

'Red flags' of the neck and shoulder area

a review of the literature

Abstract

Objective: to identify red flags for the neck-shoulder area that in the context of direct access to physical therapy in the Netherlands might assist clinical decision making during the screening process.

Method: a review of two databases and a hand search of peer-reviewed literature, guidelines and textbooks was conducted.

Results: 139 studies met the inclusion criteria. Together with 7 text books and 6 guidelines they generated a total of 25 possible red flags. Many red flags refer to identical clinical features but differ in their wording, level of practicality and are often described in coexistence with other signs and symptoms.

Conclusion: further agreement on exact wording as well as research on practicality and appropriateness of red flags for use during screening for direct access to physical therapy is needed.

Introduction

During the last two decades physical therapy (PT) in the Netherlands has made remarkable progress in terms of quality improvement. Developed and coordinated by the Royal Dutch Society of Physical Therapy an accredited continuous education programme has lifted PT to a new level of professionalism [1]. This progress has contributed to the introduction of direct access (DA) to PT in January 2006 [2]. The American Physical Therapy Association (APTA) defines direct access as "the right of an individual to obtain treatment from a licensed physical therapist where and when he or she may choose." Direct access thus allows patients to bypass the general practitioner prior to being evaluated and treated by a physical therapist. Experience with DA to PT in America dates back as far as 1957 and the majority of states have permitted DA to PT since the 1980s. According to APTA (2005) DA to PT is a success; with no increase of complaints centred on patient harm or malpractice, DA episodes were shorter, encompassed fewer numbers of services and were less costly than those classified as physician referral episodes [3,4]. Although generalizability of these results is not self-evident, a pilot study in the Netherlands showed similar results [5]. Other examples of successful implementation of DA to PT are found in Australia, New Zealand and Great Britain [5].

Prior to the actual start of DA to PT in the Netherlands, the entire group of 18.000 professionals attended a specially designed educational programme [6]. This programme contained communicational training as well as (reflective) clinical reasoning exercises. During the training special attention is focussed on the competence of screening; a directly accessible PT should be able to determine whether a patient's health problem falls within the scope of his individual professional capacities [6,7]. To facilitate this decision making process, a guideline was developed [7]. Basically, this guideline promotes three lines of reasoning: first of all, it strongly advises to refrain from any treatment in case of inexplicability or unacquaintedness. Secondly, a PT should screen for patterns that are typically appropriate for PT (inclusion). Anomalies in these patterns should lead to referral to a general practitioner. Thirdly, a PT has to screen for signs or symptoms that could indicate the presence of a serious pathology, exceeding the boundaries of PT (exclusion). The guideline refers to these signs and symptoms as "red flags", a term quite commonly heard of in contemporary medicine. During the course of the educational programme, all therapists received a list of red flags that distinguishes between general and specific red

flags. Specific red flags concern precise locations of the human body and general red flags refer to systemic involvement [6].

The symbolical use of the "red flag" originates from the era of the Roman Empire. With the colour red representing bloodshed, the red flag was their symbol of war [8]. Nowadays red flags still indicate danger; since 1899 they are used in the car racing industry as an absolute stop sign in perilous situations [9]. The exact introduction of this red flag imagery in medical science remains a mystery. The earliest mentioning of the term in Medline dates back to 1973 [10]. In 1998 Waddell introduced the red flag in PT [11]. In medical science the meaning of the term red flag varies [12,13]. In this study we adopt the following definition: "red flags are historical and clinical clues that may indicate the presence of a serious underlying disorder" [14].

