



Diagnostic and Neck Pain

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Task Force on Neck Pain and Its Associated Disorders

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The Task Force





What are the questions?

Important questions:

- Is there a serious injury (fracture or/and dislocation) or not?
- Is there a serious disease?
 - Red flags
- Is there nerve root involvement or not?
 - Manual tests and imaging
- Is there a functional disability?
 - Self administered questionnaires



Content Presentation

- Influenced by Sackett and Haynes Criteria (2001)
 - Articles and studies classified according to Phase I-IV where possible
- Number of diagnosis/assessment articles
 - Accepted/rejected
 - Distribution of research (content and type of studies)
 - What evidence do we have for clinical assessment?
 - Where are the gaps in research?

Evidence Grading

Sackett and Haynes 2001



Phase	Question	Inclusion	Ref. Standard	Interpretation
I	Test differ	Patient/ Healthy	No	Explor.
II	Test + Test -	Patient + Healthy	No	Explor.
III	Test differ	Patient + Patient -	Yes	Confirm
IV	Improve health	Patient +	Yes	Confirm

Diagnosis of Neck Pain



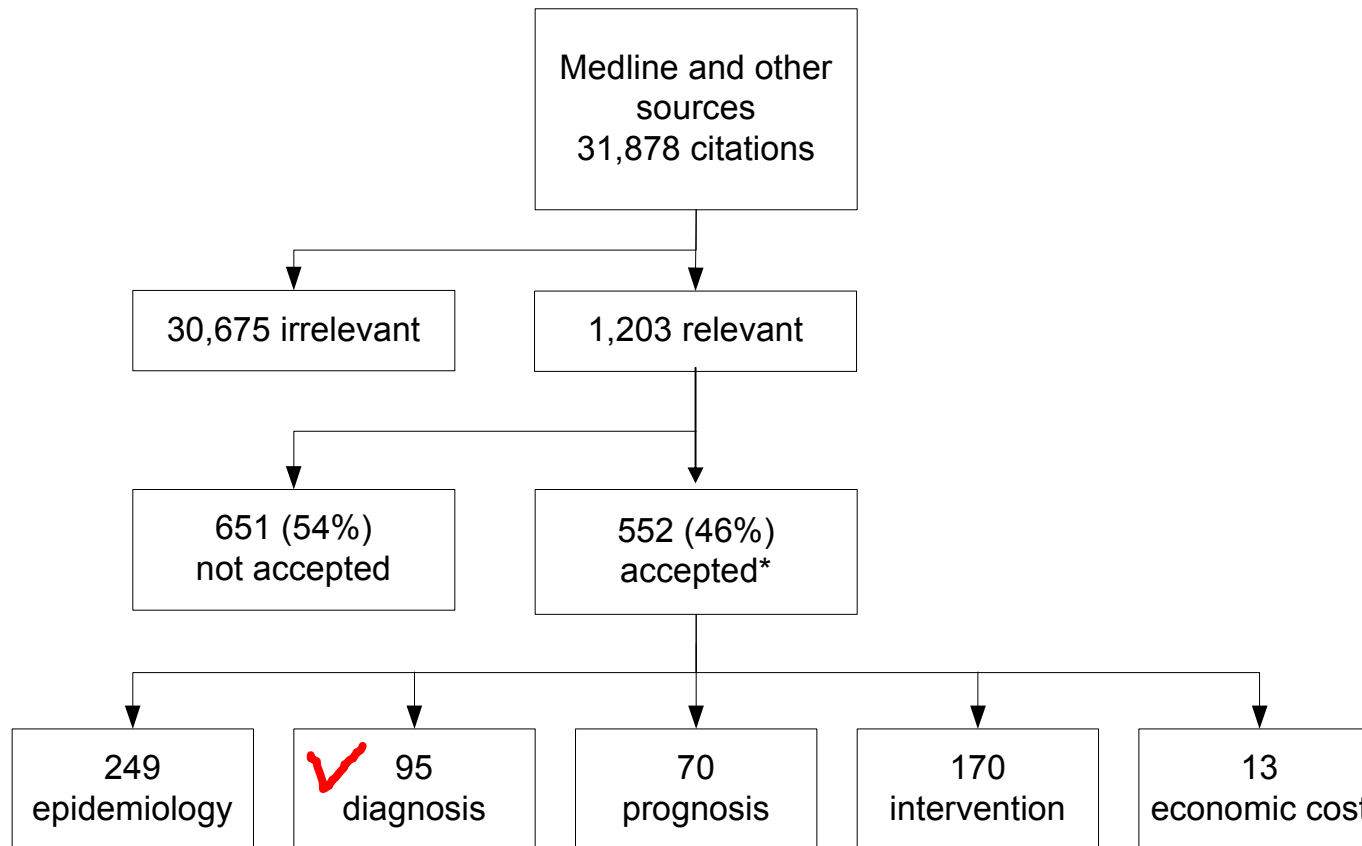
1. What is wrong with the neck?
 - Pathology (disease) is unknown in most cases
2. Is it serious (rule out pathology)?
 - Fracture, tumour, infection, systemic causes are all rare, but need to be ruled out
3. What tests or diagnostics are valid and helpful?
 - Reliability, validity and predictive



