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Supplementary Table 1: Definitions provided for symptomatic multidirectional pathological laxity within included studies. The definitions were analyzed based on a formal description or diagnostic criteria of symptomatic multidirectional pathological laxity, their pathological characteristics, exclusion criteria of studies, the definition of laxity, and specified direction of instability (global versus non-global).

| Author | Year | Journal | Level of Evidence / Study Design | No. of Patients with MDI | Pathology of MDI | Definition / Diagnostic Criteria of MDI | Exclusion Criteria of MDI | Definition of Laxity | Direction (Global vs. Non-global) |
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| Alpert et al. ¹⁶ | 2008 | Arthroscopy | Level 4 Case series | 13 | Spectrum ranging from capsular redundancy to frank labral tear | Diagnosed based on positive sulcus sign and instability in more than 1 direction, excluding patients with only anterior-inferior instability. | - Anterior-inferior instability - Previous shoulder surgery | Not defined | Non-global (2, inferior) |
| Bak et al. ¹⁷ | 2000 | American Journal of Sports Medicine | Level 4 Case series | 25 | Isolated capsular and ligamentous redundancy | Diagnosed based on symptoms and signs of glenohumeral instability in at least 2 directions. | - Previous open shoulder surgery, or requiring Bankart surgery | Laxity: Sum of laxity scores (based on criteria by Altchek et al.) in all three directions exceeding 3, or 2 more than contralateral shoulder | Non-global (2) |
| Baker et al. ⁷⁰ | 2009 | American Journal of Sports Medicine | Level 4 Case series | 40 | Wide spectrum including excessive inferior capsular redundancy, Bankart lesion, labral lesion, rotator interval lesion | Defined as inferior instability with at least one other direction (anterior or posterior) of instability, based on combination of history, physical examination, evaluation under anesthesia, and arthroscopic findings. | - Psychogenic voluntary subluxation | Laxity: 2+ based on criteria by Altchek et al. | Non-global (2, inferior) |
| Barden et al. ⁷¹ | 2004 | Clinical Orthopaedics and Related Research | Level 2 Prospective cohort study | 12 | Not defined | Defined as symptomatic global laxity of glenohumeral joint, and may present with or without trauma, bilateral involvement or generalized joint laxity. Diagnosed based on following criteria: (1) functionally significant inability to keep humeral head centered in glenoid | - Mental incompetence, psychiatric or emotional difficulties related to voluntary instability - Musculo-skeletal, neurologic or genetic | Generalized Joint Laxity: Diminished resistance to translation in multiple directions as compared with a normal glenohumeral joint | Non-global (2) |

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| | | | | | | fossa, especially in positions not at the extremes of motion, (2) absence of an injury mechanism likely to tear the glenohumeral ligaments, (3) spontaneous reductions of translations, (4) glenohumeral translations that duplicated the symptoms of concern of the patient, (5) diminished resistance to translation in multiple directions as compared to normal joint, (6) absence of traumatic lesions | abnormality (e.g. Ehlers-Danlos syndrome) - Injury mechanism likely to tear the glenohumeral ligaments - Traumatic lesions | | |
| Barden et al. ⁷² | 2005 | Clinical Neurophysiology | Level 2 Prospective cohort study | 7 | Loose and redundant joint capsule, atypical shoulder muscle activation | Defined as symptomatic subluxation and/or dislocation of the glenohumeral joint in more than one direction. Diagnosed based on: (1) functionally significant inability to keep the humeral head centered in the glenoid fossa, especially in positions not at the extremes of motion, (2) absence of an injury mechanism likely to tear the glenohumeral ligaments, (3) spontaneous reductions of translations, (4) glenohumeral translations that duplicated the symptoms of concern to the patient, (5) a diminished resistance to translation in multiple directions as compared with a normal glenohumeral joint; and, (6) an absence of traumatic lesions | - Confounding genetic or neurological health conditions (e.g., Ehlers-Danlos syndrome or syringomyelia) - No treatment prior to testing - Traumatic lesions - Injury mechanism likely to tear the glenohumeral ligaments | Generalized Joint Laxity: Diminished resistance to translation in multiple directions as compared with a normal glenohumeral joint | Non-global (2) |
| Caplan et al. ¹⁸ | 2007 | American Journal of Orthopedics | Level 4 Case series | 355 | Repetitive microtrauma to shoulder capsule under stress, with plastic deformation of ligamentous structures, abnormalities in proprioception (due to damaged mechanoreceptors) | Defined as having atraumatic symptomatic instability in 2 or more activities that put different directions of stress on the shoulder, or in simply carrying books (thought to be indicative of inferior shoulder instability). | - Traumatic history | Generalized Ligamentous Laxity: Ability to hyperextend knees more than 10°, hyperextend elbows more than 10°, bend thumb and wrist forward so that it touches volar wrist, bend fingers so they are parallel to forearm | Non-global (1) |
| Castagna et | 2018 | BioMed Research | Level 4 | 10 | Capsular laxity with greater | Diagnosis based on history of either subluxation | - Traumatic history | Not defined | Non-global (2, |

