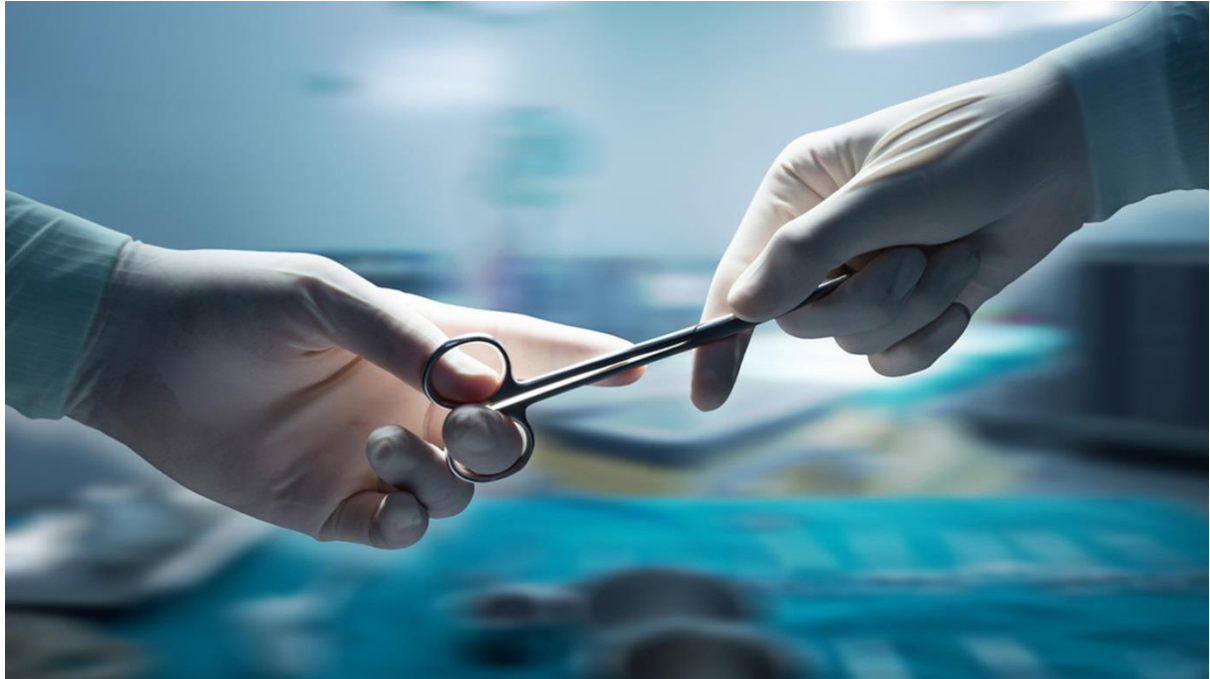


# West Midlands Regional Spine Network



## Spinal infection guidelines

## June 2022

<b>Category</b>	<b>Operational Delivery Network policy document West Midlands Regional Spine Network (WMRSN)</b>
<b>Purpose</b>	<b>To provide a guideline for recognition, referral and initial management of spinal infections</b>
<b>Version</b>	<b>1.0</b>
<b>Previous versions</b>	<b>Nil</b>
<b>Supporting documents</b>	<b>WMRSN MRI policy WMRSN Emergency disorders policy BASS knowledge update spondylodiscitis</b>
<b>Responsible working group</b>	<b>WMRSN Board</b>
<b>Sign off</b>	<b>WMRSN board</b>
<b>Related networks</b>	<b>N/A</b>
<b>Distribution</b>	<b>All WMRSN hospital COO and Medical director Clinical leads ED / spine surgery / radiology / MSK &amp; Spine triage or interface services Chair STPs / CCG Betsi Cadwaladr health board</b>
<b>Review date</b>	<b>1.6.2023</b>