Although the term red flag seems quite common in everyday practice, as a search term in MEDLINE it yields a mere 124 hits. Only a small portion (13/124) of these results deals with red flags related to the musculoskeletal system. Besides being limited in number, these studies have heterogenous perspectives; some focus on specific pathology, others on separate areas of the human body. Publications usually represent a biomedical perspective and their applicability in DA to PT is unknown. A comprehensive set of well defined red flags that are relevant to the context of DA to PT in the Netherlands is still lacking. The list used in the Dutch educational programme is not the result of an extensive review of the literature, but embodies a quick pragmatic solution. This study concentrates on the area with the highest referral rate [15]; the spine. With an annual prevalence of 87,6 per 1.000 men and 112,7 per 1.000 women neck- and back problems account for a quarter of the total costs of PT and exercise therapy [16]. This study focuses on the neck and shoulder area; the number one and seven in the top ten of physiotherapy referral diagnoses [17]. Given the fact that direct access to PT in the Netherlands has adopted the use of the red flag imagery, a review is conducted to identify all available red flags for the neck-shoulder area that in the context of direct access to PT in the Netherlands might assist clinical decision making during the screening process. The resulting survey of possible red flags will be used in a Delphi study. The aims of the Delphi study are consensus on the exact wording of the flags and face validation by a panel of medical experts.

Problem statement

Research objective:

To identify red flags for the neck-shoulder area that in the context of DA to PT in the Netherlands might assist clinical decision making during the screening process.

Research question:

What red flags are there to be found in research literature for the neck-shoulder area?

Sub question:

Which red flags are suitable for PT use during the screening process in the context of direct access?

Relevance:

A comprehensive list of red flags that is suitable for use during the screening process of DA to PT can assist the clinical decision making process and thus improve the quality of PT care.

Methods

Search strategy

Initially studies were identified by searches of the computerized bibliographic database Medline (using PubMed). By use of the MeSH browser a list of synonyms or useful alternatives for the term red flag was generated. The following terms were used to identify eligible studies: *early diagnosis*[MeSH], *diagnosis*, *differential*[MeSH] and *signs and symptoms*[MeSH]. All terms were exploded to increase sensitivity. Boolean operators were added to rule out studies focussing on therapy or imaging techniques and to limit the hits to the neck-shoulder area. Subsequently, additional sources of information such as bibliographies of identified articles, related articles, CINAHL, textbooks and consensus guidelines were searched for red flags of the neck-shoulder area.

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red flag*[All Fields] OR "early diagnosis"[MeSH] OR "diagnosis, differential"[MeSH] OR "signs and symptoms"[MeSH]
AND
("neck"[MeSH Terms] OR neck[Text Word]) OR ("shoulder"[MeSH Terms] OR shoulder[Text Word])
AND
("diagnosis"[Subheading] OR "diagnosis"[MeSH Terms] OR diagnosis[Text Word])
NOT
("therapy"[Subheading] OR ("therapeutics"[TIAB] NOT Medline[SB]) OR "therapeutics"[MeSH Terms] OR therapy[Text Word]) NOT
(("magnetic resonance imaging"[TIAB] NOT Medline[SB]) OR "magnetic resonance imaging"[MeSH Terms] OR MRI[Text Word]) NOT CT[Text Word] AND ("radiography"[Subheading] OR ("x-rays"[TIAB] NOT Medline[SB]) OR "x-rays"[MeSH Terms] OR ("radiography"[TIAB] NOT Medline[SB]) OR "radiography"[MeSH Terms] OR X-ray[Text Word]) NOT ("electroencephalography"[TIAB] NOT Medline[SB]) OR "electroencephalography"[MeSH Terms] OR EEG[Text Word]) NOT psychological[All Fields]
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Inclusion / exclusion criteria

For the computerized search studies were included if they met the following 3 criteria: 1) the studies pertained to the neck, shoulder and upper chest area; 2) the mentioned red flags were either palpable, audible, visible or manually testable; 3) the abstract or the fulltext contains a clear description of the red flags.

No restrictions were imposed on language or date of publication. Studies were excluded from the review on the following criteria: 1) the data pertained to non-PT diagnostic procedures, such as laboratory tests, imaging and genetic research. 2) the document was anecdotal or editorial. For the textbook search the only inclusion criterion used was that the book was up to date and utilized for current medical education.