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| al. ¹⁹ | International | Case series | | | density of elastin fibers | with spontaneous reduction or dislocation requiring manual reduction, with positive sulcus test and anterior or posterior apprehension, without history of trauma | - Unequivocal diagnosis of genetic disorders (e.g. Marfan syndrome, Ehler-Danlos syndrome) - Cervical or neurological disease predisposing to shoulder instability | | inferior) |
| Chen et al. ⁷³ | 2015 | Knee Surgery, Sports Traumatology, Arthroscopy | Level 4 Systematic review | 1053 | Capsuloligamentous laxity, labral abnormalities | Defined as pathological capsular laxity. Included articles with patients with symptomatic instability in 2 or more directions. | - Voluntary dislocation - Significant bony deficiency - Concurrent SLAP repair and/ or rotator cuff repair | Not defined | Non-global (2) |
| Choi et al. ²⁰ | 2002 | British Journal of Sports Medicine | Level 4 Case series | 47 | Repetitive minor trauma (to inferior glenohumeral ligament complex) causing unrecoverable elongation and decrease in resistance to peak force | Defined as symptomatic glenohumeral instability in more than 1 direction. Diagnosed principally based on examination under anaesthesia findings – requiring dislocation in at least one direction and subluxation or dislocation in another. | Nil | Not defined | Non-global (2) |
| D'Alessandro et al. ⁵⁸ | 2004 | American Journal of Sports Medicine | Level 2 Prospective cohort study | 81 | Excessive capsular redundancy | Diagnosis of glenohumeral instability based on combination of patient history and physical findings – MDI patients had persistent deep shoulder pain, 3+ sulcus sign, global ligamentous laxity, and excessive capsular redundancy arthroscopically. | - Significant bony deficiency at anterior-inferior glenoid rim (bony Bankart lesion) - Large Hill Sachs lesions - Previous shoulder instability surgery | Glenohumeral Ligament Laxity: Positive "lift-off" or "drive-through" sign on shoulder arthroscopy | Non-global (1, inferior) |
| Dewing et al. ⁷⁴ | 2008 | American Journal of Sports Medicine | Level 2 Prospective cohort series? | 13 | Spectrum including labral deficiency, capsular elongation, patulousness of capsule, ligament injuries, bony deficiencies | Diagnosis of instability based on clinical history, physical examination documenting symptomatic laxity, apprehension and relocation examination – with multidirectional instability characterised by minimum 2+ translation in greater than 2 plans | - Glenoid bone loss >20% - Engaging Hill-Sachs lesions - Degenerative arthritic | Not defined | Global |

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and a minimum 1+ symptomatic sulcus examination.

changes

- Rotator cuff tear
- Dislocated, or subluxated long head of the biceps tendon
- Previous surgery of the involved shoulder

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| Duncan et al. ²¹ | 1993 | Arthroscopy | Level 4 Case series | 10 | Hyperelasticity or hyperlaxity of joint capsule, secondary to dysfunction of inferior glenohumeral ligament (from congenital generalized hyperelasticity or repetitive activities or injuries) | Diagnostic criteria unclear; patients had evidence of inferior dislocation (sulcus sign $\geq 2\text{cm}$) as well as anterior and/or posterior dislocation. | - Atraumatic dislocation with congenital hyperlaxity | Generalized Ligamentous Laxity: Criteria as defined by Marshall et al. | Non-global (2, inferior) |
| Emery et al. ⁷⁵ | 1991 | Journal of Bone and Joint Surgery | Level 4 Case series | 17 | Capsular redundancy, position of glenoid, version of humeral head, general joint laxity | Defined as inferior instability with either positive anterior or positive posterior drawer tests | Nil | General Joint Laxity: Inferred from measurements on left index finger with hyperextensometer with torque of 2.5kg/cm | Non-global (2, inferior) |
| Engelsma et al. ²² | 2010 | Knee Surgery, Sports Traumatology, Arthroscopy | Level 2 Prospective cohort study | 5 | Associated with excessive posterior capsular laxity and/or posterior labral lesions, but no unifying pathological condition | Diagnosis of posterior instability based on history of shoulder dislocation or sense of looseness and examination demonstrating pain and/or apprehension, with excessive posterior glenohumeral translation. Sub-categorized as MDI based on posterior instability combined with positive anterior apprehension test or anterior labra lesion, with a sulcus sign (Gerber B5) or without (Gerber B4). | - Voluntary instability or dislocation | Laxity: Based on examination of contralateral shoulder and elbows and ability to bring thumb to forearm | Non-global (2, anteroposterior) |
| Fitzgerald et al. ²³ | 2002 | Journal of Shoulder and Elbow Surgery | Level 4 Case series | 33 | Excessive capsular joint volume and pathologic ligamentous laxity, primarily of the inferior glenohumeral | Diagnosed based on history of symptomatic subjective instability in more than one direction that could be confirmed on outpatient examination, an examination under anaesthesia | - Voluntary dislocation | Generalized Ligamentous Laxity: Bilateral elbow hyperextensibility and ability of abducted thumb to reach ipsilateral forearm | Non-global (2, inferior) |

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ligament complex demonstrating translation over glenoid rim anteriorly or posteriorly, a positive sulcus sign with inferior stress, and evidence on diagnostic arthroscopy of increased capsular volume.