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## INTRODUCTION

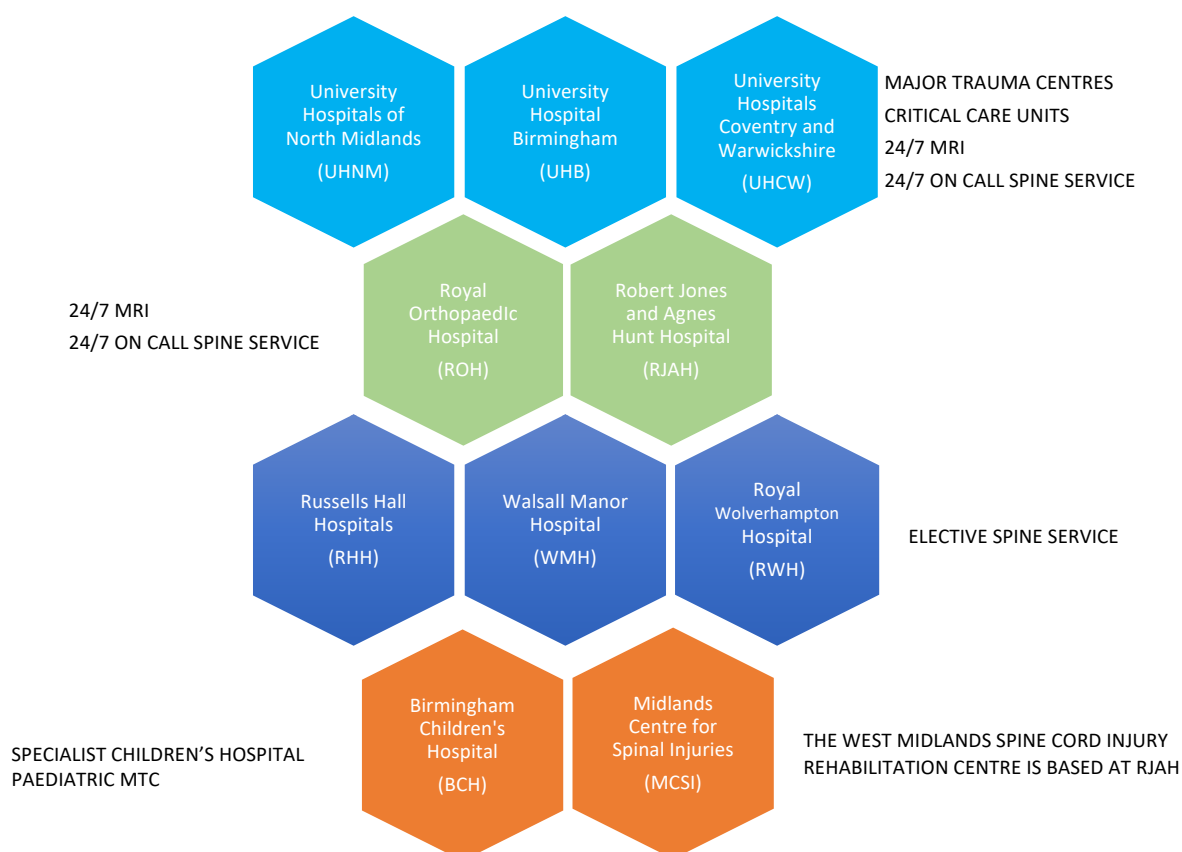
The West Midlands Regional Spine Network (WM RSN) includes 3 major trauma centres (MTC), 2 specialist orthopaedic hospitals, 3 neuroscience centres and 3 spine partner hospitals. There is also a specialist children’s hospital, a regional specialist spinal cord injury rehabilitation centre and neurorehabilitation centres associated with the MTCs.

UHNM, UHB, UHCW, ROH and RJAH are known as spine hubs as they provide 24 hours spine on call cover. RWH, Walsall Manor and RHH are spine partners as they provide a spine service but without 24 hours on call cover.

This document outlines the emergency services provided by each hospital, the expectation on referral and hospital specific process and pathways for referrals.

There are obligations on the referrer as well as the receiving Spine Centre that this document also outlines.