Results

The Medline search yielded 2980 citation postings. Of these, 136 generated results (table 1). Searching CINAHL rendered no new citations. Hand searching the textbooks yielded 2 more possible red flags (table 2). The consensus guidelines generated extra qualifiers for two possible flags (table 3).

Noot van de auteurs.

Dit Engelstalige artikel is een deel van de masterthesis van Bert Mutsaers voor de studie Fysiotherapiewetenschap. Omdat beide auteurs vanuit een uniek Nederlands perspectief hebben gekeken naar rode vlaggen en het screeningsproces, is er voor gekozen om in het Engels te schrijven zodat ook buitenlandse collegae kennis kunnen nemen van onze resultaten. Dit artikel is nog niet eerder gepubliceerd en is met opzet niet aangepast voor de DTO-special, omdat de auteurs van mening zijn dat de kennis van en inzichten ten aanzien van rode vlaggen onafhankelijk zijn van de professional die er gebruik van maakt. Om die reden is de oorspronkelijk tekst die gaat over de situatie binnen de Fysiotherapie niet aangepast. De auteurs gaan uit van de overeenkomsten tussen het beroep van oefentherapeut en fysiotherapeut, en niet van de verschillen. De directe toegankelijkheid is bij uitstek het terrein gebleken waarop beide beroepsgroepen elkaar hebben ontmoet en constructief met elkaar samenwerken.

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With an annual prevalence of 87,6 per 1.000 men and 112,7 per 1.000 women neck- and back problems account for a quarter of the total costs of PT and exercise therapy

Medline

Six studies mention **chest pain** as a possible indicator for a serious medical condition [ID:1-6]. In most studies chest pain is specified with qualifying adjectives or mentioned in coexistence with other symptoms. Four studies [ID:1,2,4,5] describe exertional chest pain as a possible indicator for a cardiac condition. Cohn and Cohn (2002) specify the quality of the chest pain as "vise-like" or "an elephant standing on your chest" [ID:5]. Four studies mention radiation of pain to one or both shoulders [ID:1,3,4], the upper back and shoulder blades [ID:6] or one or both arms [ID:4] as supplementary symptoms of possible cardiac origin. Chest pain in combination with fever, egophony and dullness to percussion suggests pneumonia [ID:2]. Combinations of chest pain and fever, shortness of breath and dyspnoea [ID:1,2,6] augment the suspicion of an underlying pathology.

Several studies refer to specific clinical signs as possible indicators of serious pathology. Sharizaila and Wills (2005) and Awerbuch et al. (1990) describe the **Beevor's sign** in facioscapulohumeral dystrophy (FSH) and other neuromuscular diseases [ID:7,8]. Three studies refer to the presence of the **Lhermitte sign** [ID:47-49] in spinal cord pathology such as cervical myelopathy. Brody and Wilkins (1969) describe the signs of **Kernig and Brudzinski**; two clinical tests on meningitis [ID:69]. Finally the **Valsalva sign** is mentioned in assessing for neck malignancy [ID:133] and heart failure [ID:134].

Hearing loss is found as a possible indicator for serious disease. Three studies describe qualifiers such as "severe", "sudden" and "unilateral" [ID:9,11,12]. Dependant on coexisting symptoms as otalgia, tinnitus, swallowing difficulties and neck stiffness it can be indicative for FSH, Brown-Vialetto-van Laere syndrome or meningitis [ID:9,10,12].

Besides being mentioned as a coexisting symptom in chest pain, according to some studies

dyspnoea (or orthopnoea) can be a pointer for lung disease and diaphragmatic paralysis [ID:13,14,15,58]. In the latter case it is mentioned in coexistence with paradoxical abdominal movements or shallow breathing. Cook and Chapman (2003) added the qualifier "sudden onset" [ID:15].

