JAR Journal of Acupuncture Research

Original Article

pISSN 2586-288X • eISSN 2586-2898
J Acupunct Res 2024;41:209-215
https://doi.org/10.13045/jar.24.0024

Development of a Checklist and Assessment Items for an Objective Structured Clinical Examination of the Shoulder Joint Using Ultrasound

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Background: The increasing importance of developing good clinical skills in medical education underscores the value of an objective structured clinical examination (OSCE). Additionally, ultrasound devices and studies have been frequently used by Korean medical doctors. However, education and use of ultrasound in the current curriculum in Korea are insufficient; therefore, we developed an OSCE for shoulder joint ultrasonography for clinical practice students at Korean medical universities.
Methods: We reviewed previous studies and shoulder ultrasound guidelines to create a checklist for an OSCE. A satisfaction questionnaire survey was also developed by collecting and analyzing existing survey data on medical education satisfaction to address quality and problems of OSCE.
Results: The checklist consisted of six items: ultrasound preparation, biceps tendon detection, subscapularis detection, supraspinatus detection, infraspinatus and teres minor detection, and finishing. The satisfaction survey consisted of four items: topic appropriateness and difficulty assessment, content assessment, self-assessment, and comment on the OSCE.
Conclusion: We developed an ultrasound OSCE checklist for the rotator cuff. The OSCE should be revised based on the satisfaction survey data and expert opinions in the future. Our study data can be useful for practical training at Korean medical universities.

Keywords: Education, medical; Rotator cuff; Ultrasonography

Received: July 19, 2024; Accepted: July 26, 2024
Published on: October 15, 2024

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INTRODUCTION

The objective structured clinical examination (OSCE) is a clinical skill test developed by Harden et al. [1] in 1975 that evaluates the performance of clinical skills in 5–10 minute units according to a checklist. The United States Medical Licensing Examination Step 2 Clinical Skill Test in 2004 was the first OSCE in the United States, and the Seoul National University College of Medicine was the first to develop an OSCE in Korea in 1994. In 2009, the Korea Medical Licensing Examination introduced six OSCEs and the clinical practice examination (CPX). In 2021, the national examination for dentists also introduced an OSCE and CPX. Since then, their development have been continuous, and the importance of education through OSCEs and CPXs in modern medical education has increased [2]. Ultrasound is a medical device that displays cross-sectional images of the muscles, ligaments, and organs, and has both diagnostic and therapeutic values, such as when performing ultrasound-guided injections. Given that the use of ultrasound diagnostic devices has been required among Korean medical doctors, studies on ultrasound-guided acupuncture [3], pharmacopuncture [4], acupotomy [5] have also been conducted. Although Korean medical colleges have promoted ultrasound education and developed OSCEs, studies on musculoskeletal ultrasound using an OSCE remain insufficient [6,7].

According to the Health Insurance Review and Assessment Service (HIRA) data open portal, shoulder lesions (M75) are the most frequent cause of hospitalization, following other intervertebral disc disorders (M51 among musculoskeletal diseases). Moreover, the total treatment costs and prevalence have steadily increased over the past 10 years [8,9]. However, education and OSCE for shoulder joint ultrasound have not yet been developed. Thus, the present study aimed to provide insights into the shoulder joint using ultrasound and to improve the safety and efficiency of ultrasound-guided acupuncture.

MATERIALS AND METHODS

We reviewed the literature to develop an OSCE checklist and a satisfaction questionnaire survey for evaluating the knowledge, skills, and attitudes related to performing shoulder ultrasound among 4th year clinical practice students in an undergraduate course in Korean medicine.