Types of Diagnostic Studies

1. Reliability of test
 - Is it reproducible and consistent?
2. Validity of test
 - Must be reliable
 - Compare test to “gold standard”
 - Sensitivity: proportion of diseased with + test
 - Specificity: proportion without disease with - test
3. Predictive values (rule out or rule in disease)
 - +PV: proportion with a + test that have the disease
 - -PV: proportion with a - test that don't have the disease

Results of Search and Review



* Some studies relate to more than one subject.



Reviewed and Accepted Papers

Area of Interest	Papers Reviewed	Accepted (%)
Risk	469	249 (53%)
Assessment	274	95 (35%)
Prognosis	226	70 (31%)
Intervention	359	170 (47%)
Total	1328*	584 (44%)

* The task force reviewed 1203 studies, some of which related to more than one area of interest.

Scientifically Admissible Studies



Section I	Emergency screening for cervical blunt trauma	24 studies
Section II	Clinical assessment non trauma	54 studies
Section III	Patient self-administered questionnaires	19 studies

Section I



- Screening for serious injury (cervical spine fractures/instability) all studies are from emergency rooms
 - Emergency clinical examination vs. X-ray Phase II-III studies (14 studies)
 - Emergency X-ray vs. CT-Scan (4 studies and 1 meta analysis) Phase II-III studies
 - 3-views X-ray vs. flexion-extension x-ray (3 studies)
 - Training of residents (1 study)

Section I



- Emergency clinical examination vs. X-ray Phase II and III studies (>40,000 patients screened)
- ***Nexus Low Risk Criteria*** and ***Canadian C-Spine*** studies included
 - Clear criteria to rule out neck fractures in clinical emergency room examination (all ages except children)

Section I



Clinical Examination Evidence to Rule Out Neck Fracture in Emergency Room (Nexus Low Risk Criteria [NLC])

- no posterior midline cervical spine tenderness
- no evidence of intoxication
- a normal level of alertness
- no focal neurological deficit and
- no painful distracting injuries

Neck Trauma Fractures



	CCR Patients All	NLC Patients All	NLC Patients > 65 years
Sens	100 (98-100)	99.0 (98.0-99.6)	98.5 (94.8-99.7)
Spec	42.5 (40-44)	12.9 (12.8-13.0)	14.6 (14.5-14.8)
PPV	2.9 (2.5-3.4)	2.7 (2.6-2.8)	5.3 (5.2-5.3)
NPV	100 (99.9-100)	99.8 (99.6-100)	99.5 (98.3-99.9)

