Anterior Shoulder Instability Part III—Revision Surgery, Rehabilitation and Return to Play, and Clinical Follow-Up—An International Consensus Statement

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Purpose: The purpose of this study was to establish consensus statements via a modified Delphi process on revision surgery, rehabilitation and return to play, and clinical follow-up for anterior shoulder instability. **Methods:** A consensus process on the treatment using a modified Delphi technique was conducted, with 65 shoulder surgeons from 14 countries across 5 continents participating. Experts were assigned to one of 9 working groups defined by specific subtopics of interest within anterior shoulder instability. **Results:** The primary relative indications for revision surgery include symptomatic apprehension or recurrent instability, additional intra-articular pathologies, and symptomatic hardware failure. In revision cases, the differentiating factors that dictate treatment are the degree of glenohumeral bone loss and rotator cuff function/integrity. The minimum amount of time before allowing athletes to return to play is unknown, but other factors should be considered, including restoration of strength, range of motion and proprioception, and resolved pain and apprehension, as these are prognostic factors of reinjury. Additionally, psychological factors should be considered in the rehabilitation process. Patients should be clinically followed up for a minimum of 12 months or until a return to full, premorbid function/activities. Finally, the following factors should be included in anterior shoulder instability-specific, patient--reported outcome measures: function/limitations impact on activities of daily living, return to sport/activity, instability symptoms, confidence in shoulder, and satisfaction. **Conclusion:** Overall, 92% of statements reached unanimous or strong consensus. The statements that reached unanimous consensus were indications and factors affecting decisions for revision surgery, as well as how prior surgeries impact procedure choice. Furthermore, there was unanimous consensus on the role of psychological factors in the return to play, considerations for allowing return to play, as well as prognostic factors. Finally, there was a lack of unanimous consensus on recommended timing and methods for clinical follow-up. **Level of Evidence:** Level V, expert opinion.

See commentaries on pages 243, 247, and 250

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Introduction

Shoulder stabilization surgery is often indicated due to the high risk of recurrent instability, and postoperative rehabilitation protocols and follow-up are often dictated by surgeon experience and personal biases.[1-5] Furthermore, in the setting of failed shoulder stabilization, the optimal treatment algorithm is largely undefined owing to a wide variety in patient populations, including sports played, geographical and philosophical differences affecting surgical decision making, and a relative lack of high-level evidence to guide treatment.[6-8] Given the current state of the literature, consensus statements generated by agreement between experts in the field are an important source of evidence to help guide the treatment of patients with anterior shoulder instability.

Treatment failure following anterior shoulder stabilization is a challenging problem to treat and requires a well-structured diagnostic approach.[9] A number of factors have been associated with recurrence of instability, including failure to treat coexistent pathologies during the index operation, technical factors, and the decision to perform a soft-tissue procedure in the setting of critical glenoid bone loss.[10-12] However, there is great variability in the literature about how to best define and treat a failed primary stabilization procedure.[9,13-16] Furthermore, regional variations in practice patterns have resulted in a disjointed global approach in how surgeons approach revision surgery.[17] This also affects how patients undergoing anterior shoulder stabilization are managed postoperatively, including the duration of immobilization, and the criteria used to determine readiness to return to play.[18-20] Additionally, there is a lack of guidelines surrounding the optimal duration and frequency of clinical follow-up, as well as whether routine imaging studies should be obtained following surgery.[21] This results in increased heterogeneity in the literature, and a less evidence-based approach to the management of patients with anterior shoulder instability.

The Anterior Shoulder Instability International Consensus Group (ASI-ICG) was created with a mandate to establish clinical guidelines for key aspects

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of the treatment of this pathology, including revision surgery, rehabilitation, and return to play, and follow-up, which is the focus of this report. The purpose of this study was to establish consensus statements via a modified Delphi process on revision surgery, rehabilitation and return to play, and clinical follow-up for anterior shoulder instability. Our hypothesis was that there would be consensus on the majority of statements regarding revision surgery, rehabilitation and return to play, and follow-up for anterior shoulder instability.

Methods

Consensus Working Groups

Sixty-five shoulder surgeons from 14 countries across 5 continents participated in these consensus statements on anterior shoulder instability, with 69 initially being invited and 4 declining. The working groups were established by the steering committee: Laith M. Jazrawi, Bogdan A. Matache, Ivan Wong, Eiji Itoi, Eric J. Strauss, Ruth A. Delaney, Lionel Neyton, George S. Athwal, Leo Pauzenberger, and Hannan Mullett. These authors contributed to the creation of this working group and recommended people to be involved in the process. Furthermore, the past few conferences of the American Association of Nurse Anesthetists, the American Orthopaedic Society for Sports Medicine, the American Shoulder and Elbow Surgeons, the European Society for Surgery of the Shoulder and Elbow, the European Society of Sports Traumatology, the Knee Surgery & Arthroscopy, and the International Conference on Sustainable Expert Systems were screened for those invited speakers whose speech or research focused on anterior shoulder instability to ensure that the thought leaders in this area were invited. Furthermore, we sought to include surgeons from multiple countries so that different philosophies and viewpoints were included. Experts were assigned to one of 9 working groups defined by specific subtopics of interest within anterior shoulder instability, including 1) diagnosis, 2) nonoperative management, 3) Bankart repair, 4) Latarjet procedure, 5) remplissage, 6) glenoid bone grafting, 7) revision surgery, 8) rehabilitation and return to play, and 9) follow-up. Working groups were kept geographically balanced to limit bias and ensure the groups were representative of the field at large. Thus, each working group was assigned surgeons from at least 2 different continents, and all groups had surgeons from at least 3 different countries involved in an effort to minimize regional bias. The working groups are shown in Appendix Box 1. Furthermore, the participants were instructed to answer the questionnaires based on the best available evidence rather than personal preference. A liaison (ETH) served as the primary point of contact and facilitated communication and the distribution of surveys to ensure consistency across the working groups. Additionally, the liaison formulated each subsequent round of questionnaires based on the prior round's responses. To reduce the potential for bias in the data analysis and/or literature review, the liaison did not submit answers to the questionnaires or partake in the voting process.

