808.