## WM RSN EMERGENCY SERVICE OUTLINE



UHNM, UHB, UHCW are adult MTCs. BCH is a paediatric MTC for the region. BCH takes all non-trauma paediatric spine emergencies for Birmingham as well. The MCSI is a regional specialist rehabilitation centre for spinal cord injury. The MTC all have acute rehabilitation services and neurorehabilitation services that also look after some spinal cord injured patients.

## TYPES OF EMERGENCY DISORDERS ACCEPTED FOR MANAGEMENT BY HOSPITAL

Hospital	Major Trauma	Isolated spine trauma (ISS < 9)	Osteoporotic and elderly trauma (no neurology)	Cauda Equina Syndrome	MSCC	Intradural pathology	Primary sarcoma	Spinal cord injury (acute)	Spinal cord injury specialist rehabilitation
UHNM	✓	✓	✓	✓	✓	✓		✓	
UHB	✓	✓	✓	✓	✓	✓	✓	✓	
UHCW	✓	✓	✓	✓	✓	✓		✓	
ROH		✓	✓	✓	✓		✓		
RJAH		✓	✓	✓	✓		✓		
RHH		✓*	✓*						
WMH		✓*	✓*						
RWH		✓*	✓*						
BCH	✓^	✓^			✓^	✓^			
MCSI									✓

\*can manage isolated spine trauma presenting at own ED if no requirement for surgery

^paediatric major trauma centre and specialist children's hospital

### EXECUTIVE SUMMARY

- The aim of this policy is to provide guidance for the assessment, initial management and referral of patients with spinal infection across the network.
- Spinal infection is mostly managed medically but can result in severe infection, sepsis and neurological compromise (needing surgery).
- Red flags for diagnosis include
  - Temperature or rigors associated with localised spinal pain and tenderness
  - Recent source of infection
  - Known immunocompromise
  - Night-time spine pain / weight bearing spine pain
  - Systemic features of infection associated with spine pain / nerve pain / neural compromise (including sphincter disturbance)
- Patients should be screened for sepsis
- Patients should be investigated early with a whole spine MRI.
- Blood work up should include blood cultures.
- Repeat assessments for sepsis and neurological compromise should be undertaken.
- Where possible tissue cultures should be obtained via radiological or open biopsy before starting antibiotics if blood cultures are negative and patient's clinical status allows a delay in antibiotics.
- Surgery may be required for sepsis, neurological deficit, failure to respond or bony destruction.
- Intravenous antibiotics are usually required initially, and long lines and tunnelled lines should be considered early on
- Six weeks total duration of antibiotics is usually sufficient
- Immunocompromised patients, undrained abscesses and MRSA infections may need 3 months total duration of antibiotics
- These patients require a multidisciplinary approach between a physician, spine surgeon and microbiologists
- All iatrogenic spine patients are best managed in a spine surgical unit
- Non iatrogenic spine infections do not need to be managed on a spine surgical unit unless surgery is required. Shared care and decision making is to be encouraged.

## What is the guideline trying to achieve?

The guideline aims to improve 3 important aspects relating to spine infection:

1. Ensuring recognition of potential spine infection in a patient
2. Ensuring timely investigations are carried out for potential spine infection
3. Ensuring patients are appropriately investigated and managed in the appropriate setting for the initial management of spine infection

The guideline does not cover primary meningitis. The guideline does not cover detailed surgical strategies.

## Clarifying the terms used.

Iatrogenic spine infection – refers to a spine infection following a procedure or intervention. This can include regional anaesthetic techniques and lumbar punctures as well as spine surgery.

Non iatrogenic spine infection (NISI) – refers to a spontaneous infection in the spine. It may follow other obvious remote sources of infection but does not start due to an intervention or procedure in the spine.

Abscess – a collection of pus within a space or compartment of the body.

Spondylodiscitis – an infection of the vertebral body and disc of the spine.

Epidural abscess – a collection of pus within the epidural space.

Facet joint infection / septic arthritis – infection primarily of the facet joints of the spine.