Two researchers (MJK and JYH) developed a checklist for ultrasound education and a satisfaction survey. The overall process of developing an OSCE was based on the Clinical Practice Guidelines for Acupuncture and Moxibustion Medicine [10], and the process for ultrasound examination was based on the guidelines described in previous studies [7,11,12]. The posture and anatomical landmarks for detecting the rotator cuff were reflected in the checklist based on the European Society of Musculoskeletal Radiology guidelines [13] and previous studies [14-16]. The time limit for conducting the OSCE is 10 minutes; the OSCE comprises a total of 20 points and is evaluated by professors from Korean medical schools and student peers. After developing the OSCE, a satisfaction survey will be conducted on the topics, difficulty, and content, and self-evaluation will also be required. Each questionnaire was developed based on a satisfaction survey on the development of the OSCE and CPX education at existing Korean medical colleges [17], ultrasound OSCE for carpal tunnel syndrome [7], and previous studies on ultrasound OSCE [18,19].

RESULTS

1. The objective structured clinical examination process

Clinical training will be conducted during the first and second semesters of the fourth year of the course, and 2-hour theory and practical lectures will be conducted during each group training period. The theoretical lecture focused on the anatomy of the shoulder joint and rotator cuff (subscapularis, supraspinatus, infraspinatus, and teres minor), ultrasound operating methods, and postures during exploration. The lectures, which included ultrasound detection practices based on theoretical lectures, will be conducted by professors and residents of Korean medical doctor. After the lecture, a practice time of 4 hours will be provided, and students would be paired up and assume the roles of doctor and patient.

2. Checklist and satisfaction questionnaire survey

Table 1 shows the OSCE checklist developed in this study. The six-item checklist includes preparation for ultrasound examination; detection of the biceps tendon, subscapularis, supraspinatus, infraspinatus, and teres minor muscles, and completion of examination. The beginning and completion processes were assessed for patient communication, hand hygiene, and device manipulation. The evaluation was based on the appropriate posture for examining each muscle, identification of anatomical landmarks and target structures on ultrasound images, and skill in probe manipulation. The satisfaction survey

Table 1. Shoulder sonography using the objective structured clinical examination checklist

1. Preparation for ultrasound			/4
1-1	Introduce yourself to the patient and confirm the patient's identity	1 point 0 point	
1-2	Explain to the patient the significance of the ultrasound examination	1 point 0 point	
1-3	The doctor performs hand hygiene	1 point 0 point	
1-4	Turn on the ultrasound device and apply a sufficient amount of gel to the probe	1 point 0 point	
2. Biceps tendon detection			/3
2-1	The patient is seated on a chair with the patient's joint to be examined flexed at 90°, the forearm in the supine position, and the shoulder joint internally rotated	1 point 0 point	
2-2	Attach the probe in the transverse plane to the anterior aspect of the shoulder joint to identify the greater tuberosity (GT) and lesser tuberosity (LT) of the humerus and the long head of the biceps tendon running in the groove between the greater and lesser tuberosities 2 points: Probe manipulation is smooth, and the anatomical landmarks and corresponding muscles are well described 1 point: Probe manipulation is poor, and the anatomical landmarks and muscles are insufficiently described 0 point: The anatomical landmarks and muscles are not detected	2 points 1 point 0 point	
3. Subscapularis detection			/3
3-1	To check the subscapularis (Subs), the patient is positioned with the shoulder joint in a neutral position	1 point 0 point	
3-2	Attach the probe in the transverse plane to the anterior surface of the humerus to identify the Subs inserting into the LT, and externally rotate the shoulder joint to identify the Subs movement 2 points: Probe manipulation is smooth, and the anatomical landmarks and corresponding muscles are well described 1 point: Probe manipulation is poor, and the anatomical landmarks and muscles are insufficiently described 0 point: The anatomical landmarks and muscles are not detected	2 points 1 point 0 point	
4. Supraspinatus muscle detection			/3
4-1	The patient places his or her hand on the iliac crest on the side to be examined with the shoulder joint extended, internally rotated, and the elbow flexed	1 point 0 point	
4-2	The supraspinatus tendon running over the GT is identified by attaching the probe to the GT of the humerus 2 points: Probe manipulation is smooth, and the anatomical landmarks and corresponding muscles are well described 1 point: Probe manipulation is poor, and the anatomical landmarks and muscles are insufficiently described 0 point: The anatomical landmarks and muscles are not detected	2 points 1 point 0 point	
5. Subs and teres minor detection			/5
5-1	The patient places the hand on the side to be examined on the contralateral shoulder	1 point 0 point	
5-2	The physician places the probe in a transverse plane behind the patient, specifically behind the glenohumeral joint, to identify the humerus and the infraspinatus muscle running over it 2 points: Probe manipulation is smooth, and the anatomical landmarks and corresponding muscles are well described 1 point: Probe manipulation is poor, and the anatomical landmarks and muscles are insufficiently described 0 point: The anatomical landmarks and muscles are not detected	2 points 1 point 0 point	
5-3	Move the probe 2 to 3 cm downward to identify the teres minor 2 points: Probe manipulation is smooth, and the anatomical landmarks and corresponding muscles are well described 1 point: Probe manipulation is poor, and the anatomical landmarks and muscles are insufficiently described 0 point: The anatomical landmarks and muscles are not detected	2 points 1 point 0 point	
6. Finishing the inspection			/2
6-1	The doctor wipes the gel off the patient's body and probe, performs hand hygiene, and announces the end of the test	1 point 0 point	
6-2	The examination process and manipulation were performed skillfully and within the time limit 1 point: Performed within the time limit 0 point: Exceeded the time limit	1 point 0 point	
Total score			/20

