

Conceptualising and teaching the risk of serious vascular adverse events associated with manual therapy when treating the neck: An overview of a recent International Framework



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@UCODVC_Research

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**TEACHING
CLINICAL COMPETENCIES**

Antwerp, Belgium

Disclosures

- Work at UCO - HEP that focusses on educating osteopaths
 - Responsible for CPD, Clinical Practice, Research and Knowledge Exchange
- Practising osteopath
- Editor for Elsevier journal focussing on osteopathy and related disciplines and interventions
- Received research funding
- No funding received for the work in this presentation
 - Draws on IFOMPT work but my own views
- Run a course of CPD with Dr Roger Kerry for UCO

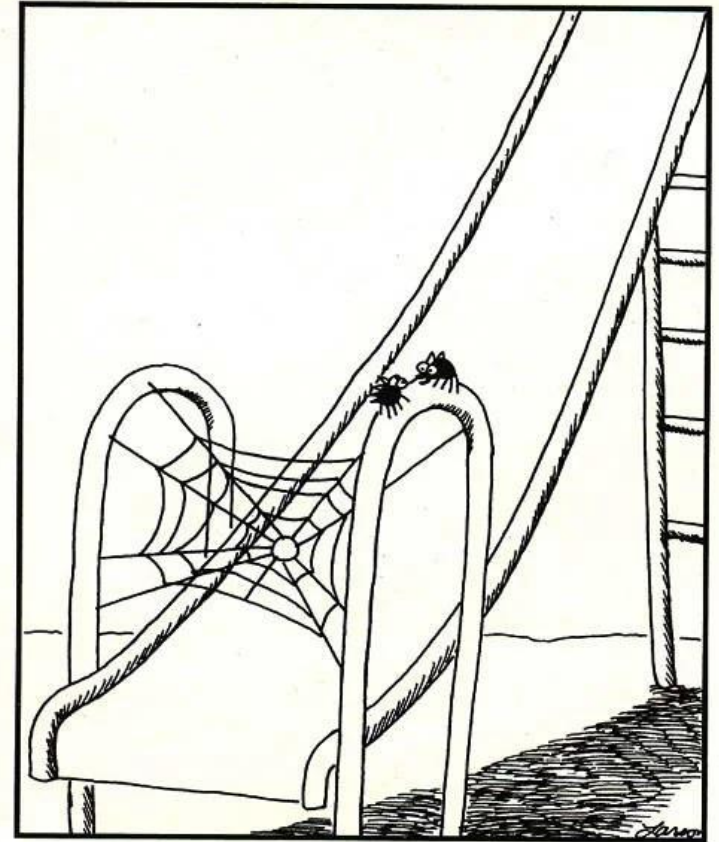
Acknowledgement



Dr Roger Kerry,
Nottingham University
Some slides and development of
some content 😊

Overview

- Background
- Pathophysiology and epidemiology of selected vascular pathologies (formerly cervical artery dysfunction CAD) – Treatment risk
- History
- Physical Examination
- Decision making
- Consent and explaining risk
- Teaching context



"If we pull this off, we'll eat like kings."

Millie Turner exclusive: 'I was at serious risk of a stroke - I had to stop playing'

Manchester United centre-back finally resumed full training this week after patiently recovering from a carotid artery dissection

By Tom Garry, WOMEN'S FOOTBALL REPORTER

28 August 2022 • 8:30am



HEAD TO HEAD

Should we abandon cervical spine manipulation for mechanical neck pain? Yes

Benedict Wand and colleagues argue that the risks of cervical spine manipulation are not justified, but **David Cassidy and colleagues** (doi:10.1136/bmj.e3680) think it is a valuable addition to patient care

Benedict M Wand *associate professor*¹, Peter J Heine *research fellow*², Neil E O'Connell *lecturer*³

¹School of Physiotherapy, University of Notre Dame Australia, 19 Mouat Street, Fremantle, WA 6959, Australia; ²Warwick Clinical Trials Unit, Division of Health Sciences, University of Warwick, Coventry, UK; ³Centre for Research in Rehabilitation, Brunel University, Uxbridge, UK

Cervical spine manipulation (a high velocity, low amplitude, end range thrust manoeuvre) is a common treatment option for

the increased risk after chiropractic treatment may be an artefact of patients seeking care for neck pain resulting from existing

**International Framework for Examination of the
Cervical Region for potential of vascular pathologies
of the neck prior to Orthopaedic Manual Therapy
(OMT) Intervention:**

International IFOMPT Cervical Framework



International IFOMPT
Cervical Framework

Authors: Rushton, A., Carlesso, L.C., Flynn, T., Hing, W.A., Kerry, R. Rubinstein, S.M., Vogel, S.

Author affiliations

Rushton, A. - School of Physical Therapy, Western University, Canada

Carlesso, L.C. - School of Rehabilitation Science, McMaster University, Canada

Flynn, T. - School of Physical Therapy, South College, Knoxville, USA

Hing, W.A. - Faculty of Health Sciences and Medicine, Bond University, Australia

Kerry, R. - Division of Physiotherapy & Rehabilitation Sciences, University of Nottingham, UK

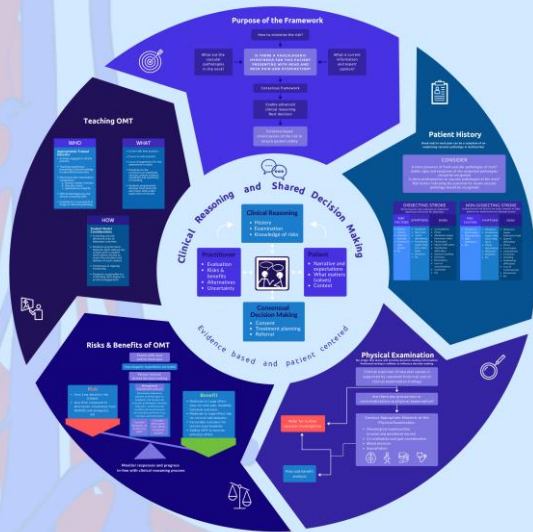
Rubinstein, S.M. - Department of Health Sciences and Amsterdam Public Health Research
institute, Vrije Universiteit, The Netherlands

Vogel, S. - Research Centre, University College of Osteopathy, UK

The framework

ifompt.org (research & resources)

International Framework for Examination of the Cervical Region for Potential of Vascular Pathologies of the Neck Prior to Orthopaedic Manual Therapy (OMT) Intervention



International IFOMPT
Cervical Framework
Rushdon, Carlsson, Flynn, Hing,
Vogel, Rubinstein and Kerry

Patient History

Head and/or neck pain can be a symptom of an underlying vascular pathology or dysfunction

CONSIDER

Is there presence of frank vascular pathologies of neck?
Subtle signs and symptoms of the suspected pathologies should be recognised
Is there predisposition to vascular pathologies of the neck?
Risk factors indicating the potential for neuro-vascular pathology should be recognised

DISSECTING STROKE

Recent trauma may represent an important significant risk factor for dissection

RISK FACTORS	SYMPTOMS	SIGNS
• Trauma	• Headache	• Unsteadiness
• Neck pain	• Neck pain	• Ptosis
• Visual disturbance	• Paresthesia (upper limb, face, lower limb)	• Weakness (upper limb, lower limb)
• Speech difficulties	• Speech difficulties	• Facial palsy
• Nausea/vomiting	• Dizziness	• Swallowing difficulties
• Dizziness	• Dizziness	• Nausea/vomiting
• Drowsiness	• Drowsiness	• Loss of consciousness
• Confusion	• Confusion	• Confusion
• Etc...	• Etc...	• Etc...

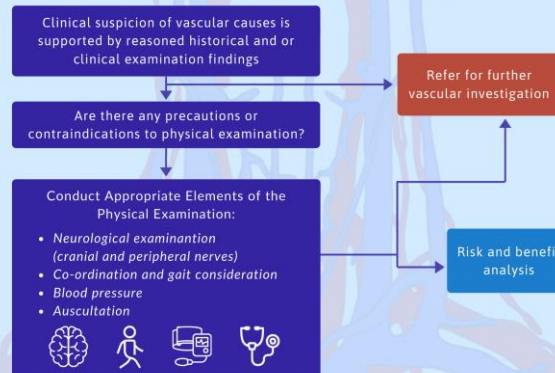
NON-DISSECTING STROKE

Cardiovascular risk factors are more common in older patients for atherosclerotic (disease) even

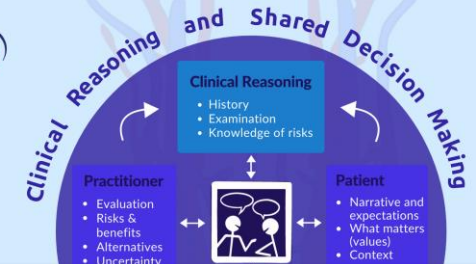
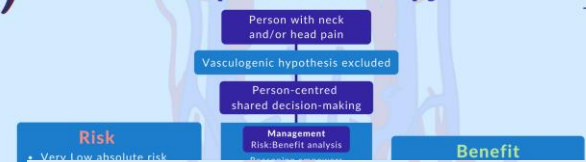
RISK FACTORS	SYMPTOMS	SIGNS
• Current or past smoker	• Headache	• Weakness (upper limb, lower limb)
• Hypertension	• Paresthesia (upper limb, lower limb, face)	• Speech difficulties
• High cholesterol	• Visual disturbance	• Ptosis
• Etc...	• Neck pain	• Facial palsy
	• Dizziness	• Unsteadiness
	• Drowsiness	• Confusion
	• Confusion	• Vomiting
	• Etc...	• Swallowing difficulties
		• Loss of consciousness
		• Drowsiness
		• Etc...