NPV= Negative Predictive Value, PPV=Positive Predictive Value

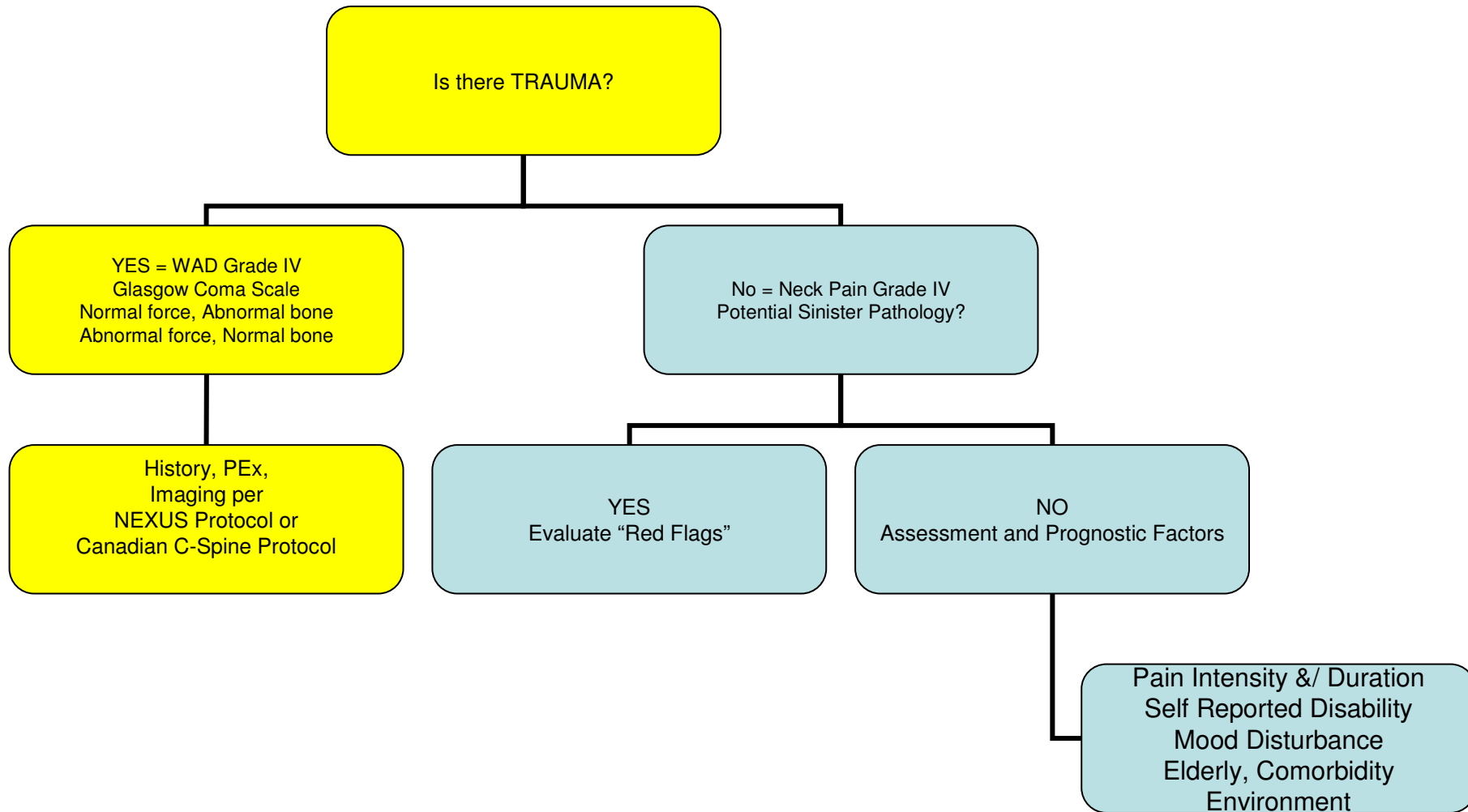
Implement



Section I

- Emergency X-ray vs. CT-Scan (4 studies and 1 meta analysis)
 - Sensitivity (3-views) 0.54 (CI 95% 0.48-0.59)
 - Specificity (3-views) 0.93 (CI 95% 0.79-0.98)
 - Sensitivity: CT-Scan 0.98 (CI 95% 0.95-0.99)
 - CT- scan used as Gold Standard specificity not reported.
- Flexion-extension X-ray or 5 views
 - No additional value

