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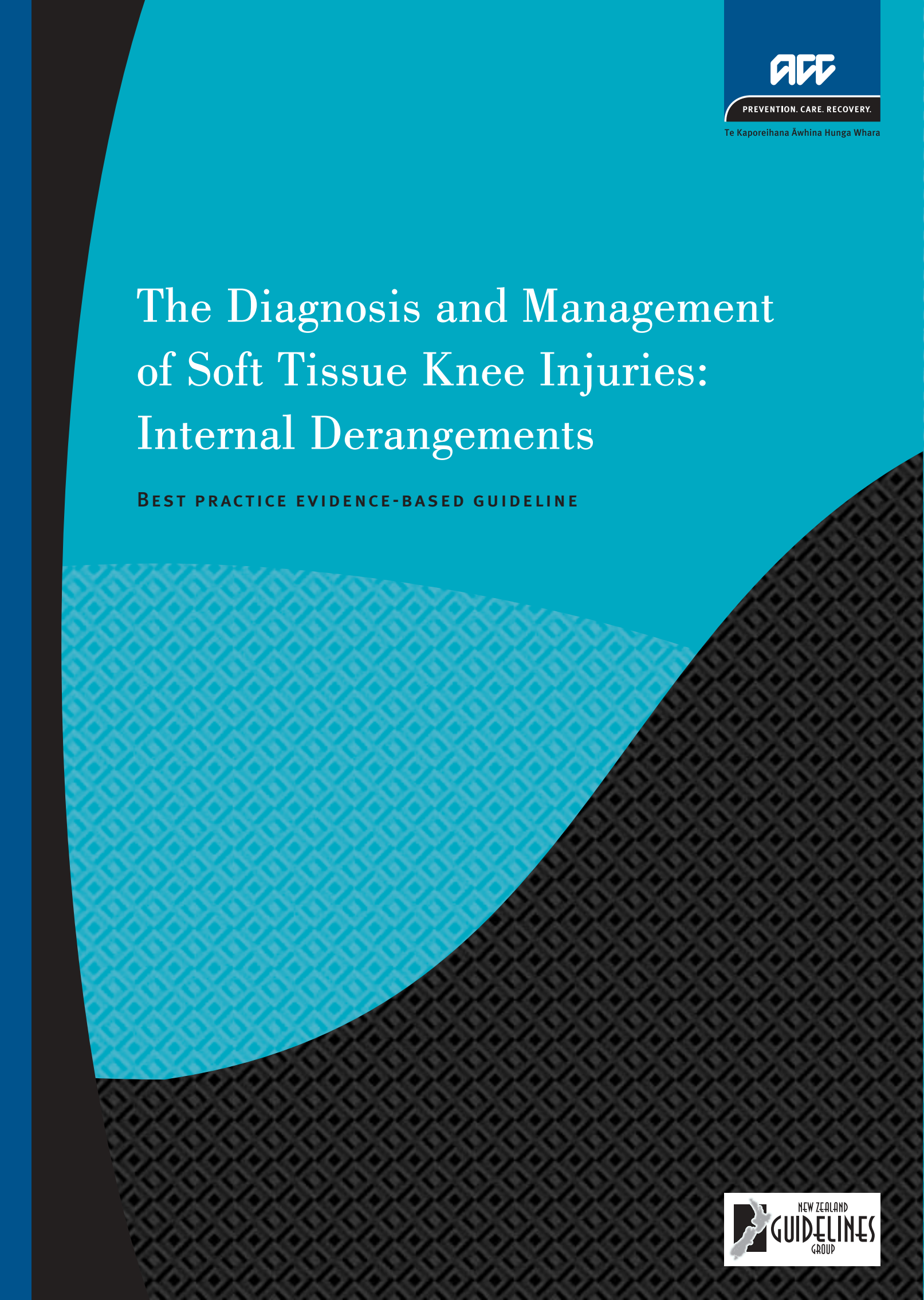
The Diagnosis and Management of Soft Tissue Knee Injuries: Internal Derangements

BEST PRACTICE EVIDENCE-BASED GUIDELINE



NEW ZEALAND GUIDELINES GROUP

Statement of intent

Clinical guidelines are produced to help health professionals and consumers make decisions about health care in specific clinical circumstances. Research has shown that if properly developed, communicated and implemented, guidelines can improve care. The advice on the management of internal derangements of the knee given in this guideline is based on epidemiological and other research evidence, supplemented where necessary by the consensus opinion of the expert development team based on their own experience.

While guidelines represent a statement of best practice based on the latest available evidence (at the time of publishing), they are not intended to replace the health professional's judgment in each individual case.

The guideline is endorsed by:

- **Arthritis New Zealand**
- **EPIQ (Effective Practice, Informatics & Quality Improvement)**
- **New Zealand Society of Physiotherapists Inc**
- **NZ Association of Musculoskeletal Medicine**
- **Royal Australian and New Zealand College of Radiologists**
- **Royal New Zealand College of General Practitioners**
- **Sports Medicine New Zealand Inc**
- **The New Zealand Orthopaedic Association**

Contents

Purpose

The purpose of the guideline is to provide an evidence-based summary of the diagnostic management and treatment options available for internal derangements of the knee to assist health practitioners and consumers make informed decisions to improve health outcomes.

About the guideline

Introduction

The guideline aims to provide the best evidence currently available to assist consumers' primary and secondary care providers in making informed decisions about the diagnosis and management of people with internal derangements of the knee.

The Accident Compensation Corporation (ACC) commissioned and funded the New Zealand Guidelines Group (NZGG) and Effective Practice, Informatics and Quality Improvement (EPIQ) to develop an explicit evidence-based guideline in response to evidence of variation in practice in the diagnosis and management of internal derangements of the knee.

The development of the guideline was led and managed by the EPIQ Group under the auspices of the NZGG. The EPIQ group is based in the School of Population Health in the Faculty of Medical and Health Sciences at the University of Auckland. The centre is a collaboration of academics, clinicians and other health sector professionals, who undertake training, research and development in evidence-based practice, health informatics and quality improvement for the health and disability sector.

The New Zealand Guidelines Group Incorporated is a not-for-profit organisation established to promote effective health and disability services. NZGG facilitates the development and implementation of guidelines across all areas of health care in New Zealand. Guidelines make a contribution to this aim by sharing the latest international studies and interpreting these in a practical way for adoption in the New Zealand setting.

For more information on the NZGG visit www.nzgg.org.nz

Guideline development process

In February of 2002, NZGG convened a multidisciplinary team of professionals and consumers to develop the guideline chaired by Associate Professor Bruce Arroll, MBChB PhD (Dept of General Practice and Primary Health Care, University of Auckland) with Gillian Robb MPH MNZSP (EPIQ, University of Auckland) as full time project manager. Team members were nominated by professional organisations and invited to take part. The team met twice during the year and held a final teleconference to agree on the final draft of the guideline.

At the first meeting of the guideline development team the clinical questions the guideline was to address were decided. A systematic search of the literature was undertaken to identify relevant studies. Inclusion and exclusions criteria are listed in Appendix 2. Individual studies were critically appraised using the Generic Appraisal Tools for Epidemiology (GATE) developed by Professor Rod Jackson, University of Auckland. These are available on the following website: http://www.health.auckland.ac.nz/comhealth/epiq/epiq.htm

Evidence and recommendation grading system

The grading system used for this guideline involves three levels (refer Appendix 1 for further details).

1. Individual studies are each given a level of evidence which reflects the quality of the individual study (refer Appendix 1 for the details). Throughout the guideline, the level of evidence has been included alongside the references. This is formatted as reference[level of evidence].

2. The level of evidence used was based on the Scottish Intercollegiate Guidelines Network (SIGN) Grading system (see Appendix 1). Because this grading system does not include diagnostic tests, we included a separate system for identifying the level of evidence for diagnostic tests.

3. The third step in grading is to consider the whole body of evidence ie, all the studies relevant to the issue, and decide on a recommendation and grade based on all of the individual studies. The guideline development team agreed on the recommendations using the 'Considered Judgment' Form. The Considered Judgment Form and Evidence Tables are available at NZGG's website (www.nzgg.or.nz - click on 'Guidelines', then title of Guideline, then 'Supporting Materials').

Grades of recommendations

The grades A to I are a measure of the strength of evidence underlying the recommendations and should not be construed as an indication of the relative importance of the recommendations.

In this guideline, Grade C refers to recommendations which were developed by the considerable expertise of the multidisciplinary team. Expert opinion has only been cited where there was no higher level of evidence.

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Declarations of competing interests

Members of the guideline team who are in clinical practice receive payments from ACC for the diagnosis and management of ACC claimants with knee injuries. This is not considered a competing interest.

John Matheson is involved with the Highlanders' Franchise.

Peter McNair undertakes educational talks and seminars for Workscience Ltd and sells equipment used for the rehabilitation of muscles following injury.

Peter Gendall is a minority shareholder in Manukau Radiology Institute Ltd and in Mercy MRI Ltd. He is also an employee of Mercy Radiology Group and a contractor to Manukau Radiology Institute Ltd.

Russell Tregonning has received funding from Zimmer (NZ) and Bionet (NZ) for attendance at symposiums.

No other competing interests were declared.

Consultation

A draft guideline was widely circulated to consumer, primary health care organisations, professional colleges and organisations, expert reviewers, and other clinicians for peer review and modified as a result of their feedback.

- Andrew Orange, MIPA
- Ashley Bloomfield, Ministry of Health
- Chris Ngar, Lakes District Health Board
- Duncan Reid, School of Physiotherapy, Auckland University of Technology
- Fiona Corbin, Progressive Health Inc
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- Physiotherapy Department, Healthcare Otago
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- Rob Cook, Heart Foundation

- Russell Tregonning, Bowen Hospital
- S Kara, ProCare
- Terry Johnson, Whanganui District Health Board
- Tracey Bourner, NZ Register of Acupuncturists Inc

Acknowledgements

The guideline team would like to thank the members of the EPIQ group for their advice and guidance during the development of the guideline. Thanks are also due to the NZGG team for their support, and for co-ordinating production of the guideline.

Updates

The guideline will be reviewed and updated every five years. NZGG will appoint an appropriate person to carry out the review and will seek funding for this process from ACC. A comprehensive literature search will be completed to identify any new evidence. Any changes made to the guideline will be circulated to relevant people and organisations for review and agreement. Agreed changes will be widely circulated to relevant health practitioner individuals and groups.

Key messages

Diagnosis

- A thorough and detailed history is important in establishing the diagnosis.
- Aspiration is beneficial for a severe haemarthrosis but is generally not indicated for diagnostic purposes.

Use of X-ray

- The Ottawa Knee Rules provide a guide to indicate if an X-ray is required.
- People with a haemarthrosis should be X-rayed to exclude fractures.

Initial management/referral

- Urgent referral to an orthopaedic surgeon is required for people with red flags, symptoms of serious pathology, severe soft tissue disruption and a significant fracture.
- Early specialist referral is recommended for people with a suspected injury to the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL) or posterolateral complex. Rehabilitation with a recognised provider is required for a person with these injuries until they are seen by a specialist. Early specialist referral is also required for a locked knee due to suspected meniscal entrapment, or where the diagnosis is in doubt.
- People with mild knee injury (no apparent ligament laxity or meniscal damage) should be treated with R.I.C.E. (rest, ice, compression, elevation), and paracetamol if required and avoid H.A.R.M. (heat, alcohol, running, massage) in first 72 hours hours. Activities should be gradually resumed as pain and swelling settle, with follow-up after 7 days if symptoms persist.
- People with a suspected meniscal tear should be referred for a trial of rehabilitation for 6-8 weeks, and if symptoms persist, referred to a specialist
- Bracing is generally not required, but is appropriate for an acute rupture of the medial collateral ligament tear (MCL) until knee stability has been achieved in 4-6 weeks.
- People should be provided with information about knee injuries and treatment options in the appropriate language, if possible.

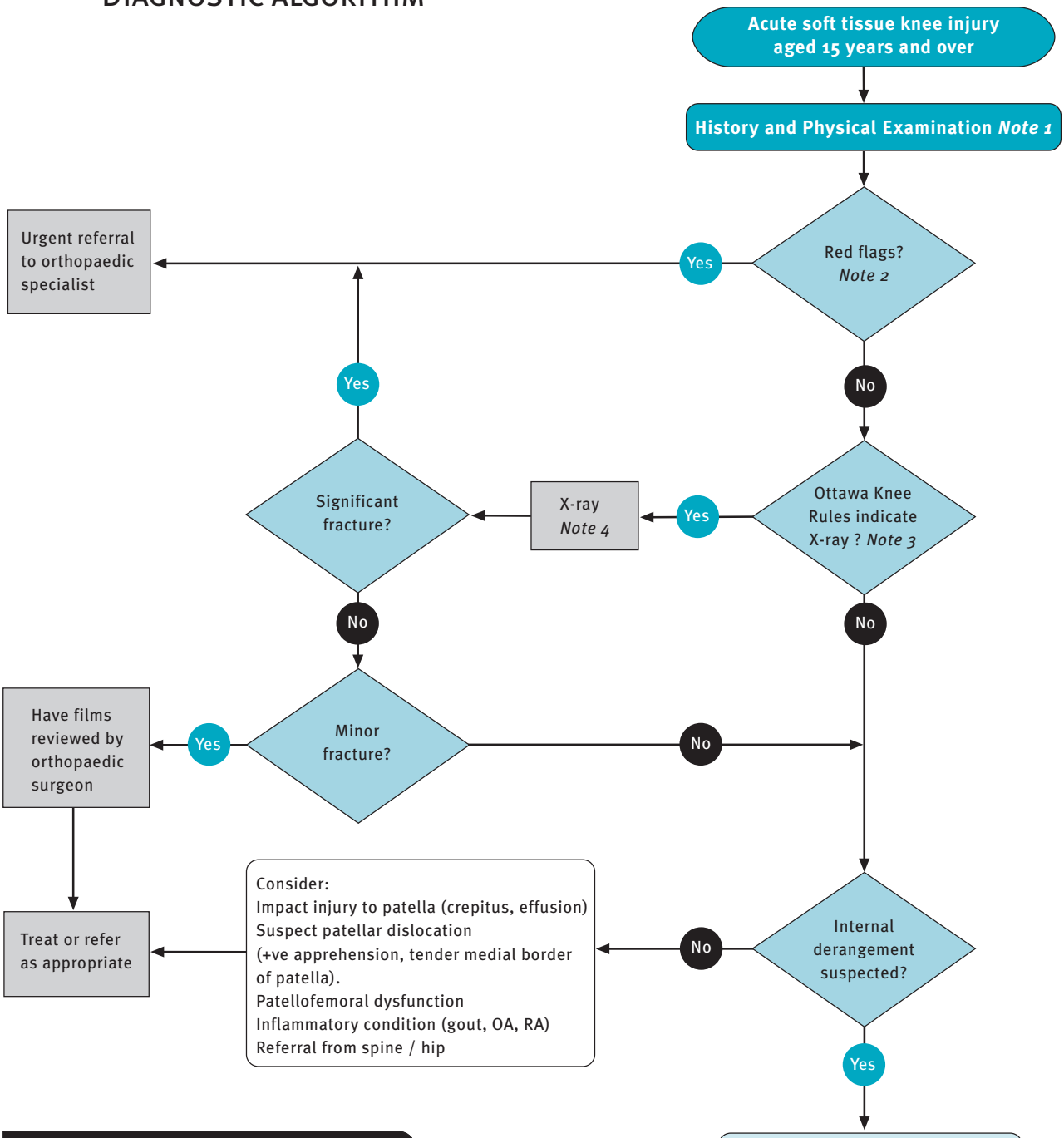
Rehabilitation

- Rehabilitation should focus on functional treatment rather than electrotherapy modalities.
- Referral to a specialist is appropriate at any stage if pain, swelling, recurrent locking or instability persist; if symptoms interfere with the ability to work; or if clinical milestones are not achieved.

