National Institute for Health and Care Excellence

Final

Spinal metastases and metastatic spinal cord compression

[G] Evidence reviews for investigations – management

NICE guideline number NG234

Evidence reviews underpinning recommendation 1.5.10 in the NICE guideline

September 2023

Final

These evidence reviews were developed by NICE

Disclaimer

The recommendations in this guideline represent the view of NICE, arrived at after careful consideration of the evidence available. When exercising their judgement, professionals are expected to take this guideline fully into account, alongside the individual needs, preferences and values of their patients or service users. The recommendations in this guideline are not mandatory and the guideline does not override the responsibility of healthcare professionals to make decisions appropriate to the circumstances of the individual patient, in consultation with the patient and/or their carer or guardian.

Local commissioners and/or providers have a responsibility to enable the guideline to be applied when individual health professionals and their patients or service users wish to use it. They should do so in the context of local and national priorities for funding and developing services, and in light of their duties to have due regard to the need to eliminate unlawful discrimination, to advance equality of opportunity and to reduce health inequalities. Nothing in this guideline should be interpreted in a way that would be inconsistent with compliance with those duties.

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Contents

Investigations - management

Review question

How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

Introduction

Radiological imaging has an important role in the delineation of disease and assessment of spinal stability: crucial to management decisions for people with metastatic spinal disease. This review aimed to summarize evidence on the effectiveness of different imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression.

Summary of the protocol

See Table 1 for a summary of the Population, Intervention, Comparison and Outcome (PICO) characteristics of this review.

Table 1: Summary of the protocol (PICO table)

Population	• Adults with confirmed
	  ○ metastatic spinal disease
	  ○ direct malignant infiltration of the spine.
	• Adults with confirmed spinal cord or nerve root compression because of
	  ○ metastatic spinal disease
	  ○ direct malignant infiltration of the spine.

Intervention/test	• MRI • CT • CT myelogram • Myelography • Radioisotope • DEXA • PET-CT • X-ray • Angiography
Comparator/ reference standard	• In comparison with each other • Different sequences of tests in comparison with each other • No tests

Outcome	**Critical outcomes:**
	• Quality of clinical decision making, for example:
	  ○ Were people over or under treated
	  ○ Was treatment appropriate
	• Usefulness for clinical decision making, for example:
	  ○ Proportion of tests providing useful information
	  ○ Confidence in treatment decisions
	• Neurological and functional status including:
	  ○ Bowel and bladder function
	  ○ Mobility or ambulatory status
	• Overall survival

Important outcomes:
- Health related quality of life
- Pain
- Test related adverse events
- Requirement for supplemental imaging
- Accuracy of spinal stability predictions

CT: computed tomography; DEXA: Dual-energy X-ray absorptiometry; MRI: magnetic resonance imaging; PET-CT: positron emission tomography-computed tomography

For further details see the review protocol in appendix A.

Methods and process

This evidence review was developed using the methods and process described in Developing NICE guidelines: the manual. Methods specific to this review question are described in the review protocol in appendix A and the methods document (supplementary document 1).

Declarations of interest were recorded according to NICE's conflicts of interest policy.

Effectiveness evidence

Included studies

A systematic review of the literature was conducted but no studies were identified which were applicable to this review question.

See the literature search strategy in appendix B and study selection flow chart in appendix C.

Excluded studies

A combined literature search was done for this review and evidence report [F]. See evidence report [F] investigations - diagnosis Appendix J for the list of excluded studies from this search.

Summary of included studies

No studies were identified which were applicable to this review question (and so there are no evidence tables in Appendix D). No meta-analysis was conducted for this review (and so there are no forest plots in Appendix E).

Summary of the evidence

No studies were identified which were applicable to this review question (and so there are no GRADE tables in Appendix F).

Economic evidence

Included studies

A systematic review of the economic literature was conducted but no economic studies were identified which were applicable to this review question.

A single economic search was undertaken for all topics included in the scope of this guideline. See supplement 2 for details.

Excluded studies

Economic studies not included in this review are listed, and reasons for their exclusion are provided in supplement 2.

Economic model

No economic modelling was undertaken for this review because the committee agreed that other topics were higher priorities for economic evaluation.

