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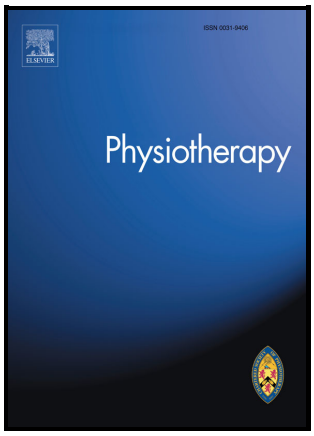

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Rehabilitation Guidelines Following Arthroscopic Shoulder Stabilisation Surgery for Traumatic Instability- A Delphi Consensus

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Abstract

Background

There is no consistent approach to rehabilitation following arthroscopic shoulder stabilisation surgery (ASSS) in the UK. The aim of this study was to agree a set of post-operative guidelines for clinical practice.

Method

Expert stakeholders (surgeons, physiotherapists and patients) were identified via professional networks and patient involvement and engagements groups. A three-stage online Delphi study was undertaken. Consensus was defined by the OMERACT threshold of 70% agreement.

Results

11 surgeons, 22 physiotherapists and 4 patients participated. It was agreed patients should be routinely immobilised in a sling for up to 3 weeks but can discard earlier if able. During the immobilisation period, patients should move only within a defined "safe zone." Permitted functional

activities include using cutlery, lifting a drink, slicing bread, using kitchen utensils, wiping a table, light dusting, pulling up clothing, washing/drying dishes. Closing car doors or draining saucepans should be avoided. Through range movements can commence after 4 weeks, resisted movements at 6 weeks. Patients can resume light work as they feel able and return to manual work after 12 weeks.

Return to non-contact sports when functional markers for return to play are met was agreed. Return to contact sport is based on function & confidence after a minimum of 12 weeks. Additional factors to consider when determining rehabilitation progression: functional/physical milestones, patient's confidence and presence of kinesiophobia. The preferred outcome measure is the Oxford Instability Shoulder Score.

Conclusion

This consensus provides expert recommendations for the development of rehabilitation guidelines following ASSS.

Contribution of the paper

- This paper is the first to provide expert recommendations for patients undergoing rehabilitation following arthroscopic shoulder stabilisation surgery.
- This paper provides clinicians and patients with expert guidance on appropriate expectations regarding functional restriction and progression following arthroscopic shoulder stabilisation surgery.
- In the absence of national clinical guidelines for this patient group, these recommendations will reduce variation and improve quality of care.
- The knowledge acquired from this study will also lay the foundation for clinical guidelines to be developed.
- The results of this study also demonstrate the need for further, empirical work to be carried out in this area.

Keywords
Shoulder, instability, rehabilitation, post-operative rehabilitation, shoulder stabilisation surgery

Introduction

The British Elbow and Shoulder Society (BESS) jointly with the British Orthopaedic Association (BOA) define traumatic anterior shoulder instability as "excessive translation of the humeral head on the glenoid fossa, caused primarily by a traumatic event"(1). Having sustained a traumatic anterior shoulder dislocation, Olds et al (2019)(2) found a recurrence rate of 36% but ranges of 19% to 86% recurrence have been reported (3,4). Likelihood of recurrence is influenced by a variety of risk factors such as age at the point of initial dislocation, occupation, number of previous dislocations, and the presence of hyperlaxity and the presence of a bony Bankart lesion(3). Males under the age of 20 years are particularly at risk with approximately 72% experiencing recurrent instability symptoms within the first 2 years of primary dislocation(5).

Recurrent shoulder instability following dislocation can have a profound impact on patients' quality of life. The inability to participate in recreational or competitive sport and/or fulfil the demands of their occupation can have a deleterious effect on patients' self-image and rates of clinical depression in this cohort are high(6,7).

In the presence of confirmed structural pathology and where the patient's functional limitations and/or risk of recurrence is considered sufficient to warrant it, surgery may be recommended to reconstruct the affected capsule-labral complex, usually with arthroscopic shoulder stabilisation surgery (ASSS), also known as Bankart repair(8).