Delphi Consensus Method

Nine working groups covering the principal topics of interest in the area of anterior shoulder instability were established. A set of questions pertaining to each working group was generated on the basis of clinical relevance, and areas of controversy were identified through systematic review of the literature and by the nine experts on the steering committee. A modification of the Delphi method was used to generate consensus statements for each working group, with groups completing 3 initial rounds of questionnaires, followed by amendments, and lastly a final vote. Surveys were distributed in a blinded fashion using RedCap. All of the questionnaire responses and votes were anonymized. Questions progressed from an open-ended to a more structured format and were designed to elucidate areas of agreement and disagreement between group members. Once a preliminary consensus statement was generated within a working group, participants were asked whether they "agreed" or "disagreed" with it. If there were unanimous agreement within a group on a preliminary consensus statement, this statement was elevated to a final vote. If the agreement was not unanimous within a group, these questions were subject to further suggested changes anonymously through the RedCap software by members of the entire consensus group, with statements being amended where there was agreement with the proposed change. The final voting process allowed all study participants to assess the consensus statements generated by the other working groups and vote on whether they "agreed" or "disagreed" with them, thus all statements were voted on by all 65 participants.

Final Voting

After the final votes for each question occurred, the degree of agreement was expressed using a percentage rounded to the nearest whole number. Consensus was defined as 80-89%, whereas strong consensus was defined as 90-99%, and unanimous consensus was indicated by receiving 100% of the votes in favor of a proposed statement.

Results

Revision Surgery

Of the 10 total questions and consensus statements in this group, 4 achieved unanimous consensus, and 6 achieved strong consensus. The statements achieving unanimous consensus were the primary relative indications for revision surgery include a) symptomatic apprehension or recurrent instability, b) further intra-

articular pathologies, and c) symptomatic hardware failure. The following factors should be considered in determining the choice of revision procedure a) age, b) subscapularis integrity, c) glenoid/humeral bone-loss, d) number of instability episodes, and e) activity level/sport. The following may impact a subsequent revision procedure a) subscapularis integrity, b) subscapularis approach (take-down or split), c) hardware used and whether it is possible to remove them, d) bone augmentation procedures that alter anatomy, and e) revision procedures do worse than primary procedures. The following different/additional considerations can be made in the evaluation of a failed revision procedure a) new glenoid bone loss, or was not addressed at initial surgery, b) new Hill-Sachs lesion or was not addressed at initial surgery, c) hyperlaxity, d) nerve function, e) patient activity, f) patient aspirations, g) rotator cuff function, and h) failure of prior hardware. All of these statements are shown in Table 1, and the initial questions from Rounds 1-3 are included in Appendix Box 2.

Rehabilitation and Return to Play

Of the 8 total questions and consensus statements in this group, 3 achieved unanimous consensus, and 5 achieved strong consensus. The statement achieving unanimous consensus was the following: psychological factors should be considered in the rehabilitation process following operative stabilization for anterior shoulder instability. However, it is unclear how to build this in return to play protocols or testing. The following should be considered when allowing an athlete to return to play in the same season as the injury without surgery a) timing in season, b) risk of reinjury vs. benefit of continued play, c) the importance of the season and the athlete's role, d) mechanism of injury, e) recovery of range of motion, f) recovery of strength, g) resolution of apprehension, h) pain, i) associated bone loss, and j) ability to brace/protect the shoulder. The following prognostic factors should be considered: a) age, b) sport (including overhead or collision sports), c) the number of episodes, d) initial mechanism of injury, e) ease and timing of reduction, f) glenoid and humeral bone loss, g) extent of labral tear, h) other associated pathologies (i.e., nerve damage and rotator cuff tear), i) compliance with rehabilitation, j) apprehension, k) restoration of strength, and l) restoration of range of motion. All of these statements are shown in Table 2, and the initial questions from Rounds 1-3 are included in Appendix Box 3.

Clinical Follow-Up

Of the 7 total questions and consensus statements in this group, none achieved unanimous consensus, 5 achieved strong consensus, and 2 achieved consensus. The most clinically relevant statements were that treatment success following operative or nonoperative management should be defined as a stable, pain-free shoulder with a return to full premorbid function. Additionally, patients who underwent nonoperative or surgical stabilization should be clinically followed-up for a minimum of 12 months or until return to full premorbid function activities, whichever occurs later and then as needed. All of these statements are shown in Table 3, and the initial questions from Rounds 1-3 are included in Appendix Box 4.

Discussion

The most important finding from this study was that all of the statements reached consensus. Seven of the included statements reached unanimous agreement. Overall, 92% of statements reached unanimous or strong consensus. These consensus statements represent the ASI-ICG's expert agreement on revision surgery, rehabilitation and return to play, and clinical follow-up for anterior shoulder instability. The statements that reached unanimous consensus were indications and factors affecting decisions for revision surgery, as well as how prior surgeries impact procedure choice. Furthermore, there was unanimous consensus on the role of psychological factors in return to play, considerations for allowing return to play as well as prognostic factors. Finally, there lacked unanimous consensus on recommended timing and methods for clinical follow-up. Ultimately, these studies represent Level V data as expert opinion, and our hope is that it will serve as a catalyst to address the gaps in the evidence where they exist while providing guidance based on the current evidence.