Diagnostic Framework

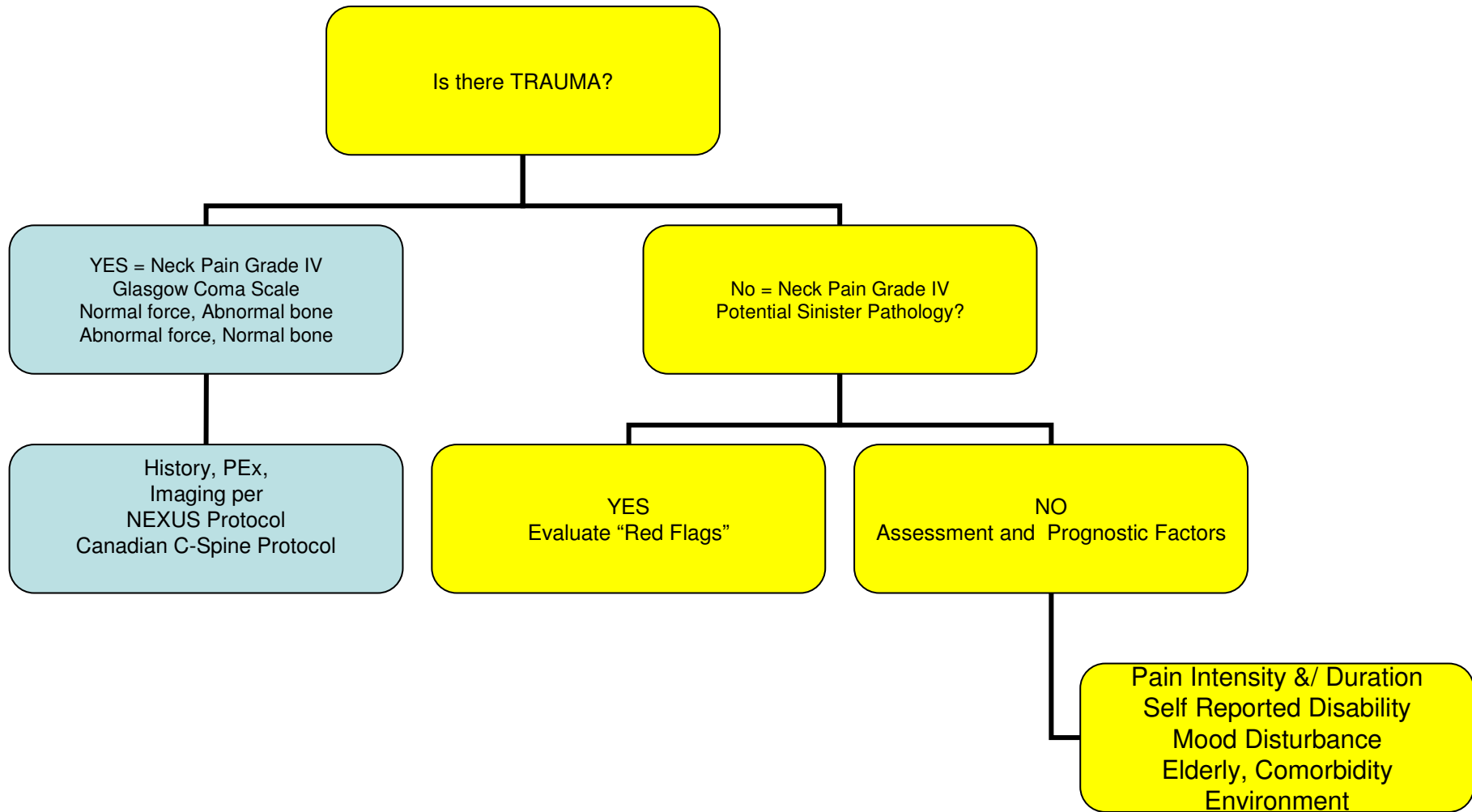




Screening for Neck Fractures

- Based on strong evidence emergency room physicians should use a screening tool such as the Nexus Low Risk Criteria (NLC) or Canadian C-spine Rule (CCR) for patient with blunt trauma to the neck
- There is consistent evidence that CT-scan is more sensitive for high risk patient