Post-operative management

- There is evidence that bracing in the immediate post-operative period following ACL reconstruction is not effective.
- Rehabilitation is recommended following ligament reconstruction and repair, but is not advocated following meniscectomy unless functional limitations are identified.

Diagnostic algorithm

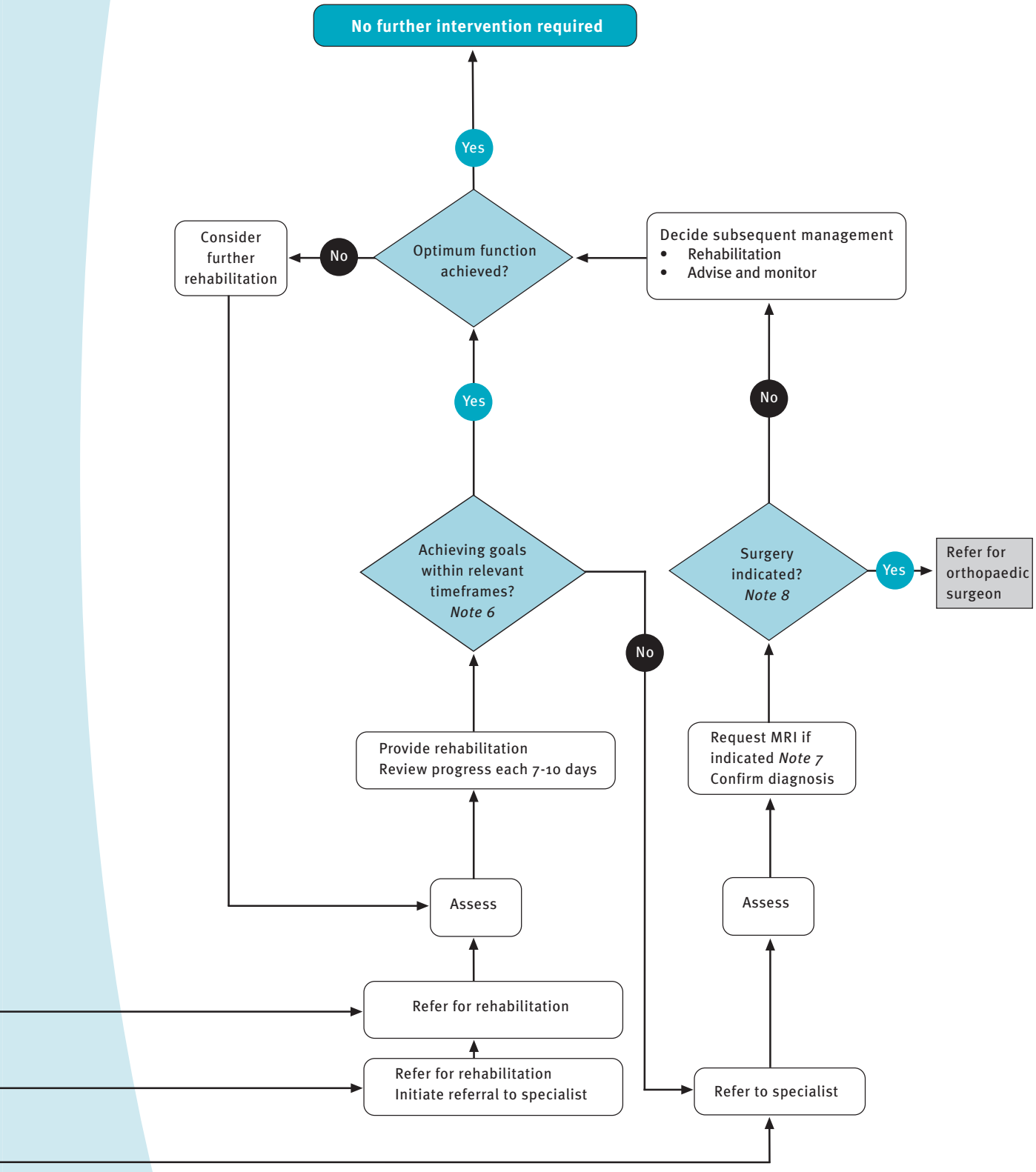


Key:

ACL	Anterior cruciate ligament
MCL	Medial collateral ligament
PCL	Posterior cruciate ligament
MVA	Motor vehicle accident
WB	Weight Bearing
ED	Emergency Department
Dx	Diagnosis
SLR	Straight leg raising
AP	Anteroposterior
R.I.C.E	Rest, Ice, Compression, Elevation
FWB	Full weight bearing
OA	Osteoarthritis
RA	Rheumatoid arthritis

See notes page 14

Management algorithm



Note 1: History and physical examination

Significant History

- Mechanism of injury
- Inability to weight bear at time of injury
- Onset of swelling (extent and time frame)
- Sense of disruption / audible pop
- Locking, catching, instability
- Previous episodes, management and results
- General health / other illnesses

Significant Clinical Examination

- Swelling, bruising, abrasions, scars
- Inability to extend knee or flex knee >90˚
- Appropriate clinical tests
- Multidirectional instability

Note 2: Red Flags

- Neurovascular damage, (high velocity injury, absent pulses, foot drop, multiple plane laxity)
- Extensor mechanism rupture (unable to actively SLR; palpable gap; change in height of patella)
- Infection (fever, severe pain, Hx drug abuse)
- Bleeding disorders (Haemophilia)
- Possibility of cancer (previous Hx of tumour, persistent severe pain, night pain)

Note 3: Ottawa Knee Rules

X-ray if any of:

- Age 55+
- Tender head fibula
- Isolated tenderness patella
- Inability to flex > 90˚
- Inability to bear weight (4 steps) at time of injury and in the examination

Note 4: X-ray

- Standard AP with slightly flexed knee
- Horizontal across table lateral with slightly flexed knee
- AP oblique if strong suspicion of fracture not confirmed on previous views
- Skyline patellar views when patellar instability or impact injury to patella clinically suspected

Note 5: Initial Treatment (first 72 hours)

- R.I.C.E.
- Paracetamol
- Aspiration if necessary
- Bracing (MCL only)

Note 6: Rehabilitation (ACL)

Non-operative Management Goals

- Regain joint motion and muscle strength, educate and motivate, return to work and sport, advise on activity modification if appropriate

Pre-operative Rehabilitation Goals

- Initiate rehabilitation process prior to surgery, familiarise the patient with post-operative treatment methods to gain joint motion and muscle strength, Aim for full knee extension and at least 120˚ flexion

Post-operative Rehabilitation Goals

- As for non-operative management, achieve clinical milestones within appropriate timeframes:

Suggested Clinical Milestones:

Acute Phase (1-3 weeks) - Full passive knee extension, 90-100˚ flexion, SLR, FWB /normal gait Intermediate Phase (weeks 4–12) – Full flexion within 8 weeks, 75-80% isometric quads strength, open kinetic chain limited to between 45-90˚ (refer to text) Functional Training (4-6 months) – Return to sport 6-9 months (85-90% isometric or isokinetic quads strength)

NB:

1. Rehabilitation is not usually indicated following arthroscopic menisectomy. Follow surgeon's rehabilitation protocol for meniscal repairs and other ligament reconstructions or repairs
2. Review progress each 10-14 days. If not achieving goals within relevant timeframe refer to specialist

Note 7: Indications Imaging MRI

- MRI should generally be used ahead of diagnostic arthroscopy
- MRI is useful when the clinical diagnosis of meniscal tear or ACL tear is difficult or in doubt
- MRI is useful for showing the true extent of a multiligament injury complex
- Atypical pain or unusual circumstances

Note 8: Indications for surgery for people >30

ACL reconstruction

- Consider age, occupation, level of instability, level of disability
- Where modifying activity is not a viable option
- Disability and functional instability following appropriate rehabilitation

Meniscal Tears

- Disabling pain, catching and locking
- Meniscal re-attachment in younger patients

Loose body / other

- History of mechanical symptoms
- Not all radio-opacities are loose bodies: repeat X-rays are useful to see if they have moved

Diagnostic Arthroscopy

- Equivocal MRI scan
- Otherwise undiagnosed but disabling symptoms

Background

Participation in sport and recreation has been widely encouraged for all age groups for the substantial public health benefits.[1] However, while this may have reduced the burden of cardiovascular disease by improving risk factors, it is 'wreaking havoc with knees worldwide'.[2] Acute knee injuries have been described as an 'epidemic' by some.[2-4]

In New Zealand, figures based on annual report data from ACC for the year 2000/2001 show that there were over 75,000 new claims for soft tissue injuries of the knee, ranking third after low back (94,000) and ankle injuries (82,000). The cost of new claims was highest for knees representing nearly 20% of the total cost for new soft tissue injury claims.

The knee joint is a complex weight-bearing joint situated between the ends of the longest levers in the body with little bony congruence. It is subject to extremely high forces during sport and some occupational activities and its supporting soft tissue are therefore vulnerable to injury. Injuries frequently involve either the ligaments or cartilages, or both. Depending on the severity of the injury, they can result in significant on-going disability at considerable cost both to the individual in terms of quality of life, and to ACC and society as a whole.

The focus of this guideline is on those injuries commonly referred to as internal derangements of the knee. These include injuries to the major knee ligaments (the anterior and posterior cruciate ligaments, the medial and lateral collateral ligaments) and the medial and lateral menisci.

Brief anatomy

Medial and lateral collateral ligaments

The medial collateral ligament (MCL) and the lateral collateral ligaments (LCL) are located each side of the knee and are the primary static stabilisers limiting side to side motion. The deep fibres of the medial ligament form part of the middle third of the capsule and are firmly attached to the peripheral rim of the meniscus. The lateral ligament has no attachment to the lateral meniscus and is considered part of the posterolateral complex of the knee.[5]

Cruciate ligaments

The anterior cruciate ligament and posterior cruciate ligament (PCL) are strong ligaments inside the knee joint, which cross over each other. They prevent anterior translation (ACL) and posterior translation (PCL) of the tibia on the femur. Both cruciate ligaments are comprised of a continuum of bundles of fibres, some of which are taut in all ranges of knee flexion and extension.

Medial and lateral menisci

Each meniscus is a semi-lunar shaped fibro-cartilage disc located between the femur and tibia. The medial meniscus is firmly attached around its periphery to the joint capsule and deep fibres of the medial ligament. The lateral meniscus has no attachments to the capsule of the lateral ligament and is considerably more mobile.

Each has a thicker convex periphery of which about 20-30% of the medial meniscus and 10-25% of the lateral meniscus is vascularised in the adult knee.[6 7]

The menisci play an important role in knee function, particularly with regard to load transmission, stability, shock absorption, and joint lubrication.[6 8 9] Injury increases the risk of early onset degenerative change in the articular cartilage.[8 10] It is therefore important to preserve the menisci as much as possible by repairing the meniscus where possible, or only removing what is necessary.[9]

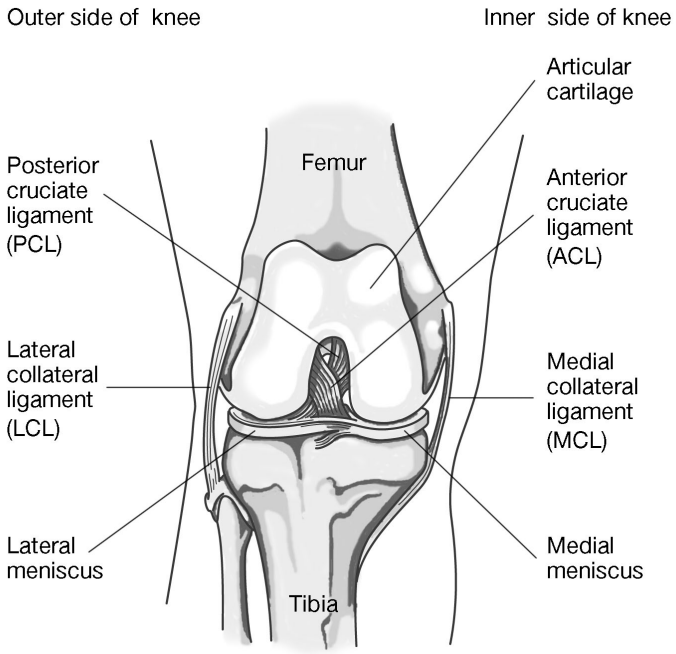
The posterolateral complex

The anatomy of the posterolateral aspect of the knee is complex and can be quite variable.[11 12] This is further complicated by the fact that terminology used to describe these injuries is inconsistent.