Following ASSS, a period of rehabilitation is usually considered necessary to optimise outcomes(9). The regime that yields the best results however has not been established. The post-operative rehabilitation included as part of surgical trials is rarely described in sufficient detail(10), therefore wide variation exists(11). Consequently, there are no best practice guidelines in place which are based on data from high quality, methodologically robust clinical trials(11).

In 2022, a clinical guideline group consisting of physiotherapist members of BESS commenced a programme of work to investigate the optimal package of rehabilitation following arthroscopic shoulder stabilisation surgery. In 2023, a survey was undertaken to establish current practice across the United Kingdom (UK)(12). The results of the survey demonstrated wide variations in national practice. It was found that factors such as patient function, confidence, kinesiophobia and individual patient factors were the preferred basis for much of the clinical reasoning process in determining progression. However, in reality, temporal milestones and minimum time thresholds dominated points at which patients actually progressed.

In the absence of clinical trial data, the aim of this study was to establish clinical consensus among experts in this field regarding rehabilitation following ASSS on which best practice rehabilitation guidelines could be based. This included i) the type and duration of immobilisation ii) the commencement of movement iii) the resumption of activities of daily living (ADLs) iv) return to work and sport and v) criteria on which progress could be made.

Methods

Study design

We conducted a three-round online Delphi study using the national survey data from Maher et al (2023)(12) as a primer for responses.

Participants

Expert stakeholders including the authorship group, plus shoulder surgeons and physiotherapists were identified via the BESS membership with an open invitation to all BESS members to participate. Potential patient representatives were approached via existing Patient and Public Involvement and Engagement (PPIE) groups used by clinician panellists.

Survey instrument and rounds

Each Delphi round was hosted on the online Health Survey platform (www.onlinesurveys.co.uk). Round one presented the results of the national survey conducted by the authors around current rehabilitation practice across the UK following shoulder arthroscopic stabilisation surgery(12). Panellists were required to provide a response to each survey question.

Rounds 2 and 3 presented the results of each previous round along with the consensus positions that had been reached. Items that had not reached consensus were presented again, along with anonymous feedback and compromise statements based on free text responses.

Consensus threshold

For this study, it was determined that a maximum of 3 rounds would be used as part of the Delphi process. The threshold for consensus was set at 70% agreement as defined by the Outcome Measures in Rheumatology (OMERACT) guidelines(13). Question responses with ≥70% agreement were carried through to be included in the final guidelines. Those responses with 30 to 70% agreement were voted upon again in the subsequent Delphi rounds and those with <30% were excluded.

If, following three rounds agreement fell below 70%, the most popular response was taken as an interim recommendation prior to future research.

Ethical approval

Using the NHS Health Research Authority (HRA) decision making tool, NHS Research Ethics Committee (REC) approval was not required but ethical oversight and governance was provided by

Gloucestershire Hospitals NHS Foundation Trust Scientific Review Group (Local R&D reference 22/043/GHT).

Data Analysis

Data were imported into Excel (Microsoft Corps, Redmond, CA, USA) and analysed using descriptive statistics.

Results

37 panellists consented to be part of the Delphi process. All panellists completed rounds 1 and 3. 35 panellists completed round 2. Demographics of the panellists can be seen in table 1. The stages of the Delphi process can be seen in figure 1.

Demographics

Round 1	**Panellists n=37**			
	Surgeon 11(30%)	Physiotherapist 22(60%)	Patient 4(11%)	BESS member 31(94%)
Round 2	**Panellists n=35**			
	Surgeon 11(31%)	Physiotherapist 20(57%)	Patient 4(11%)	BESS member 29(94%)
Round 3	**Panellists n=37**			
	11(30%)	Physiotherapist 22(60%)	Patient 4(11%)	BESS member 31(94%)

Table 1: Demographics of Delphi panellists.