Nausea and vomiting are mostly mentioned as signs of autonomic dysregulation and can be indicative for a wide variety of diseases [ID:77,79,81,118,135]. Three studies refer to nausea and vomiting in coexistence with diaphoresis, fever and inexplicable tiredness [ID: 77-79]. No qualifying adjectives were found.

Fifteen studies were found referring to **orofacial pain** as a possible indicator for serious disease [ID: 19-33]. Chamuleau et al (2005) and Brotons and Penarrocha (2003) use the wording "atypical", whereas other studies define "unilateral", "severe", "neurogenic" and "dental" as qualifications for orofacial pain [ID:24,28,31]. Although in the vast majority of cases the cause is dental disease or tempero-mandibular dysfunction [ID:19], a small percentage could be symptomatic for osteoblastoma [ID:22], lung cancer [ID:23,24,32], osteonecrosis [ID:25] or Lyme disease [ID:27]. Kreiner and Okeson (1999), Durso et al (2003) and Penarrocha et al (1990) state that orofacial pain can be of cardiac origin [ID:29,31,32].

Atrophy of the shoulder girdle can be a symptom of neuropathy or neuralgic amyotrophy [ID:34-36]. Specifications found include a "sudden" or even "violent" onset and "no specific root distribution"

[ID:35,36]. Coexistence with severe pain and loss of sensation is mentioned in two studies [ID:32,35].

Four studies refer to **neck extensor weakness** as an indicator for serious pathology. Specifications given are "profound" and "with sparing of the flexors" [ID:42]. Although the cause of this clinical manifestation can vary from myasthenia gravis to amyotrophic lateral sclerosis and mitochondriopathy [ID:40,42], all studies refer to it as the "dropped head syndrome".

Three studies refer to **facial atrophy** as a possible symptom of serious disease. Though often of benign non-inflammatory origin, it is also a symptom of pathologies as fibrous dysplasia, neurofibromatosis, Rhombert's disease and craniofacial tumors [ID:44,45]. Amongst the qualifiers found are: "progressive", "hemifacial" and "craniofacial" [ID:43]. Coexisting symptoms as atrophy of neck and limb muscles strengthen the suspicion of myotonic dystrophy [ID:45].

A **neck mass** or a lump in the neck can be a symptom of a neoplasm, an branchial anomaly or a cyst [ID:50,54,56,59]. Qualifiers found for neck masses are "hard", "progressive" and "fixed" [ID:53,55]. Donangelo et al (2001) and Bazzi et al (1991) mention hoarseness and fever as suspicious supplementary symptoms [ID:53,54]. A special form of neck mass is a goiter. It can be indicative for Graves' disease as well as malignancy [ID:52,53,56].

As qualifying adjectives for **hoarseness** the search rendered "sudden onset" [ID:61], "persisting for more than two weeks" [ID:61-63] and "recurrent" [ID:65]. Accompanying symptoms that should increase awareness of malignancy or aortic involvement are unexplained

dyspnoea, fatigue and swelling or bruising of the neck [ID:58,66]