The major structures which comprise the posterolateral complex of the knee include the iliotibial tract, lateral ligament, popliteus complex, popliteofibular ligament, middle third of the lateral capsular ligament, fabellofibular ligament, arcuate ligament, posterior horn of the lateral meniscus, lateral coronary ligament, posterior lateral part of the joint capsule.[11]

The posterolateral complex contributes to both the static and dynamic stability of the knee.[13]

Figure 1: Anatomy of the knee: Anterior view



Source: 'Your Orthopedic Connection'. Patient Education Website of the American Academy of Orthopedic Surgeons. Copyright June 2000. Used with permission.

General diagnosis

Introduction

A thorough history and careful clinical examination provide most of the information required to diagnose a soft tissue knee injury. Clinicians should be familiar with typical mechanisms of injury and presenting signs and symptoms for each diagnosis. (See Specific Diagnoses, page 25) At this stage it is also important to be alert to the potential for red flags and fractures (page 18).

Clinical tests commonly used for the diagnosis of soft tissue knee injuries are most useful for confirming a diagnosis in the context of an appropriate history. They provide little information when used in isolation, or in the absence of an appropriate history.

Investigations for soft tissue knee injuries primarily include plain films and possibly also MRI. Plain films are seldom necessary, other than to exclude fractures, but they do show the presence of effusion and other soft tissue features (eg, change in patellar height) that might be useful in diagnosis. Diagnostic arthroscopy should only be considered in unusual circumstances where clinical evaluation and imaging have failed to provide sufficient information in the face of continuing pain, swelling and loss of function.

Laxity and instability

It is useful at this stage to distinguish between mechanical laxity and functional instability in the knee joint.

- Mechanical laxity refers to an excess in the range of movement in the joint due to loss of integrity of the ligaments and other soft tissues which contribute to joint stability.

- Functional instability refers to a 'sense of instability' or 'giving out' of the joint experienced by the person in the course of their usual activities. It may or may not be associated with mechanical laxity.[15 16][4]

Grading of ligament injuries

Ligament injuries are commonly graded according to the severity of the injury.

- Grade I: A grade I ligament injury has no increased laxity and there is a firm end-point in testing. There is pain and tenderness over the course of the ligament, but no actual disruption of fibres has occurred.

- Grade II: Grade II ligament injuries involve some disruption of the fibres. There is some increased laxity compared with the other knee, but still a firm end-point on testing. There is usually pain and tenderness over the course of the ligament.

- Grade III: Grade III ligament injuries involve a complete rupture of the ligament with gross laxity and a 'mushy' end feel, or no end feel on testing. There may not be any tenderness over the ligament because there are no 'intact' fibres to stress while testing.

Red flags

Red flags are signs and symptoms that alert the clinician that more serious pathology may exist, and usually require urgent referral to an orthopaedic surgeon. These include neurovascular damage, extensor mechanism disruption, septic arthritis, bleeding disorders and suspicion of cancer.

Neurovascular damage

In people with a suspected knee dislocation, a thorough neurovascular examination is essential. These injuries are uncommon, but not rare, and should be suspected in injuries involving multiple ligaments, where relocation may have occurred spontaneously.[17][4] The popliteal artery is most vulnerable with a posterior knee dislocation, but damage from overstretching can occur with an anterior dislocation. If artery flow is not restored in 6-8 hours, amputation may need to be undertaken.[12 17]

Absence or asymmetry of pedal pulses requires urgent vascular surgery assessment. Intimal tears of the artery may not present with abnormal physical findings, and clinicians need to monitor these injuries carefully for any signs of deterioration.[12][4] Clinicians should also be alert to the possible development of acute compartment syndrome which may develop in the days following injury, and for signs of deep vein thrombosis.[17] [4]In order to exclude occult vascular injury many units will perform lower limb angiograms in all people who have had a knee dislocation.

It has been reported that 15% of people with posterolateral injuries also have a common peroneal nerve injury.[17][4] Questions about tingling, numbness and weakness in the lower leg and foot are therefore important in the initial evaluation. Sensory and motor function of both the common peroneal and tibial nerves should be evaluated carefully. Gradual loss of sensory function may be associated with a developing compartment syndrome.[17][4]

Extensor mechanism disruption

Inability to actively straight leg raise, a palpable gap in the extensor mechanism and a change in patella height are the classic signs associated with a rupture of the extensor mechanism. This injury is typically the result of a fall, and the person is usually unable to weight bear. [4]

Septic arthritis

The cardinal signs of infection include fever, swelling, redness and heat. There is usually difficulty moving the knee, associated with significant pain. Systemic symptoms such as nausea, vomiting and loss of appetite may also be associated with a joint sepsis. [4]

Infection is most likely to occur in children, in close temporal relationship with cutaneous staphylococcal infection ('school sores') or associated with penetrating and infected soft tissue injury in any age group. The possibility of minimally symptomatic and fulminant infection must be kept in mind in immuno-compromised people, for example people with rheumatoid

arthritis, diabetes and particularly those on corticosteroid therapy. Infection should also be considered after knee surgery. [4]

Bleeding disorders

People with known bleeding disorders or on anti-coagulation medication should be referred for both orthopaedic and haematological evaluation.[4]

Suspicion of cancer

The possibility of cancer should be considered in people presenting with moderate or severe unremitting pain or atypical symptoms with no history of a traumatic event to the knee injury. Associated systemic symptoms such as weight loss and malaise may also be present.[4]

Excluding fractures

In other countries, it has been estimated that up to 85-90% of people presenting with acute knee injuries undergo radiography, and yet the incidence of fracture in these injuries is between 6-12 %, resulting in many unnecessary X-rays. [18 19] In New Zealand, about 30% of people with soft tissue injuries of the knee have a knee X-ray. (ACC claims data 1999/2000)

A number of clinical decision rules to exclude fractures in soft tissue knee injuries have been developed,[18-22] but only the Ottawa Knee Rules meet the criteria for 'level 1' evidence.[23]

The Ottawa Knee Rules

A knee X-ray series to exclude fracture is only required for acute knee injury people with any one or more of the following findings:

- Aged 55 or older and/or
- Tenderness at the head of the fibula and/or
- Isolated tenderness of the patella and/or
- Inability to flex knee to 90 degrees and/or
- Inability to walk four weight-bearing steps at time of injury and at examination

A haemarthrosis is associated with a high degree of intra-articular pathology including osteochondral fracture which involves a breach of the articular cartilage and underlying subchondral bone.[4] All people with knee injuries who present with a tense haemarthrosis should be X-rayed to exclude fracture.[4]

People with significant fractures should be referred immediately to an orthopaedic surgeon. For people with a minor undisplaced fracture, orthopaedic surgeons need to review the films only. [4]

The routine use of X-rays

The routine use of X-rays has been questioned. With increasing costs of health care, the cost-effectiveness of this practice should be evaluated.

Diagnostic tests should be used in response to a clinical question that the test is supposed to answer.[24] The types of clinical questions may relate to:

- detecting or excluding disorders
- contributing to decisions about further management
- assessing prognosis
- monitoring progress.[24]

For example, X-rays may be indicated for people where bone density may be compromised following prolonged course of corticosteroids, past history of anorexia, and premature menopause. [4]

Recommendations	
A	The Ottawa Knee Rules should be applied in the evaluation of acute knee injuries to assist clinicians in making decisions about the need for radiography to exclude fractures.
C	People with a haemarthrosis should be X-rayed to exclude fractures.
C	People with significant fractures should be referred immediately to an orthopaedic surgeon. For people with a minor undisplaced fracture, orthopaedic surgeons need to review the films only.
C	The routine use of X-rays is generally not recommended

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Initial management/referral

Both the nature and extent of the injury, as well as the practitioner's training and experience determine the need for referral.[25] Where there is uncertainty about a diagnosis and a suspicion of either meniscal or ligament damage, referral to a specialist is appropriate to clarify the diagnosis and to ensure appropriate management is initiated. Access to appropriate specialists is also a factor influencing decisions about referral.

Severe injuries (multiple structures involved)

Severe soft tissue injuries usually involve a combination of injuries to the ligaments, cartilages and other soft tissues. Significant severe swelling (probably haemarthrosis) and multidirectional instability on clinical testing is suggestive of a severe injury. People with these injuries should be referred for immediate evaluation by an orthopaedic surgeon.

The presence of a significant fracture on X-ray is also an indication for immediate referral to an orthopaedic surgeon. A minor or undisplaced fracture does not necessarily require referral to an orthopaedic surgeon, but the films should be reviewed by the surgeon to ensure subsequent planned management is appropriate.[4]

Mild injuries (no ligament laxity or meniscal injury detected)

Typically these injuries present with mild swelling, some discomfort on moving the knee, but no evidence of meniscal or ligament laxity on clinical testing.

People with a mild knee injury should be able to manage their injury at home with advice about the application of R.I.C.E and a simple analgesia such as paracetamol. They can be advised to resume activity gradually when pain and swelling have settled, for example, using an exercycle starting with 3-5 minutes and building to 20-30 minutes over a two-week period. Alternatively, swimming can be recommended, but breaststroke can aggravate symptoms and should be avoided. People with a mild knee injury should be advised to return for follow up if symptoms do not begin to settle within one week.

Injuries to the ACL, PCL and posterolateral complex

Injuries to the anterior cruciate ligament (ACL), posterior cruciate ligament (PCL) and posterolateral complex are difficult to diagnose and are frequently missed in primary care.[26] Early referral to a specialist (refer next page) to clarify the diagnosis and discuss treatment options is therefore important and a definitive diagnosis should be made within 2-4 weeks.

People with these types of injuries should be warned about the seriousness of the injury and that surgery to stabilise the knee may be necessary to reduce the likelihood of subsequent meniscal damage due to recurrent episodes of giving way.

People with these types of injuries can be referred for rehabilitation to manage the symptoms, give advice and initiate appropriate functional treatment until seen by the specialist.

Injuries to the MCL

People with severe grade II (partial tear) or grade III (rupture) injuries of the medial collateral ligament tear (MCL) should be supplied with a simple brace for 4-6 weeks to stabilise the knee while healing takes place. Rehabilitation can be initiated within the first week to manage the acute symptoms and to progress on to more active functional treatment as appropriate.

Meniscal injuries

The management of people with meniscal tears varies. Where functional limitations have been identified, a trial of rehabilitation for 6-8 weeks is appropriate. If symptoms persist and interfere with the ability to return to work, earlier referral to a specialist is appropriate. A person with a locked knee due to suspected meniscal entrapment should be referred to a specialist for review.

To whom to refer

For people needing further evaluation or management there are a number of specialist groups to whom people can be referred.

Orthopaedic surgeons

Orthopaedic surgeons provide expertise in the diagnosis and management of disorders of the knee. In addition to requesting specific diagnostic tests, injecting joints and prescribing appropriate medication, they also evaluate the need for surgery and carry out any necessary surgical procedures.

Sports physicians and musculoskeletal physicians

Sports physicians and musculoskeletal physicians provide a wide range of conservative options, including clarification on diagnosis and advice about rehabilitation. They are able to request specific diagnostic tests such as MRI that can assist decisions about subsequent management. They provide expertise in pain management and are able to inject joints or prescribe medication where necessary.

Physiotherapists or other recognised rehabilitation treatment providers

Physiotherapists have traditionally been recognised as the profession that provides rehabilitation services for musculoskeletal injuries; however osteopaths are also trained in the management of musculoskeletal injuries and funded by ACC to provide services.

While there is an absence of evidence for the osteopathic management of knee injuries specifically, those studies relating to the physiotherapy have been of insufficient quality to establish the effectiveness of the various methods used by physiotherapists.[27] An absence of evidence or a lack of good quality evidence does not mean there is no benefit from treatment, and there is a consensus from expert opinion that rehabilitation for people with identified functional limitations improves their outcomes.

Treatment providers with experience in the management of knee injuries are able to assess impairments, loss of function and disability and supervise an appropriate rehabilitation programme.

Recommendations	
C	People with no evidence of ligament laxity or meniscal damage should be treated with R.I.C.E., paracetamol if required and advised to resume usual activities when pain and swelling have settled, and return for follow-up if symptoms persist after 7 days.
C	Urgent referral to an orthopaedic surgeon is required for people with: • red flag signs and symptoms • severe knee injuries • significant fracture on X-ray.
C	Early referral to a specialist is recommended for people with: • injury to the ACL, PCL or posterolateral complex • a locked knee due to suspected meniscal entrapment • equivocal diagnosis.
C	Subsequent referral to a specialist for people : • with a suspected meniscal tear if symptoms persist after a trial of rehabilitation for 6-8 weeks • at any stage of the rehabilitation process where symptoms persist and clinical milestones are not being achieved.
C	Referral for rehabilitation is recommended for people with: • suspected meniscal tears • injuries to the MCL • other ligament injuries to manage symptoms until seen by a specialist.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Imaging

Magnetic Resonance Imaging (MRI) is now widely accepted as the diagnostic examination of choice in the knee and has to a large extent replaced diagnostic arthroscopy. It has been shown in good quality studies, to have a reasonable level of accuracy in the diagnosis of meniscal and ligament injuries of the knee.[28-34] [D++]

MRI is sensitive in detecting tears of the MCL, but may not differentiate between the different grades of injury.[35][D+] Because the current trend for MCL injuries is toward non-operative management, MRI is of little practical value in evaluating collateral ligament tears unless clinical examination suggests multiple structures are involved.[36][4]

Identification of meniscal tears is one of the most common indications for MRI of the knee. Its accuracy in identifying the size and location of most meniscal tears and its ability to identify the presence of associated damage to ligaments and articular cartilage are well documented. [37][4][38](4) [39][4] MRI has not yet been shown to predict the repairability of meniscal tears and peripheral tears.[7][4]

Although many studies have confirmed the validity of MRI for the diagnosis of ACL injuries, the advantage of MRI over clinical evaluation remains unclear. It is, however, the ability of MRI to simultaneously evaluate all intra and extra articular structures that defines its major advantage for ACL injuries. [39][4] MRI does not always differentiate reliably between partial and complete ACL tears. Partial tears represent between 10 – 28% of all injuries and because the clinical examination is also inaccurate for partial tears, there remains a 'diagnostic gap'.[39][4][40][4]

The primary value of MRI in the diagnosis of acute grade III PCL injuries is to identify additional injuries, particularly to the structures comprising the posterolateral complex. [41][4][42][4] Information from MRI must be closely correlated with the clinical picture and physical examination to ensure an accurate diagnosis.[42][4]

In people with chronic posterolateral knee ligament injuries, MRI can identify these injuries with reasonable accuracy, but further work is needed to address the appearance of individual structures on MRI, given the complex and variable anatomy of this region.[43][4][40][4]

Despite the many benefits of MRI, however, some pitfalls have been described resulting in both false positive and false negative MRI findings. [39][4] Findings should therefore be interpreted within the context of the presenting clinical history and findings.