Table 2. Objective structured clinical examination (OSCE) satisfaction survey questionnaire

	Worst (1 point)	Bad (2 points)	Average (3 points)	Good (4 points)	Very good (5 points)
1. Evaluation of the topic and difficulty level					
1-1 Do you think the learning objectives for the OSCE for shoulder ultrasound are appropriate?					
1-2 Do you think the difficulty level of the shoulder ultrasound OSCE is appropriate?					
1-3 Do you think the lecture is adequate to conduct an ultrasound OSCE?					
2. Evaluation of contents					
2-1 Do you think that the lecture and time are sufficient to conduct an OSCE?					
2-2 Do you think each item on the OSCE is adequate for learning the anatomy of the shoulder joint and rotator cuff muscles?					
2-3 Do you think each item on the OSCE is appropriate for performing ultrasound?					
2-4 Do you think OSCE would be helpful for ultrasound-guided procedures?					
2-5 Are you willing to implement ultrasound-guided acupuncture treatment in your clinical practice?					
2-6 Are you satisfied with the overall shoulder ultrasound OSCE?					
2-7 Is the OSCE time limit appropriate?					
3. Self evaluation					
3-1 I actively participated in the shoulder ultrasound OSCE training					
3-2 I was considerate of the patient and communicated appropriately during the ultrasound examination					
3-3 I understand the proper posture required for assessing the anatomy of the shoulder joint by ultrasound examination					
3-4 I can manipulate the ultrasound probe, probe the anatomical structures, and perform freezing to confirm the shoulder joint's anatomy					
3-5 I can explain the shoulder joint and rotator cuff muscles through ultrasound					
4. What are your thoughts and suggestions to improve the shoulder ultrasound OSCE?					

used a 5-point scale (worst, bad, average, good, very good) for evaluating the subject, difficulty, and learning content, and self-evaluation is also included. Subjective evaluations were performed to obtain opinions on the OSCE and suggestions for improvement (Table 2).