The committee's discussion and interpretation of the evidence

The outcomes that matter most

Quality of clinical decision making and usefulness for decision making were critical outcomes. This was to capture the extent to which different types of radiological imaging help in making appropriate decisions about management. Overall survival, and neurological and functional status were chosen as critical outcomes, because better management decisions should lead to better patient outcomes. Quality of life and pain were important outcomes because good management decisions should improve these outcomes, even when overall survival or neurological status are unaffected.

Test related adverse events was an important outcome because any benefits of radiological imaging must be balanced with potential harms due to testing. Requirement for supplemental imaging was an important outcome because test results can be equivocal or identify features requiring a different type of radiological imaging, leading to delays and uncertainty. Finally, accuracy of spinal stability predictions was chosen as an important outcome because this is a key factor in management decision making and influences which treatment options are appropriate.

The quality of the evidence

No studies were identified which were applicable to this review question so the committee based their recommendations on their expertise and experience.

Benefits and harms

The committee discussed a related recommendation from the previous version of the guideline and agreed to retain it but recognised that a person may have already had a CT scan in a prior diagnostic work up so they recommended multiplanar viewing or 3-plane reconstruction of recent CT images to assess spinal stability and plan vertebroplasty, kyphoplasty or spinal surgery. They noted that a 3-dimensional image of position and size of the affected area of the spine should be considered to plan the surgical technique that is needed to help stabilise or decompress the spine (see evidence review N for information on invasive interventions). This is part of surgical planning and is current practice.

They acknowledged that this is also directly related to another recommendation on using scoring systems for spinal stability (see evidence report K) which would require radiological imaging to inform the stability score and that a targeted CT scan would be the most appropriate technique. Such scores would also feed into surgical decision making. The retained recommendation therefore facilitates this to be done, too.

Despite the lack of evidence, the committee did not make a research recommendation. They agreed that this is one of the less controversial areas in the management of malignant spinal disease and instead prioritised research elsewhere.

Cost effectiveness and resource use

The systematic review of previous economic evidence identified no studies for this topic. The committee, based on their knowledge and experience, retained the recommendations from the previous version of the guideline because 3-plane imaging is needed to fully visualise the surgical target area. Therefore, there will be no additional resource impact beyond that of the previous recommendations.

Recommendations supported by this evidence review

This evidence review supports recommendations 1.5.10 in the NICE guideline.

References – included studies

Effectiveness

A systematic review of the literature was conducted but no studies were identified which were applicable to this review question.

See the literature search strategy in appendix B and study selection flow chart in appendix C.

Appendices

Appendix A Review protocol

Review protocol for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

ID	Field	Content
0.	PROSPERO registration number	CRD42022325543
1.	Review title	Radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression
2.	Review question	How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?
3.	Objective	To establish effective radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression
4.	Searches	The following databases will be searched: • Cochrane Central Register of Controlled Trials (CENTRAL) • Cochrane Database of Systematic Reviews (CDSR) • Cumulative Index to Nursing and Allied Health Literature (CINAHL) • Embase • Emcare • Epistemonikos • International Health Technology Assessment (IHTA) database • MEDLINE & MEDLINE In-Process

ID	Field	Content
		Searches will be restricted by: • Date: 1990 onwards (see rationale under Section 10) • English language studies • Human studies Other searches: Inclusion lists of systematic reviews The searches will be re-run 6-8 weeks before final submission of the review and further studies retrieved for inclusion. The full search strategies for MEDLINE database will be published in the final review.
5.	Condition or domain being studied	Radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression
6.	Population	Inclusion: Adults with confirmed: • metastatic spinal disease • direct malignant infiltration of the spine. Adults with confirmed spinal cord or nerve root compression because of: • metastatic spinal disease • direct malignant infiltration of the spine. Exclusion: • Adults with spinal cord compression because of primary tumours of the spinal cord, meninges or nerve roots. • Adults with spinal cord compression because of non-malignant causes. • Adults with primary bone tumours of the spinal column.