Physical Examination

No single test alone will provide decision-making information
Positional testing is unlikely to influence decision making



Risks & Benefits of Orthopaedic Manipulative Therapy



Teaching Orthopaedic Manipulative Therapy

WHO

Appropriately Trained Educator

- Actively engaged in clinical practice
- Teaching experience, mentoring & formal training in educational processes
- Neuromuscular examination competence
 - a. Sensory-motor function
 - b. Vascular status
 - c. Ligamentous integrity
- Differential diagnosis and clinical reasoning skills
- Competent in assessment & triage of relevant pathology

WHAT

- In line with best practice
- Focus on safe practice
- Local arrangements for risk assessment in place
- Emphasis on the continuum of amplitude, velocity, patient comfort, sensitivity and specificity of handling
- Students progressively develop hand dexterity and motor skills under supervision of faculty

HOW

Student Model Considerations

- Screening and risk disclosure prior to laboratory activities
- Students practise hand dexterity skills without any contact with a student which allows faculty to assess the precision and delivery of each student
- Continuous & ongoing monitoring
- Student is responsible for controlling their degree of practical engagement

Position Statement: International Framework for Examination of the Cervical Region for potential of vascular pathologies of the neck prior to Musculoskeletal Intervention: International IFOMPT Cervical Framework

AUTHORS ^

Clinical reasoning tool to illustrate level of support for a vasculogenic hypothesis



LOW

None or minimal data supporting vasculogenic hypothesis

MODERATE

Mixed data supporting and refuting vasculogenic hypothesis

HIGH

Data supporting vasculogenic hypothesis

The position paper summarises framework and illustrates clinical reasoning with a series of case vignettes



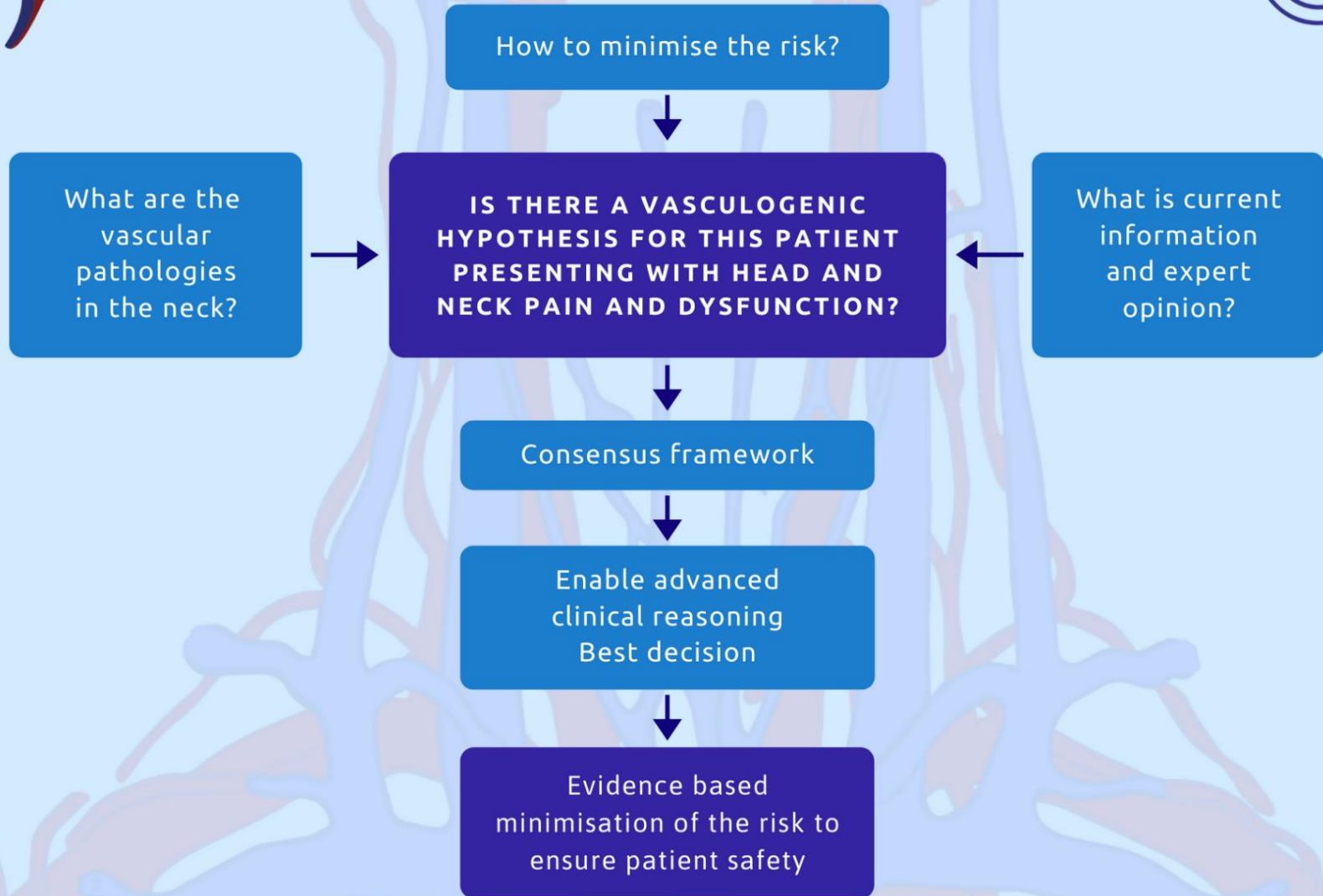
Newly Published, ePub Ahead of Issue
Pages: 1-14



Keywords



Purpose of the Framework



Cervical artery dysfunction and not just manipulation

- Focus has been on vertebral artery and vertebrobasilar system
- Cervical artery system includes the internal carotid artery
- Not just manipulation
 - *"The common denominator in the activities [non high-velocity thrust movements] indicated is cervical movement, thus the phenomenon might not be one of HVT [high velocity thrust], but of movement more generally"* (Kerry and Taylor 2014, Biller et al 2014)
- Styloid process size and other abnormalities (Raser et al 2011, Thomas et al 2014, Muthusami et al 2013,)

Manipulation and C'sp

- Increased risk shown for manipulation and stroke (Rothwell et al 2001, Smith et al 2003, Cassidy et al 2008, 2017, Tracy et al 2015)
- Rare
- GP risk equivalent to Chiro risk (Cassidy et al 2008, 2017)
- Prodromal or dissection in situ most common cause of presentation accounts for risk



Summary



- Constant need for vigilance for vascular complications in neck and head pain by people who treat head and neck pain!

- Individuals must demonstrate a high level of clinical judgement

- Not everyone is like this

Education context

- Considerable uncertainty
- High levels of reasoning and competence
 - Novice practitioners
 - Safety

Educational setting



- Brings together
 - Anatomy
 - Pathophysiology
 - Epidemiology and clinical epidemiology
 - Case history taking
 - Examination skills
 - Clinical reasoning and uncertainty
 - Communication skills, shared decision making and consent
 - Referral and emergency care skills

Cervical Arterial Dysfunction / Vascular Neck Pathology overview

Table 1: Range of vascular pathologies of the neck

Structure/site	Pathology	Symptoms/Presentation
Carotid artery	Atherosclerosis Stenotic Thrombotic Aneurysmal	Carotidynia ³ , neck pain, facial pain, headache, cranial nerve dysfunction, Horner's Syndrome, transient ischaemic attack (TIA), stroke
Carotid artery	Hypoplasia	Commonly silent, rare cerebral ischaemia
Carotid artery	Dissection	Neck pain, facial pain, headache, TIA, cranial nerve palsies, Horner's syndrome
Vertebral artery	Atherosclerosis	Neck pain, occipital headache, possible transient ischaemic attack (TIA), stroke
Vertebral artery	Hypoplasia	Commonly silent, rare cerebral ischaemia
Vertebral artery	Dissection	Neck pain, occipital headache, TIA, cranial nerve palsy
Temporal/ Vertebral/ Occipital/Carotid arteries	Giant cell arteritis	Temporal pain (headache), scalp tenderness, jaw and tongue claudication, visual symptoms (diplopia or vision loss – may be permanent)
Cerebral vessels	Reversible cerebral vasoconstriction syndrome (RCVS)	Severe 'thunderclap' headaches
Subarachnoid	Haemorrhage	Sudden severe headache, stiff neck, visual disturbance, photophobia, slurred speech, sickness, unilateral weakness,
Jugular vein	Thrombosis	Neck pain, headaches, fever, swelling around neck/angle of jaw
Any other cervico-cranial vessel	Vascular anomaly or malformation	Possible headache/neck pain i.e. un-ruptured carotid aneurysm

Hutting et al
2013

Kranenburg et al
2017

Risk of stroke
following HVT

Traditional
tests are poor
(+ve 'VBI'
test' = 0.006%
chance of
having stroke)

Risk of non-HVT
interventions >
HVT

What's the data saying?