DISCUSSION

An ultrasound can be used to visualize anatomical structures and is widely used to improve the safety and effectiveness of invasive procedures, including nerve blocks and biopsies. According to a survey on the use of ultrasound conducted by the members of the Korean Medical Association in 2023 [20], 61.7% (374/606) of the respondents used ultrasound, and 54.6% used ultrasound to improve treatment accuracy and effectiveness. As the use of ultrasound has increased, standard procedures for ultrasound imaging [21] have been developed, and clinical studies on various acupuncture treatments have been conducted [3,22]. Regarding the origin of studies on ultrasound-guided acupuncture treatment [22], 11 studies were conducted in China, five studies in Korea, and one study in the United States, of which 8 were randomized controlled trials. Regarding the type of treatment, 11 studies were performed focusing on acupuncture, three on moxibustion, two on herbal medicine, and one on electroacupuncture. Shoulder pain was the

most common disease in six studies; knee pain in four studies; peroneal nerve paralysis in two studies; and neck and back fasciitis, metatarsal tunnel syndrome, superficial angioma, and intractable hiccup in one study each. According to the HIRA big data open portal [8], the prevalence of shoulder lesions (M75) increased from approximately 7,165 per 100,000 people in 2011 to 10,333 in 2020, and rotator cuff disease (M751) accounted for the largest proportion with 1,690,702 cases per year in 2020. Additionally, per capita medical expenses increased by 27.6%, from 284,000 won in 2018 to 363,000 won in 2022 [9]. According to the 2022 Korean Medicine Utilization Survey conducted by the Ministry of Health and Welfare [23], Korean medicine was used for musculoskeletal and shoulder diseases in 74.8% and 42.8% of cases, respectively. Additionally, a survey on the use of ultrasound by Korean medical doctors conducted in 2023 [20] has revealed that 50.1% of ultrasound examinations were conducted for shoulder joint treatment.

Since the first CPX education in Korean medicine was conducted at the Graduate School of Korean Medicine, Pusan National University in 2011, various OSCE and CPX modules have been developed [24], and the Korean Medicine Education Accreditation Standards 2022 [25] of the Korean Medicine Education Evaluation Institute in 2022 has proposed that more than 10 OSCEs and CPXs be conducted. Accordingly, OSCE and CPX education is expanding in domestic Korean medical colleges, and research has been conducted on OSCE and CPX development [6]. An ultrasound OSCE for diagnosing carpal tunnel syndrome has been developed [7], although it still remains quantitatively insufficient.

A previous satisfaction survey on education and clinical practice in Korean medical colleges [12,21-23] was conducted on the practical training process, education and learning content, evaluation and feedback, usefulness, and areas for improvement. Sim et al. [17] and Kim et al. [26] have reported a low satisfaction level regarding the connection between education and practice. Meanwhile, Han et al. [27] have reported a high demand for the connection between theoretical lectures and clinical applications. Moreover, Cho et al. [28] have demonstrated a high opinion regarding the need for disease education, which is frequently observed in clinical settings, and an improvement of technical skills education. However, these satisfaction surveys were conducted only once, and the results were not continuously monitored for survey evaluation and modification. Therefore, the present study aimed to develop a high-quality shoulder joint ultrasound OSCE by conducting continuous satisfaction surveys through continuous quality improvement, evaluating the results, and monitoring improvement in satisfaction.

However, this study had several limitations. The present study developed a checklist and questionnaire survey through a literature review. As it only targeted the rotator cuff and biceps tendon among the shoulder joint structures, the entire shoulder joint cannot be assessed. Moreover, a considerable improvement among students cannot be achieved owing to short learning and practice periods. Continuous supplementation is necessary through expert reviews of individual items and student feedback through satisfaction surveys.

CONCLUSION

The increasing importance of clinical skills in Korean medicine education and use of ultrasound devices by Korean medical doctors has underscored the need for ultrasound education. Accordingly, we developed a shoulder joint ultrasound OSCE checklist for ultrasound use by Korean medical students and a questionnaire to collect students' opinions. Revising and supplementing the OSCE based on our study results will qualitatively improve the practical education in Korean medical schools by utilizing ultrasound manipulation of the anatomical structure of the shoulder joint.

