Thoracic and Chest Pain
The thoracic spine is the region of the spine least likely to be injured in sport when compared to the cervical and lumbar region. However, this region can contribute to lumbar and cervical spine dysfunction.

Anatomy
The thoracic spine is comprised of twelve thoracic vertebrae that are located between the cervical and lumbar spine. The vertebrae of the thoracic spine articulate with ribs, which in turn join with the sternum to make up the thorax. Therefore, it is a relatively hypomobile part of the spine and serves the function of protecting the heart and lungs.

Risk Factors and Prevention
You may be able to avoid back pain by improving your fitness, strength and flexibility and learning and practicing proper techniques and postures for work, rest and sport.

Posture: Increased thoracic curve
Normal movement of the neck and shoulder are dependent on normal mobility of the upper thoracic spine. During overhead activities, the thoracic curve straightens. A habitual ‘slouched’ upper thoracic posture (increased thoracic curve) may over time reduce the ability of the thoracic curve to straighten. This may result in changes in the mechanics of the shoulder joint, which could lead to strains in the muscles, and joints around the shoulder, neck and shoulder blade.
The upper ribs may be pulled forwards due to these ‘slouched’ positions of the upper thoracic spine. Restriction of upper rib mobility may produce symptoms of **thoracic outlet syndrome** (see below for description of same) or subacromial impingement (shoulder joint dysfunction). Consequently, restricted thoracic mobility may increase the demands on the more mobile cervical spine and lumbar spine. This may lead to symptom development.

**Adequate warm up:** It has been shown that prolonged driving or sitting position with poor posture before active sport increases the likelihood of injury. Therefore, it is important to adequately warm up before training and competition.

**Slouching** after training or competition may contribute to strain due to excess load on warmed up joints.

**Smokers** have diminished oxygen levels in their spinal tissues, which can hinder the healing process.

**Maintain a healthy weight.** Being overweight puts strain on your back muscles. If you're overweight, trimming down can prevent back pain.

### Causes of thoracic spine and chest pain

**Bony Injuries**

**Fractured ribs** may occur in contact sports. A fracture may occur after a severe blow to the chest from direct contact or from a fall, as in diving to block a ball. It is usually associated with a winded sensation and pain with taking a deep breath, sneezing and coughing. An X-ray will confirm a rib fracture and help differentiate it from a soft tissue injury.

Although rare, a rib stress fracture can occur after repetitive use of the shoulder, such as repeated overhead throwing. This occurs due to excessive muscle traction at the muscular attachments to the ribs. A Chartered Physiotherapist or your team doctor will complete a full examination to determine the cause of pain and if needed will refer you for an X-Ray if needed. Fractured ribs usually unite and become painless in 4-6 weeks. However, fractured ribs may lead to secondary dysfunction of the thoracic spine facet joints which can cause persistence of pain. A Chartered Physiotherapist may use mobilization techniques when appropriate to assist restoration of normal movement.

A pneumothorax or rarely a haemopneumothorax may occur as a result of a rib fracture. Any athlete with rib trauma must undergo a respiratory examination to exclude these conditions. Chest pain associated with difficulty in breathing and referred pain to the tip of the shoulder may be due to an idiopathic spontaneous pneumothorax. This is a medial emergency so attend your doctor or A+E if displaying these symptoms.

Less commonly, a fracture may occur to a vertebral body through a high impact fall and a fracture to the sternum (chest bone) may occur by a severe blow to the chest.
The team doctor or Chartered Physiotherapist will be able to assess need for an X-ray and/or review by A+E.

**Muscular Injuries**
The muscles of the thorax may be injured by overstretching, by sudden severe contractions of these muscles, by direct contact or by poor throwing technique due to poor posture. Being unaccustomed to exercise or the lack of a warm up of all the relevant joints may predispose you to a muscle strain. Consequently, muscle spasm and pain around the shoulder blade or parallel to the spine may result.

**Joint Injuries**
The most common cause of musculoskeletal thoracic spinal pain is disorders of the thoracic intervertebral joints and the numerous rib articulations. Intervertebral joint injuries include injuries to the intervertebral discs, rib joints (costovertebral) and joints between the vertebrae (facet joints).