- There is some evidence suggesting children should be screened.

Diagnostic Framework



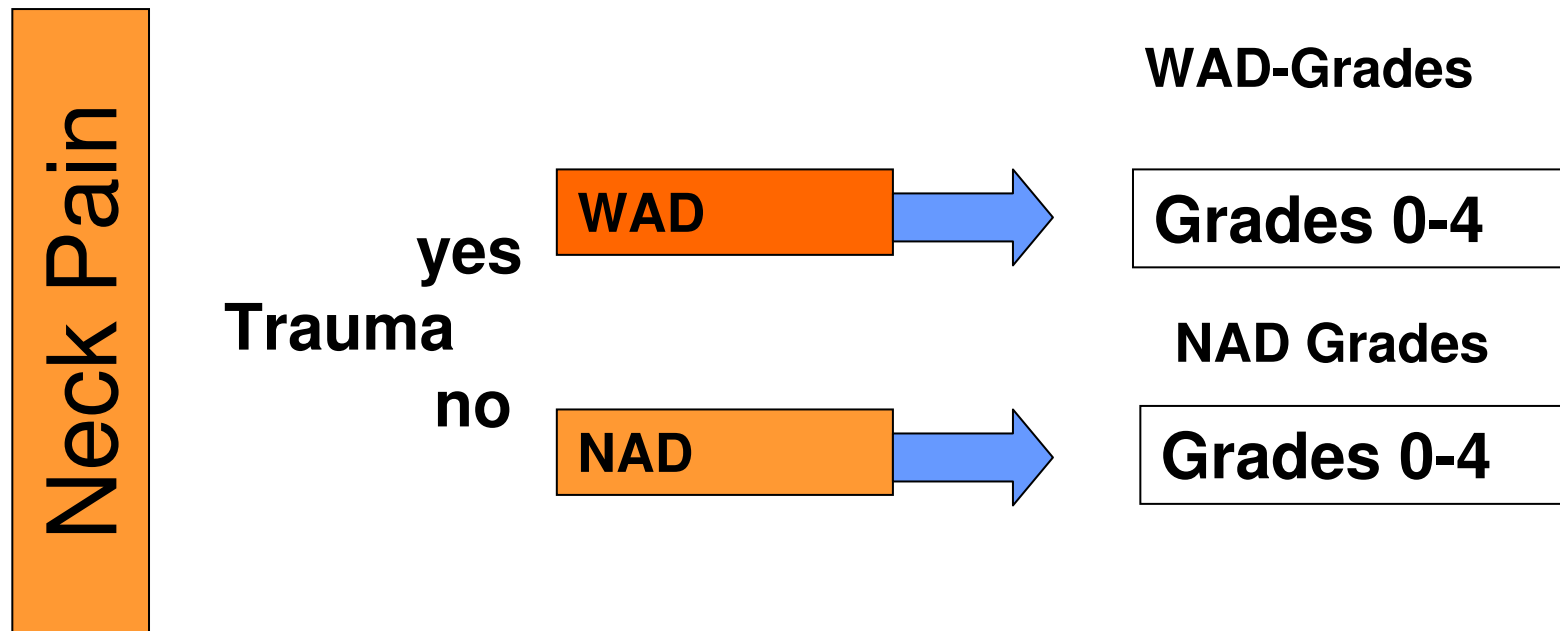


Framework for Classification of Neck Pain Bordeaux 2004

- Based on the evidence
- Practical for clinician
- Simple if possible
- Discussion influenced by WAD
- Additional symptomatology and co-morbidities were thoroughly discussed