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| Frostick et al. ²⁴ | 2003 | Arthroscopy | Level 4 Case series | 32 | Capsular redundancy, some presenting with labral lesions | Diagnostic criteria unclear; patients had positive sulcus sign reproducing their symptoms, with instability in at least 2 directions. | - Neurological disorders affecting shoulder (e.g. transverse myelitis) - Chronic dislocation because of nonadherence - Previous surgery on same shoulder | Generalized Hyperlaxity: Criteria as defined by Carter and Wilkinson. | Non-global (2, inferior) |
| Gartsman et al. ²⁵ | 2001 | Arthroscopy | Level 4 Case series | 47 | Large capsular volume, labral detachment | Diagnosed based on: (1) shoulder dislocation or sensation of looseness and slipping, (2) examination demonstrating pain and/or apprehension with excessive anterior, inferior and posterior translation, (3) arthroscopic findings of multidirectional glenohumeral instability | - Only 2 directions of instability (e.g. anterior-inferior or posterior-inferior instability) - Previous instability operation | Ligamentous Laxity: Presence of laxity in shoulder and elbow on contralateral (non-operative) side, and ability to bring thumb to forearm | Global |
| Hsu et al. ⁷⁶ | 2010 | Acta Radiologica | Level 3 Retrospective cohort study | 21 | Capsular redundancy or incompetence from traumatic injury or congenital laxity (posteroinferior MDI), labral tears, glenoid cartilage defect, ligament injuries, poor neuromuscular control, bony deficiencies | Diagnosed based on: (1) no history of initial trauma, (2) sulcus sign, (3) positive jerk test, (4) no anterior apprehension sign, (5) no evidence of Bankart lesion on MR arthrogram or arthroscopic examination | - Previous surgery - Anteroinferior labral tear - Capsular extravasation from capsule rupture in MR arthrography | Not defined | Non-global (2, posteroinferior) |
| Illyés et al. ⁵¹ | 2006 | Knee Surgery, Sports Traumatology, Arthroscopy | Level 2 Prospective cohort study | 15 | Increased tilt of scapula and decreased scapulohumeral rhythm, abnormal movement patterns and imbalance of muscle strength (e.g. deltoids, trapezius, rotator cuff) | Defined as symptomatic global laxity of the glenohumeral joint, and may with or without trauma, unilaterally or bilaterally, and with or without generalized joint laxity. Diagnosed based on the following criteria: (1) functionally significant inability to keep the humeral head centered in the glenoid fossa, | - Mental incompetency, psychiatric or emotional difficulties related to voluntary instability - Musculoskeletal, neurological or genetic abnormality other than | Not defined | Non-global (2) |

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especially in positions not at the extremes of motion, (2) absence of injury mechanism likely to tear the glenohumeral ligaments, (3) spontaneous reductions of translations, (4) glenohumeral translations that duplicated the symptoms of concern to the patients, (5) diminished resistance to translation in multiple directions as compared with a normal glenohumeral joint, (6) absence of traumatic lesions

shoulder instability
- Injury mechanism likely to tear glenohumeral ligaments
- Traumatic lesion

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| Jacobson et al. ⁷⁷ | 2012 | Arthroscopy | Level 4 Systematic review | 197 | Patulous inferior capsule, inferior glenohumeral ligament laxity, labral pathology, ligamentous laxity | Defined as traumatic or atraumatic onset of involuntary symptomatic shoulder instability in more than 1 direction without a structural lesion such as a Bankart lesion | - Articles reporting results of patients with Bankart lesions - Articles including patients in whom dislocation occurred voluntarily | Not defined | Non-global (2) |
| Jalovaara et al. ⁶² | 1992 | Clinical Orthopedics and Related Research | Level 4 Case series | 9 | Loose of stretched capsule | Diagnostic criteria unclear; patients had involuntary instability in inferior, with anterior ± posterior, directions | - Voluntary instability | Generalized Hyperlaxity: Excessive hyperextensibility of multiple joints (e.g. fingers, elbows, knees) | Non-global (2, inferior) |
| Joseph et al. ²⁶ | 2003 | American Journal of Sports Medicine | Level 4 Case series | 21 | Capsulolabral detachment, capsular redundancy | Diagnosed based on global shoulder laxity on physical examination (anterior, posterior, and inferior) that was symptomatic inferiorly and in at least one other direction. | - Previous surgery for stabilization - Requiring simultaneous repair of Bankart lesion, SLAP lesion, rotator cuff tear or subacromial decompression | Generalized Ligamentous Laxity: Signs included elbow hyperextension, metacarpophalangeal joint extension beyond 90°, thumb abduction to the forearm, genu recurvatum, and hypermobile patellae | Non-global (2, inferior) |
| Kim et al. ²⁷ | 2004 | American Journal of Sports Medicine | Level 4 Case series | 31 | Capsular redundancy Posteroinferior labral lesion (for posteroinferior MDI) | Diagnosed based on (1) symptomatic instability in more than 1 direction, (2) positive jerk test with painful clunking of the shoulder, (3) no Bankart | - Bankart lesion - Previous shoulder surgery | Generalized Ligamentous Laxity: Diagnosed with presence of any two of the following signs: thumb- | Non-global (2, inferior) |