Many knee injuries can be assessed without the need for this expensive investigation. Where there is an equivocal diagnosis however, MRI may be very useful to clarify the diagnosis and aid management. [4]

Recommendation	
C	MRI may be considered by specialists where further information is required to make a diagnosis and decide appropriate subsequent management.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

For ease of description, we have highlighted the features associated with injuries to isolated structures. Practitioners will be aware that diagnosis can be complex given that many injuries involve multiple structures with varying degrees of severity.

Medial collateral ligament

All grades of injury to the MCL ligament can heal spontaneously and result in excellent knee function.[44] Long term follow up of ten years suggests that these people continue to participate in sport with minimal loss of function in the knee joint and few osteoarthritic changes.[45 46]

Epidemiology

The medial collateral ligament (MCL) is one of the most commonly injured structures of the knee joint.[47] Injuries can be isolated, but complete ruptures of the MCL frequently occur in association with injuries to the ACL.[48]

History

Injury is generally sustained with a direct blow to the lateral aspect of the knee applying a valgus stress to the joint. Depending on the position of the knee, and magnitude of the force, damage to the cruciate ligaments and menisci may also occur.[49][4] A twisting indirect mechanism may also cause MCL disruption where valgus and tibial external rotation are involved in the injury. [4]

Physical examination

The characteristic laxity caused by injury to the MCL is opening of the medial joint space. These injuries are more accurately diagnosed 24 hours after injury.[50][3] Tenderness along the course of the MCL is suggestive of MCL injury. It is important to rule out an associated ACL or PCL tear as this will alter subsequent management.

Clinical tests

Abduction Stress Test

Laxity at 30° suggests a partial or complete tear of the MCL. Abnormal medial opening in full extension on valgus testing (abduction stress test) indicates medial capsular laxity, posterior capsular laxity and possible involvement of the ACL and PCL. [4]

Recommendations	
C	A positive valgus stress test performed in extension and 30 degrees of flexion is reasonably accurate in the diagnosis of an MCL tear.
C	Tenderness along the course of the MCL is suggestive of MCL injury.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Medial and lateral meniscus

Because the menisci are integral components of normal knee function, every effort is made to preserve as much of the meniscus as possible to minimise the development of degenerative changes in the knee joint.[7] [4][51][4]

Epidemiology

While ligaments account for most injuries to the knee, meniscal tears are also common, occurring most frequently in soccer, football, basketball and baseball.[6 52 53]

Because the medial meniscus is less mobile, it is injured more frequently than the lateral meniscus, outnumbering lateral meniscus tears 2:1 to 5:1.[54] It has been reported that meniscal injuries occur in about two thirds of knees with an acute ACL tear, and this may be higher in chronic ACL deficient knees due to mechanical stresses placed on the medial meniscus with repeated giving way. [55]

History

Meniscal injuries result from either acceleration or deceleration typically associated with flexion, tibial rotation and compression components causing a shear stress across the meniscus.[56][4] For younger people, the types of movement typically associated with meniscal injuries include twisting, squatting or cutting manoeuvres. For middle-aged and older people, injury can occur with more trivial movements.[54][4]

Critical aspects of the history for meniscal injuries include the mechanism of injury, catching, locking, pain and swelling.[8][4] Locking is commonly associated with a meniscal tear and has been defined as 'an acute block to extension with some flexion possible'[57][3] Locking however, can also be associated with anterior cruciate ligament tears, loose bodies, degenerative changes and muscle spasm. [8][4]

A history of a squatting or twisting injury, associated with joint line tenderness, an effusion and loss of extension are strongly suggestive of a meniscal tear.[4]

Physical Examination

While some meniscal lesions can be managed non-operatively, it is important to be able to identify those lesions that may need surgery and should therefore be referred early for specialist opinion.[58][DSR+]

Tests specific to the diagnosis of meniscal injuries and commonly described include the McMurray test, the Apley Grind test, joint line tenderness and loss of end range extension. Clinical tests (eg, lack of full extension and McMurray's test) are more reliable after about six weeks when the acute phase is over.[4]

A history of definite injury, joint line tenderness and the presence of an effusion were found to be significant predictors of a mechanical cause of locking.[59] People presenting with an

acutely locked knee due to a mechanical cause should be referred for orthopaedic evaluation and possible therapeutic arthroscopy.[57 59 60][3] Some people with apparent locking resolve spontaneously over time and for these people where a mechanical cause is not suspected, 'watchful waiting' may be the appropriate management in the first instance.[4]

Clinical tests

McMurray Test

This is the most commonly described test for the diagnosis of meniscal tears; however, at least seven interpretations of the test have been described. The most common variation is the inclusion of a valgus and varus force, not described in the original description of the test.[14][4]

A number of studies were located which evaluated the McMurray test as part of the clinical examination.[61-66] Only one of these met the inclusion criteria for the guideline, and suggested that the McMurray test was neither sensitive nor specific in the diagnosis of meniscal injuries, but that 'the weight of McMurray's test should be added to that of other clinical manoeuvres'.[61][D++]

Joint Line Tenderness

It has been reported that localised tenderness along the joint line is probably the most important finding with a meniscal tear.[53][4] Joint line tenderness, however, is common to other knee pathologies and may not necessarily discriminate a meniscal tear from other pathologies.[65][D-] In particular, anterior joint line tenderness is uncommon in meniscal tears (except with displaced bucket-handle tears).[4]

Specific joint line tenderness palpated in the posterior part of the joint may be useful given that 81% of meniscal tears are located posteriorly.[54][4] However, a common lateral meniscal tear occurs in the middle third (parrot beak tear). [4]

Loss of End Range of Extension

A displaced meniscal tear commonly presents with a loss of end range extension. It should be distinguished from the flexion deformity temporarily caused by hamstring spasm soon after a significant injury, or acute ACL tear.[4]

Apley Grind/Compression Test

No studies were located which evaluated the performance of the Apley Grind test in acute knee injuries. Expert opinion suggests that the Apley grind is of little clinical value in making a diagnosis of a meniscal injury. [4]

Recommendation	
C	In the context of an appropriate history the McMurray test, well localised joint line tenderness, and a block to end range extension, may have some additional diagnostic significance.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Anterior cruciate ligament

An anterior cruciate ligament injury is a serious injury and potentially disabling.[26] Disability may either be in the form of symptomatic instability limiting the degree to which people can participate in pivoting and jumping sports, or it may predispose the person to degenerative joint disease, particularly if there are associated meniscal tears.[67]

For many people conservative management leads to good functional outcomes in 3-6 months, but for people involved in occupations where activity modification is not appropriate, or in those who do not want to give up pivoting or jumping sports, surgical reconstruction may be the most appropriate management. Depending on the initial severity of the injury and the age and activity level of the person, good functional outcomes can be expected for most people in 6-9 months.[68]

Epidemiology

The anterior cruciate ligament is most commonly injured by people in the 15-25 age group who participate in pivoting sports. [52 69] In New Zealand, these injuries commonly occur as a result of participating in rugby, netball and basketball, soccer and skiing. [4]

Haemarthrosis is associated with a partial or complete tear of the ACL in about 70-80% of cases.[55 70-74] Meniscal tears present in 70-75% of all acute ACL injuries, and it has been reported that damage to the articular cartilage occurs in 46% of ACL injuries, MCL injury in 24% and occult bone injuries in 56 – 85% of people with complete tears.[70 75 76]

Anterior cruciate ligament injuries are 2-8 times higher in women than in men participating in the same sports.[77]Risk factors for women are multifactorial. Intrinsic factors such as anatomical and physiological differences are non-modifiable; however, extrinsic factors such as muscle strength, activation patterns and jumping and landing characteristics are modifiable, but require further research.[77]

History

The majority of injuries are non-contact injuries resulting from sudden deceleration and change of direction with a fixed foot.[70][4] A hyperextension injury resulting from landing on another player's foot, as frequently happens in basketball, is also a common non-contact cause of ACL injury.[78] [4]

The person presents with a typical history, including an audible 'pop', a sense of disruption, or that the knee 'came apart' and a significant swelling within a few hours. This presentation alone has been reported as being 70% accurate for the diagnosis of an ACL rupture. [79][4] It should be noted that it is important to exclude other injuries associated with the development of early swelling, for example, osteochondral fractures and patellar dislocations.[70][4] The ability to continue the activity or walk off the field does not exclude an ACL injury.

Physical examination

The diagnosis of an ACL tear is difficult to make and frequently missed at primary care level. Early diagnosis of ACL tear is important because of the risk of further injury to other intra-articular structures if the person returns to sport unaware of the severity of the initial injury. Doubt about diagnosis should therefore prompt referral to a doctor with special musculoskeletal training for diagnosis, counselling and discussion about treatment options. A typical history should alert the examiner to the probability of an ACL tear. In particular, the presence of significant swelling should lead the clinician to ask questions about its onset.

Loss of end range extension is sometimes associated with an ACL tear, and may be misinterpreted as a probable meniscal tear. It also may be present in the first six weeks or so after knee injury due to hamstring spasm.[4]

Clinical tests

Lachman

The Lachman test for ACL integrity is recognised as the most clinically accurate test for the diagnosis of an ACL injury. For orthopaedic surgeons, the Lachman test has been shown to have reasonable validity in the diagnosis of ACL tears.[31 80-83][D++] It has been found to be more sensitive about 10 days after injury when acute swelling, pain and muscle spasm had subsided.[83] [D++]

This test is difficult to perform on large knees and with small hands. Two modifications have been described, but neither has been appropriately evaluated in blinded diagnostic studies using arthroscopy as the gold standard.[84 85] [D-]

Anterior Drawer

The anterior drawer test was the classic test for ACL injuries for many years, however it is now considered less reliable compared with the Lachman test for the diagnosis of acute ACL tears. Inability to flex the knee to 90 degrees and protective muscle spasm may prevent anterior translation of the tibia resulting in a false negative finding. [4] The clinical usefulness of this test for the diagnosis of ACL tears has been questioned. [4]

No studies were found which met our inclusion criteria which specifically evaluated the anterior drawer test compared with arthroscopy as the gold standard.

Pivot Shift

The pivot shift is a complex test involving flexion and rotation. It is difficult to perform in an acute knee injury where there is significant pain and muscle spasm and may be too painful to perform even up to about 10 days after the injury.[83][D++] Numerous types of pivot shift test have been described in the literature. The lateral pivot shift test of MacIntosh, the jerk test of Hughston, Slocum's test and Losee's test have all been described.[70] [4]

Recommendations	
A	The Lachman test when correctly performed is reasonably accurate in the diagnosis of complete ruptures of the ACL.
B	The Lachman test is more accurate when acute pain, swelling and muscle spasm has subsided at about 10 days.
C	The pivot shift test is best performed by experienced practitioners.
C	Loss of end range extension should alert the clinician to the possible involvement of the ACL.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Posterior cruciate ligament

PCL is the 'new challenge in knee diagnosis and surgery' although it is significantly less common then ACL or MCL tears.[86] [4] Increased understanding of the anatomy and biomechanics of the PCL have shown that this ligament is central to knee stability and function and it is now the focus of much research.[42][4][87][4]

People with isolated tears of the PCL can function at a high level without surgical reconstruction, but because these injuries are commonly associated with injuries to the posterolateral complex, persistent symptoms and instability may result. These injuries require careful evaluation.[42][4]

Epidemiology

There is large variability in the reported incidence of PCL tears. [39 88 89] This is possibly due to different patient populations and also the experience of the investigators in diagnosing PCL tears, as these tears are frequently missed.[39 42 41 88 90] The incidence of PCL injuries in acute haemarthrosis has been consistently reported as 37%.[86 91]

It has been reported that up to 40% of all PCL injuries are isolated tears[88][4] and that these are more frequent in athletes, while combined PCL and other associated injuries are more commonly due to other severe trauma. It is therefore likely that the incidence and severity of injuries vary according to the setting in which the person is evaluated.[89] Up to 60% of PCL injuries have associated injuries to the posterolateral structures.[42]

Tears are most common in the mid portions, (68%) followed by proximal tears (19%) and distal tears (4%).[92]

Associated meniscal lesions with acute isolated PCL tears are rare, and there appears to be no tendency for these to develop with time from injury.[88]

Avulsion fractures of the fibular head and non-displaced fractures of the medial tibial plateau may be associated with PCL injuries and must be ruled out.[87]

History

The mechanism of injury is relatively consistent with PCL injuries. A posterior force to the proximal tibia is typically described, whether this is due to a fall on a flexed knee as commonly occurs with sport, or due to a motor-vehicle accident where the proximal tibia impacts against the dashboard.[89][4] When this force is combined with a rotational force, then injuries to the posterolateral complex can occur.[41][4][42][4]

Isolated PCL injuries are often asymptomatic in the acute setting and people may not complain of pain or instability, and in fact, are often unaware they have had a significant ligament injury. People usually report vague symptoms, including pain in the posterior aspect of the knee, mild to moderate effusion and pain with kneeling. Instability is more likely to be reported when there are associated injuries to other structures.[42][4]

In more chronic PCL injuries, anterior knee pain is a common complaint due to the altered biomechanics of the quadriceps mechanism. This can result in degenerative changes to the patellofemoral joint and medial tibiofemoral compartment.[93][4]

Physical examination

Careful examination is required to diagnose isolated injuries to the PCL and to discriminate these injuries from combined PCL and posterolateral complex injuries. Examiners should note abrasions to the proximal anterior tibia due to direct impact forces.[41][4]

Associated injuries must be ruled out, as management for combined PCL and posterolateral complex or other injuries have a different prognosis and require early specialist evaluation. Isolated rupture of the PCL has little effect on tibial rotational laxity or varus and valgus angulation. Where there is concomitant rotational and/or varus and valgus laxity, then other structures are involved and these people should be referred for specialist evaluation.[4]

Clinical tests

The two most commonly described tests are the posterior drawer test and the posterior sag test.