Following completion of round 3, further equality, diversity, and inclusion (EDI) demographic information was collected to include age, number of years qualified for non-patient contributors, ethnicity, and gender. Details of this can be seen in table 2.

		n	**%**
Age	21-30 31-40 41-50 51-60 61-70	0 13 12 10 1	0 35 32 27 3

	Not stated	1	3
Gender	Female	17	46
	Male	20	54
	Transgender woman	0	0
	Transgender man	0	0
	Non-binary	0	0
	Prefer not to say	0	0
	Other	0	0
Ethnicity	White (British)	27	73
	White (Irish)	1	3
	White (Gypsy/Irish traveller)	0	0
	White (European)	1	3
	Mixed/Multiple ethnic group – White & Black Caribbean	0	0
	Mixed/Multiple ethnic group – White & Black African	0	0
	Mixed/Multiple ethnic group – White & Asian	1	3
	Any other mixed/multiple ethnic background	0	0
	Asian/British Asian – Indian	5	14
	Asian/British Asian – Pakistani	0	0
	Asian/British Asian – Chinese	0	0
	Any other Asian background	0	0
	Black/African/Caribbean/Black British – African	0	0
	Black/African/Caribbean/Black British – Caribbean	1	3
	Any other Black/African/Caribbean/Black British	0	0
	Arab	0	0
	Prefer not to say	0	0
	Other	0	0
No of years qualified	1-10	1	3
	11-20	14	42
	21-30	8	24
	31-40	9	27
	Over 40	1	3

Table 2: EDI demographics

Post operative immobilisation.

Panellists agreed that patients' shoulders should be immobilised following ASSS (70%) with a sling the method of choice (81.1%), in preference to other types of bracing. 22(60%) felt this should be a cross body sling, as opposed to slings in which the shoulder was positioned in a neutral (27%), low abduction (5%) or abducted (0%) position, but this did not reach the consensus threshold.

Level of movement restriction during the immobilisation period and "safe zones"

31(84%) panellists responded that patients should be able to move their shoulder in any direction, but only within their "safe zone." Acknowledging that individual patients may be prescribed personalised "safe zones", in rounds two and three, panellists were asked to confirm what their interpretation of the "safe zone" was. Results for this can be seen in table 3 and show that there is no consensus position regarding what positions or ranges of movement should be considered as the "safe zone".

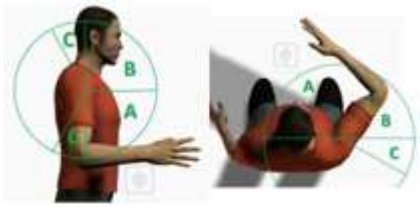
	Round 2			**Round 3**		
		n	**%**		**n**	**%**
 ©Shoulder Doc. Reproduced with permission	Zone A only	17	49	Zone A only	22	60
	Zones A&B	15	43	Zones A&B	15	40
	Zones A, B&C	1	3	Zones A, B&C	0	0
	None of the above	2	6	None of the above	0	0

Table 3: Safe zones

Consensus regarding activities of daily living (ADLs) during the immobilisation period

In round one, 83.8% of panellists stated that patients should be able to move their shoulder in any direction during the immobilisation period, if the movement occurred within the patient's "safe zone". Panellists were asked in rounds two and three, which functional activities should be included within this. ADLs that did and did not reach the consensus threshold can be seen in table 4.

ADL	**Yes** (%)	**No** (%)	**Met Consensus**
Using a knife and fork	97	3	Yes
Lifting a cup of tea	89	11	Yes
Slicing a loaf of bread	78	22	Yes
Using utensils, e.g. a spatula or wooden spoon to cook	80	20	Yes

Tipping out a small saucepan of water e.g. to drain pasta or rice	46	54	No
Wiping a table surface clean/light dusting	80	20	Yes
Washing/drying dishes	76	24	Yes
Pulling up clothing – e.g. pants, socks, trousers, skirt	86	14	Yes
Loading/unloading contents of a dishwasher	41	60	No
Pushing open a door	57	43	No
Closing a car door as in indoor passenger	73	27	Yes

Table 4: ADLs permitted during the immobilisation period

Duration of immobilisation

Consensus was reached when determining how long patients should use their sling. 89% agreed that if patients were only moving within their "safe zone", patients should have the use of a sling for three weeks but could discard it earlier if they feel ready to do so.