Meningitis – an infection or inflammation of the meningeal coverings of the spine

GP refers to a general practitioner or other care practitioner in a primary care setting.

Triage service refers to a primary/secondary care interface triage service. It often takes the form of a musculoskeletal integrated service.

ED refers to an Emergency Department in an acute hospital.

Secondary care refers to spine surgical services, pain clinic services and rheumatology services (even if based in primary care).

## What is spine infection?

Spine infection for the purpose of this guideline means any infection (pus forming or otherwise) involving the vertebra, disc, epidural space, facet joints or neural elements of the spine or the immediate surrounding soft tissue (including the psoas muscle). It excludes meningitis where that is a primary issue (and not secondary to a spine infection as defined above).

Spine infection can affect any part of the spine, but tends to commonly affect the lumbar spine (58%) and thoracic spine (30%).

The majority of infections are bacterial including staphylococcal sp. (50%).

Haematogenous spread from a remote infected site or adjacent infection spread are common modes of non-iatrogenic spine infection (NISI). Even bacteraemia from a remote site (e.g. dental manipulation) can result in NISI.

## What are the symptoms of spine infection?

Patients may present with symptoms of infection (temperature, rigors, malaise, loss of appetite, night sweats) but usually associated with localised spine pain. The spine pain would tend to be a severe, localised pain and not generalised myalgia.

Some patients may simply present as a pyrexia of unknown origin or even sepsis.

If neural compromise is evident (e.g. with an epidural abscess) the above symptoms may be associated with radiating limb pain (radicular pain) or numbness, weakness and even paralysis. Sphincter disturbance due to neurological compromise can also arise with significant neurological deficit.

Although psoas abscesses can occur de novo, investigation of the symptoms of a psoas abscess should include an MRI of the spine as they frequently occur together.

More insidious organisms may present later (e.g. TB, Brucella sp) with pain and localised deformity (gibbus) due to bony destruction.

In iatrogenic spine infections the presence of pyrexia, malaise, an erythematous wound or pus discharge should alert the clinician to a spine infection.

### **Risk factors for spine infection**

- Elderly
- Diabetes
- Malnutrition
- Prolonged steroid use
- Renal dialysis
- Immunocompromised conditions
  
- Surgery of long duration / high blood loss
- Implant surgery
- Revision surgery

## What does a GP or triage practitioner do?

In all cases of infection remember to consider sepsis. Use the [NICE stratification tools](#).

### **Non iatrogenic spine infection (NISI)**

It is unlikely that a NISI will present to primary care. Most of these patients will present with infection issues and your referral should be based on established local guidance for infections.

If you have a high index of suspicion for NISI, then it would be prudent to refer to secondary care (or equivalent pathway for your area) and discuss your concerns. An MRI scan may be warranted to aid or refute diagnosis.

If you have someone with clear, new onset neurological symptoms in keeping with cord or nerve root compromise with features of infection, then an emergent referral to the spine surgical service is warranted. Patients with features of meningitis or other intracranial infection should NOT be referred to spine surgical services.

Any patients requiring emergency referral should be kept nil by mouth.