ID	Field	Content
		• Children and young people under the age of 18.
7.	Test	• MRI • CT • CT myelogram • Myelography • Radioisotope • DEXA • PET-CT • X-ray • Angiography
8.	Comparator	• In comparison with each other • Different sequences of tests in comparison with each other • No tests
9.	Types of study to be included	For test & treat studies: experimental studies (where the investigator assigned intervention or control) including: • Randomised controlled trials • Non-randomised controlled trials • Systematic reviews/meta-analyses of controlled trials. In the absence of test-and-treat studies: the following designs will be included: Observational studies (where neither control nor intervention were assigned by the investigator) including: • prospective cohort studies • retrospective cohort studies
10.	Other exclusion criteria	Inclusion: • Full text papers,

ID	Field	Content
		Exclusion: • Conference abstracts • Articles published before 1990. MRI has regularly used in diagnosis since the early 1990s – patient cohorts from pre-1990 are unlikely to representative of current cohorts. • Papers that do not include methodological details will not be included as they do not provide sufficient information to evaluate risk of bias/study quality. • Non-English language articles
11.	Context	Metastatic spinal cord compression in adults: risk assessment, diagnosis and management (2008) NICE guideline will be updated by this review question
12.	Primary outcomes (critical outcomes)	• Quality of clinical decision making, for example ○ Were people over or under treated ○ Was treatment appropriate • Usefulness for clinical decision making, for example ○ Proportion of tests providing useful information ○ Confidence in treatment decisions • Neurological and functional status including: ○ Bowel & bladder function ○ Mobility or ambulatory status • Overall survival
13.	Secondary outcomes (important outcomes)	• Health related quality of life • Pain • Test related adverse events • Requirement for supplemental imaging • Accuracy of spinal stability predictions
14.	Data extraction (selection and coding)	All references identified by the searches and from other sources will be uploaded into EPPI reviewer and de-duplicated.

ID	Field	Content
		Titles and abstracts of the retrieved citations will be screened to identify studies that potentially meet the inclusion criteria outlined in the review protocol. Dual sifting will be performed on at least 10% of records; 90% agreement is required. Disagreements will be resolved via discussion between the two reviewers, and consultation with senior staff if necessary. Full versions of the selected studies will be obtained for assessment. Studies that fail to meet the inclusion criteria once the full version has been checked will be excluded at this stage. Each study excluded after checking the full version will be listed, along with the reason for its exclusion. A standardised form will be used to extract data from studies. The following data will be extracted: study details (reference, country where study was carried out, type and dates), participant characteristics, inclusion and exclusion criteria, details of the interventions if relevant, setting and follow-up, relevant outcome data and source of funding. One reviewer will extract relevant data into a standardised form, and this will be quality assessed by a senior reviewer.
15.	Risk of bias (quality) assessment	Risk of bias of individual studies will be assessed using the preferred checklist as described in Appendix H of Developing NICE guidelines: the manual • ROBIS tool for systematic reviews • Cochrane RoB tool v.2 for RCTs and quasi-RCTs The non-randomised study design appropriate checklist. For example Cochrane ROBINS-I tool for non-randomised controlled trials and cohort studies; the EPOC RoB tool for controlled before and after studies. The quality assessment will be performed by one reviewer and this will be quality assessed by a senior reviewer.
16.	Strategy for data synthesis	Depending on the availability of the evidence, the findings will be summarised narratively or quantitatively. Data Synthesis Where possible, pairwise meta-analyses will be conducted using Cochrane Review Manager software. A fixed effect meta-analysis will be conducted and data will be presented as risk ratios for dichotomous outcomes. Peto odds ratio will be used for outcomes with zero events Mean differences or standardised mean differences will be calculated for continuous out-