Model for Neck Pain Diagnosis 2004



Pain and severity of pain?
Acute/subacute/chronic/recurrent?
Perception of disability?
Other disease/other symptoms?
Occupational/non occupational?

From prognosis and treatment groups
Duration symptoms
Function
Medical
System



Framework for Classification of Neck Pain 2007

- Once structural integrity of the neck has been confirmed there is no difference in assessment, treatment and prognosis for WAD (Grade I-III) and Neck Pain (Classification I-III)



Classification of WAD/Neck Pain

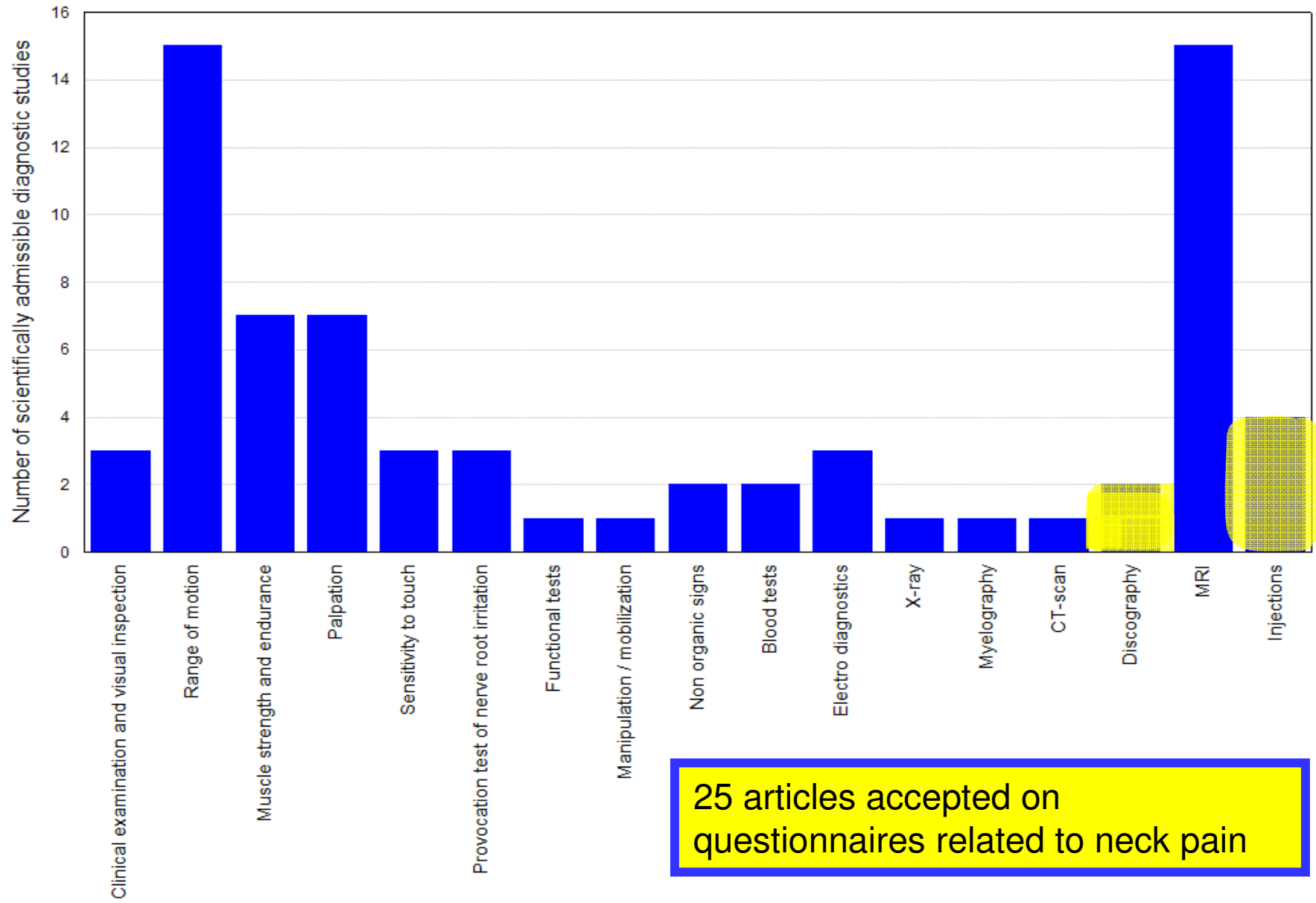
- Neck Pain Grade I
 - **No pathology and little interference with activities of daily living**
 - **Stiffness and tenderness, but no other signs**
- Neck Pain Grade II
 - **No pathology, but significant interference with activities of daily living**
 - **Decreased ROM and tenderness**
- Neck Pain Grade III
 - **Radiculopathy related pathology**
 - **Signs of nerve root compression**
- Neck Pain Grade IV
 - **Pathological WAD (fracture/dislocation)/Neck Pain (tumour, infection, systemic disease)**