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| | | | | | | lesions on MR arthrogram or arthroscopic examination, (4) positive sulcus sign | | | to-forearm distance of 4cm, index MCP extension >90°, elbow hyperextension, knee hyperextension, patellar hypermobility |
| Kiss et al. ²⁰ | 2001 | International Orthopaedics (SICOT) | Level 2 Prospective cohort study | 59 | Bone and labral abnormalities, ligamentous abnormalities, impaired muscular control, collagen abnormalities, psychological elements | Diagnosed based on symptomatic glenohumeral instability in at least 2 directions. | Nil | Generalized Joint Laxity: Beighton score of 5 or more | Non-global (2) |
| Kiss et al. ⁶³ | 2010 | Journal of Electromyography and Kinesiology | Level 2 Prospective cohort study | 32 | Labral and ligamentous abnormalities, abnormal patterns of muscle activity | Defined as symptomatic global laxity of the glenohumeral joint, which may or may not be caused by trauma, may be unilateral or bilateral, with or without generalized joint laxity. Diagnosed based on (1) symptomatic instability of the glenohumeral joint with no history of trauma, and no history of dislocation that was not reduced spontaneously, (2) apprehension test and sulcus sign, (3) no traumatic lesions detected on x-ray or pre-operatively | - Traumatic lesion or history | Not defined | Non-global (2, inferior) |
| Kjær et al. ²⁰ | 2020 | Journal of Shoulder and Elbow Surgery | Level 2 Prospective cohort study | 29 | Increased capsular laxity, dysfunctional muscle recruitment and decreased muscle tension, altered scapular position during arm movement | Defined as symptomatic glenohumeral joint instability in more than 1 direction. Diagnostic criteria unclear; patients had subjective experience of shoulder instability in daily life (e.g. recurrent subluxations or dislocations) without a traumatic onset, for at least 3 months before the study, as well as shoulder instability in at least 2 directions on the FEDS tests: positive sulcus sign, positive apprehension-relocation test and/or positive jerk test, and/or a load-and-shift test positive for another direction than the 3 previous tests. | - Other diseases in addition to hEDS/HSD (e.g. diabetes, multiple sclerosis, etc.) - Severe vertebral malalignment (e.g. scoliosis) - History of frozen shoulder or shoulder surgery (of the most unstable shoulder) in the past 5 years | Laxity: Positive sulcus sign | Non-global (2, inferior) |

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| | | | | | | | - Traumatic onset of their shoulder instability | | |
| Krishnan et al. ³⁰ | 2004 | Clinical Orthopaedics and Related Research | Level 4 Case series | 10 | Redundant inferior pouch | Defined as symptomatic inferior glenohumeral subluxation or dislocation attributable to a redundant inferior pouch with symptom instability in at least one other direction. | - Ehlers-Danlos syndrome, Marfan's syndrome, other collagen tissue abnormalities | Not defined | Non-global (2, inferior) |
| Lebar et al. ¹⁵ | 1992 | American Journal of Sports Medicine | Level 4 Case series | 10 | Capsular laxity and redundancy | Diagnostic criteria unclear; patients had positive sulcus sign | Nil | Generalized Ligamentous Laxity: Hypermobility in other joints (e.g. wrists, elbows, knees) | Non-global (1, inferior) |
| Lee et al. ³¹ | 2013 | Skeletal Radiology | Level 3 Retrospective cohort study | 47 | Increased capsular size; increased chondro-labral and osseous retroversion (posteroinferior MDI) | Defined as instability in two or three directions Diagnosed based on clinical history, physical examination documenting symptomatic laxity, apprehension and relocation examination, and sulcus sign. | - Traumatic anterior or anteroinferior instability with a Bankart lesion - Labral tear including SLAP lesion - Rotator cuff tear, glenohumeral ligament and capsular tear - Extravasation of contrast through joint on MR arthrography | Not defined | Global |
| Levy et al. ³² | 2001 | Journal of Bone and Joint Surgery (Br) | Level 4 Case series | 52 | Capsular laxity | Diagnosed based on (1) history of repetitive microtrauma or minimal traumatic event leading to recurrent symptoms of instability, (2) clinical examination revealing generalized laxity with signs of (multidirectional) instability, and (3) arthroscopic findings of voluminous capsule with increased joint volume, easy 'drive through' sign, without a Bankart or Hill-Sachs bony lesion. | - Hill-Sachs or bony Bankart lesion | Not defined | Global |
| Lim et al. ³⁵ | 2016 | Skeletal Radiology | Level 3 Retrospective cohort study | 25 | Capsule redundancy | Defined as instability in two or three directions Diagnostic criteria unclear; patients had positive following test: sulcus sign, apprehension test, | - Rotator cuff tear - Traumatic anterior or anteroinferior instability | Generalized Ligament Laxity: Elbow or MCPJ hyperextension, genu recurvatum, patellar | Global |

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| | | | | | | anterior and posterior drawer test, and jerk test. | with a Bankart lesion - Glenohumeral ligament and capsular tear - Dislocation or subluxation of the long head biceps tendon | instability, ability to rest thumb on ipsilateral forearm | |
| Lippitt et al. ⁶⁴ | 1994 | Journal of Shoulder and Elbow Surgery | Level 4 Case series | 8 | Redundant capsule, rotator interval lesion | Diagnostic criteria unclear, but patients had reproduction of typical problems on glenohumeral laxity tests (such as jerk test, push-pull and/or sulcus tests), without traumatic lesion on radiograph nor major traumatic shoulder injury. | - No traumatic shoulder injury or lesion (e.g. Bankart lesion) | Laxity: Abnormal tracking of humeral head with anterior drawer, posterior drawer, sulcus, push-pull and/or fulcrum test | Unclear |
| Lo et al. ⁶⁴ | 2004 | American Journal of Sports Medicine | Level 4 Case series | 5 | Not defined | Diagnosed based on: (1) history of symptomatic instability and pain, (2) symptoms of inferior subluxation or dislocation, (3) greater than 2+ sulcus sign (2 cm), (4) excessive motion in greater than 2 planes with load and shift test, (5) normal radiographs, (6) no history of surgery or other problems with that extremity | - Previous surgery | Not defined | Non-global (2, inferior) |
| Longo et al. ⁷⁸ | 2015 | Arthroscopy | Level 4 Systematic review | 790 | Congenital hyperlaxity, muscular disbalance, bony and capsulolabral anatomy (labral hypoplasia, glenoid size), repetitive microtrauma leading to increased glenohumeral volume | Defined as symptomatic instability in 2 or more directions – with or without hyperlaxity. | Variable | Not defined | Non-global (2) |
| Lubiatowski et al. ⁷⁹ | 2012 | European Journal of Orthopaedic Surgery and Traumatology | Level 4 Case series | 12 | Excessively, redundant capsule | Diagnostic criteria unclear; all patients had either atraumatic shoulder instability or instability induced by minor trauma accompanied by significant joint laxity, with multidirectional pattern of instability. | Nil | Not defined | NR |
| Lyons et al. ⁸⁵ | 2001 | Arthroscopy | Level 4 Case series | 26 | Redundancy of the inferior glenohumeral ligament complex with a resultant increase in | Diagnostic criteria unclear; all patients had inferior subluxation, with anterior and/or posterior subluxation on examination under anaesthesia. | - Previous shoulder surgery - Bankart lesion or any | Generalized Ligamentous Laxity: Criteria as defined by Marshall et al. | Non-global (2, inferior) |