### **Iatrogenic spine infection**

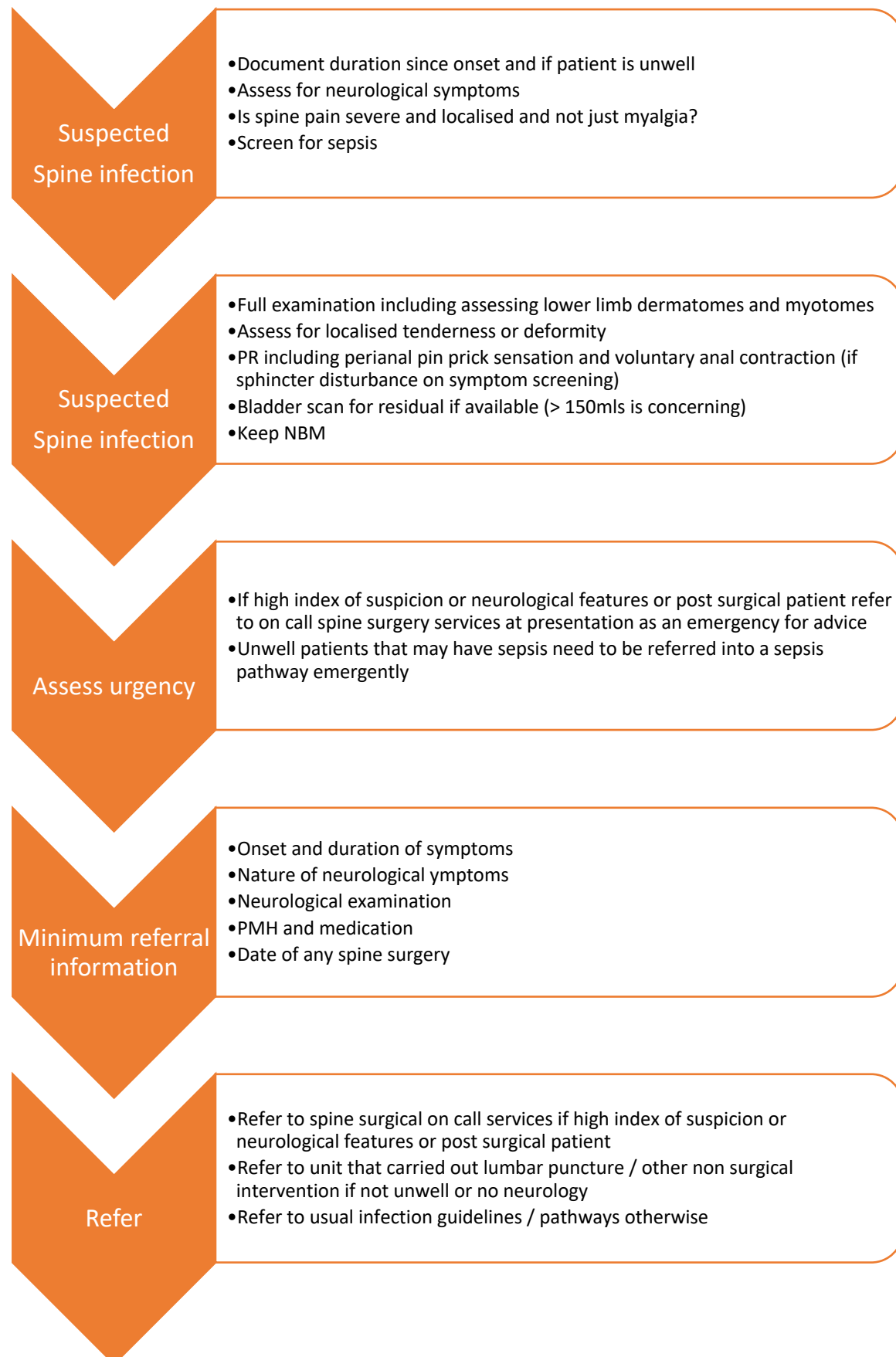
Any features of infection following spine surgical intervention should be referred to the spine surgical unit that carried out the surgery on the same day of presentation.

Any features of infection following a lumbar puncture or similar non-surgical intervention should be referred to the unit that carried out the intervention on the same day of presentation. The only exception is when there are clear new neurological features associated with the infection, in which case emergent referral to the spine surgical service for advice is warranted.

Any patients requiring emergency referral should be kept nil by mouth.



## GP / Triage service workflow



## What does an ED department or other inpatient service do for initial assessment?

If the patient has presented to ED or another secondary care department and spine infection is suspected then a full assessment including a neurological examination should be completed and documented as a baseline. This should include a rectal examination and a post micturition bladder scan. The patient should be kept nil by mouth.

The patient should be considered for sepsis using the appropriate stratification tool (see [NICE](#)).