Risk of stroke HVT (and treatment)

- Vertebral Artery dissections in normal population: 0.75 – 2.9/100,000
- Int Carotid Artery dissections more frequent
- Serious adverse events associated with physical treatments more commonly involve the Vertebral Artery
- Vertebral Artery dissection stroke associated with physical treatment population: 0.4 – 5/100,000

Relative Risk: 0.14 – 6.66 (decrease of 86% to increase of 666%!)

Bejot Y, Daubail B, Debette S, et al. 2014 Incidence and outcome of cerebrovascular events related to cervical artery dissection: the Dijon Stroke Registry. International journal of stroke.9(7):879-82

Nielsen SM, Tarp S, Christensen R, Bliddal H, Klokke L, Henriksen M. 2017 The risk associated with spinal manipulation: an overview of reviews. Syst Rev. 6(1):64. .

Absolute Risk Increase: 0.006%
(“worse-case” scenario)

Numbers Needed to Harm: 416,666

Risk of VA dissection
in normal population

1: 100,000

Risk of VA dissection in
manipulation population

6: 100,000

Absolute Risk : $0.006\% \text{ minus } 0.001\% = 0.005\%$
= epidemiologically irrelevant (for causation)

Comparative risks of commonly used therapeutic interventions for head and neck pain

Intervention	Adverse Event	Risk	Baseline prevalence (events occurring without any intervention) per 100,000 ^a	Absolute Risk (absolute percentage increase if intervention is given)
NSAIDS (non-specific)	MI ¹ GIB ²	1.48 – 1.75* 4.27**	2,400 87	5.95% - 6.6% 0.46%
NSAIDS (Cox-2)	MI ¹ GIB ²	1.58 – 2.65* 2.90**	2,400 87	6.19% - 8.67% 0.34%
Aspirin	Bleed ^b	1.43 ³ – 3.05 ^{4 ***}	87	0.21% - 0.35%
Paracetamol⁵	CV GIB Renal	1.19 – 1.68** 1.11 – 1.49** 1.40 – 2.19**	2,400 (e.g. of MI) 87 1,350	5.26% - 6.43% 0.18% - 0.27% 3.24% - 4.30%
Cervical OMT^c	Stroke (VBA)	6.66**	0.79	0.006%

¹: Bally et al (2018); ²: Masclee et al (2014); ³: Zeng and Roddick (2019); Roberts et al (2014)

^a: based on UK government data ^b: intra- and extracranial, and gastrointestinal; ^c Including MI; cerebrovascular accidents and hypertension ^d Specifically reductions in estimated glomerular filtration rate, increases in serum creatinine concentration and the need for renal replacement therapy ^e using a 'worse-case' scenario of lowest baseline (0.79/100,000) and highest OMT-prevalence (5/100,000)

NB: Risk of cardiovascular events with all NSAIDS increase with a history of cardiovascular risk factors and age (Koffman et al 2014)

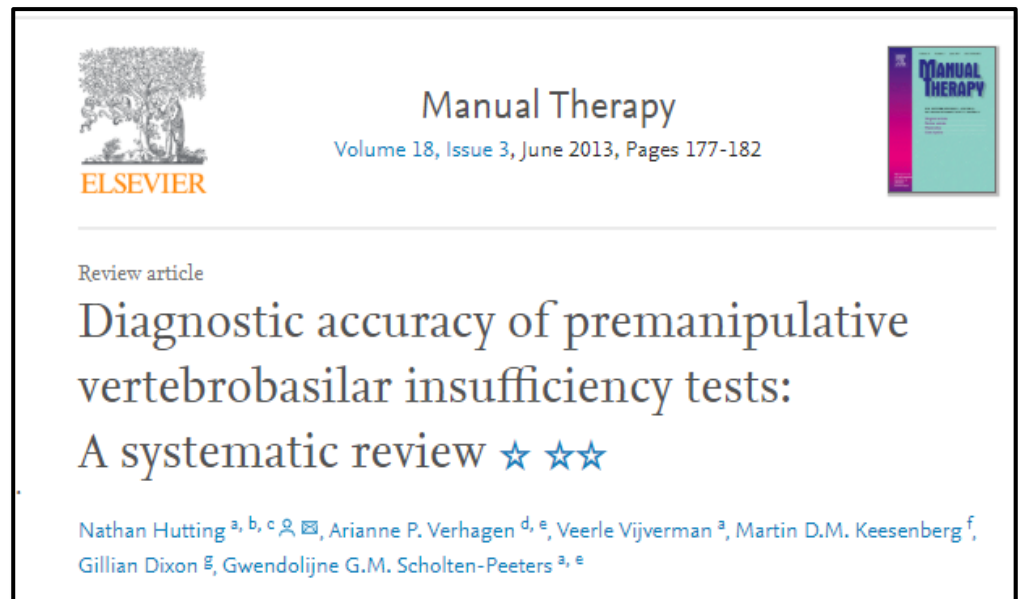
Risk of stroke
following HVT

Traditional
tests are poor
(+ve 'VBI'
test' = 0.006%
chance of
having stroke)

Risk of non-HVT
interventions >
HVT

What's the data saying?

Testing



Results: Of the 1677 potential citations only 4 studies were included, all of questionable quality.

Sensitivity was low and ranged from 0 to 57%, specificity from 67 to 100%, positive predictive value from 0% to 100%, and negative predictive value from 26 to 96%. The positive likelihood ratio ranged from 0.22 to 83.25 and the negative likelihood ratio from 0.44 to 1.40.

Conclusion: Based on this systematic review of only 4 studies it was not possible to draw firm conclusions about the diagnostic accuracy of premanipulative tests. However, data on diagnostic accuracy indicate that the premanipulative tests do not seem valid in the premanipulative screening procedure. A surplus value for premanipulative tests seems unlikely.



Professional issue

Yes, we should abandon pre-treatment positional testing of the cervical spine

Nathan Hutting^a ✉, Hendrikus Antonius "Rik" Kranenburg^b, Roger Kerry^c

Highlights

- Positional testing for vertebrobasilar insufficiency (VBI) is often used by manual therapists.
- The VBI tests do not seem to be important in the pre-manipulative screening.
- The rationale and value of the VBI tests should be questioned.
- A negative VBI test can easily be wrongly interpreted as 'safe to manipulate'.
- The use of the VBI tests cannot be recommended and should be abandoned.

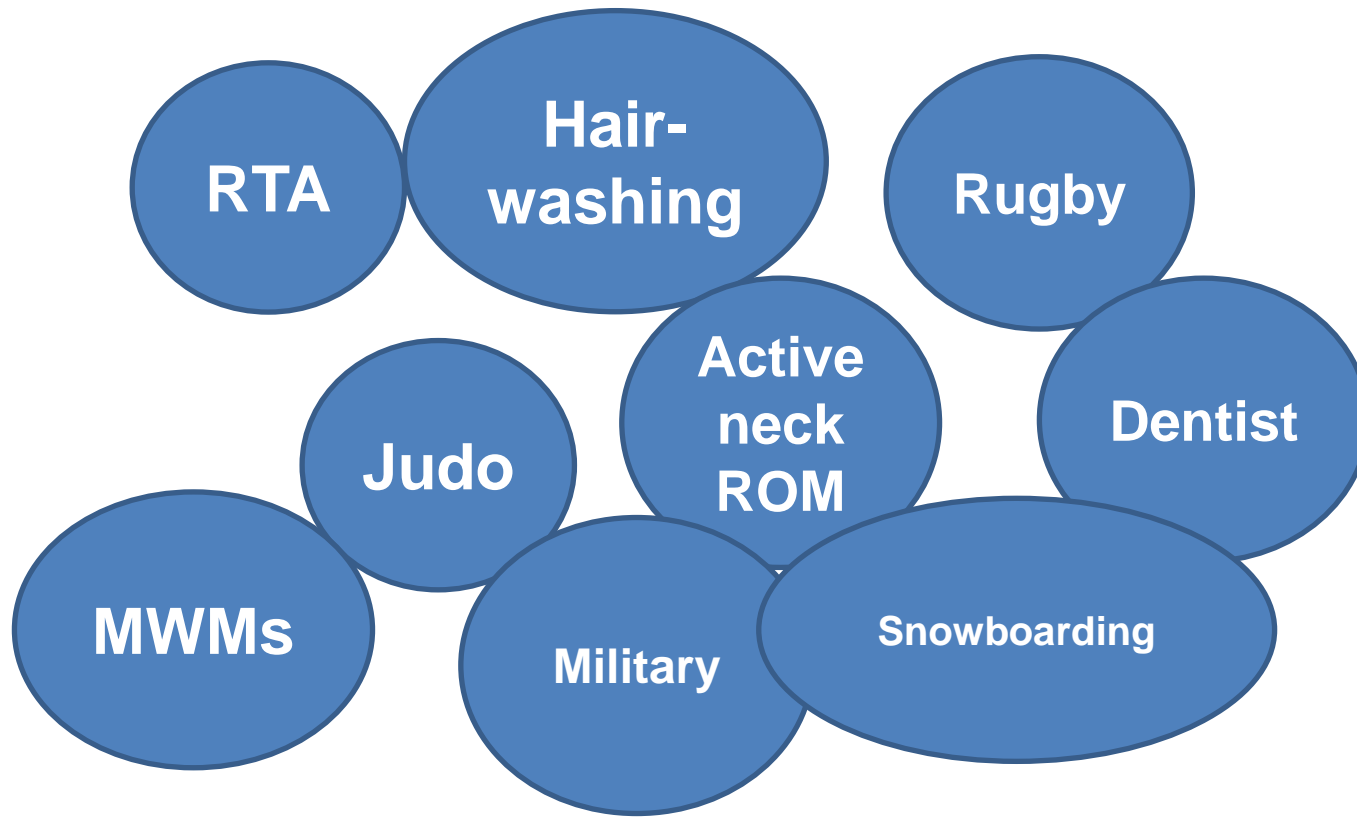
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What's the data saying?