AUTHOR CONTRIBUTIONS

Conceptualization: JYH, MJK. Data curation: JYH, MJK. Formal analysis: JYH, MJK. Investigation: JYH, MJK. Methodology: JYH, IHP, MJK. Project administration: JYH, MJK. Resources: JYH, IHP, MJK. Supervision: JYH, IHP, MJK. Writing – original draft: JYH, MJK. Writing – review & editing: JYH, IHP, MJK.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

FUNDING

None.

ETHICAL STATEMENT

This research did not involve any human or animal experiments.

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REFERENCES

1. Harden RM, Stevenson M, Downie WW, Wilson GM. Assessment of clinical competence using objective structured examination. Br Med J 1975;1:447-451. doi: 10.1136/bmj.1.5955.447
2. Cho JJ, Noh HM, Kim SH, Kwon H, Park YM, Choi BM. The current status and development of a skill examination for the Korean speciality certification examination. J Korean Med Assoc 2014;57:444-454. doi: 10.5124/jkma.2014.57.5.444
3. Chu H, Park S, Kang K, Lee J, Oh J, Yoon J, et al. Current insights and updates in ultrasound-guided acupuncture: a comprehensive review and status report. J Korean Med Soc Acupotomology 2023;7:121-130. doi: 10.54461/JAcupotomy.2023.7.2.121
4. Jeong JK, Park GN, Kim KM, Kim SY, Kim ES, Kim JH, et al. The effectiveness of ultrasound-guided bee venom pharmacopuncture combined with integrative Korean medical treatment for rotator cuff diseases: a retrospective case series. Acupuncture 2016;33:165-180. doi: 10.13045/acupunct.2016063
5. Lee S. Prospects for the development of acupuncture treatment led by the use of ultrasound imaging devices. J Korean Med Soc Soft Tissue 2021;5:8-11. doi: 10.54461/JKMST.2021.5.1.8
6. Shin J, Go Y, Song C, Cho E, Leem J. Presentation on research trends and suggestion for further research and education on objective structured clinical examination and clinical performance examination in Korean medicine education: scoping review. J Soc Prev Korean Med 2022;26:87-112. doi: 10.25153/spkom.2022.26.2.008
7. Cho E, Han YM, Kang Y, Kim JH, Shin MS, Oh M, et al. Development of an objective structured clinical examination checklist and a post-education questionnaire for musculoskeletal ultrasound training focusing on volar wrist and carpal tunnel syndrome. J Acupunct Res 2022;39:105-114. doi: 10.13045/jar.2022.00038
8. Health Insurance Review & Assessment Service. HIRA Bigdata Open portal. Health Insurance Review & Assessment Service [Internet]. Wonju: 2015 [cited 2024 Feb 20]. Available from: https://opendata.hira.or.kr/home.do
9. Jung J, Shon MS. Epidemiology and etiology of shoulder pain based on health statistics data from Healthcare Bigdata Hub in Korea. J Korean Med Assoc 2022;65:687-698. doi: 10.5124/jkma.2022.65.11.687
10. Korean Acupuncture & Moxibustion Medicine Society. Clinical practice guideline of acupuncture medicine. Rev. ed. Hanmi Book. 2020:28-64.
11. Knobe M, Carow JB, Ruesseler M, Leu BM, Simon M, Beckers SK, et al. Arthroscopy or ultrasound in undergraduate anatomy education: a randomized cross-over controlled trial. BMC Med Educ 2012;12:85. doi: 10.1186/1472-6920-12-85
12. Knobe M, Münker R, Sellei RM, Holschen M, Mooij SC, Schmidt-Rohlfing B, et al. Peer teaching: a randomised controlled trial using student-teachers to teach musculoskeletal ultrasound. Med Educ 2010;44:148-155. doi: 10.1111/j.1365-2923.2009.03557.x.
13. Martinoli C. Musculoskeletal ultrasound: technical guidelines. Insights Imaging 2010;1:99-141. doi: 10.1007/s13244-010-0032-9
14. Gaitini D. Shoulder ultrasonography: performance and common findings. J Clin Imaging Sci 2012;2:38. doi: 10.4103/2156-7514.99146
15. Selame LAJ, Matsas B, Krauss B, Goldsmith AJ, Shokoohi H. A stepwise guide to performing shoulder ultrasound: the Acromio-clavicular joint, Biceps, Subscapularis, Impingement, Supraspinatus Protocol. Cureus 2021;13:e18354. doi: 10.7759/cureus.18354
16. Serpi F, Albano D, Rapisarda S, Chianca V, Sconfienza LM, Messina C. Shoulder ultrasound: current concepts and future perspectives. J Ultrason 2021;21:e154-e161. doi: 10.15557/JoU.2021.0025
17. Sim SB, Kweon JH, Kim HW, Hong JW, Shin SW. Student satisfaction study of clinical skills training in Korean medical education. J Korean Med 2013;34:37-53. doi: 10.13048/jkm.13011
18. Schmidt G, Gerlinger C, Endrikat J, Gabriel L, Müller C, Baus S, et al. Teaching breast ultrasound skills including core-needle biopsies on a phantom enhances undergraduate student's knowledge and learning satisfaction. Arch Gynecol Obstet 2021;304:197-202. doi: 10.1007/s00404-021-06016-8
19. Raja AE, Emam M, Shustorovich A, Tatini AL, Coslick A, Dreher GM, et al. A hybrid musculoskeletal ultrasound curriculum for physical medicine and rehabilitation residents-a multi-center pilot program. Curr Phys Med Rehabil Rep 2023;11:51-61. doi: 10.1007/s40141-023-00380-z
20. Kim JY, Yun JM, Lee SH, Lee YJ, Ko DK, Heo I, et al. Survey on the current usage of ultrasound-guided procedures in Korean medicine clinics and hospitals. Medicine (Baltimore) 2024;103:e37659. doi: 10.1097/MD.0000000000037659
21. Kim S, Lee S, Ha WB, Lee JH, Jung HJ, Chu HM, et al. Develop-