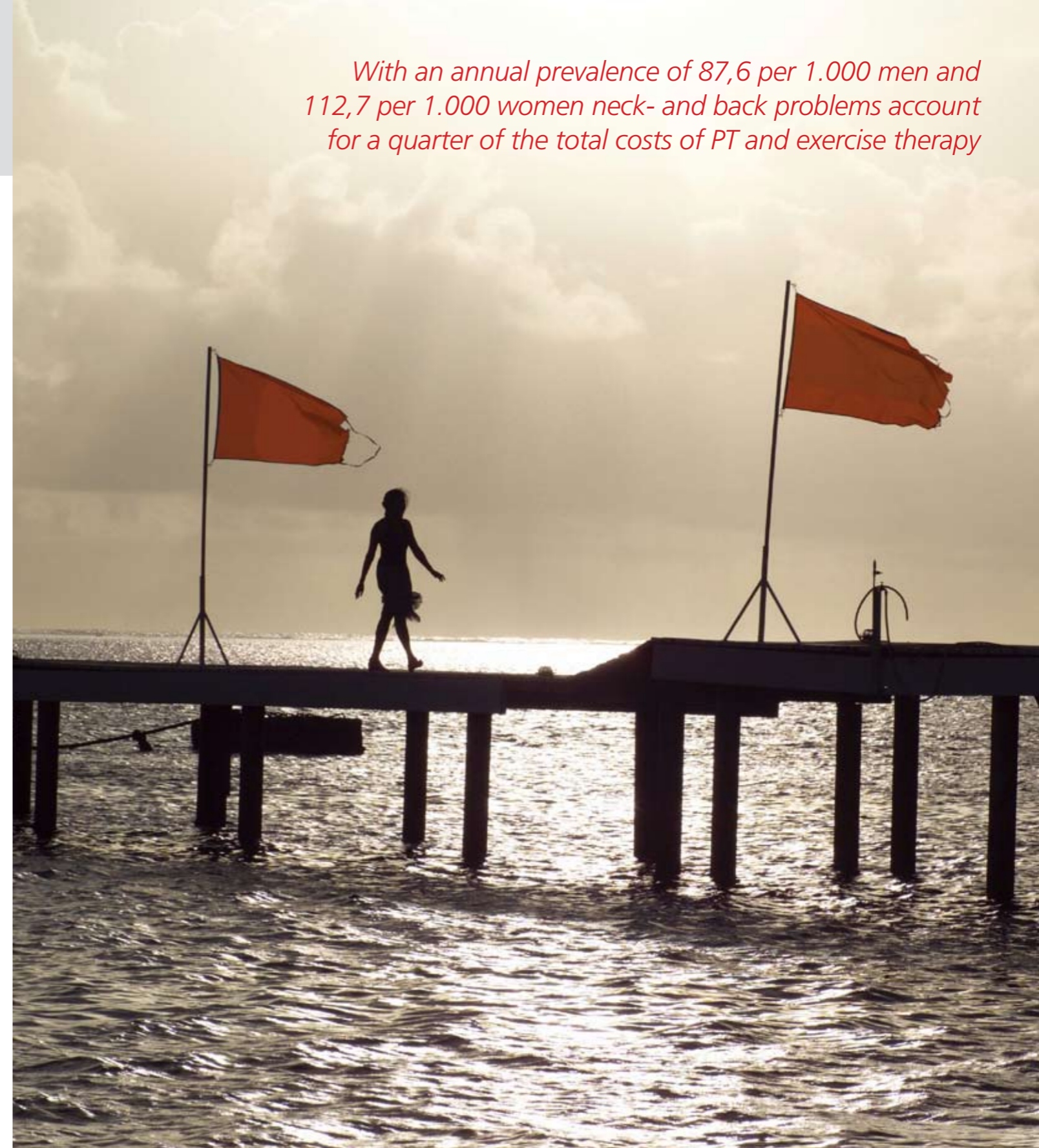
According to six studies **neurological deficit** is an indicator of serious disease. Five articles specifically point to radiculopathy as a possible manifestation of vertebral column metastasis [ID:68,69,71],

infection [ID:71] or Pancoast tumor. As a qualifier, only "progressive" was found in this search.

In the vast majority of cases **fever** is caused by infectious agents. In a number of cases it is symptomatic of neoplasm [ID:75,76]. Special attention should be paid to acute fevers and fevers of unknown origin as they can be indicative for infective endocarditis [ID:78]. Fever in combination with headache and a stiff neck can be caused by meningitis [ID:77,79].