Non-manipulation events of stroke (cervicogenic)



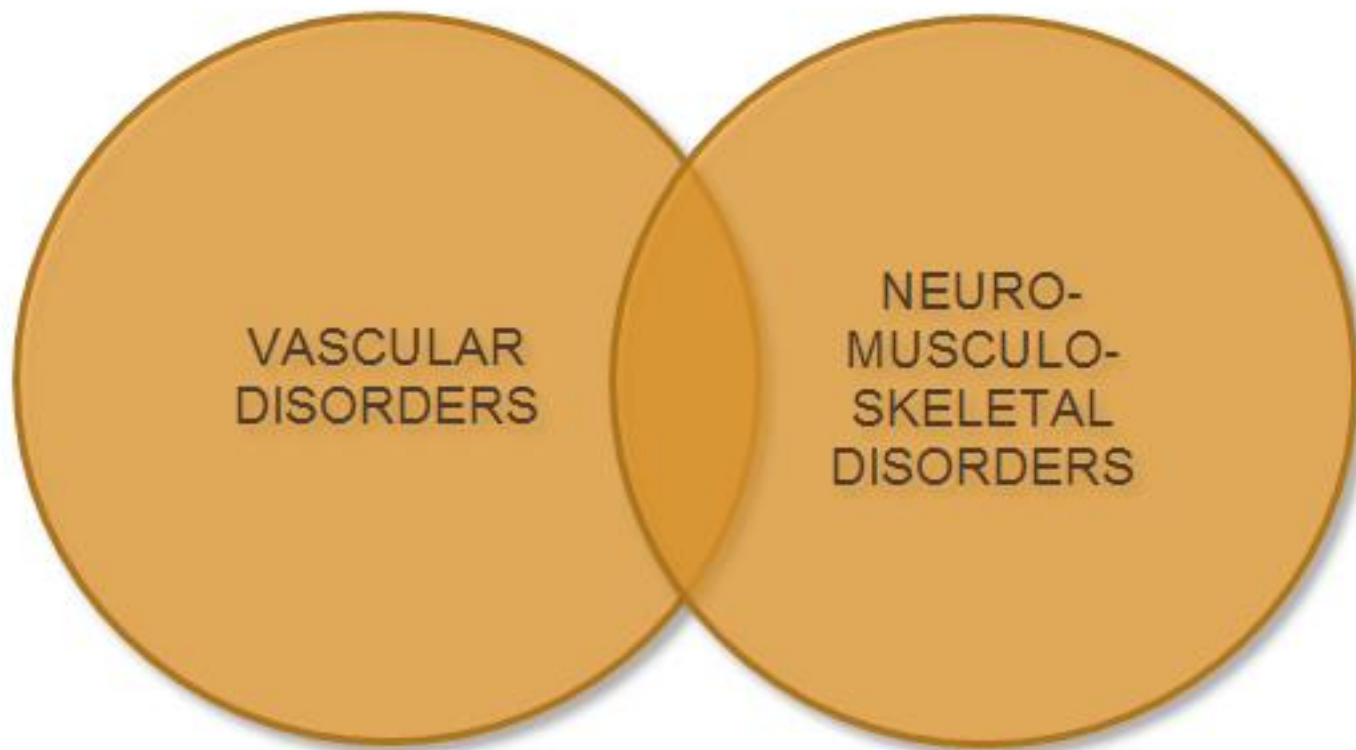
[RESEARCH REPORT]

HENDRIKUS ANTONIUS "RIK" KRANENBURG, PT^{1,2} • ROB TYER, PT³ • MAARTEN SCHMITT, PT, PhD⁴ • GERT JAN LUIJCKX, MD, PhD⁵
CEES VAN DER SCHANS, PT, PhD^{1,2,6} • NATHAN HUTTING, PT, PhD^{7,8} • ROGER KERRY, PT, PhD⁹

Effects of Head and Neck Positions on Blood Flow in the Vertebral, Internal Carotid, and Intracranial Arteries: A Systematic Review

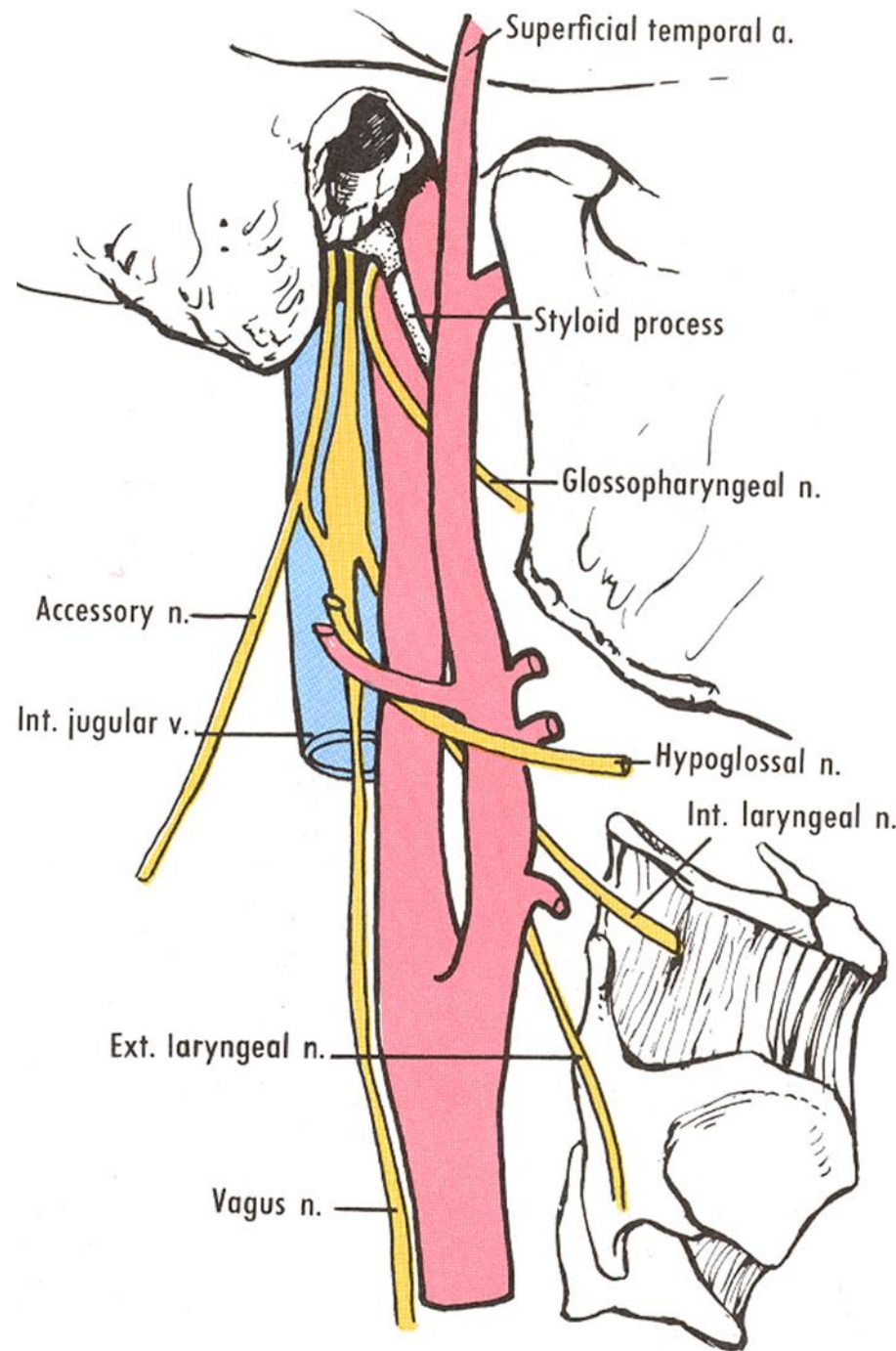
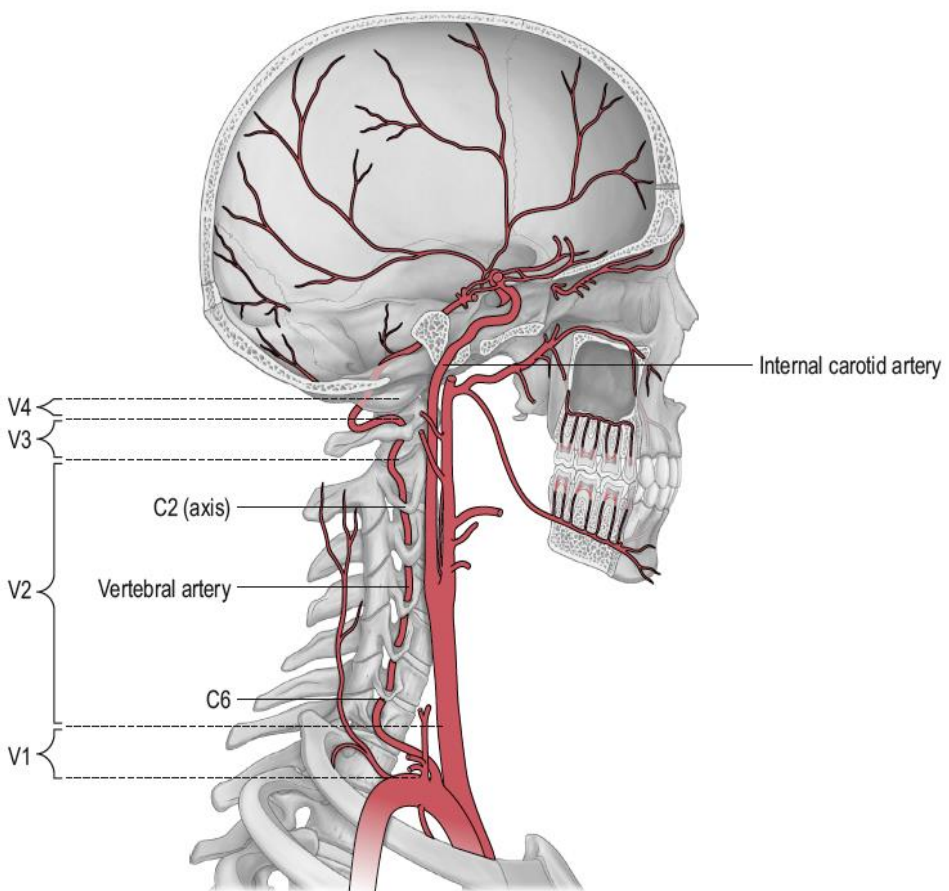
● **CONCLUSION:** The findings of this systematic review suggest that craniocervical positioning may not alter blood flow as much as previously expected.