Commencing movement within and out of the "safe zone"

As long as movement occurred within the "safe zone" patients could begin passive (80%), active assisted (97%) and active movement (80%) during the immobilisation period. When it comes to moving out of the "safe zone", panellists were asked at what point following ASSS patients should be able to commence through range passive movement, active assisted, active, and resisted range of movement. As can be seen in table 5, the only consensus position was that patients should wait for at least 6 weeks before resuming full range resisted movement. Commencing early "strengthening" work within the safe zone during the immobilisation period was not supported with an agreement level of only 56.8%

	Passive		**Active assisted**		**Active**		**Resisted**	
	n	%	n	%	n	%	n	%
After 48 hours	1	3	1	3	0	0	0	0
After 72 hours	0	0	0	0	0	0	0	0
Within 1 week	0	0	1	3	2	5	0	0

After 1 week	0	0	0	0	0	0	0	0
After 2 weeks	1	3	6	16	2	5	0	0
After 3 weeks	5	14	6	16	4	11	1	3
After 4 weeks	18	49	21	57	23	62	2	5
After 5 weeks	0	0	0	0	1	3	0	0
After 6 weeks	5	14	1	3	4	11	28	76
After 7 weeks							0	0
After 8 weeks							3	8
After 9 weeks							0	0
After 10 weeks							0	0
After 11 weeks							0	0
After 12 weeks							0	0
After 12+ weeks							0	0
Don't advocate use	6	16					0	0
Other	1	3	1	3	1	3	3	8

Table 5: Resuming passive, active assisted, acted and resisted ROM

Returning to work

There was a consensus (76%) position that patients should be able to resume light work (e.g. computer use) as pain allows or as the patient feels able. With regards return to manual work there was a consensus position that patients should wait for at least 12 weeks (81%)

Return to sport

Return to non-contact sport

A consensus position (70%) was reached that patients should be able to return to non-contact sports when functional markers for return to play have been met.

Return to contact sport

When making decisions regarding return to contact sports, 70% did not use specific criteria but were led by the patient's level of function and confidence as long as a minimum time threshold of 12 weeks (76%) has been met.

Functional markers

The two functional markers indicating when non-contact and contact sports could be resumed that reached the required level were the ability to confidently weight bear through the affected side (74%) and to be able to confidently move in and out of a combined position of 90° abduction/external rotation (71%). Other functional markers such as the Kerlan-Jobe orthopaedic clinical score (KJOC), psychological readiness, presence of kinesophobia, a negative apprehension test were taken into consideration but did not reach the required consensus threshold.

Although a consensus was not reached for their roles as functional markers, there was a consensus that - the achievement of functional/physical milestones (92%), patient's level of confidence (95%) and the presence of kinesophobia (78%) should be considered when determining progression. Other patient factors such as the reported quality of surgical fixation, the presence of hyperlaxity, overall general health, patient age, smoking and alcohol intake were considered but fell short of the consensus threshold.

Unable to reach consensus.

After three rounds, 6 areas failed to reach consensus. These, along with the highest level of agreement that was reached are presented in table 6.

	n	**%**
The definition of the “safe zone”. Zone A only	22	60
The position the shoulder should be immobilised in – cross body sling	22	60
Agreement that early strengthening work within the safe zone could be commenced during the immobilisation period	21	57
Commencing through range passive range of movement after 4 weeks	18	49
Commencing through range active assisted range of movement after 4 weeks	21	57
Commencing through range active range of movement after 4 weeks	23	62

Table 6: Areas where consensus was not reached after 3 rounds

Discussion

This three-round Delphi study comprised an expert panel of surgeons, physiotherapists and patients. The primary objective of this study was to establish consensus regarding post-operative rehabilitation. Consensus positions were reached on 24 of the 31 statements considered and are presented in table 7.