Ten studies refer to **skin lesions** as possible signs of skin cancer or melanoma [ID:80-89]. Three of them use the qualifiers "growing", "spreading", "pigmented" and "on exposed areas" [ID:82,85,86]. Though **headache** in itself is a quite common and often harmless complaint [ID:105,111], a number of studies define qualifiers that may detect exceptions. "New" headaches, headaches with an "acute" or "sudden" onset, headaches that "progress over days to weeks" or are "maximum immediately", "severe" headaches, "first or worst" headaches and unilateral headaches qualify for referral and further investigation [ID:102,103,108,110,111,113,114]. Special caution is advocated for acute onset, progressive headaches in the elderly [ID:104]. Amongst pathologies to worry about in these cases are; meningitis, intracranial aneurysms or haemorrhages, strokes, lung cancer and neoplasms of the brain [ID:98,104,105,108,109,110,113-115,117,118]. Headaches with concomitant stiff neck, fever, vomiting,

The textbook search rendered two new possible red flags: with pain as a common denominator



focal neurological deficits or after trauma are also suspect of serious underlying pathology [ID:98,99,112-114,119,120].

Dizziness or **vertigo** is mostly benign, but if it can be classified as "central" or if it manifests as an "acute, first attack", then it might be indicative for cerebral vascular disorders, multiple sclerosis or intracranial neoplasms [ID:121-124].

A **globus sensation**, often referred to as a lump in the throat, can be a manifestation of gastro-esophageal disease varying from laryngitis, pharyngitis to granuloma [ID: 125,126]. Globus sensation concomitant

with heartburn and regurgitation suggests reflux associated disease [ID:125,127].

People with a **history of cancer** are at increased risk for recurrence. With regard to the neck-shoulder the "breast cancer survivor" is mentioned in particular [ID:128,129].

Hyperreflexia was found in two studies as a possible pointer for serious disease. Lyons et al (1992) disclose eight case reports in which hyperreflexia, especially in older patients with concomitant neurological deficit was caused by lymphoma [ID:132]. In combination with

fluctuating stiffness of the legs and autonomic dysregulation, Stayer and Meinck (1998) mention hyperreflexia as a symptom of stiff-man syndrome [ID:133].

Tinnitus can be a symptom of a serious health condition. As qualifying adjectives "pulsatile", "fluctuating" and "unilateral" are mentioned [ID:134-136]. When accompanied by hearing loss and vertigo, it can be symptomatic for increased intracranial pressure [ID:135]. If the hearing loss is unilateral, neuroma or vascular abnormalities should be considered [ID:136].

Textbooks

The textbook search rendered two new possible red flags: with **pain** as a common denominator, Dutton (2004) describes constant and severe pain, arm pain lasting for more than 2-3 months, persistent root pain and pain that worsens after one month as red flags.

Donald (2000) uses the qualification: pain that has no mechanical exacerbating or remitting factors and pain induced by coughing, sneezing, straining, or bending forward. Van der Meer et al (2005)

mention respiratory pain and pain in the right shoulder as red flags. Lawrence et al (2006) describe severe pain in coexistence with visual loss and finally swallowing pain in combination with globus sensation was found to be an alarm sign (Klinisch zakboek, 1988). Besides pain, involuntary changes in weight were mentioned by several textbooks. Both **increase of weight** and **weightloss** were found to possible warning signs of serious pathology (Dutton, 2004; Donald, 2000; van der Meer, 2005; Het klinisch zakboek, 1988; Chang 2006)

Guidelines

The guidelines yielded no new possible red flags. The referral guidelines of suspected cancer (Royal College of General Practitioners, 2005) further specified the symptom 'skin lesion' by promoting a seven criteria referral aid for skin cancer. The guideline on diagnosis and management for thyroid nodules (Endocrine Practice, 2006) did the same for the symptom 'neck mass', by describing four different qualities of suspect nodules.