Revision anterior shoulder instability surgery encompasses an incredibly broad spectrum of indications and treatments and is associated with inferior outcomes, a lower rate of return to play, and a higher complication rate as compared to primary surgery. All 10 statements generated by the revision surgery working group achieved >90% agreement among study participants. Notably, there was strong consensus agreement that revision soft-tissue stabilization can be performed in a noncontact athlete, with minimal bone loss and good tissue quality. This statement is supported by the limited available literature pertaining to the subject, with a recent systematic review by Yon et al. showing a mean rate of recurrence of 15.3% following revision soft tissue stabilization that compares favorably to the rate of recurrence following primary surgery (3-18%).[22-25] However, it should be noted that several studies have reported higher rates of recurrence from >25%, which emphasizes the need for appropriate patient selection.[22,26,27] The second part of this statement, that a remplissage procedure in addition to revision Bankart repair can be performed in the setting of a Hill-Sachs lesion, is supported by a study by Lavoué et al.,[28] as they were able to achieve an 81% overall rate of return to play following revision Bankart repair,

Table 1. Revision Surgery

Questions and Answers	Agreement	Consensus
Q: How can treatment failure be defined?	98%	Strong Consensus
A: Treatment failure can be defined as a) recurrent instability, b) persistent apprehension, c) functional limitations, d) loss of functional range of motion, e) pain, f) failure to return to preinjury function/sports, g) subscapularis deficiency in the setting of an open stabilization, and h) symptomatic bone graft nonunion or hardware failure in the setting of a bone graft procedure.		
Q: What are the indications for revision surgery?	100%	Unanimous
A: The primary relative indications for revision surgery include a) symptomatic apprehension or recurrent instability, b) further intra-articular pathologies, and c) symptomatic hardware failure.		
Q: What are the contraindications for revision surgery?	93%	Strong Consensus
A: The primary relative contraindications for revision surgery include a) uncontrolled seizures, b) arthritis, c) infection, d) psychiatric disorder, and e) lack of compliance with rehabilitation.		
Q: What factors should be considered in determining the choice of revision procedure?	100%	Unanimous
A: The following factors should be considered in determining the choice of revision procedure a) age, b) subscapularis integrity, c) glenoid/humeral bone-loss, d) number of instability episodes, and e) activity level/sport.		
Q: When can revision soft-tissue stabilization be performed?	97%	Strong Consensus
A: Revision soft-tissue stabilization can be performed in a noncontact athlete, with minimal bone loss and good tissue quality. Additionally, a soft-tissue repair with a remplissage may be performed if there are minimal glenoid bone loss and a Hill-Sachs lesion that was not addressed in the initial surgery.		
Q: How does a previous procedure impact the results of a subsequent revision procedure?	100%	Unanimous
A: The following may impact a subsequent revision procedure a) subscapularis integrity, b) subscapularis approach (take-down or split), c) hardware used and whether it is possible to remove them, d) bone augmentation procedures that alter anatomy, and e) revision procedures do worse than primary procedures.		
Q: What different/additional considerations can be made in the evaluation of a failed revision procedure?	100%	Unanimous
A: The following different/additional considerations can be made in the evaluation of a failed revision procedure a) new glenoid bone loss, or was not addressed at initial surgery; b) new Hill-Sachs lesion, or was not addressed at initial surgery; c) hyperlaxity; d) nerve function; e) patient activity; f) patient aspirations; g) rotator cuff function; and h) failure of prior hardware.		
Q: What revision procedure should be performed after a failed coracoid transfer?	95%	Strong Consensus
A: A glenoid bone-graft procedure should be performed after a failed Latarjet procedure. However, if the coracoid is healed and a Hill-Sachs lesion has not been addressed, this should be addressed via a remplissage procedure or a humeral head allograft.		
Q: What revision procedure should be performed after a failed glenoid bone grafting procedure?	95%	Strong Consensus
A: A Latarjet procedure should be performed after a failed glenoid bone-grafting procedure if it was not done prior, or if one was done prior, then a revision glenoid bone-grafting procedure should be performed. Furthermore, if a Hill-Sachs lesion has not been addressed, this should be addressed via a remplissage procedure or a humeral head allograft.		
Q: How many failed stabilizations are necessary to consider a salvage procedure?	97%	Strong Consensus
A: Consideration of a salvage procedure is not dependent on the number of prior stabilizations, but rather the age of the patient, activity level, degree of osteoarthritis, and rotator cuff integrity.		

but outcomes were inferior in patients with medium or deep Hill-Sachs lesions.

Strong consensus was also achieved on the choice of surgical procedure following a failed coracoid transfer and no Hill-Sachs lesion, with the preference being a glenoid bone-grafting procedure. A number of recent studies have described both open and arthroscopic techniques of grafting the anterior glenoid in the setting of a failed Latarjet procedure using either autologous or allogenic bone graft.[29-32] The French Shoulder and Elbow Society[32] retrospectively reviewed the short-term outcomes of 46 patients treated with the Eden-Hybinette procedure for a failed Latarjet and showed that 86% of shoulders were stable, and 80% of patients were satisfied at a mean follow-up of 38 months. However, only 60% were able to return to play, with only 19.5% able to do so at their preinjury level, and the rate of return to play was significantly correlated with patient age, development of arthritis, and time elapsed between the index and revision procedures. Provencher et al.[31] reviewed their series of 31 patients treated with a fresh distal tibial allograft following a failed Latarjet procedure and found significant improvements in the American Shoulder and Elbow Surgeons (ASES), Single Assessment Numerical Evaluation (SANE), and Western Ontario Shoulder Instability Index (WOSI) scores at a mean follow-up of 47 months, as compared to preoperative values. In addition, despite the 78% rate of coracoid graft resorption preoperatively, 92% of distal tibial allografts were healed at final follow-up.