Immobilisation

Consensus position	**Failed to achieve consensus position but most popular answer**
Shoulders should be routinely immobilised following arthroscopic stabilisation surgery. A sling is the preferred method of immobilisation. During the immobilisation period, the following functional movements are acceptable as long as they occur within the patient's "safe zone" ✓ Using a knife and fork ✓ Lifting a cup of tea ✓ Slicing a loaf of bread ✓ Using utensils, e.g. a spatula or wooden spoon to cook ✓ Wiping a table surface clean/light dusting ✓ Washing/drying dishes ✓ Pulling up clothing – e.g. pants, socks, trousers, skirt ✓ Closing a car door as in indoor passenger Following arthroscopic shoulder stabilisation surgery, as long as they are only moving within their safe zone, patients should use a sling for 3-weeks but could discard it earlier if they felt ready to do so.	A cross body sling **The following functional movements were not considered acceptable, even if occurring within the "safe zone".** ✘ Tipping out a small saucepan of water, e.g. to drain pasta/rice ✘ Loading/unloading contents of a dishwasher ✘ Pushing open a door
Safe zone	
Consensus position None	**Failed to achieve consensus position but most popular answer** Definition of the "safe zone" as zone A
Commencing range of movement	
Consensus position Patients should be able to resume through range (outside of safe zone) **resisted** movement after 6 weeks.	**Failed to achieve consensus position but most popular answer.** Commencing through range **passive** movement after 4 weeks Commencing through range **active assisted** movement after 4 weeks Commencing through range **active** movement after 4 weeks
Return to work	

Consensus position Patients should be able to return to light work (e.g., computer use) as pain allows/as patient feels able. Patients should be able to return to manual work after a minimum of 12 weeks.	
Return to sport	
Consensus position Patients should be able to return to non-contact sports based on achieving functional markers for return to play criteria. When returning to contact sport, specific criteria are not used but clinicians are led by patient's level of function/confidence, as long as they have passed a minimum time threshold. The minimum time threshold at which patients should be able to return to contact sports is 12 weeks. *Functional markers used to support decision making regarding return to non-contact and contact sport should include*: - ✓ The ability to confidently weight bear through the affected side ✓ The ability to move confidently in and out of a combined position of 90° abduction/external rotation. *Additional factors that should be considered when determining progression are: -* ✓ Functional/physical milestones ✓ Patient's level of confidence ✓ The presence of kinesiophobia	
Outcome measures	
Consensus position The preferred outcome measure is the Oxford Instability Shoulder Score	

Table 7: Consensus positions and most popular non-consensus responses

The "safe zone"

Perhaps the most notable finding from this study was the failure to agree a consensus on what constitutes the patient's "safe zone" following ASSS. The earliest reference in the literature to the concept of a "safe zone" was in 2016(14) where it was suggested that the integrity of the repair should be tested intra-operatively. The resultant "safe zone" is the range of movement in which significant stress on the repair can be avoided, so may differ between patients due to extent of injury. There was only 60% agreement across three rounds as to what constituted the "safe zone", reflecting this variation, so this aspect of rehabilitation may need to be individualised rather than standardised.

Type and duration of immobilisation/commencement of movement

There was a consensus that the shoulder should be immobilised in a sling following ASSS but movement could commence from day 1, as long as it occurred within the safe zone. Panellists were given the option of different positions of immobilisation, including a cross body sling, a sling in a neutral position or a sling in a low abduction position. Whilst it did not reach the required threshold, a cross body sling was the most common position at 60%. Freehill et al (2023)(15) conducted an international survey of the immobilisation practices of 499 shoulder surgeons following arthroscopic Bankart repair. They found that 62% of surgeons in the United States of America (USA) favoured abduction immobilisation compared to 15% in European countries. European countries overall favoured the cross-body sling, in line with our findings, with 74% opting for this position. Freehill et al (2023)(15) also found that USA respondents suggested a mean of 4.8 weeks of immobilisation in the USA and 4 weeks in Europe. Both are higher than the 3 weeks found in our study. Additionally, our participants were happy for patients to discard their sling, but only if moving within their "safe zone". Use of immobilisation following surgery is attracting increasing attention following surgery. In a nested qualitative study of a randomised controlled trial of rehabilitation following rotator cuff repair, one of the motivating factors for participation in the trial for patients was the prospect of