Onset of pain may be sudden or gradual. Injury may occur from a direct blow to the joint, a sudden sharp movement, such as twisting or bending down to the side, or from a forward flexed posture which produces strain into the joint. A slumped posture a forward poking chin, increased thoracic kyphosis and protruding shoulder girdle predisposes an athlete to a joint strain and injury. This may result in inflammation in the joint and muscle spasm of surrounding muscles. Habitually poor posture may result in degeneration in the joint.

Slouching after training or competition may contribute to strain. It has been shown, prolonged driving and sitting position with poor posture before active sport increases the likelihood of injury. Therefore, it is important to adequately warm up before training and competition.

**Signs and Symptoms**
- Pain - commonly located between or around the shoulder blades but can be located closer to the neck or low back or to the front or side of the chest.
- There may be pain with twisting of the spine, usually one side more than the other.
- Pins and needles and numbness may be present.
- Deep breathing and coughing may cause pain.
- A typical presentation of these intervertebral joint problems is hypomobility and tenderness of one or more segments. There may be associated muscle spasm of the paraspinal (muscles either side of the spine) and periscapular (muscle surrounding the shoulder blade) muscles.

Treatment may include manipulative techniques or mobilization to restore full mobility. Soft tissue therapy may be used to correct abnormalities in the paravertebral and periscapular musculature. Stretching and strengthening exercises should also be included in the treatment program.

**Disc Herniation**
Thoracic disc herniation is rare. However, when it does occur, disc herniation most commonly occurs in the lower thoracic spine. Symptoms may include local back pain
with pain, pins and needles and/or numbness radiating in the distribution of the affected nerve.

**T4 Syndrome**
Diffuse pain and sensory symptoms such as pins and needles or numbness in the upper arm may occur due to intervertebral joint problems around the upper thoracic region. These vague symptoms have been termed as ‘T4 syndrome’. Predisposing factors may include unaccustomed lifting, stretching, pushing or exercises as well as trauma such as a fall. Posture also plays a role in the onset of the syndrome, with a slumped posture a forward poking chin, increased thoracic kyphosis and protruding shoulder girdle likely to predispose an athlete to the condition. There may be specific muscle tightness which encourages poor head and shoulder posture which may contribute to the problem.

A Chartered Physiotherapist will provide a full assessment and assist in the restoration of mobility of the upper to middle thoracic segments which may relieve symptoms. An exercise program may be given to stretch tight muscles and selectively strengthen weak muscles which may assist in recovery. Restoration of full mobility of the upper to middle thoracic segments by manipulation or mobilization may relieve symptoms.

**Chest pain**

Internal injuries, although rare must be recognized and differentiated from the musculoskeletal structures. As severe pathological processes such as infections, neoplasms, and metabolic disorders frequently present as pain in the back, it is important to rule out these conditions by attending your doctor.

It may be difficult to distinguish between chest pain of cardiac origin and pain referred from the thoracic spine. The possibility is increased in the presence of associated symptoms such as palpitations or shortness of breath or when there is a family history of cardiac disease. Other causes of chest pain include peptic ulcers, gastroesophageal reflux, chest infection and malignancy. The most common cause of chest pain in the athlete under 35 years is referred pain from the thoracic spine. This may or may not be associated with thoracic pain. Therefore, athletes presenting with anterior or lateral chest pain require a thorough investigation.

**Sudden Adult Death Syndrome** is defined as a non-traumatic, non-violent, unexpected death occurring as a result of natural causes within 6 hours of a previously witnessed state of normal health. Sudden death syndrome is usually caused by some form of heart disease. The most common heart disease causing sudden death is hypertrophic cardiomyopathy (thickening of cardiac muscle), coronary artery abnormality, Marfan’s Syndrome (abnormality of connective tissue that weakens the structure of the aorta and cardiac valves) and congenital heart disease. The most common non cardiac sudden death in athletes is the use of alcohol, cocaine or other illegal drugs. Cerebral aneurysm (weakness in an artery or vein in the brain that breaks and results in catastrophic bleeding) and head trauma may also cause sudden death.
Other Causes of Chest Pain

**Sternoclavicular joint dysfunctions**
The sternoclavicular joint is the sole articulation between the upper limb and the axial skeleton. The stability of the joint comes from the strong surrounding ligaments. The SC joint can be injured by a direct blow or commonly from a blow to the shoulder. Simultaneous injuries of the acromioclavicular joint and SC joints are reasonably common. Traumatic injuries include sprains, subluxations and dislocations which may involve rupture of the joint and/or surrounding ligaments and fractures of the clavicle.