ID	Field	Content
		comes. Heterogeneity Heterogeneity in the effect estimates of the individual studies will be assessed using the I2 statistic. I2 values of greater than 50% and 80% will be considered as significant and very significant heterogeneity, respectively. In the case of serious or very serious unexplained heterogeneity (remaining after pre-specified subgroup and stratified analyses) meta-analysis will be done using a random effects model. Minimal important differences (MIDs) Default MIDs will be used for risk ratios and continuous outcomes only, unless the committee pre-specifies published or other MIDs for specific outcomes For risk ratios: 0.8 and 1.25. For continuous outcomes: MID is calculated by ranking the studies in order of SD in the control arms. The MID is calculated as +/- 0.5 times median SD. For studies that have been pooled using SMD (meta-analysed): +0.5 and -0.5 in the SMD scale are used as MID boundaries. Validity (for both test & treat and diagnostic accuracy analyses) The confidence in the findings across all available evidence will be evaluated for each outcome using an adaptation of the 'Grading of Recommendations Assessment, Development and Evaluation (GRADE) toolbox' developed by the international GRADE working group: http://www.gradeworkinggroup.org/
17.	Analysis of sub-groups	Evidence will be stratified by: • Myeloma versus other cancer types • Functional status / fitness for treatment Evidence will be subgrouped by the following only in the event that there is significant heterogeneity in outcomes: Subgroups listed in the equality impact assessment form: age, race, sex & socioeconomic status Where evidence is stratified or subgrouped the committee will consider on a case-by-case basis if separate recommendations should be made for distinct groups. Separate recommendations may be made where there is evidence of a differential effect of interventions in distinct groups. If there is a lack of evidence in one group, the committee will consider, based on

ID	Field	Content		
		their experience, whether it is reasonable to extrapolate and assume the interventions will have similar effects in that group compared with others.		
18.	Type and method of review	☒	Intervention	
		☐	Diagnostic	
		☐	Prognostic	
		☐	Qualitative	
		☐	Epidemiologic	
		☐	Service Delivery	
		☐	Other (please specify)	
19.	Language	English		
20.	Country	England		
21.	Anticipated or actual start date	05 May 2022		
22.	Anticipated completion date	23 August 2022		
23.	Stage of review at time of this submission	Review stage	Started	Completed
		Preliminary searches	☐	☐
		Piloting of the study selection process	☐	☐
		Formal screening of search results against eligibility criteria	☐	☐
		Data extraction	☐	☐
		Risk of bias (quality)	☐	☐

ID	Field	Content		
		assessment		
		Data analysis	☐	☐
24.	Named contact	5a. Named contact National Institute for Health and Care Excellence 5b Named contact e-mail [metastaticspinal@nice.org.uk 5e Organisational affiliation of the review National Institute for Health and Care Excellence (NICE)		
25.	Review team members	NGA Technical Team		
26.	Funding sources/sponsor	This systematic review is being completed by the National Guideline Alliance which receives funding from NICE.		
27.	Conflicts of interest	All guideline committee members and anyone who has direct input into NICE guidelines (including the evidence review team and expert witnesses) must declare any potential conflicts of interest in line with NICE's code of practice for declaring and dealing with conflicts of interest. Any relevant interests, or changes to interests, will also be declared publicly at the start of each guideline committee meeting. Before each meeting, any potential conflicts of interest will be considered by the guideline committee Chair and a senior member of the development team. Any decisions to exclude a person from all or part of a meeting will be documented. Any changes to a member's declaration of interests will be recorded in the minutes of the meeting. Declarations of interests will be published with the final guideline.		
28.	Collaborators	Development of this systematic review will be overseen by an advisory committee who will use the review to inform the development of evidence-based recommendations in line with section 3 of Developing NICE guidelines: the manual. Members of the guideline committee are available on the NICE website: [NICE guideline webpage].		
29.	Other registration details			
30.	Reference/URL for published protocol	https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=325543		
31.	Dissemination plans	NICE may use a range of different methods to raise awareness of the guideline. These include standard approaches such as:		

ID	Field	Content	
		notifying registered stakeholders of publication publicising the guideline through NICE's newsletter and alerts issuing a press release or briefing as appropriate, posting news articles on the NICE website, using social media channels, and publicising the guideline within NICE.	
32.	Keywords	Humans; Spinal Cord Compression; Spinal Neoplasms	
33.	Details of existing review of same topic by same authors		
34.	Current review status	☒	Ongoing
		☐	Completed but not published
		☐	Completed and published
		☐	Completed, published and being updated
		☐	Discontinued
35..	Additional information		
36.	Details of final publication	www.nice.org.uk	