earlier sling removal and earlier mobilisation(16) . For some patients, sling use was considered unacceptable and had a negative effect on their pain and their sense of identity and self-efficacy.

No consensus was reached regarding the commencement of through range passive, active and active assisted range of movement. The most popular time scale was to begin movement outside of the safe zone at 4 weeks, but agreement levels fell far short of the 70% consensus threshold ranging from 49%-62%. A systematic literature review of rehabilitation protocols reported post operative immobilisation ranging from 1 day to 6 weeks(11). Another systematic review(10) found that only two RCTs directly compared accelerated rehabilitation to standard protocols. Merk et al's (1996)(17) standard rehabilitation involved 3 weeks immobilisation compared to 1-2 weeks in the accelerated group. Kim et al's (2003)(18) accelerated group involved no immobilisation and introduced range of movement exercises from day 1 compared to standard immobilisation of three weeks. Brand at al's(10) systematic review concluded that there was no statistical difference between the accelerated and standard groups. Our consensus finding of sling use for 3 weeks but allowing movement within the safe zone, as opposed to complete immobilisation, is an important distinction between the current study's findings and those of previous trials, and one that merits further investigation in future work.

The hesitant approval of full range of movement to commence at four weeks is also more conservative than that found in standard post-operative regimes. In a 7-year prospective study of non-athletic population patients following arthroscopic Bankart repair, full range of flexion and internal rotation could commence from the first day following surgery and ROM in all direction and strengthening exercises from four weeks(19). The total failure rate was 14% which is considered low(20). Netto et al (2012)(21) allowed removal of sling after 7 days for passive range of movement exercises up to 90° external rotation and 90° scapular plane abduction which is beyond zone A within Funk's (2016)(14) "safe zone" model. From 4 weeks, all ROM was permitted.

Resumption of activities of daily living (ADLs)

The ability to perform basic ADLs during the immobilisation period, was linked to the conditions of those movements being performed within the patient's "safe zone". However, if the interim recommendation to adopt the most popular answer of zone A is to be accepted, the bulk of the ADLs accepted would fall within this range.

Return to work and sport.

Consensus positions regarding return to work were reached in round 3. With regard returning to non-contact sport, there was less emphasis on time-based milestones but a requirement that functional markers should be met. However, only 2 out of the 7 functional markers reached the consensus threshold. A return to contact sport at a minimum of 12 weeks is significantly less that than the 6month milestone found reported throughout much of the literature(19,21–23). It does however reflect the recommendations of a systematic review who suggested that the final phase of rehabilitation to include return to sport should span from 13 weeks to 9 months(9). It would therefore appear that our Delphi panellists exhibited more caution in the earlier, rather than later phases, of rehabilitation.

Strengths and Limitations

As the first piece of work to establish a national, expert consensus on rehabilitation, this study has many strengths. Firstly, our panellist retention across the three rounds was high and consisted of a broad demographic. National Institute of Health Research Health Technology Assessment (NIHR HTA) guidance on Delphi studies anticipates a dropout rate of 20% over the three rounds(24,25). We only had 2 missing responses from round two, equating to 6%, and our patient voice, another strength of this work, was maintained throughout. The patients' views ensure that any recommendations made are acceptable to the patients that they will apply to and can be implemented in real-world practice.

Whilst recruiting clinician panellists by virtue of their membership of a specialist organisation ensures a certain level of expertise, it did limit the opportunity for non-BESS members to participate. The initial survey and Delphi were both focused on practice within the UK, therefore these findings may be limited in their generalisability. Similarly, throughout the Delphi, we did not differentiate the different populations who may undergo ASSS, for example the young, athletic population versus older people who may have multi-morbidity.