Posterior Drawer Test

The most sensitive test for the PCL is the posterior drawer test.[41][42][89][4] Clinicians should note however that the end feel can start to become firm by about two weeks after the injury and the diagnosis may be missed.[88][4]

A positive posterior drawer may be missed if the tibia is resting in a posteriorly subluxed position with the knee at 90 degrees and the foot resting on the bed (posterior sag). In this

position, the tibia can be drawn anteriorly, which could be misinterpreted as a positive Lachman test.[41] [4]

Posterior Sag

The posterior sag is evident when both knees are placed at 90 degrees of flexion with the feet resting on the examination table. Gravity causes an altered contour of the proximal end of the tibia of the injured knee compared with the uninjured knee.[87][4]

Recommendation	
C	The posterior drawer test is the most sensitive test for evaluating the integrity of the PCL.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Posterolateral complex

Injuries to the posterolateral complex are potentially disabling. Specialist referral is necessary for appropriate assessment and management and to ensure optimal functional outcomes for people.

Epidemiology

Injuries to the posterolateral complex of the knee are rare, but can cause severe disability. They are usually associated with injuries to either the ACL or PCL, and rarely occur in isolation.[11][4] These injuries have poor functional outcomes, and failure to diagnose and treat these injuries are thought by some orthopaedic surgeons to be one of the main causes of ACL graft failure.[43][4]

History

Athletic trauma and motor vehicle accidents are the most common causes of injury to the posterolateral aspect of the knee. Typically there is a blow to the anteromedial tibia in an extended knee, or a fall on a flexed knee, which drives the tibia posterior. They may also result from non-contact injuries as occurs in hyperextension injuries.[94][4]

Symptoms include posterior pain; symptoms of peroneal nerve involvement (sensory and motor) and associated ligament pathology.[13][4]

Accurate diagnosis is important as these injuries may require early surgical intervention for a satisfactory result.[11 13] [4] Further diagnostic tests are usually required to discriminate between an isolated PCL injury and associated involvement of the posterolateral complex. [4]

Physical examination

Because these injuries are relatively rare and complex, and the interpretation of diagnostic tests for these injuries difficult, people with these injuries should be referred for specialist assessment.

Clinical tests

Special clinical tests for this area include the external rotation recurvatum test, posterolateral drawer testing, and the reversed pivot shift test.[12][4] These tests have been well described, but are complex and difficult to perform and interpret. The are best performed by experienced practitioners.[87][4]

Increased external rotation of the tibia, and increased lateral opening on varus stress should alert the clinician to the involvement of the posterolateral complex.[4]

Recommendation	
C	Primary care providers should refer any people with suspected injury of the posterolateral complex to an orthopaedic surgeon for further evaluation.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

General management

Introduction

The management of soft tissue injuries of the knee includes a range of treatments, from advice only, through to surgical management with extensive post-operative rehabilitation. A key role for health practitioners is to act as a resource to enable people to make treatment decisions based on the best available evidence.

There are some aspects of management that are common to all knee injuries and these have been described under general management. The majority of knee injuries seen in primary care will be managed according to these principles.

Aspects of management specific to each of the major structures in the knee joint have been described under 'specific management'. Questions relating to the surgical management of knee injuries are outside the scope of the guideline, and there is little evidence in the literature to clearly identify indications for surgery for different knee pathologies. We have attempted to provide an overview for each of the structures, and to identify some of the critical issues primary care providers need to be aware of so that referral is appropriate and timely to ensure the best outcomes for people with these injuries.

R.I.C.E

The use of rest, ice, compression, elevation ('R.I.C.E.') is widely accepted and expected as standard management for all acute musculoskeletal injuries to reduce pain and swelling. Refer to the ACC protocol: ACC Thinksafe: *Managing your sports injury* available on the ACC website www.acc.co.nz

Rest

The use of crutches may be necessary for the first few days to assist weight-bearing.[4]

Ice

Variation in the methods of applying ice suggests a lack of evidence for the use of ice therapy in reducing swelling.[95] It is, however, reasonable to recommend its use for the relief of pain in the first 48-72 hours following a knee injury. [4]

Compression

Currently various types of simple elastic bandages are considered adequate for controlling swelling. A 'compression' type of bandage is no longer considered necessary. [4]

Rest and elevation

Rest and elevation are standard management for acute soft tissue injuries of the lower limb, particularly if there is significant swelling. People should be advised to rest with the limb elevated and supported on a pillow until the swelling is under control, and to avoid prolonged periods with the leg in the dependent position.

Avoid harm

People should be advised about the risks of further damage to the injury in the early stages. People should be advised to avoid applying heat and massage to a recent injury and drinking alcohol. Attempting to continue activity, or do exercises in the first couple of days after injury, may also result in causing further damage.

Recommendation	
C	There is insufficient evidence in the literature to support the use of R.I.C.E., however, it is commonly accepted practice for the self-management of a mild soft tissue knee injury in the first 48-72 hours.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

R.I.C.E. protocol	
REST	• Avoid activity in the first 48-72 hours to prevent further damage. • Crutches may be necessary if weight-bearing is too painful.
ICE	• Wrap ice in damp towel (direct application onto bare skin can result in an ice burn). • Apply ice for 20 mins every two hours during the day for the first 48-72 hours.
COMPRESSION	• Tubigrip or a simple elastic bandage can be applied between ice treatments to help reduce swelling. • Avoid firm bandages and tubigrip at night as these can constrict the circulation.
ELEVATION	• Raise the leg on a pillow during the day as much as possible to help reduce the swelling.
AVOID H.A.R.M.	In the first 72 hours avoid the following: • Heat: avoid hot baths, showers or saunas, heat packs and liniments • Alcohol: alcohol increases bleeding and swelling and delays healing • Running: any form of exercise will cause further damage • Massage: avoid massage which causes increased bleeding and swelling.

Pharmacology

The use of medication, and in particular the use of non-steroidal anti-inflammatory drugs (NSAIDs) is widely accepted as part of the routine treatment of soft tissue injuries.[96 97] The rationale for using NSAIDs for acute sports injuries is based on the belief that controlling the inflammatory response following injury will speed the recovery process. However, there has been debate about how long treatment should continue and concerns about possible detrimental effects to the healing process in the later stages. [98][4] In addition, NSAIDs are associated with significant morbidity mostly in the form of gastrointestinal symptoms.[99][4][97][4]

There is little evidence to suggest that systemic NSAIDs are more beneficial in the treatment of soft tissue injuries than simple analgesics such as paracetamol.[100-103] [1+] However, there is moderate evidence that topical NSAIDs are safe and effective in the treatment of soft tissue injuries.[104][1+]

Recommendations	
C	Paracetamol is probably the most cost-effective and potentially least harmful choice of analgesic for soft tissue knee injuries.
C	NSAIDs may be beneficial for treating a persistent effusion that has not responded to the 'RICE' protocol.
A	Topical NSAIDs are effective and safe for acute sprains, strains and sports injuries.

Grades indicate the strength of the supposting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Haemarthrosis

Haemarthrosis in the knee joint is caused by rapid extravasation of blood into the joint usually within 2-6 hours following an acute injury. This is in contrast to a delayed effusion, which occurs after 24 hours.[71] It can be a result of contact or non-contact injury, and is often associated with sporting injuries, although can occur as a result of falls, injuries in the home and at work, and motor vehicle accidents.[72 105]

Haemarthrosis is associated with a high incidence of knee intra-articular pathologies, the most common being tears of the ACL (70%).[55 70-74] Other associated injuries may include tears of the collateral ligaments, posterior cruciate ligament, osteochondral fractures, and tears of the synovium or capsule.[72 106] In some cases, recurrently dislocating patellae are associated with haemarthrosis due to the tearing of the vascular medial retinaculum and synovium.[107]

The history and clinical examination in an acute knee with haemarthrosis may be difficult due to associated pain and guarding (hamstring spasm). Findings are therefore not always reliable

indicators of the severity of the injury.[73] Aspiration can provide dramatic relief for people in whom a severe haemarthrosis is causing significant pain. While this can enhance the physical examination, aspiration is not recommended for diagnosis alone. [4]

No published evidence about the benefits or harms of aspiration was located.[108]

Recommendations	
C	Aspiration is not generally indicated for diagnosis.
C	Aspiration is indicated for a severe and painful suspected haemarthrosis of the knee joint following an acute knee injury.
C	For practitioners who are not experienced in the procedure, people should be treated with usual 'RICE' and referred to a specialist, local Base Hospital or another practitioner who has more experience.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Rehabilitation: physiotherapy

'Rehabilitation involves any procedure designed to maximise function after injury or illness'.[109] Traditional concepts of rehabilitation tended to focus more on regaining strength and motion; however, more recent concepts embody the notion of 'functional rehabilitation' and this includes concepts of agility, proprioception and confidence.[110] It has also been recognised that knee injuries can result in significant disability, and that psychological factors and skills play a critical role in successful injury rehabilitation.[111-114]

Physiotherapists use a wide range of exercise-related interventions in the rehabilitation of knee injuries; however, there is insufficient evidence to establish the effectiveness of any one type of intervention.[27][1++]

Proprioception

Proprioception is a term used to encompass a broad range of neurophysiological mechanisms that mediate the physical state of the body. It includes the orientation of the body in space, the rate and direction of motion, the tendon and muscles sensations, pressure and vibration sensations, and the sense of equilibrium.[115]

Proprioception is important in maintaining dynamic knee stability, which is the ability of the knee joint to remain stable when subject to rapidly changing loads. Injury to any of the joint structures will result in loss of the protective function of the proprioceptive mechanisms which protect the joint from extreme loading and extreme range of motion.[115 116]

There is currently no reliable method for objectively determining functional stability of the lower extremity, and decisions to return people to sport are based on a combination of functional tests, muscle strength and time from surgery.[117] It has been advocated, however, that proprioceptive re-training be incorporated in rehabilitation programmes for injured knees.[118][1+]

Recommendations	
A	There is insufficient evidence in the literature to establish the relative effectiveness of the various approaches and methods currently used by physiotherapists in the conservative management of soft tissue knee injuries.
B	Proprioceptive training may be beneficial in improving outcomes for people with ACL deficient knees and its inclusion in rehabilitation programmes for both the conservative and post-operative management of ACL tears is recommended.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Rehabilitation: electrotherapy modalities

Electrotherapy is one of the fundamental elements of physiotherapy practice.[119] Electrophysical modalities include the use of infrared, ultraviolet, shortwave diathermy, microwave, ultrasound, and various forms of electrical stimulation, including interferential therapy, transcutaneous electric nerve stimulation (TENS), Neuromuscular Electrical Stimulation (NMES).

For the purposes of this guideline, the evaluation of electrotherapy modalities has been limited to the use of ultrasound, laser therapy and the various forms of electrical stimulation which include TENS, NMES and Biofeedback. Infrared and ultraviolet are not relevant in the treatment of soft tissue knee injuries, and shortwave and microwave are rarely used in clinical practice.

Ultrasound

Ultrasound therapy continues to be widely used by physiotherapists for a diversity of conditions.[120] Typically, ultrasound is used in the treatment of soft tissue injuries of the musculoskeletal system to reduce oedema, relieve pain, accelerate tissue healing and modify scar formation.[120 121][4]

A number of reviews have investigated the use of ultrasound for musculoskeletal conditions.[122-128] None of these reviews supported the use of ultrasound for the treatment of musculoskeletal injuries; however, most were based on poor quality trials. One reviewer concluded that an absence of effect does not mean lack of effect, [120] and a second reviewer found that reported treatment effects were small, and probably of limited clinical significance.[125][1++]

A recent review of the biophysical effects of therapeutic ultrasound found that there was 'insufficient biophysical evidence to provide a scientific foundation for the clinical use of therapeutic ultrasound for the treatment of people with pain and soft tissue injury'.[129][2+]

NMES

Neuromuscular electrical stimulation (NMES) is the application of electrical currents to skeletal muscle with an intact peripheral nervous system to strengthen muscles and promote functional activity.[130 131][4]

The use of NMES in knee rehabilitation, either as part of the conservative management or post-surgical management, is controversial and there is debate about whether the effects of NMES are achieved through functional overload, or the specific action of NMES on type II muscle fibre.[132][4] In addition, variation in methodology, stimulation parameters and outcome measures preclude any conclusions about the efficacy of NMES in the rehabilitation of knee injuries.[133][1+][134][1+/-][135][1+/-][136][1+/-]

Laser

Laser is an acronym for 'Light Amplification by Stimulated Emission of Radiation'. Low level laser therapy (LLLT) has been used in clinical practice for the past 20 years, to enhance the healing process and for pain management in musculoskeletal conditions.[137][4]

The effects of laser therapy on normal and damaged tissue are 'far from clear' [137][4][138][4] No significant effects for the reduction of pain in musculoskeletal conditions have been demonstrated.[139][1+]

TENS

Transcutaneous electric nerve stimulation (TENS) is primarily used for pain relief in the treatment of soft tissue injuries. It was developed on the premise that stimulation of large diameter nerve fibres effectively blocks the transmission of pain in the smaller diameter nociceptive fibres, known as the 'Gate Control Theory of Pain Modulation' [140]. It is this mechanism that is activated by high frequency/low intensity TENS commonly used for the relief of acute pain in musculoskeletal injuries.[141] The response to TENS, however, is variable and unpredictable. Trial and error are important for finding optimal settings and placement of electrodes for each patient.[141][4]

There is no evidence that the use of TENS for pain relief in soft tissue injuries of the knee facilitates recovery over and above that achieved by exercise alone.[136][1+/-]

In people with an acute traumatic injury for whom oral analgesics are contraindicated, TENS may offer an effective alternative.[142][1+]

Biofeedback

Biofeedback, or electromyography (EMG) is commonly used to facilitate the function of the quadriceps activity following knee injury and knee surgery. Electrodes placed over the muscle belly allow activity in the muscle to be converted to a visible or audible signal, and the person is able to monitor the contraction and voluntarily enhance the contraction. [143]

There has been on-going debate about the efficacy of both electrical stimulation and biofeedback in recovering the function of the muscles following injury or surgery and whether one is more effective than the other.[144]

There is currently insufficient evidence for the use of EMG in the rehabilitation of the quadriceps muscle following ACL reconstruction and menisectomy.[143-146][1+/-]

Recommendations	
B	Ultrasound is of little benefit in the treatment of soft tissue knee injuries.
I	At present there is insufficient evidence to support the use of NMES, TNS or biofeedback in the post-operative rehabilitation following menisectomy or ACL reconstruction.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Bracing in the non-operative management of knee injuries

The role of bracing in the management of all types of ligament injuries is controversial. Due to increased involvement in sport and recreation, there has been an increase in the demand for all types of knee braces, and the market has responded by producing numerous varieties or bracing, most without substantial scientific validation by the manufacturer.[147][4]

The American Association of Orthopaedic Surgeons (AAOS) define three categories of knee braces.[148]

- Prophylactic bracing is intended to prevent or reduce the severity of knee injuries.
- Rehabilitation braces are designed to allow protected and controlled motion during the rehabilitation of injured knees (treated operatively or non-operatively).
- Functional braces are designed to provide stability for unstable knees during functional activities. These can be 'off the shelf' or custom made braces.