● **LEVEL OF EVIDENCE:** Therapy, level 2a.
J Orthop Sports Phys Ther 2019;49(10):688-697.
Epub 5 Jul 2019. doi:10.2519/jospt.2019.8578

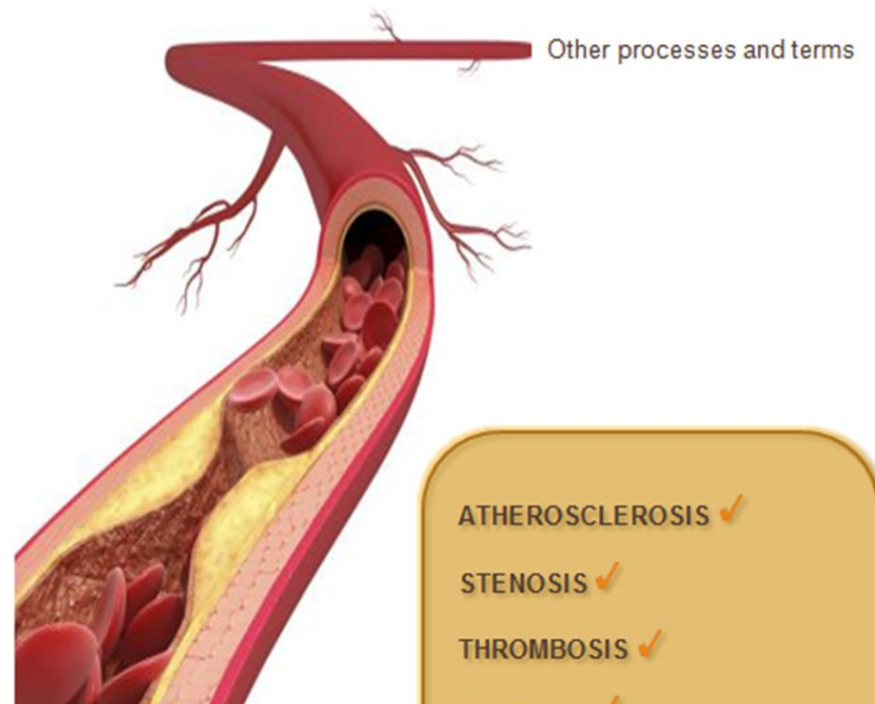
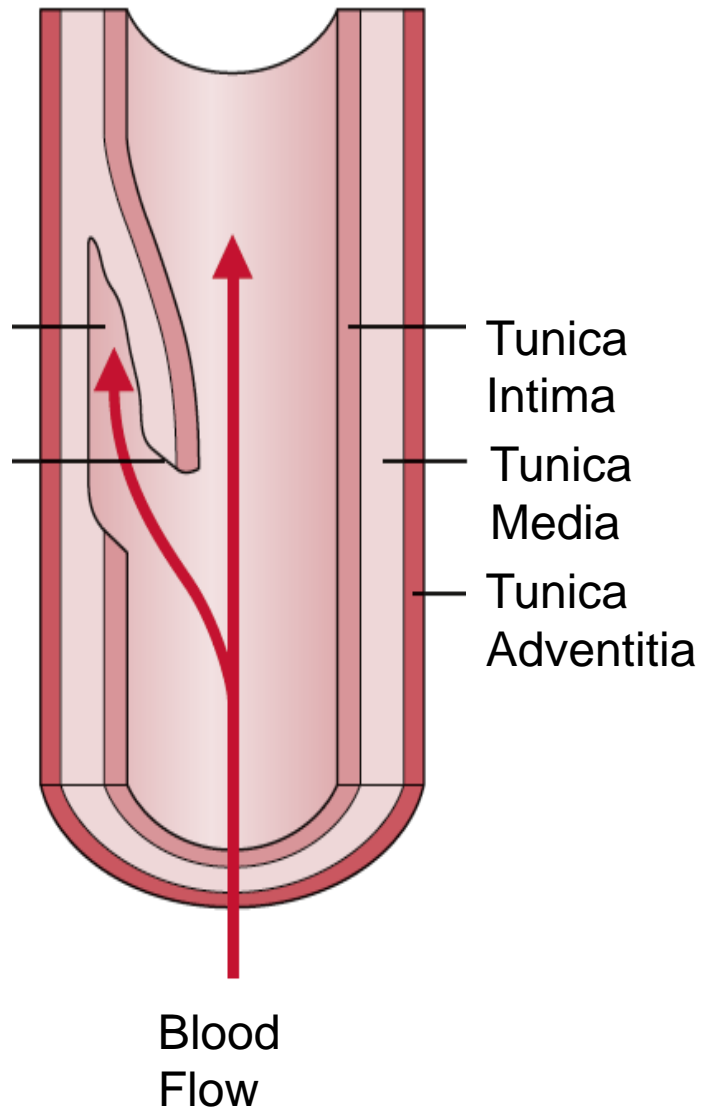


The AETIOLOGY of vascular disorders can be thought of on a **continuum**:





False
Lumen
Intimal
Tear



ATHEROSCLEROSIS ✓

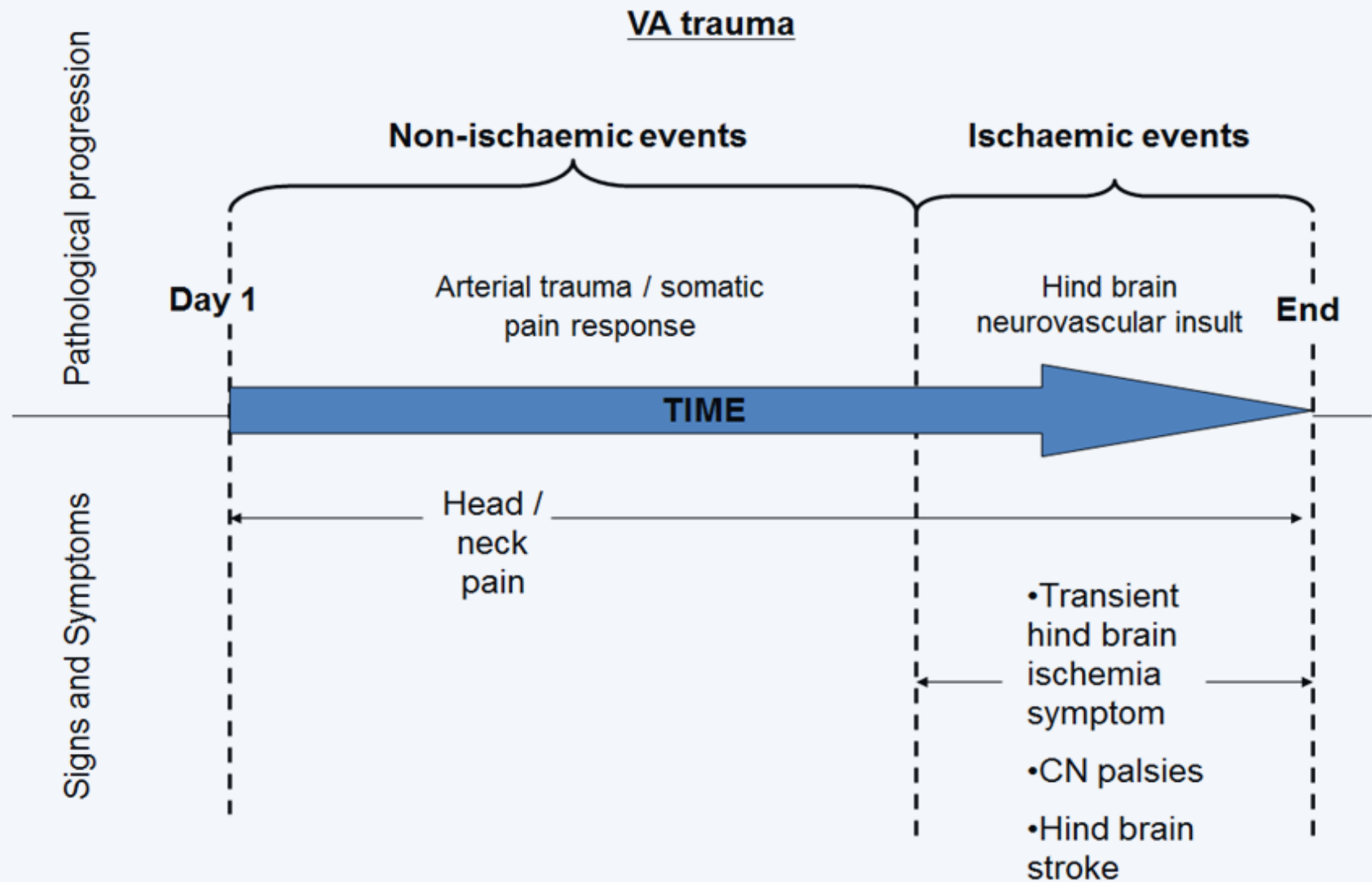
STENOSIS ✓

THROMBOSIS ✓

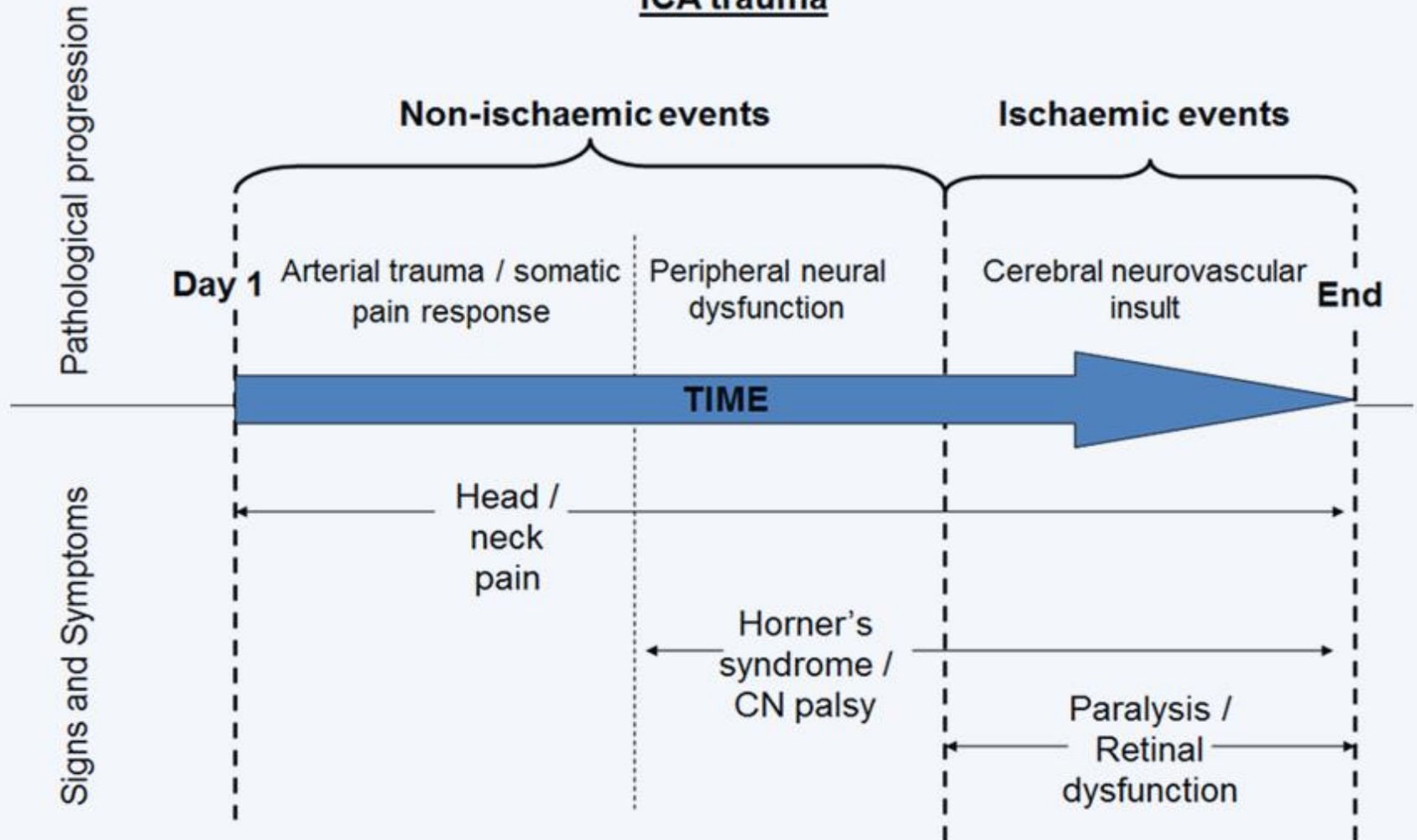
EMBOLUS ✓

ISCHAEMIC ✓

ANEURYSM ✓



ICA trauma



5D's and 3N's

• Diplopia	Double vision or other vision problems
• Dizziness	Vertigo, light-headedness
• Drop Attacks	Sudden numbness/weakness of face/arm/leg
• Disarthria	Difficulty speaking
• Dysphagia	Difficulty swallowing
• Ataxia of Gait	Difficulty walking
• Nausea	Vomiting or queasiness
• Numbness	Loss of sensation on one side
• Nystagmus	Involuntary rapid eye movements



Patient History



Head and/or neck pain can be a symptom of an underlying vascular pathology or dysfunction

CONSIDER

Is there presence of frank vascular pathologies of neck?

Subtle signs and symptoms of the suspected pathologies should be recognised

Is there predisposition to vascular pathologies of the neck?

Risk factors indicating the potential for neuro-vascular pathology should be recognised

DISSECTING STROKE

Recent trauma may represent an important significant risk factor for dissection

RISK FACTORS	SYMPTOMS	SIGNS
<ul style="list-style-type: none">• Recent trauma• Vascular anomaly• Current or past smoker• Etc...	<ul style="list-style-type: none">• Headache• Neck pain• Visual disturbance• Paresthesia (upper limb, face, lower limb)• Dizziness• Etc...	<ul style="list-style-type: none">• Unsteadiness• Ptosis• Weakness (upper limb, lower limb)• Facial palsy• Speech difficulties• Swallowing difficulties• Nausea/vomiting• Dizziness• Drowsiness• Loss of consciousness• Confusion• Etc...

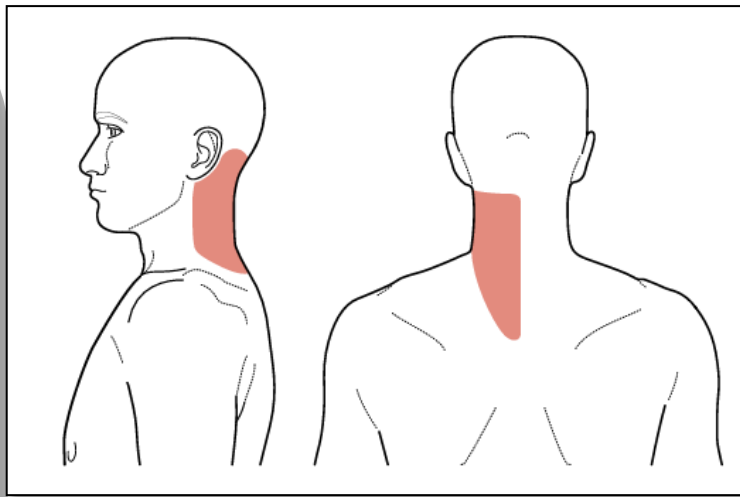
NON-DISSECTING STROKE

Cardiovascular risk factors are more common in older patients for atherosclerotic (disease) events

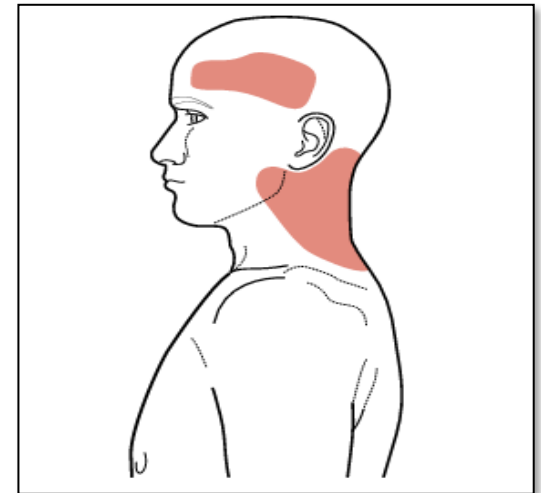
RISK FACTORS	SYMPTOMS	SIGNS
<ul style="list-style-type: none">• Current or past smoker• Hypertension• High cholesterol• Etc...	<ul style="list-style-type: none">• Headache• Paresthesia (upper limb, lower limb, face)• Visual disturbance• Neck pain• Dizziness• Etc...	<ul style="list-style-type: none">• Weakness (upper limb, lower limb)• Speech difficulties• Ptosis• Facial palsy• Unsteadiness• Confusion• Vomiting• Swallowing difficulties• Loss of consciousness• Drowsiness• Etc...