CDSR: Cochrane Database of Systematic Reviews; CENTRAL: Cochrane Central Register of Controlled Trials; CT: computed tomography; DARE: Database of Abstracts of Reviews of Effects; DEXA: Dual-energy X-ray absorptiometry; GRADE: Grading of Recommendations Assessment, Development and Evaluation; HTA: Health Technology Assessment; MID: minimally important difference; MRI: magnetic resonance imaging; NHS: National health service; NICE: National Institute for Health and Care Excellence; PET-CT: positron emission tomography-computed tomography; RCT: randomised controlled trial; RoB: risk of bias; SD: standard deviation

Appendix B Search strategy (clinical/economic)

Literature search strategies for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

Database: MEDLINE – OVID interface

#	Searches
1	Spinal Cord Compression/
2	exp Spinal Cord Neoplasms/ or Spinal Neoplasms/
3	((cauda equina or cervical* or cervicothoracic or cord* or coccyx or duralsac* or dural sac* or intervertebr* or lumbar or lumbosac* or lumbo sac* or medulla* or orthothoracic or sacral or sacrum or spinal or spine* or thecal sac* or thoracic or vertebr* or epidural or extradural or extra dural) adj3 (infiltrat* or invad* or invasion or metast* or oligometast*)).ti,ab.
4	(((cauda equina or cervical* or cervicothoracic or cord* or coccyx or duralsac* or dural sac* or intervertebr* or lumbar or lumbosac* or lumbo sac* or medulla* or orthothoracic or sacral or sacrum or spinal or spine* or thecal sac* or thoracic or vertebr* or epidural or extradural or extra dural or ((axon* or neuron* or nerve*) adj2 root)) adj3 (collaps* or compress* or pinch* or press*)) and (adeno* or cancer* or carcinoma* or chordoma* or intraepithelial* or intra epithelial* or malignan* or metast* or neoplas* or oligometast* or tumo?r*)).ti,ab.
5	(mescc or mscc).ti,ab.
6	or/1-5
7	Diagnostic Imaging/
8	((diagnos* adj (imag* or radiogra* or scan*)) or ((radiogra* or radiolog*) adj (exam* or imag* or investigat* or scan* or test*))).ti,ab.
9	exp Magnetic Resonance Imaging/
10	(magnetic resonance or DWI or FMRI or MRE or MRI or MRS or NMR* or T1W or T2W or zeugmatogra* or ((diffusion or echoplanar or functional or magnet* or MR or nuclear or NM or planar or weight*) adj2 (diagnos* or elastogra* or examin* or imag* or scan* or spectroscop* or tomogra*))).ti,ab.
11	exp Tomography, Emission-Computed/ or exp Tomography, X-Ray Computed/
12	(((CAT or CT or comput* or electron beam or FDG or multidetector or multi detector or multislice or multi slice or PET or positron emission or spiral) adj2 (detect* or diagnos* or exam* or imag* or scan* or tomogra*)) or (FDG adj2 PET) or MDCT or MSCT or SPECT or spiral CT or tomodensitomet*).ti,ab.
13	Myelography/
14	(medullogra* or myelogra*).ti,ab.
15	Diagnostic Techniques, Radioisotope/ or Radionuclide Imaging/
16	(((gamma or radionuclide* or radioisotop*) adj2 (diagnos* or imag* or investigat* or scan* or scintigra* or scintimet* or scintiscan*)) or osteoscintigra*).ti,ab.
17	Absorptiometry, Photon/
18	(DEXA or DPX or DXA or ((dual emission or dual energy or dualenergy or photon) adj3 (absorptiomet* or densitomet* or imag* or photodensitomet* or scan*))).ti,ab.
19	((bone* or BMD or skelet*) adj (imag* or scan* or scintigra* or scintiscan* or survey*)).ti,ab.
20	x rays/
21	(x ray* or xray* or digital radiogra* or discogra* or diskogra* or grenz ray* or plain film* or plain radiogra* or radiodiagnos* or radio diagnos* or radioimag* or radiophoto* or roent* or x radiat* or xradiat*).ti,ab.
22	exp Angiography/ or exp Radionuclide Angiography/
23	(angiogra* or arteriogra*).ti,ab.
24	exp Image-Guided Biopsy/
25	((biops* or sampl*) adj3 ((imag* or scan* or tomogra* or ultraso* or ultra so* or CAT or CT or MR*) adj3 guid*)).ti,ab.
26	(biops* or sampl*).ti,ab. and dg.fs.
27	or/7-26
28	6 and 27
29	letter/ or editorial/ or news/ or exp historical article/ or Anecdotes as Topic/ or comment/ or case report/ or (letter or comment*).ti.
30	randomized controlled trial/ or random*.ti,ab.
31	29 not 30
32	(animals/ not humans/) or exp animals, laboratory/ or exp animal experimentation/ or exp models, animal/ or exp rodentia/ or (rat or rats or mouse or mice).ti.
33	31 or 32
34	28 not 33
35	limit 34 to english language
36	limit 35 to yr="1990 -Current"
37	meta-analysis/ or meta-analysis as topic/ or "systematic review"/
38	(meta analy* or metanaly* or metaanaly* or ((evidence or systematic*) adj2 (overview* or review*))).ti,ab.
39	(reference list* or bibliograph* or hand search* or manual search* or relevant journals).ab.
40	(search strategy or search criteria or systematic search or study selection or data extraction or (search* adj4 literature)).ab.
41	(medline or pubmed or cochrane or embase or psychlit or psyclit or psychinfo or psycinfo or cinahl or science citation index or bids or cancerlit).ab.
42	cochrane.jw.
43	or/37-42
44	36 and 43