The AAOS report 'There is no credible long-term scientifically conducted study that supports using knee braces on otherwise healthy players'.[148] This document also reports that functional knee braces aid in the control of unstable knees, at low load, but not during high load

conditions, and suggests that there is a role for the use of bracing, in conjunction with a rehabilitation programme and appropriate modification of activities.

Surveys reveal significant variation in practice, suggesting there is still controversy about the use of bracing in nonsurgically managed knee ligament injuries.[149][4]

It has been suggested that the psychological aspects of brace use may be one of the main effects of bracing and that this needs further investigation. Effects may be positive, enhancing confidence and enabling greater participation in the rehabilitation process, or negative, where bracing may give a false sense of security and place the patient at greater risk of re-injury.[150][4]

There is insufficient evidence to determine the benefit of bracing in the conservative management of unstable knees following injury.[147 150-153] [4] However, there was consensus that bracing is beneficial for severe Grade II and Grade III ruptures of the MCL for the first 4-6 weeks to stabilise the knee until healing takes place. Rehabilitation can then be initiated early to recover function.

Recommendations	
I	Bracing is generally not required for the conservative management of soft tissue knee injuries.
C	Bracing is appropriate for isolated Grade III and severe Grade II injuries to the MCL for 4-6 weeks to stabilise the knee so that rehabilitation can be initiated.
C	Bracing may be indicated in selected cases where recurrent instability exists, but concurrent medical conditions or other factors preclude surgery.
C	Bracing may be indicated in selected cases where there is a psychological benefit associated with wearing a brace which enhances a person's ability to undertake tasks in work and sport.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Osteopathy, chiropractic and acupuncture

Osteopathy, Chiropractic and Acupuncture have traditionally been included under the umbrella of complementary and alternative medicine. However there is some debate whether this continues to be appropriate. Over the past 15 years studies in the UK, Europe and the USA show widespread use and acceptance of the use of Osteopathy, Chiropractic and Acupuncture.[154 155]

In New Zealand, acupuncturists, chiropractors, and osteopaths, are recognised by ACC and are able to claim medical fees from the Accident Compensation Corporation (ACC) for the treatment of some types of injuries.

With limited resources for health, and increasing demands for health care, evidence-based practice is becoming more important in determining priorities for funding. Few good quality studies assessing the effectiveness of complementary therapies have been undertaken using epidemiological study design. With the integration of complementary therapies into mainstream medicine, it is becoming critical that these therapies are evaluated in this way, as safety and cost-effectiveness are key concerns for all aspects of medicine, not just complementary therapies.

No studies were located that met our inclusion criteria for the use of osteopathy or chiropractic in the treatment of acute soft tissue injuries of the knee.

A recent systematic review on the effectiveness of acupuncture in the treatment and rehabilitation of accident-related musculoskeletal disorders found that it was not possible to reach a conclusion about the efficacy of acupuncture in the management of accident-related musculoskeletal injuries. [156] [1++] None of the included or excluded studies, which the authors also listed, were relevant to the management of acute soft tissue knee injuries.

Recommendation	
I	No recommendations can be made about the use of acupuncture, chiropractic, osteopathy or other complementary therapies for the treatment of soft tissue knee injuries due to a lack of good quality evidence.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Management has been described for injuries to isolated structures. Some discussion has been included about the operative versus non-operative management of injuries as well as the post-operative management following repair or reconstruction.

Medial collateral ligament

Injuries to the medial ligament are common and can occur in isolation or in conjunction with injuries to the cruciate ligaments or menisci.

Operative versus non-operative

Treatment of isolated MCL injuries has been subject to 'considerable evolution and diversity'.[157] There has been general agreement in the literature over the past 20 years that all grades of isolated medial ligament injuries can be successfully managed without surgery.[50 158-162][3]

A recent survey of orthopaedic knee specialists showed that the frequency of repairing isolated MCL ruptures has decreased from 21% in 1992 to 2% in 1998.[163] This survey also showed that repairs to the MCL were rarely done in conjunction with ACL reconstructions.

The key to successful non-operative management of Grade III medial ligament injuries is to ensure that they are isolated injuries.[159][3] Where there are combined MCL and ACL injuries, non-operative management has been less successful.[164] [3]

Grade I and II injuries are best managed with early functional rehabilitation, without the need for bracing. Return to sport can be expected in 6-8 weeks.50 [165-169][3]

The management of Grade III medial ligament injuries is similar, but bracing is recommended for the first 4-6 weeks until the knee is stable. [4]Some studies have noted that braces continue to be worn on return to sport, but there is uncertainty whether there is a prophylactic effect, or whether the effect is mainly psychological.[157][3]

Post-operative management

A Cochrane systematic review is currently in progress, which is investigating the evidence for post-operative immobilisation for anterior cruciate ligament, medial collateral ligament and meniscal injuries of the knee. This review includes partial (range limiting) as well as complete immobilisation.[170]

No other studies were located investigating aspects of the post-operative management of MCL repairs. As most repairs are likely to have been carried out in knee injuries with associated ACL tears, practitioners are advised to consult with the operating orthopaedic surgeon. [4]

Recommendation	
C	Non-operative management is recommended for all grades of isolated medial collateral ligament injuries.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Anterior cruciate ligament

Operative versus non-operative management

The scientific basis for the management of ACL injuries is yet to be established. Most reports of operative versus non-operative treatment are of poor scientific quality. Studies are non-randomised, participant selection is arbitrary, the follow up period is short and often incomplete, introducing 'unacceptable biases'.[4][1-]

In spite of the lack of a scientific basis, however, the management of ACL injuries has undergone significant modification over the past 10-15 years and appears now to be in a 'consolidation phase'.[171][4] There is a trend toward earlier surgical reconstruction to prevent secondary pathologies such as meniscal tears.

A number of factors influence decisions about the appropriate management of ACL injuries, including age, occupation, activity level, the degree of disability experienced by the person and their motivation to undertake and comply with a rehabilitation programme. The risks and benefits for each person need to be assessed so that an informed and logical decision can be made.[171][4]

The current indications for ACL reconstruction include:[67][4]

- athletically active people who wish to continue to participate in cutting, jumping and pivoting sport
- active people with an ACL tear and a repairable meniscus
- active people with an ACL tear and a complete tear of another major ligamentous restraint (eg, PCL, MCL)
- people experiencing instability during activities of daily living.

Traditionally ACL reconstruction has been offered to the younger active athlete, while non-operative management has been the treatment of choice for older people. This has been largely due to concerns about post operative complications such as delayed healing, loss of motion, arthritis and difficulties with the rehabilitation programme.[172-174][3] It has also been assumed that older people are more willing to modify their activities; however, with the increased participation of the older athlete in individual recreational activities, this is not always the case.[173 174] [3]

Given appropriate indications for ACL reconstruction, age should not be considered a barrier in the older athlete who wishes to pursue a more active lifestyle. It has been shown that older people had outcomes comparable to the younger age groups with no increased incidence of post-operative complications.[172-175] [3]

ACL reconstruction

The goal of surgery is to provide a stable knee that enables the person to return to a high level of activity. Surgical technique has evolved over the past decade with modifications to graft type, placement and fixation.

Post-operative rehabilitation

Over the past ten years, the post-operative management of ACL reconstructed knees has undergone considerable modification. Our knowledge of the effect of exercise on the graft is still limited and guidelines for rehabilitation continue to be based mainly on clinical experience.[176][4] Current post-operative management is based on an 'accelerated rehabilitation programme' which has been shown to produce better functional outcomes with fewer complications.[177][4]

This programme emphasises:

- immediate weight-bearing
- restoration of full passive extension symmetrical to the uninvolved knee within two weeks
- the early use of closed kinetic chain exercises which place less strain on the ACL graft
- full range of motion and about 80% of muscle strength by 8-12 weeks and be coping with a reasonable level of activity.
- return to sport which can be expected anywhere from 4–6 months, depending on initial injury severity, age, previous activity level and progress with rehabilitation.

Surveys of current practice indicate that Shelbourne's accelerated rehabilitation programme for the post operative management of ACL reconstruction has been widely accepted internationally and forms the basis for current rehabilitation programmes.[69 178 179]

Supervised rehabilitation by physiotherapists following ACL reconstruction is widely accepted practice; however, as yet there is insufficient evidence for the effectiveness of the various approaches and methods in current use. [27][1++]

Bracing

Bracing in the immediate post-operative period following ACL reconstruction was standard practice for many years. Braces were designed to allow protected motion to prevent excessive loading on the graft. [180] With improved operative techniques in ACL reconstruction, the need for bracing to protect the graft in the immediate post-operative period has been questioned.[181]

Recent surveys show that about 50% of surgeons still use bracing in the early post-operative period following ACL reconstruction in the UK, Canada, Australia, and the USA, suggesting that this aspect of management is still controversial. [69 178 179 182]

There is evidence that bracing in the immediate post-operative period following ACL reconstruction is not effective.[180 181 183-189][1+]

Open versus Closed Kinetic Chain Exercises

Various definitions have been used to describe open and closed kinetic chain movement. In simple terms, open kinetic chain (OKC) refers to movement where the distal segment is free (typically non-weight-bearing isotonic and isokinetic exercise) while closed kinetic chain (CKC) refers to movement where the distal segment is fixed (typically functional weight-bearing exercise).[190-192]

OKC exercises typically involve single muscle groups, with an emphasis on gaining strength using isotonic and isokinetic techniques. CKC exercises are generally functional weight-bearing exercises involving muscle and joints in a variety of movement patterns. [192] Most movement involves a combination of both open and closed kinetic chain movement, and Wilk suggests that it is more useful to think of these in terms of a 'kinetic chain continuum'.[193]

In the past decade, there has been an emphasis on the use of closed kinetic chain exercises in the post-operative rehabilitation of ACL reconstructions. The compression forces generated with these types of exercise reduce the shearing force on the knee and are considered safer, more functional and more effective than open chain kinetic exercise.[177 191 194]

Most current protocols support the inclusion of open kinetic chain exercises from about 4 weeks post-operatively, in a restricted range of knee flexion from 45 degrees to 90 degrees.[176 195] [4]

Recent research suggests that there is no harm from including OKC exercises in the later stages of the rehabilitation programme group, and possible benefit in terms of return to normal activity and sport and improved strength of the quadriceps.[194 196-199] [1+]

Home Versus Supervised Rehabilitation

The belief that people require intensive supervised rehabilitation following ACL injury or reconstruction to achieve optimum results has been questioned in recent years.[200] Traditional post-operative rehabilitation protocols were developed in response to complications which occurred as a result of immediate surgery, post-operative immobilisation and protected

weight-bearing. Delayed surgery and improved surgical techniques, in association with the introduction of accelerated rehabilitation protocols has to a large extent eliminated many of the complications. With the increasing cost of health care, the extent to which both the conservative and post-operative management of ACL reconstruction requires supervision has been questioned.[200-204]

The trend toward more 'informal rehabilitation' in a fitness centre or at home may compromise outcomes for the athlete where an early return to competitive sport is important, particularly since problems with instability are often not identified until the later stages of rehabilitation when the athlete returns to cutting and pivoting activities.[205]

Further research is required to evaluate those sub groups that would benefit from more intense post-operative rehabilitation programmes and those that would achieve satisfactory results from a home-based programme with limited numbers of physiotherapy visits.