However, reaching 24 consensus positions will now allow the BESS clinical guideline group to develop best practice guidelines following ASSS and this work is ongoing. In addition to establishing areas of consensus, it has also highlighted those areas where there is considerably less certainty and has provided clear indications for further research.

Conclusion

Recurrent traumatic shoulder instability can be both life altering and career threatening. For patients who opt to undergo ASSS, there is a need to establish the safest and most effective rehabilitation. Whilst there is not yet a definitive answer to which rehabilitation regime optimises outcomes, this consensus provides expert guidance on which rehabilitation can be based.

Ethical approval: Gloucestershire Hospitals NHS Foundation Trust Scientific Review Group (Local R&D reference 22/043/GHT).

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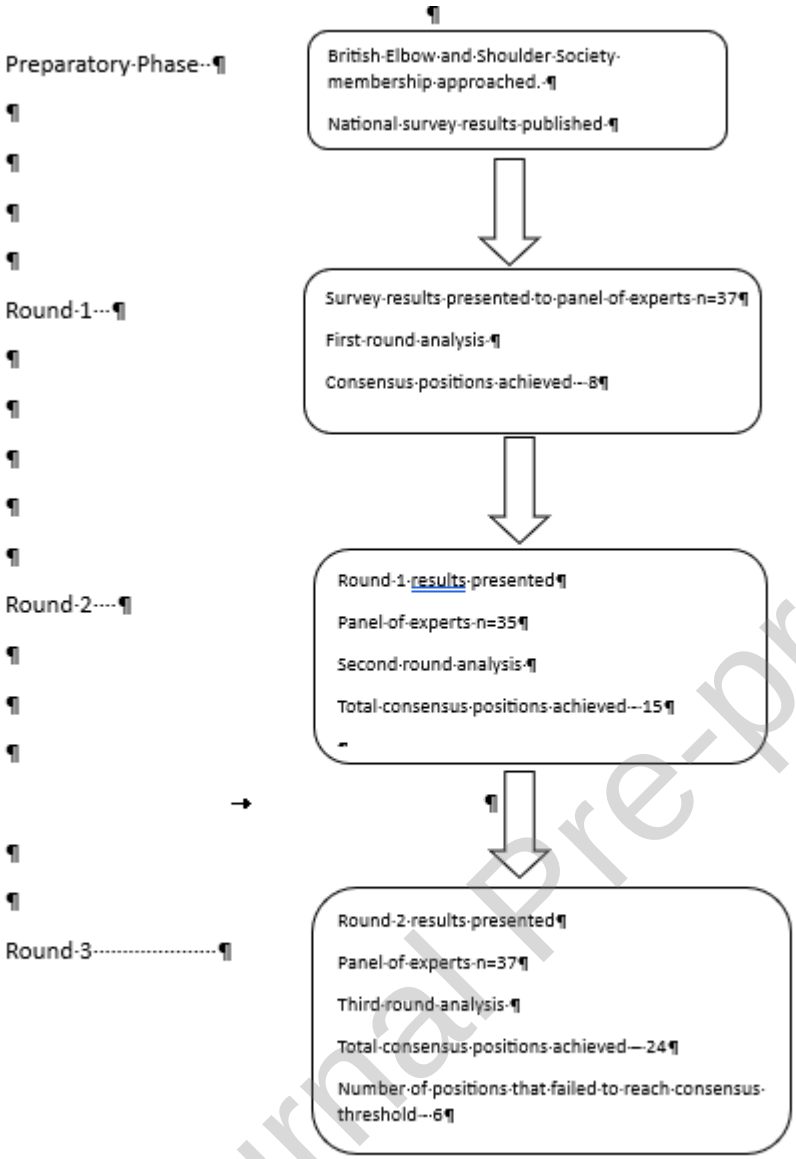

Figure 1: Delphi Process Flowchart

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