Section II-

Clinical Assessment Areas



- Patient History
- Clinical physical examination
 - Blood test
 - Lifting
 - Manipulation (Phase IV)
 - Muscle strength/endurance
 - Nerve conduct/EMG
 - Non-organic signs
 - Palpation
 - Provocation tests
 - Proprioception
- Range of motion
- Stepping test
- Walking test
- Imaging
 - CT-scan, Discography, MRI, Myelography and X-ray
- Injections
- Other tests
- Special Populations (only trauma)
 - Children and geriatrics



Section II-

Clinical Physical Examination



There is consistent evidence that the clinical physical examination is generally more predictive at ruling out a structural lesion or neurological compression than ruling in a root compression and radiculopathy (4 studies)

Section II-

Neck Range of Motion



- Small studies (passive, active, “eye-balling”, device, patient self assessment)
- Intra and inter-rater reliability is at best moderate \sim (kappa 0.5-0.60)
- Pro and re-traction of the head unreliable
- Patients with neck pain with or without radiculopathy have slightly less volitional motion
- Only one study of 15 studies used a gold standard

Section II-

Muscle Strength and Endurance



- There is some evidence that patient with chronic neck pain has slightly lower neck muscle strength compared to controls (1 study)
- Muscle endurance of the neck and arm can discriminate between patients with chronic WAD or patients with neck pain and myalgia and controls (2 studies)

Section II-

Manipulation of the Neck



- There is limited evidence against using low amplitude manipulation and endplay assessment of the cervical spine in patient with neck pain. One Phase IV study showed that this assessment did not improve the primary outcome same day (pain and stiffness)

Section II- Provocation Tests for Radiculopathy



Test	Gold-Standard	Radiculopathy (+/-)	Sensitivity	Specificity
Spurling Test with Neck Extension	Surgery	20/5	0.90 (0.68-0.99)	1.00 (0.48-1.00)
	MRI	9/16	1.00 (0.66-1.00)	0.94 (0.70-1.00)
	MRI+ surgery	29/21	0.93 (0.77-0.99)	0.95 (0.76-1.00)
# of Tests	NA	19/63		
2 tests			0.39 (0.16-0.61)	0.56 (0.43-0.68)
3 tests			0.39 (0.16-0.61)	0.94 (0.88-1.00)
4 tests			0.24 (0.05-0.43)	0.99 (0.97-1.00)