ment of an ultrasound-imaging procedure and acquisition of ultrasound images of acupuncture points for safety and accuracy of needle insertion. Integr Med Res 2017;6:427-433. doi: 10.1016/j.imr.2017.09.003

22. Kim BH, Yook TH, Song BY, Choi YM, Shin JH, Lee S, et al. Trends in domestic and foreign clinical research on ultrasound-guided acupuncture. J Acupunct Res 2018;35:214-218. doi: 10.13045/jar.2018.00255
23. National survey on Korean medicine utilization. Ministry of Health Welfare [Internet]. Sejong: 2023 [cited 2023 Apr 12]. Available from: https://www.mohw.go.kr/board.es?mid=a10411010200&bid=0019&act=view&list_no=375810
24. Jo HJ, Min SH. The current status and future operations of clinical performance evaluation (CPX) in the nationwide colleges (graduate schools) of traditional Korean medicine. J Korean Med Hist 2022;33:9-21. doi: 10.15521/jkmh.2020.33.2.009
25. Institute of Korean Medicine Education and Evaluation. KAS2022 amendment announcement public hearing. Institute of Korean Medicine Education and Evaluation. 2021:21-24.
26. Kim KJ, Han CH, Park JH, Choi SH, Lee SN. Satisfaction of Qigong lecture in college of oriental medicine. Korean J Orient Med 2009;15:69-78.
27. Han CY, Kang DW, Park JG, Kim BH, Kim KS, Kim YB, et al. An analysis of clerkship satisfaction in college of Korean medicine: focusing on doctor-patient role-play and mock CPX. J Korean Med Ophthalmol Otolaryngol Dermatol 2020;33:12-24. doi: 10.6114/jkood.2020.33.1.012
28. Cho HB, Sung WS, Hong J, Kang Y, Kim EJ. A survey on perceptions of the direction of Korean medicine education and national licensing examination. Healthcare (Basel) 2023;11:1685. doi: 10.3390/healthcare11121685