Table 2. Rehabilitation and Return to Play

Questions and Answers	Agreement	Consensus
Q: How long should patients be immobilized postoperatively?	97%	Strong Consensus
A: There is no clear time point for postoperative sling use/immobilization, as there is no high level of evidence to guide this, and is based on surgeon's preference.		
Q: Should psychological factors be considered in the rehabilitation process following operative stabilization for anterior shoulder instability? If so, how?	100%	Unanimous
A: Psychological factors should be considered in the rehabilitation process following operative stabilization for anterior shoulder instability. However, it is unclear how to build this in return to play protocols or testing.		
Q: What should be considered when allowing an athlete to return to play in the same season as the injury without surgery?	100%	Unanimous
A: The following should be considered when allowing an athlete to return to play in the same season as the injury without surgery a) timing in season, b) risk of reinjury versus benefit of continued play, c) the importance of the season and athlete's role, d) mechanism of injury, e) recovery of range of motion, f) recovery of strength, g) resolution of apprehension, h) pain, i) associated bone loss, and j) the ability to brace/protect the shoulder.		
Q: What prognostic factors should be considered when determining the patient's likelihood to return to play successfully (i.e., return to play without redislocation) following nonoperative management of anterior shoulder instability?	100%	Unanimous
A: The following prognostic factors should be considered a) age, b) sport (including overhead or collision sports), c) the number of episodes, d) initial mechanism of injury, e) ease and timing of reduction, f) glenoid and humeral bone loss, g) extent of labral tear, h) other associated pathologies (i.e., nerve damage and rotator cuff tear), i) compliance with rehabilitation, j) apprehension, k) restoration of strength, and l) restoration of range of motion.		
Q: What criteria should be considered when deciding to return an athlete to play following nonoperative management/operative stabilization for anterior shoulder instability? Are there any procedure-specific criteria? Is there a minimum time point before allowing athletes to return to play?	98%	Strong Consensus
A: The following criteria should be considered a) restoration of strength, b) restoration of range of motion, c) free of apprehension, d) pain-free, e) sport-specific skills, and f) restoration of proprioception. In those undergoing a Latarjet procedure/glenoid bone-graft radiographic imaging may be useful to assess graft healing. The minimum time point before allowing athletes to return to play is unknown.		
Q: Should different considerations be made in deciding when collision athletes may return?	93%	Strong Consensus
A: Yes, collision athletes may take longer to return due to their higher risk for recurrence.		
Q: Should different considerations be made in deciding when overhead athletes may return?	97%	Strong Consensus
A: Yes, overhead athletes may take longer to return due to the time needed to recover skill and range of motion.		
Q: Should different considerations be made in deciding when elite/nonelite athletes may return?	98%	Strong Consensus
A: Elite athletes may have different considerations in returning to play due to their financial considerations, superior premorbid conditioning, easier access to high-quality rehabilitation and medical evaluation, and implications of reinjury and recurrent instability for their career.		

Rehabilitation following shoulder stabilization and the timing to return to play are essential factors to consider when treating patients with anterior shoulder instability. Despite the differences between study participants in terms of practice setting and geography, as well the differences between sports played, there was unanimous agreement on several of the various statements pertaining to postoperative rehabilitation and return to play. This includes the statement that psychological factors should be considered in the rehabilitation process following operative stabilization for anterior shoulder instability, but that it is unclear how to build this in return to play protocols or testing.

Mental readiness, resiliency, and "grit" have recently been identified as important factors affecting a patient's ability to return to play and their outcome following anterior shoulder stabilization.[33,34] Weekes et al.[34] showed that 51% of patients treated with arthroscopic stabilization had symptoms of depression on preoperative screening. While this improved to 24% postoperatively, patients who exhibited continued signs of depression at 1 year had lower WOSI scores than those who did not. Tjong et al.[33] conducted semi-structured qualitative interviews on 25 patients who had undergone anterior stabilization and identified a number of psychological factors impeding their ability to return to play. This included fear of reinjury, mood, self-awareness issues, and self-motivation. Both of these studies highlight the importance of incorporating the assessment of psychological factors in the rehabilitation process. Altlhough there was unanimous agreement between study participants that there is a lack of clarity on how to appropriately do so, the recent validation of the Shoulder Instability-Return to Sport after Injury scale[35] for objective assessment of psychological readiness to return to play provides some hope for demystifying this subject. However, the

Table 3. Clinical Follow-Up

Questions and Answers	Agreement	Consensus
Q: How should treatment success be defined?	98%	Strong Consensus
A: Treatment success following operative or nonoperative management should be defined as a stable, pain-free shoulder with a return to full premorbid function.		
Q: Which aspect(s) of the physical examination should be performed on patients after the treatment of anterior shoulder instability?	98%	Strong Consensus
A: The following aspect(s) of the physical examination should be performed on patients after treatment of anterior shoulder instability a) range of motion, b) apprehension, c) relocation test, d) load and shift, and e) strength.		
Q: For how long should patients being treated nonoperatively be followed-up?	87%	Consensus
A: Patients being treated nonoperatively should be clinically followed up for a minimum of 12 months or until they have returned to full sports for a season, whichever occurs later and then as needed.		
Q: For how long should patients who underwent surgical stabilization be followed up?	85%	Consensus
A: Patients who underwent surgical stabilization should be clinically followed up for a minimum of 12 months or until return to full premorbid function activities, whichever occurs later and then as needed.		
Q: What routine follow-up time points should be used for research purposes?	98%	Strong Consensus
A: The following time points should be used to routinely follow up patients for research purposes a) preoperative, b) 3 months, c) 6 months, d) 12 months, e) 2 years, f) 5 years, and g) 10 years.		
Q: What components should be included in a patient-reported outcome measure for anterior shoulder instability?	98%	Strong Consensus
A: The following components should be included in a patient-reported outcome measure for anterior shoulder instability a) function/limitations, b) impact on activities of daily living, c) return to sport/activity, d) instability symptoms (including apprehension and recurrence), e) confidence in their shoulder, and f) satisfaction.		
Q: Should any routine imaging be performed at follow up? If not, is there any patient population that should undergo follow-up imaging?	90%	Strong Consensus
A: Those undergoing a Latarjet procedure should have routine imaging performed at follow-up visits.		

literature lacks mention of the appropriate criteria, with prior systematic reviews showing that the majority of studies reported time as the only criteria for approving return to play.[4,5] Furthermore, a recent survey of ASES, American Orthopaedic Society for Sports Medicine, European Society of Sports Traumatology, Knee Surgery & Arthroscopy, and European Society for Surgery of the Shoulder and Elbow members found that almost all surgeons used some time-based criteria, but that the majority assessed strength and range of motion prior to clearance to return to play.[18] Although, recent studies have been directed at this and studying the impact of return to play criteria. Junior et al.[36] found that athletes undergoing objective criteria-based return to play testing had lower rates of recurrent instability following arthroscopic Bankart repair than those cleared by time from surgery, with a 4.85-fold difference in recurrence.