If not septic than baseline investigations should be carried out and an MRI whole spine arranged

### Initial in hospital assessment for a possible spine infection

Screen for sepsis

Full history and examination assessing for risk factors and neurology

Assess for localised spine tenderness / deformity

Assess for sources of infection

Assess for risk factors for infection

If sepsis – follow the sepsis pathway

If no sepsis then arrange:

1. FBC, UE, eGFR, clotting screen, ESR, CRP
2. Peripheral blood cultures x 3 (preferably during pyrexia)
3. Venous / arterial pO<sub>2</sub> and lactate
4. Urine dipstick +/- MSU
5. MRI whole spine (postoperative spine infections can be discussed without an MRI scan)

As mentioned previously, spine infection may present as an unwell patient / PUO / general infection. The initial management may have been started on the basis of treating a non-specific or other infection site.

On-going symptoms of pain in the spine or failure to improve infection should raise the possibility of a spine infection and a whole spine MRI scan to aid diagnosis.

An undiagnosed and untreated spine infection can deteriorate into sepsis and or neurological deficit. Establishing a diagnosis is therefore time sensitive and investigations (including an MRI scan) should be performed urgently.

Any referring hospital or department must request and perform the MRI scan.

### Mobility status

Patients are best bed rested until diagnosis and extent of infection is established. This does not have to be flat bed rest with log rolling. Simple bed rest is usually sufficient unless you have been advised otherwise.

### Initial imaging

As a minimum MRI scan of the whole spine with sagittal fat suppressed, T2 and T1 sequences and T1 and T2 TSE axials through areas of abnormality should be performed. Coronal images can identify paraspinal and psoas collections. Gadolinium enhanced scans may be required in addition to confirm infection and pus collections.

## ED/Secondary care initial assessment workflow



## What's the management of a diagnosed spine infection?

The management of spine infections depends on the presentation of the spine infection.

### **Sepsis with pus load OR neurological compromise**

Resuscitate patient (high risk of AKI)  
Discuss with microbiology re best empirical antibiotic regime (IV)  
Discuss with spine surgical service  
Spine surgical service to review imaging and consider transfer (emergent) for operative intervention  
Critical care (level 2 or 3) may be required perioperatively  
Initial resuscitation and optimisation period may be required before surgery

### **Impending neurological compromise (scan showing neural compression; clinically neurologically intact)**

Resuscitate patient (high risk of AKI)  
Discuss with microbiology re best empirical antibiotic regime (IV)  
Discuss with spine surgical service  
Spine surgical service to review imaging and consider transfer (emergent) for operative intervention  
Critical care (level 2 or 3) may be required perioperatively  
Initial resuscitation and optimisation period may be required before surgery

### **Non iatrogenic Spine infection with no sepsis or neural compromise**

#### **Initial treatment**

Resuscitate patient (high risk of AKI)  
Avoid antibiotics if possible until culture results  
Consider CT guided biopsy for cultures if blood cultures have been negative  
Discuss with spine surgical service to confirm no need for surgical transfer  
Discuss with microbiology re best empirical antibiotic regime (IV) AFTER samples taken  
MDT management plan (medicine / radiology / spine surgery / microbiology) is optimal

#### **Ongoing treatment**

Adjust antibiotic regime according to culture results  
Consider long lines / tunnelled lines for prolonged IV antibiotics  
Monitor infection with CRP (24-48 hrly initially)  
Optimise nutrition and prevent AKI  
Consider echocardiogram to exclude septic emboli  
Bracing may help pain – discuss with spine surgical unit  
Reassess for sepsis and neurological deficit  
Consider 2 weeks of IV antibiotics (can be community administered) or until significant CRP improvement  
Oral antibiotic regime to be determined with microbiology  
Consider 6 weeks total duration of antibiotics (3 months for immunocompromised patients, undrained abscesses, MRSA)  
Monitor response with weekly CRP / clinical status / weight bearing xrays / +/- MRI scan  
  
Refer for spine surgical opinion if failure to improve, increasing pain or neurology, spinal deformity

In general, infections affecting the cord, subdural or epidural space will need spine surgical input and potentially early surgery.