Intensive supervised physical therapy may not be required to achieve optimum functional outcomes for people following ACL reconstruction; however, there is insufficient evidence to suggest that this is true for all cases.[200 201 203 204][1-]

Emotional and Cognitive Factors

Injury to the ACL can cause major disability and loss of quality of life.[206]. High levels of motivation and commitment are required for people with severe knee injuries to achieve successful outcomes, and it has been recognised that psychological factors may mediate rehabilitation outcomes.[111-113 207][4] There has therefore been increasing interest about the impact of emotional and cognitive factors in rehabilitation following ACL reconstruction.[208][4]

A person's perceived level of function can be influenced by the extent to which they believe they have control over the outcome of their knee injury. For example, if they believe that their outcome is dependent on the influence of 'powerful others', fate, luck, chance, they have a less favourable perception of their outcome. This is in contrast to a belief that they are largely responsible for the outcome, which is associated with a more favourable perception of the outcome.[207][4]

Relaxation and 'guided imagery' as part of a rehabilitation programme following ACL reconstruction was found to have a benefit in terms of pain, muscle strength and re-injury anxiety.[114][1+]

It is clear that factors affecting the response to a rehabilitation programme following injury to the ACL are varied and that the spectrum of patient presentations and response is large. Communication between the injured person, surgeon, medical practitioner and therapist is critical in establishing realistic expectations and to maximise the rehabilitation outcome.[209][4]

Recommendations	
C	In general, ACL reconstruction has the most to offer those people with recurrent instability who must perform multidirectional activity as part of their occupation or sport.
C	Age should not be considered a barrier to reconstructive surgery in the older athlete, providing there are appropriate indications.
C	An active functional treatment programme supervised by a physiotherapist is recommended following ACL reconstruction.
B	Open kinetic chain exercises can be introduced from 4-6 weeks between 90 and 45 degrees of knee flexion.
B	Bracing in the immediate post-operative period following ACL reconstruction is not recommended.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Medial and lateral meniscus

Increasing awareness of the important role of the meniscus in knee function has led to changes in the management of meniscal injuries over the past two decades.[210] Recognition that tears in the vascularised peripheral zone of the meniscus have the potential to heal, and that total and even partial menisectomy contribute to the early development of degenerative changes in the joint, have led orthopaedic surgeons to consider alternatives in the management of these injuries.[7] These may include anywhere from a conservative non-operative approach, to a partial or total resection of the meniscus or meniscal repair.[54]

Operative versus non-operative management

The non-operative management of meniscal injuries is preferred for the treatment of clinically stable meniscal tears where there is potential for healing and symptoms are mild; however, this decision may need to be modified for people whose occupations demand a stable knee and the time frame required for repair is not appropriate.[8][4] A trial of rehabilitation for 6-8 weeks is appropriate for people with a suspected meniscal tear in the absence of locking due to meniscal entrapment. If symptoms persist, then referral to a specialist is required to evaluate the need for surgical management. [4]

The primary goal in the operative management of meniscal injuries is to preserve as much of the meniscus as possible. The extent to which this is possible depends on the type, location and stability of the tear as well as the person's age, occupation, activity level and presence of existing degenerative changes in the joint or damage to other joint structures.[7][4]

Factors influencing decisions about operative management and the evidence for the different surgical approaches are outside the scope of this guideline, but are continuing to evolve and have been well documented in the literature.[7-9 51 54 56 210-214][4]

A Cochrane review investigating the surgical treatment for meniscal injuries of the knee in adults found a lack of trials in the literature which prevented drawing conclusions about the issue of surgical versus non-surgical treatment of meniscal injuries, or meniscal tear repairs versus excision. However, they did suggest that partial menisectomy seemed preferable to total menisectomy in terms of recovery and overall function in the short term.[215][1++]

Post-operative management

After Partial or Total Menisectomy

A typical protocol for rehabilitation following partial or total menisectomy has been described.[8] [4]

- Full weight-bearing is allowed immediately, but some people prefer to be partial weight-bearing because of pain. Crutches are used until no limp is evident on walking.
- Full active and passive range of motion is initiated on day one with quadriceps sets and straight leg raising.
- Exercycle and progressive resistance exercises are started on the second visit depending on pain and swelling.
- Functional activities are started by day 7 or 8
- Running can be started by day 10-14 with a return to competition as early as 2 weeks depending on the person, and sport, but is more likely to be by 3-4 weeks.

There is insufficient evidence to advocate routine physiotherapy following menisectomy.[216][1++] However, post-operative rehabilitation is appropriate in those people in whom a rapid return to full activity is critical to their earning capacity. Other sub-groups requiring post-operative rehabilitation may include the older person, the less-highly motivated person, and those with co-existing pathology in whom there are significant impairments with resulting loss of function.[216][1++]

Recommendation	
A	Physiotherapy is not routinely advocated following menisectomy.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

After Repair

Rehabilitation protocols following meniscal repair are yet to be established.[7 9] Differences in methods of repair and whether or not there is associated ligament damage and/or reconstruction will influence decisions about weight-bearing, range of motion restrictions, intensity and frequency of exercises and the timing of return to work, sport and other activities.[9][4]

Posterior cruciate ligament

'The most important factor influencing treatment of a PCL rupture is correct diagnosis'.[86][4] Because these injuries are relatively uncommon, the diagnosis and management of these injuries are not as well understood as ACL and meniscal injuries.[217][4] For practitioners who are less experienced in the evaluation of these injuries, the diagnosis is often missed. There is greater difficulty in discriminating between grades of injury and in identifying tears of the posterolateral complex which are associated with 60% of PCL tears.[42] [4]

Operative versus non-operative management

The natural history of isolated PCL injuries is still debated, and outcomes are variable.[87]The management of isolated PCL is therefore still controversial.[41 42 89 217] [4] There is some support for the non-operative treatment of isolated PCL injuries.[42 88][4] Studies with a longer follow-up period, however, have found the potential for progressive deterioration of the knee joint, particularly the medial compartment, suggesting that earlier surgical repair may result in better outcomes.[218][3]

Post-operative management

The post-operative management of an acute Grade III PCL injury is not as well defined and has a less predictable outcome. Various protocols have been suggested.[42 87 89 219][4]

- Immobilisation for 2-4 weeks with the knee in extension
- Partial weight-bearing for the first 6-8 weeks
- Full knee extension symmetrical to the uninvolved side should be obtained within one week
- Passive, gravity-assisted range of motion to achieve knee flexion can begin after the first week (the proximal tibia must be supported during knee flexion to protect against posterior sag)
- Flexion past 90° is not allowed until after 6 weeks
- Closed kinetic chain exercises can be initiated at 4-6 weeks when the person is full weight-bearing

- Crutches can be discarded when the person is able to walk without a limp, has 100° of flexion and no extensor lag
- Low impact aerobics, swimming and walking can be included from 8-12 weeks
- Return to work and sport may vary from between 3-6 months to 9-12 months

Recommendations	
C	There is general agreement that Grade I and II isolated PCL tears are best managed non-operatively.
I	There is insufficient evidence to establish the relative benefits of operative versus non-operative management of isolated Grade III PCL tears.
C	Practitioners should follow the post-operative rehabilitation protocol recommended by the orthopaedic surgeon.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Posterolateral complex

Injuries involving the posterolateral complex are serious. Thorough evaluation of the circulation and neural status is essential. Vascular compromise and loss of sensory and/or motor function may require immediate surgical intervention.[17][4]

Operative versus non-operative management

The non-operative treatment for minor injuries to the posterolateral complex achieves good functional outcomes, but in people with complete tears and involvement of other joint structures, surgical reconstruction is usually necessary.[11 17 220] [4]

Operative procedures for the posterolateral complex may include repair, augmentation or reconstruction, depending on time from surgery and extent of the injury.[11][4]

Early surgical management within 1-2 weeks achieves better outcomes than delayed surgical management due to significant scarring in the joint by three weeks.[11 220][4] Failure to recognise and repair Grade III injuries to the posterolateral complex will compromise the success of either anterior or posterior cruciate ligament reconstruction.[220][4]

Post-operative management

A rehabilitation programme following surgery for these injuries must be individualised for each person in consultation with the surgeon.[220] Progress will be slower given that it is a

more complex injury and progression must be individualised according to the extent and severity of the injury. A balance between active mobilisation and avoiding overly aggressive treatment is important. Return to activity and sport can begin in 9-12 months and it is likely some permanent activity modification may be required to maintain the integrity of the knee joint.[219][4]

General goals include:[219 220][4]

- full range of motion by 6-8 weeks
- non-weight-bearing in the first 6-8 weeks and then progressive weight-bearing can be initiated. Crutches can be discarded when the person has 100 degrees of knee flexion and no extension lag and is able to walk without a limp.
- an emphasis on quadriceps exercises with exercycle initiated at 6 weeks and light presses from 8 weeks
- avoiding hamstring exercises for 4 months post-operative because they are likely to interfere with the healing of the posterolateral corner.

Recommendation	
C	Practitioners should follow the protocol recommended by the orthopaedic surgeon.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Special groups

In New Zealand the Treaty of Waitangi provides for a special relationship between Maori and the Crown in all aspects of health care based, on the three principles of partnership, participation and protection. An increasing cultural diversity in New Zealand; however, provides a challenge for health practitioners in learning to embrace other cultures so that health gains are not compromised.

Recognition of other groups with a 'distinctive culture', for example the elderly, youth, the poor, professionals etc, is also important in all aspects of health care. For soft tissue knee injuries, the group requiring a high level of stability and knee performance which is critical to their employment or participation in competitive sport could be considered a 'special group.' The needs of this group with respect to surgical versus conservative management of the knee have been discussed previously.

For health practitioners, cultural competence is about having the skills to understand cultures other than one's own, and to use that understanding to improve clinical outcomes. [222] A recognition and respect for other 'knowledge systems' is central to the concept of cultural competence. The 'scientific' rationale may not be valued as much by some cultural groups who wish to include other types of treatment. Practitioners should look for opportunities for collaboration, which include both approaches. [222]

Maori

There are many issues for Maori with respect to the management of soft tissue knee injuries. Access to appropriate care is a primary concern in the diagnosis and management of soft tissue knee injuries. A recent analysis of ACC claims data in the management of soft tissue injuries of the ankle joint found that Maori receive less care than non-Maori.[223] There is no reason to believe that this is not similar for the diagnosis and management of soft tissue knee injuries.

Information in both Maori and English about the need for assessment of a soft tissue injury of the knee and ACC transport entitlements could help reduce some of the barriers to care for Maori.

Within the clinic situation, health practitioners need to be aware about different values about time and space. For some Maori, a lack of physical space may create some discomfort which may diminish the effectiveness of the consultation. A perceived lack of time may inhibit a Maori from giving all the information necessary to for appropriate diagnosis and management.

Pacific peoples

An understanding of Pacific peoples' diversity and culture and the way in which this can influence a Pacific person's viewpoint on health is necessary. Such an understanding will help the health practitioner gain the pacific person's confidence and facilitate the history taking, physical examination, diagnosis and management of soft tissue injuries of the knee resulting in better outcomes.[221]

Some traditional Pacific massage (eg, as practiced by the Samoan Fogau [223] such as lomi lomi) may help exacerbate the original injury. As noted in the section on RICE Protocol in Chapter 4, people should avoid massage for a recent knee injury which may cause increased bleeding and swelling.

Education material for people with knee injuries should be available in the Pacific person's own language. Problems of access to primary care for Pacific peoples have been well documented.[224]

Pacific peoples may benefit from resources to help with transport to and from the primary, secondary and tertiary health care providers, or from resources to enable them to be managed within the community.

Recommendation	
C	Health practitioners providing care for Maori and Pacific Island peoples should be sensitive to their particular needs and encourage the use of a support person or advocate.

Grades indicate the strength of the supporting evidence, rather than the importance of the recommendations – refer to page 71 for grading details.

Balance sheet

There is currently insufficient information to consider the risks and benefits of diagnostic procedures and treatment interventions to complete a balance sheet, but some comments have been included to address some identified issues.

Costs associated with provider services and various surgical procedures for knee injuries have been made available from ACC and are presented below in Table 1.

Table 1 Number of visits, claims and costs for new soft tissue knee claims in the 1999/2000 year for a 24 month period

	Visits			Claims		Costs		
National	**N**	**%**	**Visits/ Claim**	**N**	**%**	**Total**	**%**	**Cost/ visit**
General Practitioner	102,999	24.80	1.8	56,886	80.4	2,817,570	9.4	27.36
Physiotherapy	230,396	55.40	7.4	30,990	43.8	4,901,275	16.3	21.27
Specialist	26,577	6.40	2.0	13,089	18.5	2,652,864	8.8	99.82
Radiology	24,917	6.00	1.2	21,085	29.8	1,176,856	3.9	47.23
MRI	2,186	0.50	1.0	2,123	3.0	1,701,847	5.6	778.52
Other Provider	21,174	5.10	2.5	8,420	11.9	1,202,618	3.4	56.80
Procedures								
Arthroscopic Menisectomy/ Repair	5,428	1.30	1.1	5,165	7.3	9,432,302	31.3	1,737.71
Diagnostic Arthroscopy	586	0.14	1.0	566	0.8	738,892	2.5	1,260.91
ACL Reconstruction	1,145	0.30	1.0	1,132	1.6	4,427,925	14.7	3,867.18
Other ES Procedure	412	0.01	1.2	354	0.5	1,049,375	3.5	2,547.03
Grand Total	415,820			70,754		30,101,523		

Diagnostic procedures

Plain films

Consistent application of the Ottawa Knee Rules has the potential to reduce costs by decreasing the number of unnecessary X-rays requested to exclude fractures in acute knee injuries, although the rate of X-ray in New Zealand (30%) is already below that achieved in other centres following implementation of the Ottawa Knee Rules.[225]

The use of unnecessary X-rays may be reduced further if the Ottawa Knee rules are widely disseminated and implemented.

Diagnostic arthroscopy and MRI

MRI should be used ahead of diagnostic arthroscopy, for which there are few indications. Based on figures supplied by ACC (Table 1) the current rate of arthroscopy in New Zealand is 0.8% of all claims for soft tissue injuries of the knee, and 7.7% of all specialist procedures. The current rate of MRI is 3% of all claims for soft tissue injuries of the knee, but over 16% of specialist claims. Savings from diagnostic arthroscopies avoided may be balanced by increases in expenditure for MRIs.[226]

Management

Medication

The use of simple analgesics (paracetamol) for people with soft tissue knee versus NSAIDs may provide a benefit by avoiding the potential harms associated with the use of NSAIDs.

Physiotherapy and other recognised rehabilitation treatment providers

Information provided by ACC about the use of physiotherapy does not discriminate between people receiving physiotherapy for the conservative management of knee injuries, or the post-operative management following menisectomy, ACL reconstruction or other knee surgery. It is therefore not possible to estimate the impact of the guideline recommendations on costs associated with the provision of rehabilitation.

Specialist visits

Currently 18.5% of claimants see a specialist. Without information about current referral practices, it is not possible to predict whether implementing the guideline will result in an increase or decrease in referrals to specialists, and the impact of this on costs and the person's outcomes.

Operative procedures.

There is no good quality evidence that clearly identifies sub-groups for which surgery is the recommended treatment option. Decisions to do surgery are based on multiple individual factors, and the benefits and risks need to be discussed for each person presenting with a knee injury for which surgery may be an option.

Post-operative management

There is clear evidence that bracing following ACL reconstruction shows no benefit. However, information about current cost of bracing in the immediate post-operative period is not available.

Implementation

The guideline development team recommend the following strategy for the dissemination and implementation of the guideline.

1. The completed guideline and supporting material will be posted on the NZGG and ACC websites.

   A laminated version of the diagnostic and treatment algorithms with brief explanatory notes should be circulated to all groups involved in the diagnosis and management of soft tissue knee injuries.

   The guideline summaries and consumer pamphlet should be disseminated as widely as possible to the following groups:

   - general practitioners, accident and medical clinics, orthopaedic surgeons
   - hospital A&E departments
   - physiotherapists, osteopaths, chiropractors, acupuncturists
   - relevant colleges and organisations of the disciplines involved in the management of soft tissue injuries
   - students undergoing training in relevant disciplines.

2. Several strategies are recommended to educate treatment providers about the diagnosis and management of soft tissue knee injuries.