The consensus statements pertaining to clinical follow-up yielded >90% agreement for all except three, with the first two stating that patients treated either non-surgically or with stabilization should be followed up for a minimum of 12 months or until they have returned to full sports for a season, then as needed. Given that treatment success should be defined by a stable, pain-free shoulder with a return to full premorbid function, it follows that the majority of participants felt that patients should be followed-up until that milestone was achieved. However, the duration of follow-up is mostly surgeon-dependent and lacks clear evidence-based guidelines, which explains the relatively lower level of consensus achieved on these statements. The third consensus statement that achieved <90% agreement stated that those undergoing a Latarjet procedure should have routine imaging performed at follow-up visits. Many surgeons will obtain a radiograph at the first postoperative visit following a Latarjet procedure to ensure appropriate graft and hardware positioning, and once again after 3 months to ensure graft union before allowing a patient to resume sport-specific training. However, the number of postoperative radiographs obtained is highly surgeon- and center-dependent, which explains the <90% agreement reached on this statement.

Limitations

This consensus statement has several potential limitations. First, consensus statements are considered to be level V data, as they represent expert opinion, and there may be inherent biases in selecting the participants.[37,38] Ultimately, it is somewhat subjective in how the experts were selected, but that is the case with any expert panel, and we tried to minimize this bias. Furthermore, the questions and topics addressed may represent a potential source of bias, as there was no standardized process for generating them but were agreed upon by the group leaders. Furthermore, the use of a Likert scale may have allowed for more nuanced responses, allowing authors to have varying levels of agreement where statements had multiple components, and allowing

participants to indicate varying levels of agreement with such statements. Also, there were some limitations in the content discussed, as this article did not address the role of supervised physiotherapy in nonoperative/operative treatment. Additionally, these statements involved a modification of the Delphi process, as the participants worked on their individual groups for the first three rounds and not all of the statements. Finally, there are some limitations with the Delphi process itself, as it may represent the lowest common denominator of expert opinion with less of ownership of ideas, and ultimately represents Level V data.[38]

Conclusions

Overall, 92% of statements reached unanimous or strong consensus. The statements that reached unanimous consensus were indications and factors affecting decisions for revision surgery, as well as how prior surgeries impact procedure choice. Furthermore, there was unanimous consensus on the role of psychological factors in return to play, considerations for allowing return to play, as well as prognostic factors. Finally, there was a lack of unanimous consensus on recommended timing and methods for clinical follow-up.

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Appendix

Appendix Box 1. List of Consensus Members

G1 Diagnosis	
Alaia	USA
Cassidy	Ireland
Collin	France
Di Giacomo	Italy
Frank	USA
Waterman	USA
Wong	Canada
G2 Non-Operative Management	
Carter	USA
Erickson	USA
Itoi	Japan
Kuhn	USA
O'Shea	Ireland
Rokito	USA
Whelan	Canada
G3 Bankart Repair	
Calvo	Spain
Campbell	USA
Imhoff	Germany
Millett	USA
Moran	Ireland
Strauss	USA
Verma	USA
G4 Latarjet	
Delaney	Ireland
Garrigues	USA
Lim Fat	Mauritius
Neyton	France
Moya	Argentina
Scheibel	Germany
Virk	USA
G5 Remplissage	
Athwal	Canada
Kelly	USA
Khan	Canada
Meislin	USA
MacDonald	Canada
Molony	Ireland
Rhee	South Korea
G6 Glenoid Bone-Grafting	
Heuberer	Austria
Kwon	USA
Mazzoca	USA
Moroder	Germany
Pauzenberger	Austria
Provencher	USA
Rosso	Switzerland
G7 Revision Surgery	
Arciero	USA
Cordasco	USA
Jazrawi	USA
Ladermann	Switzerland
Levine	USA
McCarty	USA
Walch	France
Warner	USA
G8 Rehabilitation/RTP	
Brophy	USA
Cole	USA
Ciccotti	USA
Funk	United Kingdom
Lomas	USA
Mullett	Ireland
Owens	USA
Warren	USA
G9 Follow-up	
Bedi	USA
Favard	France
Krych	USA
Matache	Canada
Rodeo	USA
Edwards	USA
Zuckerman	USA

(continued)

Appendix Box 2. Group 2: Revision Surgery

Round 1

1. How can treatment failure be defined?
2. What are the indications for revision surgery?
3. What are the contraindications for revision surgery?
4. What factors should be considered in determining the choice of revision procedure?
5. When can revision soft-tissue stabilization be performed?
6. How does a previous procedure impact the results of a subsequent revision procedure?
7. What different/additional considerations can be made in the evaluation of a failed revision procedure?
8. What revision procedure should be performed after a failed coracoid transfer?
9. What revision procedure should be performed after a failed glenoid bone-grafting procedure?
10. How many failed stabilizations are necessary to consider a salvage procedure?