#	Searches
45	(controlled clinical trial or pragmatic clinical trial or randomized controlled trial).pt.
46	drug therapy.fs.
47	(groups or placebo or randomi#ed or randomly or trial).ab.
48	Clinical Trials as Topic/
49	trial.ti.
50	or/45-49
51	36 and 50
52	Non-Randomized Controlled Trials as Topic/
53	(experimental or nonrandom* or non random*).tw.
54	52 or 53
55	36 and 54
56	Comparative Studies/ or Cross-Sectional Studies/ or Follow-Up Studies/ or Time Factors/
57	(chang* or evaluat* or reviewed or prospective* or retrospective* or baseline or cohort or case series or cross sectional).tw.
58	56 or 57
59	36 and 58
60	or/44,51,55,59

Economic literature search strategy

Database: MEDLINE – OVID interface

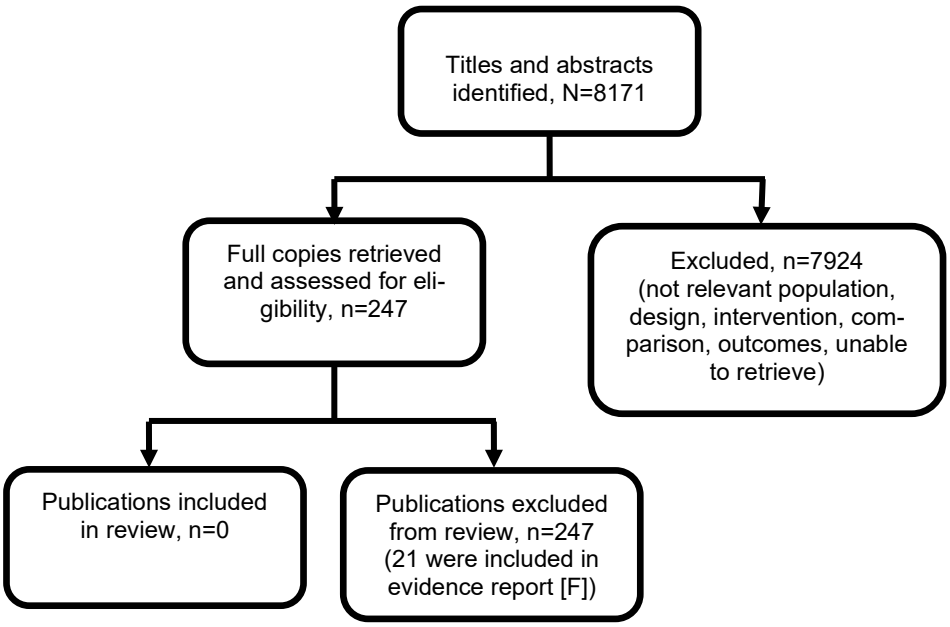
#	Searches
1	exp Spinal Cord Neoplasms/ or Spinal Neoplasms/
2	((spine or spinal or vertebr*) adj2 (adeno* or cancer* or carcinoma* or intraepithelial* or intra epithelial* or malignan* or neoplas* or tumo?r*)).tw.
3	((spine or spinal or vertebr*) and (metast* or oligometast*)).tw.
4	or/1-3
5	Spinal Cord Compression/
6	((cauda equina or cervical* or cervicothoracic or cord* or coccyx or duralsac* or dural sac* or intervertebr* or lumbar or lumbosac* or lumbo sac* or medulla* or orthothoracic or sacral or sacrum or spinal or spine* or thecal sac* or thoracic or vertebr* or epidural or extradural or extra dural or ((axon* or neuron* or nerve*) adj2 root)) and (collaps* or compress* or pinch* or press*) and (adeno* or cancer* or carcinoma* or chordoma* or intraepithelial* or intra epithelial* or malignan* or metast* or neoplas* or oligometast* or tumo?r*)).tw.
7	(myelopath* or myeloradiculopath* or radiculopath*).tw,hw. or (radicular adj2 (disorder* or syndrome*)).tw.
8	(mescc or mscc).tw.
9	or/5-8
10	((adeno* or cancer* or carcinoma* or intraepithelial* or intra epithelial* or malignan* or metast* or neoplas* or tumo?r*) adj3 (escap* or infiltrat* or invasiv* or metast* or spread*) adj5 (cauda equina or cervical* or cervicothoracic or cord* or coccyx or duralsac* or dural sac* or intervertebr* or lumbar or lumbosac* or lumbo sac* or medulla* or orthothoracic or sacral or sacrum or spinal or spine* or thecal sac* or thoracic or vertebr* or epidural or extradural or extra dural or ((axon* or neuron* or nerve*) adj2 root))).tw.
11	or/4,9-10
12	Economics/ or Value of life/ or exp "Costs and Cost Analysis"/ or exp Economics, Hospital/ or exp Economics, Medical/ or Economics, Nursing/ or Economics, Pharmaceutical/ or exp "Fees and Charges"/ or exp Budgets/
13	(cost* or economic* or pharmacoeconomic*).ti.