table 1: results of the Medline search

Common Denominator	Qualifier(s)	Accompanying Symptom(s)	ID
chest pain	exertional, radiating to one or both shoulder(s), arm(s), front of neck or (upper) back	fever, egophony, unusual fatigue, pain in shoulder blade or upper back	1,2,3,4,5,6
Beevor's sign			7,8
hearing loss	unilateral	otalgia, tinnitus, swallowing difficulties, neck stiffness	9,10,11,12,
dyspnoea	sudden onset	paradoxical abdominal movements, shallow breathing	13,14,15
nausea and vomiting		diaphoresis, dyspnoea, inexplicable tiredness	16,17,18
orofacial pain	unilateral, severe, neurogenic, dental	(unilateral) headache	19,20,21,22,23,24,25,26, 27,28,29,30,31,32,33,
atrophy of the shoulder girdle	muscle weakness	acute, severe pain in the shoulder, sensory deficits	34,35,36,37,38,
neck extensor weakness	profound, sparing of flexors	neck stiffness, weakness of shoulder girdle	39,40,41,42,
facial atrophy	hemifacial, craniofacial	weakness of the neck muscles	43,44,45,
Lhermitte sign		objective sensory deficit	46,47,48,
neck mass	painful, hard/fixed	hoarseness	49,50,51,52,53,54,55,56,57,
hoarseness	sudden, persisting for more than two weeks, recurrent	swelling and bruising of the neck, unexplained dyspnoea, fatigue	58,59,60,61,62,63,64,65,66,
the signs of Kernig and Brudzinski			67,68,
neurologic deficit	radicular, progressive		69,70,71,72,73,74,
fever	acute, unknown origin (FUO)	stiff neck, headache, drowsiness, confusion, nausea, vomiting	75,76,77,78,79,
skin lesions	growing, spreading, pigmented, on exposed areas		80,81,82,83,84,85,86,87,88,89,
headache	new headache and age >50, age <5, progressing over days to weeks, acute, severe, worst, temporal, unilateral, around ear, new	fatigue, fever, stiff neck, vomiting	90,91,92,93,94,95,96,97, 98,99,100,101,102,103, 104,105,106,107,108,109, 110,111,112,113,114,115, 116,117,118,119,120,
vertigo	first attack	scalp tenderness, malaise, depression	121,122,123,124,
globus sensation			125,126,127,
history of cancer	breast carcinoma, lung carcinoma	chronic cough, heartburn, regurgitation, head and neck symptoms, dysphagia, othalgia	128,129,
Valsalva sign			130,131,
hyperreflexia		dyspnoea, cough, nocturia, generalized fatigue, chest pain	132,133,
tinnitus	pulsatile, fluctuating, unilateral	para paresis, fluctuating stiffness of trunk and legs, autonomic dysregulation	134,135,136
		(unilateral) hearing loss, vertigo	