Infections of the disc with an associated psoas abscess are best treated with drainage of the psoas abscess (usually by interventional radiology).

Pure disc and vertebral infections uncomplicated by pus in the canal can often be managed non operatively, as can facet joint infections.

Superficial postoperative infections are managed as most wound infections would be. Deep seated infections may need surgical intervention.

#### **Common reasons for surgical intervention in spine infection**

1. **Diagnosis** – where a positive culture has not been made and a tissue sample is required. Histological samples should always be sent as well as a request for TB culture and at least 5 separate samples for microscopy, culture and sensitivity if possible.
2. **Debridement** – an ill patient requiring evacuation of the pus / infected burden may require surgery. Failure of improvement with initial medical methods may also require surgery to promote healing.
3. **Deficit**– the presence of or risk of neurological compromise may be improved with surgical treatment. Often epidural abscesses around the cord will be treated operatively to reduce the risk of rapid neurological deterioration. If the symptoms are sudden and equally severe on both sides, limiting function then the chance of CES is higher and urgent MRI scan should be considered with appropriate safety netting.
4. **Disability** – severe instability pain may arise due to bony destruction. Surgical stabilisation may improve this.
5. **Deformity** – bony destruction may result in a spine deformity requiring surgical intervention
6. **Drug resistance** – some resistant organisms may best be treated with a combination of surgical and medical treatment. This should be a MDT decision.

## What imaging is used?

### **MRI**

An MRI scan is an important investigation in the assessment of spine infection. It can confirm the diagnosis, assess the extent of infection, the presence or absence of neural compression and the presence of multiple site infection.

If a patient cannot have an MRI scan, they should be discussed with the Spine Hub if there is a high index of suspicion spine infection. MRI conditional implants may be able to undergo MRI scanning at the Spine Hub.

The MRI should be a fat suppressed, T1 and T2 weighted sagittal sequence of the whole spine with T1 and T2 TSE axials through abnormal areas as a minimum investigation.

Gadolinium enhanced imaging can help confirm infection and presence of pus as compared to granulation or inflammatory tissue.

Diffusion weighted imaging can sometimes help in diagnosing spine infection in difficult cases but requires an experienced radiologist.

### **Plain XR**

By the time x-ray changes are apparent, significant bony destruction would have happened. Weight bearing x-rays are helpful in determining deformity or other features of instability.

Ultimately the infected segment may fuse and the use of x-ray to confirm fusion is also sometimes used as an endpoint.

### **CT scan**

CT scans may be used to identify the amount of bony destruction and to replace MRI if there are contraindications to MRI scanning.

## Referrer obligations

The referrer must ensure that:

1. The patient has had baseline neurology documented.
2. The patient has been kept NBM.
3. The patient has had an MRI scan before referral to spine surgery services.
4. That the patient has been assessed for fitness for transfer and for potential surgery.
5. All appropriate initial imaging has been completed.
6. All imaging has been digitally transferred to the appropriate emergency portal as directed by the spine service.
7. The referral is in a written format ideally in a digital format as used by the spine service. Any referrals requiring immediate attention are flagged as such and followed up by a phone call.
8. The initial management plans outlined by the spine service are carried out.
9. Any agreed transfer takes place rapidly and after ensuring the patient is fit for transfer.
10. They agree to repatriate the patient when acute spinal intervention is complete.  
Repatriation should occur within 24 hours of request and failure to repatriate should be escalated through to senior management.

## Receiving spine service obligations

The spine service receiving the referral must ensure that:

1. They provide a clear and constantly available contact point for referrers.
2. Any referral received must have been reviewed by registrar grade or above and discussed with the supervising consultant.
3. Any digital or verbal referral is reviewed and a response given in less than 2 hours from receipt of referral. Any referral requiring immediate attention is actioned within ½ hour of receipt of all information.
4. There is a clear written protocol for urgent image transfer available to the referring service that allows the receiving clinical team to access images on an emergent basis to facilitate expedient provision of advice.
5. Clear advice is given outlining recommended action plan. Advice should be written and ideally in a digital format that the referring hospitals can access.
6. Any agreed transfer takes place emergently and on the same day.
7. There should be facilities to allow emergent and urgent spine surgery
8. There is continued access for advice as required.