Round 2

1. Which of the following do you agree can be considered treatment failure?
   a. Recurrent instability
   b. Persistent apprehension
   c. Functional limitations
   d. Loss of functional range of motion
   e. Pain
   f. Failure to return to preinjury functional/sports
   g. Subscapularis deficiency in the setting of an open stabilization
   h. Bone graft nonunion or hardware failure in the setting of a bone graft procedure
2. Which of the following do you agree are indications for revision surgery?
   a. Symptomatic apprehension
   b. Recurrent instability (single episode)
   c. Multiple recurrent instability episodes
   d. Further intra-articular pathologies
   e. Hardware failure
3. Which of the following do you agree are contraindications for revision surgery?
   a. Uncontrolled seizures
   b. Arthritis
   c. Infection
   d. Psychiatric disorder
   e. Lack of compliance with rehabilitation
   f. Smoker
   g. Opioid dependency
4. Which of the following do you agree are factors in determining the choice of revision procedure?
   a. Age
   b. Subscapularis integrity
   c. Glenoid/humeral bone loss
   d. Number of instability episodes
   e. Activity level/sport
   f. Patient expectation
   g. Hyperlaxity
5. Revision soft-tissue stabilization can be performed in a noncontact athlete, with minimal bone loss, and that a soft-tissue repair with a remplissage may be performed if there is minimal glenoid bone loss and a Hill-Sachs lesion that was not addressed in the initial surgery. Do you agree with this statement? If not, why not?
6. Which of the following do you agree are factors with previous procedures, which impact the results of a subsequent revision procedure?
   a. Subscapularis integrity
   b. Subscapularis approach (take-down or split)
   c. Hardware used and whether it is possible to remove them
   d. Bone augmentation procedures that alter anatomy
   e. Revision procedures do worse than primary procedures
7. Which of the following different/additional considerations should be made in the evaluation of a failed revision procedure?
   a. New glenoid bone loss, or was not addressed at initial surgery
   b. New Hill-Sachs lesion, or was not addressed at initial surgery
   c. Hyperlaxity
   d. Nerve function
   e. Patient activity
   f. Patient aspirations
   g. Rotator cuff function
   h. Failure of prior hardware
8. A glenoid bone-graft procedure should be performed after a failed Latarjet procedure. However, if the coracoid is healed and there is a Hill-Sachs lesion that has not been addressed, then this should be addressed via a remplissage procedure. Do you agree with this statement? If not, why not?
9. A Latarjet procedure should be performed after a failed glenoid bone-grafting procedure if it was not done prior, or if one was done prior, then a revision glenoid bone-grafting procedure should be performed. Furthermore, if there is a Hill-Sachs lesion that has not been addressed, then this should be addressed via a remplissage procedure or a humeral head allograft. Do you agree with this statement? If not, why not?
10. Consideration of a salvage procedure is not dependent on the number of prior stabilizations, but is dependent on the age of the patient, activity level, degree of osteoarthritis, and rotator cuff integrity. Do you agree with this statement? If not, why not?

Round 3

1. Q: How can treatment failure be defined?
   A: Treatment failure can be defined as a) recurrent instability, b) persistent apprehension, c) functional limitations, d) loss of functional range of motion, e) pain, f) failure to return to preinjury functional/sports, g) subscapularis deficiency in the setting of an open stabilization, and h) bone graft nonunion or hardware failure in the setting of a bone graft procedure.
   Do you agree with this statement? If not, why not?

2. Q: What are the indications for revision surgery?
   A: The primary relative indications for revision surgery include a) symptomatic apprehension or recurrent instability, b) further intra-articular pathologies, and c) hardware failure.
   Do you agree with this statement? If not, why not?

3. Q: What are the contraindications for revision surgery?
   A: The primary relative indications for revision surgery include a) uncontrolled seizures, b) arthritis, c) infection, d) psychiatric disorder, and e) lack of compliance with rehabilitation.
   Do you agree with this statement? If not, why not?

4. Q: What factors should be considered in determining the choice of revision procedure?
   A: The following factors should be considered in determining the choice of revision procedure a) age, b) subscapularis integrity, c) glenoid/humeral bone loss, d) number of instability episodes, and e) activity level/sport.
   Do you agree with this statement? If not, why not?

5. Q: When can revision soft-tissue stabilization be performed?
   A: Revision soft-tissue stabilization can be performed in a noncontact athlete, with minimal bone loss, and a soft-tissue repair with a remplissage may be performed if there is minimal glenoid bone loss and a Hill-Sachs lesion that was not addressed in the initial surgery.
   Do you agree with this statement? If not, why not?

6. Q: How does a previous procedure impact the results of a subsequent revision procedure?
   A: The following may impact a subsequent revision procedure a) subscapularis integrity, b) subscapularis approach (take-down or split), c) hardware used and whether it is possible to remove them, d) bone augmentation procedures that alter anatomy, and e) revision procedures do worse than primary procedures.
   Do you agree with this statement? If not, why not?

7. Q: What different/additional considerations can be made in the evaluation of a failed revision procedure?
   A: The following different/additional considerations can be made in the evaluation of a failed revision procedure: a) new glenoid bone loss, or was not addressed at initial surgery; b) new Hill-Sachs lesion, or was not addressed at initial surgery; c) hyperlaxity; d) nerve function; e) patient activity; f) patient aspirations; and g) rotator cuff function and failure of prior hardware.
   Do you agree with this statement? If not, why not?

8. Q: What revision procedure should be performed after failed soft tissue stabilization?
   A: A Latarjet procedure should be performed after a single or multiple failed soft tissue stabilization procedures, except when contraindicated.
   Do you agree with this statement? If not, why not?

9. Q: What revision procedure should be performed after a failed coracoid transfer?
   A: A glenoid bone-graft procedure should be performed after a failed Latarjet procedure. However, if the coracoid is healed and there is a Hill-Sachs lesion that has not been addressed, then this should be addressed via a remplissage procedure or a humeral head allograft.
   Do you agree with this statement? If not, why not?

10. Q: How many failed stabilizations are necessary to consider a salvage procedure?
    A: Consideration of a salvage procedure is not dependent on the number of prior stabilizations but the age of the patient, activity level, degree of osteoarthritis, rotator cuff integrity.
    Do you agree with this statement? If not, why not?