Section II-

Provocation Tests for Radiculopathy



- Tests including extension of neck and/or arm+hand (elongation of the nerves) which elicit positive pain response have positive predictive value up to 90%
- Tests clustered were ULTT, cervical rotation contra-lateral, distraction and/or Spurling
- If radiculopathy is present 4 manual tests gives higher negative predictive value >90% than 2 manual tests

Section II-

MRI Neck Pain and WAD



- Inter-rater reliability varies from Kappa 0.17-0.60 highest for disc protrusion, disc degeneration and foraminal stenosis, lowest for tectorial and posterior atlanto occipital membranes.
- MRI vs surgery as gold standard has PPV 68-75% and NPV 60-80% for presence or absence of hard disc
- MRI studies have not demonstrated specific soft tissue lesions following acute or chronic WAD
- With increase in age there are more MRI findings in the cervical spine in individuals with or without neck pain.



Section II-

MRI Findings, Age, No Neck Pain

Reference / # of cervical disc assessed	Age <30 years	Age <40 years	Age >40 years	Age >60 years
Lehto et al 1994 n=533	14%	25%	57%	
Matsumoto 1998 n=2480	M 17% W 12%			M 86% W 89%
Boden et al 1990 n=264		8%	37%	
Siivola et al 2002 n= 186	5%			

Section III-

Patients Questionnaires



- **Aberdeen Back Pain Scale**
- **Cervical Spine Outcome Questionnaire (CSOQ)**
- **Copenhagen Neck Functional Disability Scale (CNDFS)**
- **Epidemiological Screening Questionnaire For Neck Pain**
- **Global Assessment of Neck Pain**
- **McGill Pain Questionnaire**
- **Miller Behavioral Scale**
- **Neck Disability Index (NDI)**
- **Neck Pain and Disability Index**
- **Neck Pain and Disability Scale**
- **Whiplash Disability Questionnaire**

Section III-

Patients Questionnaires



- The 11 instruments (22 studies) are described with reliability (intra or inter), some validity (construct, content or predictive), responsiveness and/or correlation with other instruments.
- A few are validated against other diagnostics such imaging.
- The instruments do not confirm pathology or objective loss of function.
- The instruments consistent evidence in utility in routine clinical practice (clinical presentation and function over time).

Assessment Summary



- **Excellent screening instruments for neck fractures in emergency room**
 - These instruments are for adults
 - Lack of instruments for children
- **Red Flags for neck pain are not well established**
- **Once serious condition for neck pain has been ruled out the choice of diagnostic tools and treatments are the same for neck pain and whiplash**
- **Clinical evaluation for neck pain is more reliable in “ruling out” conditions than “ruling in” conditions**
- **ROM can be reliably “eyeballed”**
 - No evidence ROM improves outcome

Assessment Summary



- **Manipulation and joint end-play assessment is not useful as diagnostic tool**
 - One phase IV study
- **Injections**
 - Lack of scientifically admissible studies
- **Electro diagnostic clinical EMG etc**
 - Lack of studies
- **Radiculopathy**
 - Provocative tests used in combination have higher predictive values
- **Imaging-Degenerative changes occur in those with and without neck pain**
- **Patient self-assessment questionnaires are useful to document (diagnose) symptoms and functional impairment**
- **Very few phase III & IV studies**
 - Good evidence is lacking

Findings Lacking



- **Major gaps in knowledge**
 - Phase III and IV studies
 - Screening for children with blunt trauma
 - A comprehensive approach to clinical assessment
 - Confirming “Red Flags” for non-trauma neck patients
 - Electro-physiology as diagnostics
 - Order of tests diagnostics and effect
 - Health assessment utilization studies, policy studies and much, much more.....



Thank You

Tack så mycket

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