## FINALLY

This document provides guidance for recognition, assessment and initial management of spine infection. It is not exhaustive and all the spine services in the WMRSN are happy to accept calls for advice.

The document is a guideline and reflects the collective view of the spine services and partner hospitals in the WMRSN at the time of writing.

## RESOURCES

NICE sepsis stratification tool:

<https://www.nice.org.uk/guidance/ng51/resources/algorithm-for-managing-suspected-sepsis-in-adults-and-young-people-aged-18-years-and-over-in-an-acute-hospital-setting-2551485715>

BASS knowledge update on spondylodiscitis:

[https://spinesurgeons.ac.uk/resources/Documents/News/Knowledge\\_Update\\_in\\_the\\_Management\\_of\\_Spondylodiscitis\\_v05.pdf](https://spinesurgeons.ac.uk/resources/Documents/News/Knowledge_Update_in_the_Management_of_Spondylodiscitis_v05.pdf)

### Recommended MRI protocols\*

<b>Degenerative disease (eg lumbar stenosis)</b>	Region affected only T1 and T2 sagittal sequences T2 TSE axial sequences of abnormal levels (additional T2 gradient echo axial sequence for cord assessment may be added)
<b>Trauma</b>	Whole spine sagittal STIR with sagittal T1 and T2 Axial T1 and T2 TSE of affected levels (additional T2 gradient echo axial sequence for cord assessment may be added)
<b>Cauda equina syndrome</b>	Lumbar spine sagittal T1 and T2 Axial T1 and T2 TSE of affected levels (whole spine sagittal T2 to assess cord may be added)
<b>MSCC</b>	Whole spine sagittal STIR and T1 Sagittal T2, axial T1 and T2 TSE of affected levels (additional T2 gradient echo axial sequence for cord assessment may be added)
<b>Spine infection</b>	Whole spine sagittal STIR T1 and T2 sagittals of the region involved with T1 and T2 TSE axials of involved areas (additional T2 gradient echo axial sequence for cord assessment may be added)

\*It is accepted that individual institutions may have additional sequences for specific disorders. The listed sequences are the minimal recommended to establish a diagnosis, aid surgical planning and where appropriate to exclude lesions in the rest of the spine.



## Emergency image transfer protocols

<b>University Hospital of North Midlands</b>	Please ensure that you have sent any images via the Image Exchange Portal (IEP) to UHNM – Royal Stoke. For all urgent / trauma or out of hours referrals images please select “Tertiary PACS” and “blue light” priority to ensure clinician see the images immediately.
<b>University Hospital Birmingham</b>	Contact on call team
<b>University Hospital of Coventry and Warwickshire</b>	Contact on call team
<b>Royal Orthopaedic Hospital</b>	Contact on call team
<b>Robert Jones Agnes Hunt Hospital</b>	Please ensure that you have sent any images via the Image Exchange Portal (IEP) to RJAH. In office hours a phone call is required to the PACS team in RJAH in order to allocate the images to the correct patients. Out of hour they can be sent as blue light transfers.
<b>Russells Hall Hospitals</b>	Contact hospital directly
<b>Walsall Manor Hospital</b>	Contact hospital directly
<b>Royal Wolverhampton Hospital</b>	Contact hospital directly
<b>Birmingham Children’s Hospital</b>	Contact hospital directly

## Contributors

<b>Vinay Jasani</b>	<b>Consultant Spine Surgeon</b>	<b>UHNM</b>
<b>Navin Furtado</b>	<b>Consultant Neurosurgeon</b>	<b>UHB</b>
<b>Sheweidin Aziz</b>	<b>Spine Fellow</b>	<b>UHB</b>
<b>Krishna Banavathi</b>	<b>Consultant Microbiologist</b>	<b>UHNM</b>