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| | | | | | capsular volume – either occurring atraumatically with inherent capsular laxity or resulting from atraumatic capsulolabral injuries and plastic deformation of the capsule | | labral tear requiring stabilization | | |
| Ma et al. ³⁶ | 2012 | Orthopaedics | Level 4 Case series | 23 | Capsular redundancy or inherent laxity of shoulder capsule | Defined as instability in more than 2 directions. Diagnostic criteria unclear; patients had marked inferior (sulcus sign), posterior, and anterior translation grade than grade 2+. | - Only anteroinferior instability with Bankart or Bankart variant lesions - Psychogenic involuntary shoulder dislocation - Previous surgery - Rotator cuff tears - SLAP lesions - Pathogens of long head of biceps tendon | Not defined | Global |
| Misamore et al. ³⁷ | 2005 | Journal of Shoulder and Elbow Surgery | Level 4 Case series | 64 | Not defined | Diagnosed based on at least a grade 2 translation – with reproduction of feeling of instability – in at least 2 directions. | - Traumatic onset of bony injury - Radiographic evidence of bony injury - Psychiatric conditions - Previous surgery - Asymptomatic hyperlaxity | Laxity: Movement of humeral head over glenoid rim on load-and-shift test, or 2cm of translation on sulcus test | Non-global (2) |
| Mitchell et al. ³⁸ | 2021 | The Orthopaedic Journal of Sports Medicine | Level 4 Case series | 42 | Capacious capsule, labral tear | Defined as presence of positive sulcus sign, capacious capsule identified by a radiologist on MR arthrogram and/or intra-operatively, and drive-through sign on arthroscopy. Patients had to demonstrate multidirectional laxity on anterior and posterior drawer tests while under anaesthesia, equating to a grade 2 subluxation or greater. | - Frank dislocation event | Multidirectional Laxity: Translation of humeral head over glenoid rim on anterior and posterior drawer tests while under anesthesia | Global |
| Mohtadi et | 2006 | Trials | Level 1 | 58 | Ligamentous or capsular | Diagnosis based on at least two of following: (1) | - Neurological disorder | Not defined | Non-global (1, |

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| al. ³⁹ | | | Randomized controlled trial | | redundancy | symptomatic translation in one or more direction, (2) unwanted symptomatic glenohumeral translation with one of examination test (anterior and posterior apprehension tests, anterior and posterior load and shift tests, fulcrum test, relocation test, Fukuda test and/or push-pull or stress test with patient supine), (3) presence of symptomatic positive sulcus sign of 1cm or greater gap (both palpable and visible), (4) symptoms of instability (subluxation or dislocation). | (axillary nerve injury, syringomyelia) - Primary posterior instability - Bony abnormality (Hill Sachs, Bony Bankart) or Bankart lesion - Unstable biceps anchor e.g. SLAP - Full thickness rotator cuff tear | | inferior) |
| Mohtadi et al. ⁴⁰ | 2014 | Journal of Shoulder and Elbow Surgery | Level 2 Randomized controlled trial | 54 | Ligamentous laxity, capsular redundancy | Referenced consensus definition outlined by JOINTS-Canada. Diagnosis required at least two of following: (1) symptomatic translation in one or more direction, (2) unwanted symptomatic glenohumeral translation with one of examination test (anterior and posterior apprehension tests, anterior and posterior load and shift tests, fulcrum test, relocation test, Fukuda test and/or push-pull or stress test with patient supine), (3) presence of symptomatic positive sulcus sign of 1cm or greater gap (both palpable and visible), (4) symptoms of instability (subluxation or dislocation). | - Neurological disorder (e.g. axillary nerve injury, syringomyelia) - Primary posterior instability - Bony abnormality (Hill-Sachs or Bony Bankart) - Bankart lesion or unstable biceps anchor (e.g. SLAP) - Full-thickness rotator cuff tear | Not defined | Non-global (1, inferior) |
| Moon et al. ⁸⁰ | 2011 | Orthopedics | Level 4 Case series | 20 | Patulous shoulder capsule and deficiency in rotator interval | Defined as symptomatic global laxity of glenohumeral joint, occurring with or without trauma, bilateral involvement or generalized joint laxity – with reproduction of symptoms in at least 2 directions. Diagnostic criteria unclear; patients had positive and painful sulcus sign (predominant) and | Nil | Not defined | Non-global (2, inferior) |

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asymptomatic anterior instability (no patients with posterior instability).