NECK AND HEAD
PAIN IS A
COMMON EARLY
MANIFESTATION OF
CAD

-Kerry et al (2008)



p (VBA
Dysfunction)



p (ICA
Dysfunction)

History taking

Smoking

Trauma

CV
disease

Infection

Hypertension

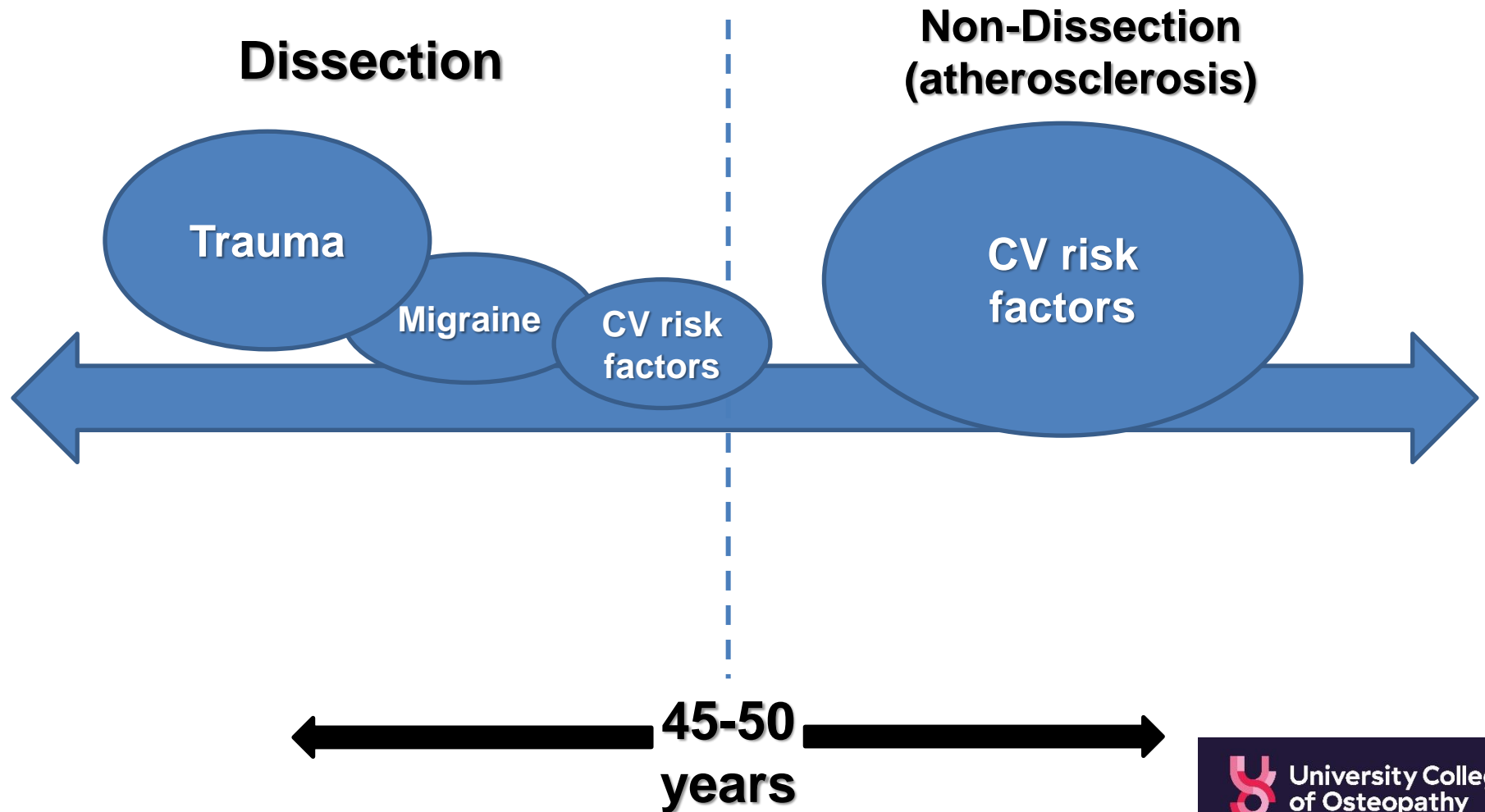
History of
migraine

Absence of
alternative
hypothesis

Diabetes

Anti-coagulation
therapy

Vascular Pathology Risk Factors





Physical Examination

No single test alone will provide decision-making information
Positional testing is unlikely to influence decision making



Clinical suspicion of vascular causes is supported by reasoned historical and or clinical examination findings

Are there any precautions or contraindications to physical examination?

Conduct Appropriate Elements of the Physical Examination:

- *Neurological examination (cranial and peripheral nerves)*
- *Co-ordination and gait consideration*
- *Blood pressure*
- *Auscultation*



Refer for further vascular investigation

Risk and benefit analysis

The Nottingham CAD Classification Model (nCAD)

Manage (PT)

Refer

Class 1

NMS pain
with no or
minor vascular
risk factors

Class 2

NMS pain
with moderate
/ high vascular
risk factors

Class 3

Pre-ischemia
Somatic
symptoms
(pain)
+/- peripheral
neurology

Class 4

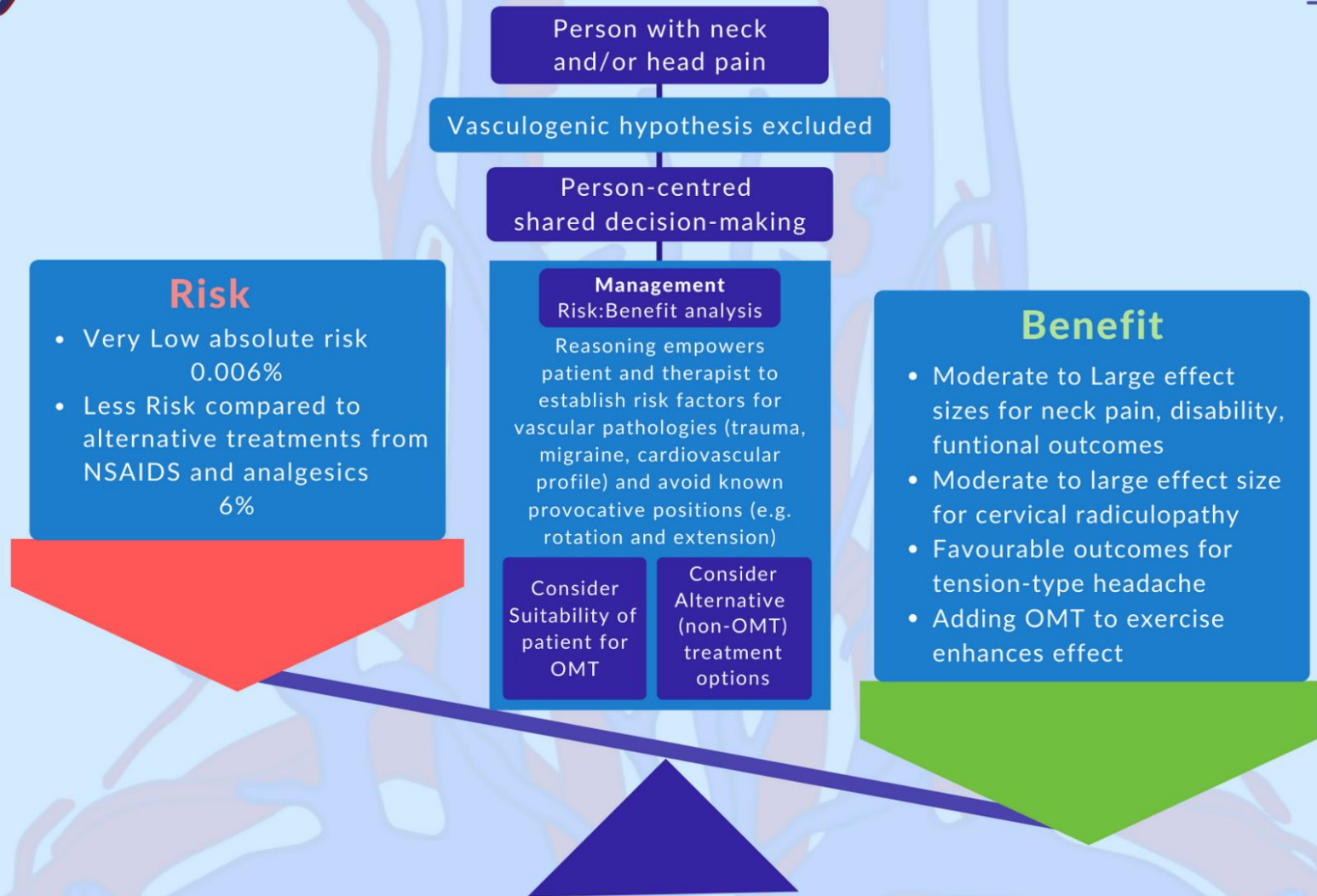
Early-ischemia
Transient brain
ischemia /
cranial
neurology