Appendix Box 3. Group 8: Rehabilitation and Return to Play

Round 1

1. How long should patients remain immobilized following a Bankart repair? Does a remplissage change this?
2. How long should patients remain immobilized following a coracoid transfer procedure?
3. How long should patients remain immobilized following glenoid bone grafting?
4. Is there a benefit to early versus delayed motion following shoulder stabilization surgery?
5. Should psychological factors be considered in the rehabilitation process following operative stabilization for anterior shoulder instability? If so, how?
6. What should be considered when allowing an athlete to return to play in the same season as the injury without surgery?
7. What prognostic factors should be considered when determining the patient's likelihood to return to play successfully (i.e., return to play without redislocation) following nonoperative management of anterior shoulder instability?
8. What criteria should be considered when deciding to return an athlete to play following nonoperative management/operative stabilization for anterior shoulder instability? Are there any procedure-

specific criteria? Is there a minimum time point before allowing athletes to return to play?
9. Should different considerations be made in deciding when collision/noncollision athletes may return?
10. Should different considerations be made in deciding when elite/nonelite athletes may return?

Round 2

1. The questions on postoperative immobilizations were merged, as the responses were very similar between the different surgical techniques. There is no clear time point for postoperative sling use/immobilization, as there is no high-level evidence to guide this, so it is based on surgeon preference. Do you agree with this statement? If not, why not?
2. There is no benefit to early versus delayed motion following shoulder stabilization surgery. Do you agree with this statement? If not, why not?
3. Psychological factors should be considered in the rehabilitation process following operative stabilization for anterior shoulder instability. However, it is unclear how to build this in to return to play protocols or testing. Do you agree with this statement? If not, why not?
4. Which of the following should be considered when allowing an athlete to return to play in the same season as the injury without surgery?
   a. Timing of season
   b. Risk of reinjury versus benefit of continued play
   c. Importance of season and athlete's role
   d. Mechanism of injury
   e. Recovery of range of motion
   f. Recovery of strength
   g. Resolution of apprehension
   h. Pain
   i. Associated bone loss
   j. Ability to brace/protect shoulder
5. Which of the following do you agree are prognostic factors that should be considered when determining the patient's likelihood to successfully return to play (i.e. return to play without recurrent instability) following nonoperative management of anterior shoulder instability?
   a. Age
   b. Sport (including overhead or collision sports)
   c. Number of episodes
   d. Initial mechanism of injury
   e. Ease and timing of reduction
   f. Glenoid and humeral bone loss
   g. Extent of labral tear
   h. Other associated pathologies (i.e., nerve damage and rotator cuff tear)
   i. Compliance with rehabilitation
   j. Apprehension
   k. Restoration of strength
   l. Restoration of range of motion
6. What criteria should be considered when making the decision to return an athlete to play following nonoperative management for anterior shoulder instability?
   a. Minimum 1 month
   b. Minimum 3 months
   c. Minimums 4 months
   d. No minimum time point
   e. Restoration of strength
   f. Restoration of range of motion
   g. Free of apprehension
   h. Pain free
   i. Sport-specific skills
   j. Restoration of proprioception
7. Which of the following criteria should be considered when making the decision to return an athlete to play following operative stabilization for anterior shoulder instability?
   a. Minimum 3 months
   b. Minimum 4 months
   c. Minimums 6 months
   d. No minimum time point
   e. Restoration of strength
   f. Restoration of range of motion
   g. Free of apprehension
   h. Pain free
   i. Sport-specific skills
   j. Restoration of proprioception
8. Which of the following imaging modalities should be used to clear those with a Latarjet procedure or glenoid bone-grafting procedure to return to play?
   a. Radiograph
   b. CT
   c. Either XR or CT—surgeon preference
   d. Imaging not required
9. Collision athletes may take longer to return because of their higher risk for recurrent instability, and more caution should be exercised in clearing them to return to play. Do you agree with this statement? If not, why not?
10. Do overhead athletes take longer to return to play? If so, is it due to higher risk for recurrence or due to longer recovery of skill?
11. Elite athletes may have different considerations in returning to play due to their financial considerations, superior premorbid conditioning, and easier access to high-quality rehabilitation and medical evaluation. Do you agree with this statement? If not, why not?

Round 3

11. Q: How long should patients remain immobilized postoperatively?

A: There is no clear time point for postoperative sling use/immobilization, as there is no high-level evidence to guide this, so it is based on surgeon preference.

Do you agree with this statement? If not, why not?

12. Q: Is there a benefit to early versus. delayed motion following shoulder stabilization surgery?

A: There is no benefit to early vs. delayed motion following shoulder stabilization surgery.

Do you agree with this statement? If not, why not?

13. Q: Should psychological factors be considered in the rehabilitation process following operative stabilization for anterior shoulder instability? If so, how?

A: Psychological factors should be considered in the rehabilitation process following operative stabilization for anterior shoulder instability. However, it is unclear how to build this into return to play protocols or testing.

Do you agree with this statement? If not, why not?

14. Q: What should be considered when allowing an athlete to return to play in the same season as the injury without surgery?

A: The following should be considered when allowing an athlete to return to play in the same season as the injury without surgery a) timing of season, b) risk of reinjury versus benefit of continued play, c) importance of season and athlete's role, d) mechanism of injury, e) recovery of range of motion, f) recovery of strength, g) resolution of apprehension, h) pain, i) associated bone loss, and j) ability to brace and protect shoulder.

Do you agree with this statement? If not, why not?

15. Q: What prognostic factors should be considered when determining the patient's likelihood to successfully return to play (i.e., return to play without redislocation) following nonoperative management of anterior shoulder instability?