14	(budget* or financ* or fee or fees or price* or pricing* or (value adj2 (money or monetary))).ti,ab.
15	(cost* adj2 (effective* or utilit* or benefit* or minimi* or unit* or estimat* or variable*)).ab.
16	or/12-15
17	11 and 16
18	limit 17 to english language
19	limit 18 to yr="2005 -Current"

Appendix C Effectiveness evidence study selection

Study selection for How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

A combined literature search was done for this review and evidence report [F] Investigations - diagnosis. See evidence report [F] Investigations - diagnosis Appendix J for the list of excluded studies from this combined search.

Figure 1: Study selection flow chart



Appendix D Evidence tables

Evidence tables for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

No evidence was identified which was applicable to this review question.

Appendix E Forest plots

Forest plots for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

No meta-analysis was conducted for this review question and so there are no forest plots.

Appendix F Modified GRADE tables

GRADE tables for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

No evidence was identified which was applicable to this review question.

Appendix G Economic evidence study selection

Study selection for: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

No economic evidence was identified which was applicable to this review question.

Appendix H Economic evidence tables

Economic evidence tables for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

No evidence was identified which was applicable to this review question.

Appendix I Economic model

Economic model for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

No economic analysis was conducted for this review question.

Appendix J Excluded studies

Excluded studies for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

Excluded effectiveness studies

A combined literature search was done for this review and evidence report [F]. See evidence report [F] Investigations - diagnosis Appendix J for the list of excluded studies from this search.

Excluded economic studies

No economic evidence was identified for this review. See supplement 2 for further information.

Appendix K Research recommendations – full details

Research recommendations for review question: How effective are radiological imaging techniques in guiding the management of spinal metastases, direct malignant infiltration of the spine or associated spinal cord compression?

No research recommendations were made for this review question.