Class 5

Late-ischemia
with frank
brain ischemia
and associated
neurology



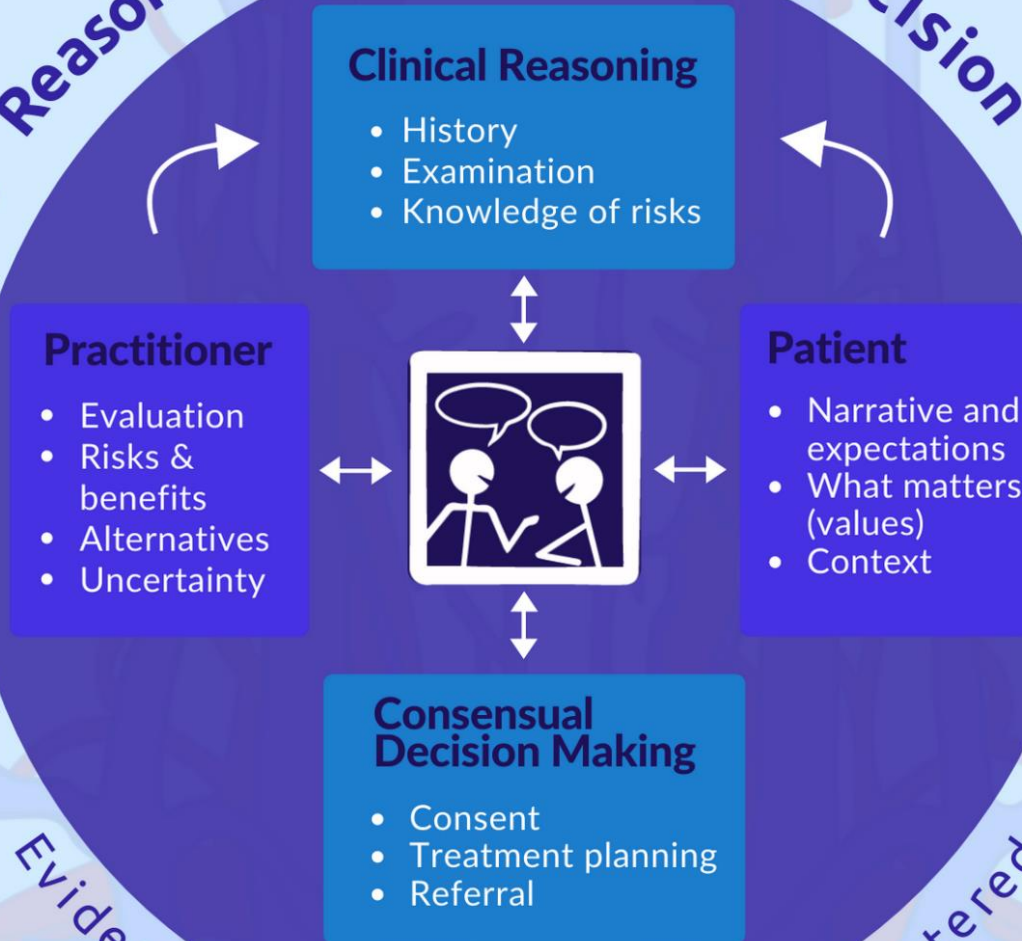
Risks & Benefits of Orthopaedic Manipulative Therapy



Monitor responses and progress in-line with clinical reasoning process

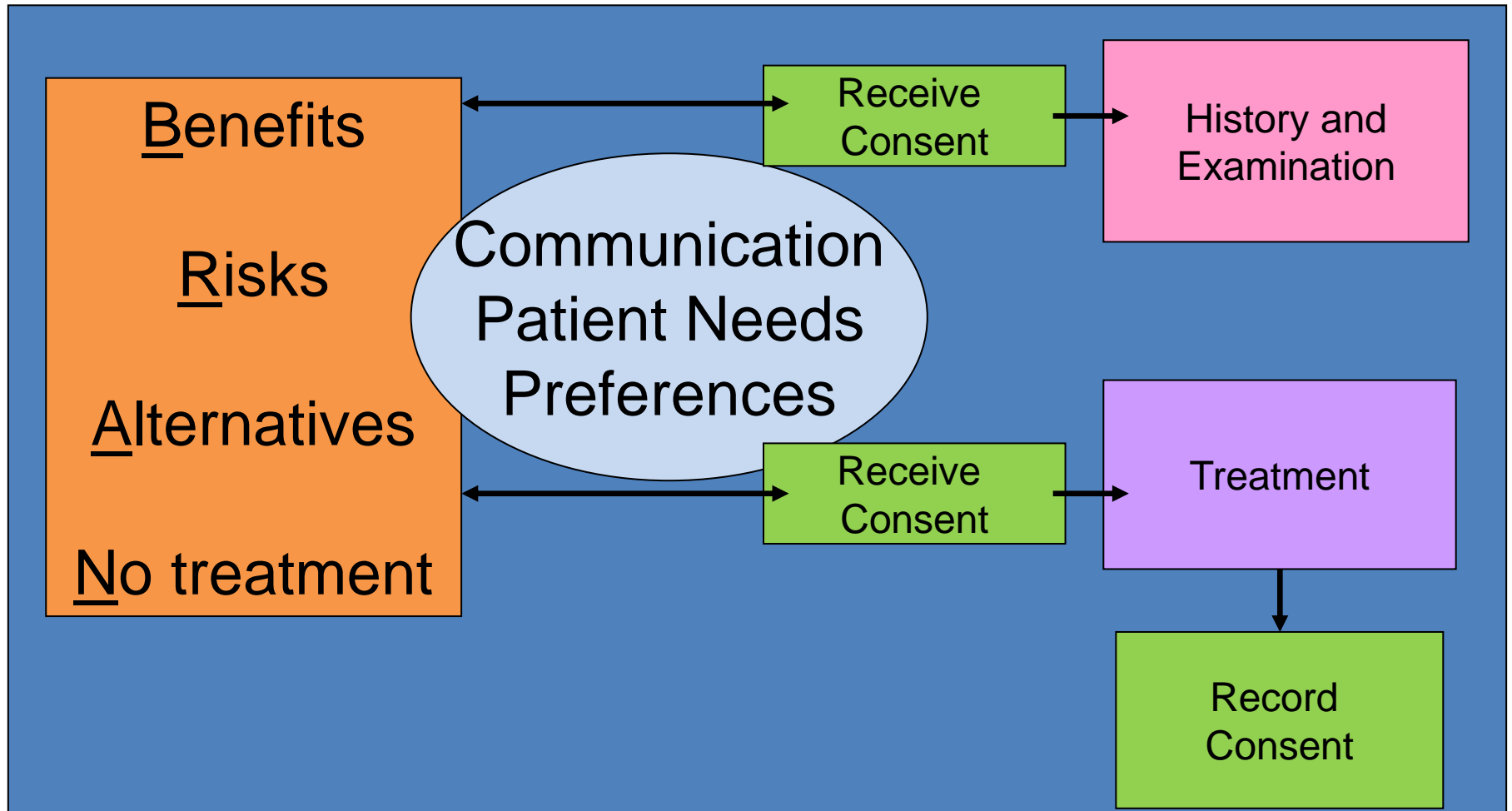


Clinical Reasoning and Shared Decision Making



Evidence based and patient centered

Patient - Practitioner



Special case depends how you view it

- Manual therapy causal, gain consent as risk of intervention
- Non causal missed diagnosis
 - Treat as cauda equina,
 - Vigilant and give information
- What would you prefer if you were a patient?
 - to have the information for you to consider or for the clinician to decide for you what information you can cope with?
 - “safety netting” to alert the patient

Explaining risk

- Use plain language
- Absolute risks and frequencies
- Images such as pictographs
- Needs of patient
 - Hoping to discuss (add to agenda)
 - What do you know about risk of ..
 - Did you have any worries about ...
 - Would you tell me about the options...



Teaching Orthopaedic Manipulative Therapy



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- Continuous & ongoing monitoring
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Summary

**Vascular
pathologies of the
neck are rare**

**Adverse events of
OMT are rare**

**No single “good”
special test**

**Vascular risk
factors should be
identified**

**Less Screening,
More Differentiation
Opportunity for
innovative but
challenging
teaching**

More learning

- <https://cpd.uco.ac.uk/blended-learning-courses>



£140

Cervical spine risk assessment and consent for manual therapists-6

November 2022 & 13 May 2023

Blended learning - Course offered face to face at UCO and simultaneously online

7 hours CPD

Revised and updated to include the International IFOMPT cervical framework this course will address practitioners' concerns about treating the neck in the context of evaluating risk and receiving consent with a focus on evidence based practice

Thank you for you attention