   - The guideline should be presented at topical conferences in 2003 including RNZCGP Conference in July, orthopaedic and physiotherapy conferences.
   - Conference sessions led by guideline team members would present the recommendations and facilitate discussion. Opportunities for teaching the accurate performance of relevant clinical tests should be included.
   - A full set of resources including ACC videos demonstrating the diagnosis of knee injuries could be made available to IPA facilitators.
   - Prepare case studies and vignettes based on the guideline.
   - The full guideline could be made available on CD.
   - GP peer review groups offer an ideal forum for the introduction and discussion of the guideline. Local guideline team members could be involved in these meetings to demonstrate clinical diagnostic tests.

3. Consumer Education: A consumer pamphlet will be produced in conjunction with ACC to provide information for consumers about the management soft tissue knee injuries. This will be distributed to GPs, physiotherapists and sports clubs so that it can be made available to consumers.

4. An evaluation of the uptake of the guideline should be conducted after 18 months from the time of publication.

Audit and performance indicators

The quality of care and management of adults with knee injuries is important to consumers, service providers and funders. No validated performance indicators were located in the literature. Further research needs to be undertaken to develop performance indicators that are meaningful, and which have been validated in the New Zealand primary healthcare setting.

Further research

Possible areas for further research have been identified. Specifically these include:

- validation of the Ottawa Knee Rules
- cost-effectiveness of MRI in the New Zealand setting
- optimal use of physiotherapy following ACL reconstruction and menisectomy.

Further research is required to identify valid indicators for assessing the impact of the guideline on the quality of care for people with internal derangements of the knee.

Appendices

1. Evidence and recommendation grading system used for this guideline
2. Guideline Methodology

Appendix 1: evidence and guideline recommendation grading system used for this guideline

Quality

The quality of each study was assessed using the GATE (Generic appraisal tool for epidemiology) appraisal tools (www.health.auckland.ac.nz/comhealth/epiq/epiq.htm).

Each study was graded according to the following criteria:

+	Good: Very low risk of bias; met all criteria
∅	Fair: Low risk of bias
–	Poor: Risk of bias; most criteria not met

Levels of evidence for therapy

The guideline development team ranked the evidence according to the revised system of the Scottish Intercollegiate Guidelines Network (SIGN).[229] Evidence statements relating to interventions have been assigned a grading according to the 'strength' of the supporting evidence where 1 is the best quality evidence and 4 is expert opinion.

Qualitative material was systematically appraised for quality, but was not ascribed a level of evidence.

Adapted SIGN Grading System used to identify the level of evidence	
1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well conducted meta-analysis, systematic reviews of RCTs or RCTs with a low risk of bias
1-	Well conducted meta-analysis, systematic reviews of RCTs or RCTs with a high risk of bias
2++	High quality systematic review or case-control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal.
2+	Well conducted case-control of cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal.
2-	Case-control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies, eg, case reports, case series
4	Expert Opinion eg, narrative reviews.

Levels of evidence for diagnostic test

The key criteria considered for inclusion were:

- number of participants >35
- blind independent assessment of the new test and the reference standard
- comparison of a reference test with the new test in > 90% of people
- an appropriate spectrum of people or a defined clinical group.

Levels of evidence

Single diagnostic studies	
D++	Good: All diagnostic tests criteria met
D+	Fair: One or two of the criteria not met
D-	Poor: None of the criteria met.

Diagnostic systematic reviews	
DSR++	High quality meta-analysis or systematic review of diagnostic studies
DSR+	Fair quality meta-analysis or systematic review of diagnostic studies
DSR-	Poor quality meta-analysis or systematic review of diagnostic studies.

Grading

The final step in grading is to consider the WHOLE BODY OF EVIDENCE ie, all the studies relevant to the issue and decide on a recommendation and grade based on all of the individual studies.

Grades of recommendations	
A	The recommendation is supported by good evidence
B	The recommendation is supported by fair evidence
C	The recommendation is supported by expert opinion only, based on level 4 evidence in the text and the expertise within the multidisciplinary team.
I	No recommendation can be made because the evidence is insufficient (ie, evidence is lacking, of poor quality or conflicting and the balance of benefits and harms cannot be determined).

The grades A to C, I are a measure of the strength of evidence underlying the recommendations and should not be construed as an indication of the relative importance of the recommendations.

Criteria for level one evidence for clinical decisions rules[24]

Derivation of the rules by statistically evaluating the predictive value of variables from the history and physical examination

Validation of the rules in an appropriate setting, with blind assessment of the reference standard

Assessment of the impact of the rules on a person's management to ensure its acceptability to people and physicians, and to determine that it improves a person's outcomes and reduces costs

Validation of the rule in local and international settings to establish its applicability.

Scope of the Guideline

The following inclusion and exclusion criteria were agreed by the guideline team at the outset.

Inclusion

- The diagnosis and management of adults (over age 15) with an acute injury to the menisci, the collateral and cruciate ligaments of the knee.

  (An acute injury was defined as one where presentation is within three months of the date of injury).

Exclusions

- Surgical management of meniscal and ligament injuries
- Chronic and recurrent knee instabilities
- Overuse injuries
- Arthritic conditions
- People with other significant co-morbidities, for example haemophilia, psychiatric disorders which may require modified management
- Injuries to the patellofemoral joint
- Patella ligament injuries
- Bone bruises
- Fat pad impingement/entrapment
- Ilio-tibial band syndrome

Search Terms

Basic search terms were used to identify studies relating to soft tissue knee injuries. Additional terms were used to address each aspect of the guideline and these were combined with the basic search for soft tissue knee injuries. Appropriate filters were used to identify diagnostic studies and randomised controlled trials.

The complete list of search terms used to identify and locate studies for this guideline are included in the reference document on the NZGG website.

Criteria Used to Locate and Include Studies

Types of studies

Only systematic reviews, meta-analyses, randomised controlled trials or quasi-randomised controlled trials were considered for inclusion for the guideline. Observational studies, case studies and laboratory base studies were excluded.

Types of participants

Participants included people over the age of 15 with an acute soft tissue injury of the knee involving the menisci or ligaments.

Types of interventions

Diagnosis

- Clinical Tests
- Use of X-ray
- Use of MRI

Treatment

- 'RICE' (rest, ice, compression, elevation)
- Medication (NSAIDs or paracetamol)
- Bracing or any form of bandaging
- Electrotherapies including ultrasound, NMES, TENS, Laser, Biofeedback
- Methods of rehabilitation therapy including open and closed kinetic chain exercises, proprioceptive retraining, home versus supervised, bracing post-operatively
- Complementary therapies, including chiropractic, osteopathy and acupuncture.

Types of outcomes

- Functional outcomes such as return to previous activity levels and return to work
- Validated functional outcome scoring systems, including Lyshom, Tegner, IKDC
- Objective tests such as stability testing (clinical tests and arthrometry), one leg hop

- Subjective assessments including VAS functional and satisfaction assessments
- Harm or adverse reactions
- Cost-effectiveness

Only published studies in the English language were included. No attempt was made to locate unpublished studies.

Search Strategy

The studies located by the Cochrane Musculoskeletal Injuries Group in Dunedin formed the basis of the literature search. This was a broad scoping search, which identified over 7000 titles of which 630 studies were considered eligible. Not all of these were relevant to the questions addressed by the guideline and it was necessary to carry out additional searching for each question.

The following search strategy was applied:

General databases

- MEDLINE (1966- current)
- EMBASE (1988 – current)
- CINAHL (1982-current)
- AMED (1985-current)
- SPORTDiscus.(1949-current)
- Current Contents (1993-current)
- PubMed (current)

Cochrane

- Cochrane Database of Systematic Reviews
- Controlled Trials Register
- Database of Abstracts of Reviews of Effectiveness (DARE)
- Cochrane Complementary Medicine fields trials register.

Selected internet sites

- PEDRo (Physiotherapy Evidence Database) www.ptwww.chs.usyd.edu.as/pedro/
- NHS Clinical Trials www.clinicaltrials.gov.ct/gui/c/r
- Health Technology Assessment for NHS www.hta.nhsweb.nhs.uk/
- NHS Centre or Reviews and Dissemination www.york.ac.uk/inst.crd/listong.htm
- New Zealand Health Technology Assessment www.nzhta.chmeds.ac.nz
- Bandolier www.jr2.ox.ac.uk/bandolier/
- National Guideline Clearing House www.guideline.gov.index/asp
- NHS Clinical Trials www.clinicaltrials.gov/ct/gui/c/r

Reference lists

The reference lists of included studies and relevant reviews were checked for further trials.

Abbreviations

ACC	Accident Compensation Corporation
ACL	Anterior cruciate ligament
CKC	Closed kinetic chain
EPIQ	Effective Pactice, Informatics, Quality Improvement
GATE	Generic appraisal tool for epidemiology
LCL	Lateral collateral ligament
MCL	Medial collateral ligament
MOH	Ministry of Health
NMES	Neuromuscular Electrical Stimulation
NSAID	Non-steroidal anti-inflammatory drug
NZGG	New Zealand Guidelines Group
OKC	Open kinetic chain
PCL	Posterior cruciate ligament
R.I.C.E	'Rest, ice, compression, elevation'
TENS	Transcutaneous Electric Nerve Stimulation

Glossary

Acupuncture: Acupuncture involves the use of needles to stimulate acupuncture points along meridians to enhance the healing process.

Aspiration: Using a needle to remove blood and fluid from an acutely swollen and painful knee.

Biofeedback: The use of electrodes to pick up electrical activity in the muscle. This is converted to visual or auditory signal to facilitate a persons' ability to contract the muscle.

Chiropractic: Chiropractic emphasises the ability of the body to heal itself by restoring and maintaining the health of the whole person through natural means. Specifically, Chiropractic aims to restore and maintain joint, muscle and nervous system function.

Clinical milestone: A clinical milestone is what a person may reasonable expect to achieve within a specified timeframe.

Closed kinetic chain exercise:
Exercises which are performed in a weight-bearing position which typically involve several joints and are more functional.

Compartment syndrome:
Compartment syndromes arise when a muscle becomes too big for the sheath that surrounds it. The pressure constricts the circulation causing ischemic pain. In knee injuries this can be due to excess swelling which interferes with the circulation to the muscle.

Complementary and alternative medicine (CAM):
Therapies which are considered outside the scope of conventional orthodox medicine. The more widely accepted therapies include acupuncture, chiropractic, osteopathy and homeopathy.

Degenerative joint disease:
Wear and tear in the joint involving the articular surfaces.

Diagnostic arthroscopy:
A procedure carried out under local or general anaesthetic which involves the use arthroscope (magnifying camera) to detect pathology in the knee.

Disability: A limitation in performance of socially defined roles and tasks within a sociocultural and physical environment. Eg, unable to perform in sport

Effusion: Swelling in the joint.

Electrotherapy: Electrophysical modalities used for therapeutic purposes by physiotherapists.

Functional limitation:
Limitations in function imposed in performance at the level of the person, eg, unable to run

Functional outcome:
An outcome which measures what activities a person can do and is meaningful to the person.

Guided imagery: A psychological intervention featuring relaxation and imagery components.

Haemarthrosis: A bleed into the joint, usually caused by damage to the structures within the joint.

Hyperextension injury:
A force causing the knee to bends backwards beyond its normal range.

Impairment: The loss of or abnormality in anatomic or physiologic structure or function at the level of an organ. Eg, loss of range of movement or strength.

Instability: A sense of instability or giving out of the knee joint experienced by the person in the course of their usual activities. It may or may not be associated with mechanical laxity.

Joint line tenderness:
Tenderness over the joint line each side of the knee, between the femur and tibia.

Laser: The use of concentrated 'light beam' for the treatment of pain in musculoskeletal injuries. Laser uses that part of the electromagnetic spectrum between 630nm and 1300 nm. The physiological effects are unclear.

Laxity: An excess range of movement due to the loss of integrity of the ligaments which contribute to joint stability.

Locked knee: Loss of full passive extension due to a mechanical cause in the joint.

Locus of control: An external locus of control refers to the belief that one's outcome is under the control of powerful others, or fate, luck or chance. An internal locus of control refers to the belief that one's outcome is under one's own control and linked to one's own behaviour.

Magnetic resonance Imaging (MRI):
Magnetic resonance imaging. This is an imaging procedure which enables the detection of pathology in the soft tissue.

Neurovascular: Pertaining to nerves and blood vessels.

Open kinetic chain exercise:
Exercises which are usually performed in the non-weight-bearing position and typically involve an isolated joint.

Osteochondral fracture:
A fracture which breaches the articular cartilage and underlying subchondral bone.

Osteopathy: Osteopathy seeks to restore and maintain the health of a person by working on the muscles, joints and other structures that make up the neuromusculoskeletal system through gentle manipulative procedures.

Ottawa Knee Rules: A set of validated clinical decision rules to assist clinicians make decisions about the need for X-rays in acute knee injuries.

Physiotherapy: The profession of Physiotherapy provides services to people to maintain and restore maximum movement and functional ability where these have been compromised through injury or illness.

Proprioception: The neurophysiological mechanisms which mediate the orientation of the body in space, the rate and direction of movement, tendons and muscle sensations, pressure and vibration sensations and the sense of equilibrium.

Red flags: Signs and symptoms which alert the clinician that more serious pathology may exist, and usually require prompt attention.

Rehabilitation: Rehabilitation involves any procedure designed to maximise function after injury or illness.

Ultrasound: The therapeutic use of high frequency sound waves believed to enhance the healing of soft tissues following injury.

Methodology Terms

Blinded: A study where the observers and participants have no knowledge of the intervention to which the groups are assigned. Studies can be single blind (investigators or participants only), double blind (investigators and participants) or triple blind, (investigators, participants and outcome assessment).

Epidemiology: Epidemiology is the study of the distribution and determinants of health-related states or events in specified population and the application of this study to the control of health problems.

Evidence-based medicine/healthcare:
The process of finding relevant information in the medical literature to address a specific clinical problem.

Gold standard: A method, procedure or measurement that is widely regarded or accepted as being the best available. Often used to compare new methods.

Likelihood ratio: The probability of a clinical finding in people with the disease divided by the probability of the same finding in people without the disease.

Sensitivity: The probability of a positive test in people with the disease.

Specificity: The probability of a negative test in people without the disease.

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