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| Morris et al. ⁴¹ | 2004 | Journal of Shoulder and Elbow Surgery | Level 2 Prospective cohort study | 6 | Impaired coordination of shoulder girdle muscle activity | Diagnostic criteria unclear; patients had pain and instability in the shoulder with a positive sulcus sign and positive anterior and posterior drawer tests associated with discomfort, without history of significant injury | Nil | Multidirectional Laxity: Asymptomatic increased translation of humeral head on glenoid in multiple directions | Global |
| Neer et al. ¹ | 1980 | Journal of Bone and Joint Surgery (Am) | Level 4 Case series | 36 | Redundancy of ligaments and inferior part of capsule | Diagnostic criteria unclear; patients had uncontrollable, involuntary inferior subluxation or dislocation, ligament laxity on physical examination and traction roentgenograms, and both anterior and posterior dislocation or subluxation. | - Bone abnormalities (glenoid, humerus) - Neural disorders - Voluntary dislocation - Bankart lesion (<i>selective</i>) - Emotional disorders | Generalized Laxity: Hypermobility of joints (e.g. fingers, thumb, elbow, and knees) | Global |
| Nyiri et al. ⁶⁵ | 2010 | Journal of Shoulder and Elbow Surgery | Level 2 Prospective cohort study | 51 | Not defined | Defined as by symptomatic global laxity of the glenohumeral joint, which may or may not be caused by trauma, may be unilateral or bilateral. Diagnosed based on (1) symptomatic instability of glenohumeral joint with no history of trauma, (2) positive, painful anterior-posterior shift, positive and painful apprehension test, and outstanding sulcus sign, (3) no traumatic lesions detected on x-ray imaging or pre-operatively. | - Traumatic lesions and/or history | Not defined | Non-global (2, inferior) |
| Ogston et al. ⁴² | 2007 | American Journal of Sports Medicine | Level 2 Prospective cohort study | 29 | Laxity in glenohumeral ligaments, possible variations in muscle activity, aberration of scapular kinetics | Diagnosed based on (1) complaints of shoulder discomfort and instability, (2) positive sulcus sign, either positive load-and-shift and/or positive apprehension test | -Psychological voluntary subluxation - Previous shoulder surgery - Cervical spine abnormality or neck pain - Ehlers-Danlos syndrome or Marfan syndrome | Laxity: Ability to subluxate or dislocate | Non-global (2, inferior) |

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| Park et al. ⁶⁶ | 2019 | Korean Journal of Radiology | Level 3 Retrospective cohort study | 65 | Excessive capsular redundancy (comprising of elongated inferior capsule and deficient rotator interval) | Defined as instability in two or three directions. Diagnostic criteria unclear; patients had atraumatic onset and positive test results for following: sulcus sign, anterior and posterior drawer test, and jerk test under general anaesthesia. Additionally, all patients had generalized ligament laxity. | - Bony deficiency (glenoid bone loss >20%), degenerative arthritis, rotator cuff tear, traumatic instability, dislocated or subluxated long head biceps tendon on MRA | General Ligament Laxity: Elbow or MCPJ hyperextension, genu recurvatum, ability to rest thumb on ipsilateral forearm | Global |
| Perkins et al. ⁵⁹ | 2001 | Journal of Sports Rehabilitation | Level 4 Case series | 8 | Not defined | Defined as demonstrable laxity anteriorly, posteriorly, and inferiorly as objectively measured by certified athletic trainer. | - Voluntary dislocation | Not defined | Global |
| Pollock et al. ⁴³ | 2000 | Journal of Bone and Joint Surgery (Am) | Level 4 Case series | 49 | Excessive redundancy of capsular ligaments (especially inferiorly) | Diagnosed based on instability in anterior, posterior and inferior directions based on history and physical examination (office and EUA) | - Voluntary instability | Not defined | Global |
| Raynor et al. ⁴⁴ | 2016 | American Journal of Sports Medicine | Level 3 Retrospective cohort study | Not reported | Varied ranging from patulous capsule (with atypical collagen) to pan-labral tears | Defined as symptomatic instability of the shoulder joint in more than one direction, one of which is inferior, with hallmark of an inferior sulcus sign on examination. Diagnosed based on clinical grounds: positive sulcus sign with symptomatic inferior translation of >1 cm (in neutral position and in external rotation), and history of dislocations or subluxations as well as clinical apprehension signs in the anterior and/or posterior direction. | - Antero-inferior and postero-inferior instability without symptomatic inferior translation of >1 cm - Under 16 years of age - Previous stabilization surgery - Connective tissue disease e.g. Ehlers-Danlos syndrome | Not defined | Non-global (2, inferior) |
| Schaeffeler et al. ⁴⁵ | 2014 | European Radiology | Level 2 Prospective cohort study | 20 | Traumatic injury of the anterior and/or posterior capsulolabral structures, or glenoid dysplasia or retroversion or hyperlaxity of joint capsule | Atraumatic MDI defined as symptomatic involuntary instability in 2 or more directions without history of initial traumatic shoulder dislocation | - Previous traumatic shoulder dislocation - Previous shoulder surgery - Presence of Bankart lesion | Hyperlaxity: Associated with positive sulcus sign, hyperabduction test, or increased anterior-to-posterior glenohumeral translation | Non-global (2) |