A: The following prognostic factors should be considered a) age, b) sport (including overhead or collision sports), c) number of episodes, d) initial mechanism of injury, e) ease and timing of reduction, f) glenoid and humeral bone loss, g) extent of labral tear, h) other associated pathologies (i.e., nerve damage and rotator cuff tear), i) compliance with rehabilitation, j) apprehension, k) restoration of strength, and l) restoration of range of motion.

Do you agree with this statement? If not, why not?

16. Q: What criteria should be considered when making the decision to return an athlete to play following nonoperative management/operative stabilization for anterior shoulder instability? Are there any procedure-specific criteria? Is there a minimum time point before allowing athletes to return to play?

A: The following criteria should be considered a) restoration of strength, b) restoration of range of motion, c) lack of apprehension, d) pain free condition, e) sport-specific skills, and f) restoration of proprioception. In those undergoing a Latarjet procedure/glenoid bone graft, radiographic imaging may be useful to assess graft healing. There is no minimum time point before allowing athletes to return to play.

Do you agree with this statement? If not, why not?

17. Q: Should different considerations be made in deciding when collision/overhead athletes may return?

A: Yes, collision athletes may take longer to return because of their higher risk for recurrence, and overhead athletes may take longer to return because the time needed for recovery of skill.

Do you agree with this statement? If not, why not?

18. Q: Should different considerations be made in deciding when elite/nonelite athletes may return?

A: Elite athletes may have different considerations in returning to play due to their financial considerations, superior premorbid conditioning, and easier access to high-quality rehabilitation and medical evaluation.

Do you agree with this statement? If not, why not?

Appendix Box 4. Group 9: Clinical Follow-Up

Round 1

1. How should treatment success be defined?
2. Which aspect(s) of the physical examination should be performed on patients after the treatment of anterior shoulder instability?
3. For how long should patients being treated nonoperatively be followed up?
4. For how long should patients who underwent surgical stabilization be followed up?
5. What routine follow-up time points should be used for research purposes?
6. What components should be included in a patient-reported outcome measure for anterior shoulder instability?
7. Should any routine imaging be performed at follow-up? If not, is there any patient population that should undergo follow-up imaging?

Round 2

1. Treatment success following operative or nonoperative management should be defined as a stable, pain-free shoulder with return to full premorbid function. Do you agree with this statement? If not, why not?
2. Which of the following aspects of the physical examination can be performed on and documented in patients after treatment of anterior shoulder instability?
   a. Range of motion
   b. Apprehension
   c. Relocation
   d. Load and shift
   e. Strength
3. Patients being treated nonoperatively should be clinically followed up for a minimum of 12 months,

or until they have returned to full sports for a season, whichever occurs later, and then as needed. Do you agree with this statement? If not, why not?

4. Which of the following routine follow-up time points should be used for research purposes (i.e., a registry)?
   a. Preoperative
   b. 1-2 weeks
   c. 6 weeks
   d. 3 months
   e. 6 months
   f. 12 months
   g. 2 years
   h. 5 years
   i. 10 years
5. Which of the following components should be included in a patient-reported outcome measure for anterior shoulder instability?
   a. Function/limitations
   b. Impact on activities of daily living
   c. Return to sport/activity
   d. Instability symptoms (including apprehension and recurrence)
   e. Confidence in shoulder
   f. Satisfaction
6. Which of the following routine follow-up time points should be used for research purposes (i.e., a registry)?
   a. Preoperative
   b. 1-2 weeks
   c. 6 weeks
   d. 3 months
   e. 6 months
   f. 12 months
   g. 2 years
   h. 5 years
   i. 10 years
7. What of the following components should be included in a patient-reported outcome measure for anterior shoulder instability?
   a. Function/limitations
   b. Impact on activities of daily living
   c. Return to sport/activity
   d. Instability symptoms (including apprehension and recurrence)
   e. Confidence in shoulder
   f. Satisfaction
8. Those undergoing a Latarjet procedure should have routine imaging performed at initial follow-up visits; otherwise, imaging should only be as clinically indicated on the basis of symptoms. Do you agree with this statement? If not, why not?

Round 3

19. Q: How should treatment success be defined?

A: Treatment success following operative or nonoperative management should be defined as a stable, pain-free shoulder, with return to full premorbid function.

Do you agree with this statement? If not, why not?

20. Q: Which aspect(s) of the physical examination should be performed on and documented in patients after treatment of anterior shoulder instability?

A: The following aspect(s) of the physical examination should be performed/documented on patients after treatment of anterior shoulder instability a) range of motion, b) apprehension, c) relocation test, d) load and shift, and e) strength.

Do you agree with this statement? If not, why not?

21. Q: For how long should patients being treated nonoperatively be followed up?

A: Patients being treated nonoperatively should be clinically followed up for a minimum of 12 months, or until they have returned to full sports for a season, whichever occurs later and then as needed.

Do you agree with this statement? If not, why not?

22. Q: For how long should patients who underwent surgical stabilization be followed up?

A: Patients who underwent surgical stabilization should be clinically followed up for a minimum of 12 months, or until return to full premorbid function activities, whichever occurs later and then as needed.

Do you agree with this statement? If not, why not?

23. Q: What routine follow-up time points should be used for research purposes?

A: The following time points should be used to routinely follow up patients for research purposes a) preoperative, b) 3 months, c) 6 months, d) 12 months, e) 2 years, f) 5 years, and g) 10 years.

Do you agree with this statement? If not, why not?

24. Q: What components should be included in a patient-reported outcome measure for anterior shoulder instability?

A: The following components should be included in a patient-reported outcome measure for anterior shoulder instability a) function/limitations, b) impact on activities of daily living, c) return to sport/activity, d) instability symptoms (including apprehension and recurrence), e) confidence in shoulder, and f) satisfaction.

Do you agree with this statement? If not, why?

25. Q: Should any routine imaging be performed at follow up? If not, is there any patient population which should undergo follow-up imaging?

A: Those undergoing a Latarjet procedure should have routine imaging performed at follow-up visits.

Do you agree with this statement? If not, why not?