Spinal fractures are a potentially massive topic and much of this knowledge is outside of the remit of a medical school curriculum. This chapter will focus on two types of fracture; fragility fractures of the thoracolumbar spine and traumatic fractures of the cervical spine. Other spinal conditions, including differential diagnosis, will be covered later in the course in the section on Back and Neck Pain.

Fragility Fractures of the Thoracolumbar Spine
Wedge fractures are commonly seen in the elderly and those with osteoporotic bone. They are fragility fractures which means they usually occur from what is relatively innocuous trauma such as a fall from standing height. The incidence of fragility fractures is increasing with an aging population, as it is with hip and wrist fractures.

They derive their name because a lateral x-ray of the spine normally shows the vertebral bodies as being rectangular. In a wedge fracture the anterior part of the body collapses to a varying degree, leaving the posterior part intact creating a wedge shape.

In the previous image the lumbar vertebra in the middle has a wedge fracture bordered by two normal vertebrae.

Stability of Thoracolumbar Fractures
The Denis classification of the structural elements of the spine is a simple way of deciding if a fracture is stable or not. It breaks the spine into three columns. If only one column is affected then the fracture is considered to be stable. Wedge fractures fall into this group as only the anterior column is involved. When two or three columns are involved the fracture is unstable and if this is the case the fracture is more significant than a simple wedge.

The following image shows the three columns on a normal vertebra.

History and Examination
The classical presentation of a lumbar wedge fracture is an elderly patient who has fallen from standing height at home and developed acute onset low back pain. The pain itself is usually the predominant feature of the condition and is well localised to the site of the fracture. The pain is usually made worse on movement and weightbearing though it can still be significant at rest. If the presentation is delayed, the history is usually one of initially severe pain which very slowly improves over weeks to months.

When examining the patient there is midline tenderness around the spinous process of the affected level. The patient will struggle or be unable to mobilise due to pain. A full neurological examination should be performed but a simple wedge fracture does not usually cause spinal cord compression. It may cause compression of the exiting nerve roots leading to radicular pain in the affected dermatome.

Patients with multiple chronic wedge fractures tend to exhibit a classic hyperkyphotic deformity of the lumbar spine.

Investigation
The initial investigation in someone who has had minimal trauma and acute onset back pain is x-ray. This is usually very good at picking up wedge fractures though it is not always easy to tell if they are new or old. It is also not good at differentiating an osteoporotic fracture from one with a sinister underlying pathology such as metastasis.

CT scans can be used to better examine the bony injury if there is a question about the stability of the fracture. They will also clearly show if there is any evidence of retropulsion of the bony fragments into the spinal canal. They only give limited information about the status of the soft tissues such as the
ligaments, intervertebral discs and the spinal cord. The following image shows a T12 wedge fracture on CT scan.

Where there is a need for more information on the soft tissues, particularly if the patient exhibits some neurological involvement, MRI is the investigation of choice. It is usually used as an adjunct to x-ray or CT rather than being the sole investigation.

The above image shows a T2 weighted MRI scan of the lumbar spine. There is a wedge fracture of the L1 vertebra. Behind it the spinal cord (dark grey) can be seen with plenty of cerebrospinal fluid surrounding it (light grey) indicating that there is no compression of the cord by disc prolapse or retropulsion of bone fragments.

Management
Traditionally the management of stable wedge fractures was conservative. Early mobilisation as pain allows and good analgesia are key to this being a success. There is limited evidence for the use of braces such as the TLSO (thoracolumbar support orthosis).

More recently kyphoplasty has become an option. This is a percutaneous technique which is done under a general or occasionally local anaesthetic, where the collapsed vertebra is injected with cement. This acts as a stabiliser of the anterior column which in turn offers pain relief and an earlier return to function.

The image above shows a CT scan of an L2 vertebra wedge fracture which has been treated with kyphoplasty. The cement shows up as bright white.

Traumatic Fractures of the Cervical Spine
Fractures of the c-spine are seen in all age groups. In the young they are usually the result of significant trauma such as a road traffic accident or hyper-extension injury playing rugby or some extreme sports. In the elderly they can be seen in low energy settings such as a fall from standing height. They should be suspected in all patients after trauma and there is more detail on this in the earlier section on managing the trauma patient.

Imaging
The appropriate imaging for suspected c-spine injuries depends on the circumstance. Whilst plain x-ray has traditionally been the investigation of choice, they have been shown to be poor at identifying injuries and for this reason are no longer used in the acute trauma setting. X-rays are still used in older patients who have neck pain following a low energy injury, though the logic of this is questionable. They may be used as an investigation in general practice when an elderly patient presents some time after a low impact injury and these occasionally show a significant injury.

When x-rays are used, AP and lateral views are the standard. For the lateral view to be considered adequate it must show the whole of the c-spine from C1 to the C7 / T1 junction. Sometimes more than one lateral view is needed to obtain this, particularly in patients with short necks or with stiff shoulders. A commonly used variant is called the swimmers view where a lateral is taken at an oblique angle with the arms elevated.
The following lateral x-ray shows an adequate view of the normal c-spine. C1 is labelled a. If you count down from this you can clearly see the junction of the C7 and T1 labelled b.

A third view is usually employed in trauma, the peg view. This is a view taken through an open mouth to image the odontoid peg (part of the C2 vertebra).

The above x-ray shows an undisplaced fracture across the base of the odontoid peg labelled a. Be careful when interpreting these x-rays as it is not uncommon for the peg to have a radiolucent line which looks fractured when it is not.

CT is now used as the initial imaging for trauma patients as part of a vertex (the top of the skull) to symphysis (the bottom of the pelvis at the symphysis pubis) scan. They are significantly more sensitive than x-ray as they add three dimensions to the imaging by taking multiple slices through the bone, rather than taking a two dimensional image as x-ray does.

The CT scan above shows a trauma patient with an odontoid peg fracture. The fracture can be seen on this sagittal section as a marked radiolucent line through the peg in the middle of the white circle.

As in the lumbar spine, when clinically there is neurological involvement an MRI scan should be performed.

The following x-ray shows the importance of an adequate lateral view.

This is an inadequate view. It only shows the C6 / C7 junction and if you don't look closely you could miss the unstable C7 fracture shown by the white arrow.
to better assess the spinal cord. The following MRI shows an injury at the extreme end of the spectrum.

This is a T2 weighted MRI scan of a C6-7 bilateral facet joint fracture dislocation with almost complete obliteration of the spinal canal and severe compression of the spinal cord. Miraculously this patient had immediate surgery and recovered.

**Management**
The initial management for a patient with a suspected or confirmed c-spine fracture is immobilisation in a hard collar as shown below.

The above x-ray gives an example of the way the previously seen odontoid peg fracture could be treated; with atlanto-occipital screw fixation.

The surgical management very much depends on the fracture configuration and the centre the patient is being treated in. A full discussion is outside the remit of this course.