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| Sciascia et al. ⁴⁶ | 2012 | Rehabilitation Research and Practice | Level 2 Prospective cohort study | 10 | Alteration in glenohumeral muscular activity | Diagnosed based on (1) verbal history or recurrent subluxation and/or dislocation, (2) history of the sensation of the shoulder "giving way", (3) positive findings for all of the following tests: load and shift test, apprehension test, relocation test, and sulcus sign. | - Neurological disorders - Previous shoulder surgery | Generalized Laxity: Fulfilling at least 3 findings as described by Carter and Wilkinson | Global |
| Spanhove et al. ⁴⁷ | 2020 | Physiotherapy | Level 2 Prospective cohort study | 27 | Laxity of capsuloligamentous complex | Diagnosed based on: (1) current subjective experience of shoulder instability in daily life without a traumatic onset, (2) shoulder pain for at least 3 months prior to study, (3) shoulder laxity in at least 2 directions on the FEDS tests: A positive sulcus sign (inferior laxity), and/or a positive apprehension-relocation test (anterior instability), and/or a positive jerk test (posterior laxity), and/or a positive load-and-shift test | - Traumatic onset - Previous frozen shoulder or shoulder surgery - Systemic diseases other than Hypermobility Spectrum Disorders or hypermobility type of the Ehlers-Danlos syndrome - Severe vertebral malalignment | Laxity: Positive sulcus sign or jerk test | Non-global (2) |
| Spanhove et al. ⁴⁸ | 2022 | Arthritis Care and Research | Level 2 Prospective cohort study | 27 | Capsular laxity, insufficient scapular upward rotation and increased scapular internal rotation, altered shoulder muscle activity | Defined as symptomatic, pathological condition associated with involuntary shoulder subluxations. Diagnosed based on: (1) shoulder pain for at least three months prior to the study, (2) symptoms of shoulder instability (e.g. involuntary recurrent subluxations/ dislocations, apprehensive muscle tension, sensation of shoulder 'giving way') in daily life, without a traumatic onset, (3) shoulder laxity in at least two directions confirmed on clinical examination. | - Frozen shoulder - Previous shoulder surgery | Laxity: >2cm translation on Sulcus test, >105° abduction on Gagey hyperabduction test, Grade 2 or 3 anterior or posterior load-and-shift test, >90° passive external rotation (in supine), >85° active external rotation (in standing), or clunk felt on posterior jerk test Multidirectional Laxity: Increased laxity in two or more directions | Non-global (2) |
| Staker et al. ⁶⁰ | 2021 | Brazilian Journal of Physical Therapy | Level 2 Prospective | 9 | Not defined | Defined as excessive shoulder joint laxity in at least 2 directions in combination with | - Traumatic onset - Previous surgery | Glenohumeral Laxity: Composite laxity score – calculated as mean | Non-global (2) |

MDI

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| | | | cohort study | | | symptomatology. Diagnosed based on (1) a composite laxity score (based on perceived translation by examiner) from anterior, posterior, and sulcus laxity testing of score exceeding 1.5, (2) either positive anterior apprehension sign or Beighton score ≥ 2 | - Symptoms of cervical origin | of three laxity test (sulcus test, anterior and posterior drawer), each graded 0 to 3 – exceeding 1.5 | |
| Toth et al. ⁴⁹ | 2011 | HSS Journal | Level 4 Case series | 101 | Not defined | Defined as greater than 1+ instability in 2 or more directions. | - Rotator cuff repair, hereditary sensorimotor neuropathy (1 patient) | Not defined | Non-global (2) |
| Treacy et al. ⁵⁰ | 1999 | Journal of Shoulder and Elbow Surgery | Level 4 Case series | 25 | Dysfunctional inferior glenohumeral ligament leading to increased capsular laxity | Diagnostic criteria unclear; patients had symptomatic subluxation of shoulder inferiorly and clinically demonstrable instability on examination (with varying severity of anterior and posterior instability). | - Traumatic onset | Generalized Ligamentous Laxity: Criteria as defined by Marshall et al. | Global |
| Vavken et al. ⁵¹ | 2016 | Journal of Shoulder and Elbow Surgery | Level 4 Case series | 15 | Lengthening of static restraints of shoulder joint | Diagnostic criteria unclear; patients had instability in at least anterior and inferior directions with positive load-and-shift as well as sulcus sign testing, as well as generalized ligamentous hyperlaxity | - Language, psychiatric, or cognitive difficulties - Multiple medical comorbidities or neurologic conditions | Hyperlaxity: Clinical or genetic diagnosis of connective tissue disease (e.g. Ehler-Danlos syndrome or Marfan syndrome) or Beighton score >6 points | Non-global (2, anteroinferior) |
| Voigt et al. ⁵² | 2009 | The Open Orthopaedics Journal | Level 4 Case series | 9 | Capacious capsular volume, congenitally deficient or insufficient labrum, rotator interval lesion | Referenced Gerber classification (i.e. Gerber B5- instability). Defined as symptomatic instability in more than 2 directions – distinct from unidirectional instability with hyperlaxity (Gerber B3), or physiological hyperlaxity. Diagnosed based on (1) history of painful sensations of looseness and slipping, or dislocation, and (2) examination that demonstrated hyperlaxity by an excessively anterior, posterior and inferior translation, and the sulcus sign. | - Asymptomatic hyperlaxity - Unidirectional instability with hyperlaxity (Gerber B3) - Traumatic onset - Bony injuries (Hill-Sachs, Bankart-lesions) - Previous shoulder surgery - Psycho-logical abnormalities | Hyperlaxity: Criteria by Hawkins and Bokor. | Global |