Signs and symptoms include local pain and swelling depending on the severity of the injury. Treatment may involve immobilisation, gentle mobilisation techniques and strengthening exercise programme.

**Costochondritis** occurs at the junction between the sternum and ribs. It is characterised by activity related pain and tenderness located to the costochondral junction. This condition is sometimes known as Tietze’s syndrome. Treatment may consist of injection therapy and mobilisation techniques.

**Investigations**
Research has shown that diagnostic tests aren't usually necessary to confirm the cause of your back pain. However, if you do attend your doctor or chartered physiotherapist for back pain, you may be questioned about the behaviour of the symptoms and assessed for joint dysfunction and muscle spasm. These assessments help determine diagnosis and the severity of the condition. They will also help rule out more serious causes of back pain.

If there is reason to suspect that you have a tumour, fracture, infection or other specific condition that may be causing your back pain, your may be sent for further investigations:

- **X-ray** - These images show the alignment of your bones and whether you have arthritis or broken bones. X-ray images won't directly show problems with your spinal cord, muscles, nerves or discs. X-Ray of the thoracic spine is not routinely indicated as it does not usually provide much to the clinical picture. Unusual presentations may signal the need for investigation.
• **Magnetic resonance imaging (MRI) or computerized tomography (CT) scans**
These scans can generate images that may reveal herniated disks or problems with bones, muscles, tissue, tendons, nerves, ligaments and blood vessels.

• **Bone scan** - In rare cases, your doctor may use a bone scan to look for bone tumours or compression fractures caused by osteoporosis. In this procedure, you'll receive an injection of a small amount of a radioactive substance (tracer) into one of your veins. The substance collects in your bones and allows your doctor to detect bone problems using a special camera.

• **Nerve studies (electromyography, or EMG)** - This test measures the electrical impulses produced by the nerves and the responses of your muscles. Studies of your nerve-conduction pathways can confirm nerve compression caused by herniated discs or narrowing of your spinal canal (spinal stenosis).

**Treatment**

Examination of the thoracic spine involves an assessment of the movement of each intervertebral segment, palpation of the joints, muscles, soft tissue along the spine and shoulder blades and anterior chest wall. The lumbar and cervical spine may also be examined.

On assessment a chartered physiotherapist will establish the severity of the injury and the most likely cause. The aim of treatment is to relieve pain and restore normal movement and strength, returning you to full training as quickly as the injury will allow. You will be advised on the best home self-management strategies, which may include exercises, modified training activities, modified work postures etc. Once a clear diagnosis has been made, recovery via the appropriate treatment techniques can occur quite rapidly.

**Manual Therapy** - If pain is from a musculoskeletal origin, manipulative, mobilising and soft tissue techniques (‘hands-on’) can quickly restore normal function. Soft tissue techniques may relieve muscle spasm before mobilisation or manipulation can make the techniques more effective. Heat may also be used to increase blood flow to the area.

Physiotherapists may also use heat/ cold treatment, acupuncture or electrotherapy to assist with pain relief.

**Taping / Strapping** - Strapping the thoracic spine and the shoulder girdle in a good position for 2-3 days may assist with healing and also encourages correct muscle activation and good postural alignment.

**Flexibility and strengthening** - Postural correction, stretching and strengthening exercises are important in regaining and maintaining good alignment. This aims to reduce the risk of recurrence in the future. Lumbar spine alignment, thoracic spine and cervical alignment may be addressed to ensure correct posture in different functional positions and activities such as standing, walking, running, kicking etc.

To maintain general fitness, a chartered physiotherapist may advise on a modified training programme. When the time is right, you may be advised on a graded return to your previous level and intensity of training and play.
**Medications** - Painkillers and anti-inflammatory medications may help control the pain. Your pharmacist or doctor can advise you on suitable medication. If home treatments aren't working, your doctor may suggest stronger medications such as muscle relaxants, prescription pain killers or anti-inflammatory medications.