MDI

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| Warby et al. ⁵³ | 2014 | Journal of Shoulder and Elbow Surgery | Level 4 Systematic review | 377 | Repetitive microtrauma imposed on a congenitally lax and redundant joint capsule, reduced scapula upward rotation, imbalance of muscle strength, suboptimal neuromuscular control of shoulder function | Defined as symptomatic glenohumeral joint subluxation or dislocation occurring in more than 1 direction, generally attributed to repetitive microtrauma imposed on a congenitally lax and redundant joint capsule. Diagnosis made by physiotherapist, doctor or surgeon based on: (1) positive sulcus sign or test for inferior laxity, (2) and positive load-and-shift test or positive sign of pain and/or apprehension in loading of the glenohumeral joint in at least 1 of the positions that stress the anterior (arm abduction at 90°, external rotation) or posterior (flexion, adduction) joint complex | Variable | Not defined | Non-global (2, inferior) |
| Warby et al. ¹³ | 2016 | British Journal of Sports Medicine | Level 4 Systematic review | 234 | Repetitive microtrauma imposed on congenitally lax and redundant joint capsule, imbalance of muscle strength, suboptimal neuromuscular control of shoulder function and reduced scapula upward rotation | Defined as symptomatic glenohumeral joint subluxation or dislocation occurring in more than one direction, with typical etiology of history of repetitive microtrauma imposed on a congenitally lax and redundant joint capsule. Diagnosis made by physiotherapist, doctor or surgeon based on: (1) positive sulcus sign or test for inferior laxity, (2) and positive load-and-shift test or positive apprehension test in the posterior and/or anterior direction. | Variable | Not defined | Non-global (2, inferior) |
| Warby et al. ⁵⁴ | 2018 | American Journal of Sports Medicine | Level 2 Randomized controlled trial | 41 | History of microtrauma imposed on a congenitally lax and redundant joint capsule; altered muscle patterning, reduced muscle strength, reduced scapular upward rotation | Defined as symptomatic glenohumeral subluxation or dislocation in at least 2 directions. Diagnosed based on apprehension or guarding with the following tests: (1) a positive sulcus sign and (2) for one other direction, at least 2 out of 3 positive for the following: draw test adducted, draw test abducted, apprehension test. | - Significant trauma - Previous glenohumeral dislocation that requires relocation - Previous shoulder surgery - Bony lesion (Bony Bankart, Hill Sachs) or fracture | Laxity: Positive sulcus or drawer test | Non-global (2, inferior) |

MDI

- Labral lesions (SLAP, Labral Bankart)
- Full thickness rotator cuff tears
- Full thickness bicep tear
- Frank labral tears
- Non-correctable volitional instability
- Neurological motor deficit
- Instability due to upper or lower motor neuron lesion
- Ehlers-Danlos or Marfan's syndrome
- Shoulder pain due to cervical dysfunction

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| Watson et al. ⁵⁵ | 2018 | Journal of Shoulder and Elbow Surgery | Level 4 Case series | 43 | Deficits in passive glenohumeral restraints, lack of upward rotation of scapular | Defined as symptomatic inferior instability (sulcus sign) with either or both of anterior and posterior dislocations or subluxations of the glenohumeral joint. Diagnosed based on symptomatic instability in 3 directions, including discomfort, pain, apprehension or guarding during instability tests (sulcus test, anterior and posterior drawer tests in 10' to 30' abduction and during 80' to 120' abduction, and the anterior and posterior apprehension tests) | - Neurologic deficit - Previous shoulder surgery - Diagnosed connective tissue disorder - Predominance of volitional instability - Significant shoulder trauma - Bony, labral or significant tendon lesions on MRI | Inferior Laxity: Positive sulcus test | Global |
| Wichman et al. ⁶⁹ | 1997 | Operative Techniques in | Level 4 Case series | 24 | Not defined | Diagnosed based on positive sulcus sign combined with anterior or posterior instability | - Patients with capsular plication along with | Inferior Laxity: Positive sulcus test | Non-global (2, Inferior) |

MDI

| Sports Medicine | | | | | Bankart lesion repair | | | | |
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| Witney-Lagen et al. ⁶⁷ | 2017 | Journal of Shoulder and Elbow Surgery | Level 4 Case series | 50 | Muscle imbalance, congenital hyperlaxity, repetitive microtrauma, and anatomic factors such as reduced glenoid depth and varied labral and capsular pathology | Diagnostic criteria unclear; patients had symptomatic subluxations or dislocations that reduced spontaneously, positive sulcus sign and external rotation of at least 90° with arm by the side of body, positive apprehension tests and positive examination under anaesthesia and drawer tests in 2 or more directions. | - Labral lesions or SLAP lesion - Voluntary dislocator - Age <16 years | Laxity: Positive sulcus test and >90° external rotation with arm by the side | Non-global (2, inferior) |
| Yeargan et al. ⁵⁶ | 2008 | Orthopedics | Level 4 Case series | 46 | Not defined | Defined as excessive, symptomatic translation in more than one plane that included a component of inferior instability | Nil | Not defined | Non-global (2, inferior) |
| Yoldas et al. ⁶⁸ | 2001 | Journal of Shoulder and Elbow Surgery | Level 2 Prospective cohort study | 43 | Redundant inferior pouch | Defined as symptomatic inferior subluxation or dislocation caused by redundant inferior pouch with symptomatic translation in one or two directions – with inferior translation usually being a major component. | - Voluntary dislocator - Previous shoulder surgery | Not defined | Non-global (1, inferior) |
| Zabinski et al. ⁵⁷ | 1999 | Journal of Shoulder and Elbow Surgery | Level 4 Case series | 20 | Excessive capsular laxity | Diagnostic criteria unclear; MDI consisted of three subtypes of instability: anterior-inferior (type 1), posterior-inferior (type 2), global (type 3). | - Previous unsuccessful arthroscopic shoulder surgery | Ligamentous Laxity: 2 of the following 3 findings present: (i) elbow hyperextension beyond neutral, (ii) index MCPJ hyperextension beyond 90°, (iii) thumb hyperabduction to forearm | Non-global (2, inferior) |