table 2: results of the textbook search

Textbook	Possible red flags	Possible red flags
Orthopaedic Examination, Evaluation, & Intervention. Mark Dutton. McGraw-Hill: New York, 2004 (ISBN 0-07-141089-9)	constant and severe pain, especially at night unexplained weight loss loss of appetite unusual fatigue (malaise) fever, chills or night sweats unexplained nausea or vomiting shortness of breath frequent or severe headaches dizziness arm pain lasting >2-3 months bowel or bladder dysfunction	visual disturbances (blurriness or loss of vision) persistent root pain radicular pain with coughing pain worsening after 1 month paralysis trunk and limb paresthesia bilateral neurological signs and symptoms difficulty with balance and coordination unilateral, bilateral or quadrilateral paresthesia
Conservative Management of Cervical Spine Syndromes Donald R. Murphy McGraw-Hill: New York, 2000. (ISBN 0-8385-6386-4)	major trauma minor trauma and age over 50 osteoporosis age over 50 or under 20 years history of cancer constitutional symptoms such as recent fever, chills, or unexplained weight loss pain that has no mechanical exacerbating or remitting factors symptoms in both the upper and lower extremities recent bacterial infection pinpoint tenderness of the spinous process neurological signs of the eye (ptosis, enophthalmos, miosis, anhydrosis) sudden onset of severe headache in a patient who is not typically a headache sufferer visual loss (visual field abnormalities)	pain induced by coughing, sneezing, straining, or bending forward palpatory cord in the axilla vertigo seizure dysphagia, dysarthria changes in mood, personality, or mentation unexplained fever exquisite scalp tenderness enlarged, tender temporal artery (temporal pain) nuchal rigidity or positive Kernig's sign arterial (cold and cyanotic) and venous (edema) signs weakness of 4/5 or less hyperreflexia (Babinski) or other pathological reflexes upper extremity oedema
Interne geneeskunde Prof. Dr J. van der Meer Prof. Dr C.D.A. Stehouwer Bohn Stafleu van Loghum, 2005, 13e herziene druk	respiratory pain (exertional) dyspnoea unusual fatigue headache vertigo diaphoresis swollen lymph nodes persisting cold/cough swallowing difficulties	seizures changes in personality (depression, paranoia) pain in the right shoulder increase of weight, general malaise struma deafness polyuria, polydipsia
Het klinisch zakboek Klachten en symptomen De Tijdstroom 1988	cyanosis, orthopnoea (acute) increase in weight nausea, vomiting chest pain weight loss, general malaise fatigue	fever, swallowing pain, globus sensation dysphagia, dysarthria moodswings, changes in personality hoarseness, swollen lymph nodes
Oncology: an evidence-based approach. Chang, Alfred E. Springer, 2006 (ISBN 0-387-24291-0)	nausea, vomiting and visual disturbances tinnitus, hearing loss and balance problems headaches, visual problems and stuffy nose hoarseness or swallowing difficulty enlarging neck mass	fever, fatigue, weight loss chest pain progressive weight gain and muscle wasting
Current medical diagnosis and treatment. Lawrence M. et al, 45th edition, 2006 (ISBN 0-07-145410-1)	nonhealing ulcer or warty nodule malaise, fever, headache	severe pain and profound visual loss progressive blurred vision
Neck ache and shoulder pain Jan MacNab, John Mc Culloch	dysphagia blurring of vision or tinnitus	

In the car racing industry, the red flag is an obligatory and absolute stop sign in perilous situations. It is raised only in situations where danger is an actual fact

table 3: results of the guideline search

Guidelines	Possible red flags	Pathology
NHG-guideline M08 (shoulder)	severe radiating pain, pins and needles in arm or hand.	radiculopathy
	joint complaints elsewhere; signs of synovitis	rheumatoid arthritis
	bilateral shoulder complaints with pain and lumbo-sacral stiffness	polymyalgia rheumatica
	severe and/or persisting shoulder complaints, fever, malaise, weight loss	infectious agent, septic arthritis
NHG-guideline M19 (headache)	new headache + age > 50	neoplasm of the brain, temporal arthritis
	signs of increased intracranial pressure vomiting focal neurological deficit changes in personality migraine with a stable aura	neoplasm of the brain
	age < 6	hydrocephalus, neoplasm of the brain
	sudden onset, severe pain	meningitis, subarachnoid haemorrhage, stroke
	severe attack of migraine + age > 40	neoplasm of the brain
	temporal pain + elderly	temporal arthritis
	pregnancy + new headache	pre-eclampsia
	progressive posttraumatic	sub/epidural haematoma
	fever and (partial) loss of consciousness	meningitis
	neck stiffness, neurological deficit	meningitis, neoplasm of the brain
New Zealand Guidelines Group Diagnosis and management of soft tissue shoulder injuries and related disorders (may, 2004)	unexplained deformity or swelling significant weakness not due to pain suspected malignancy fever, chills, malaise significant, unexplained sensory, motor deficit pulmonary or vascular compromise	
National collaborating Centre for Primary Care. Referral Guidelines for suspected cancer. London (UK): Royal College of General Practitioners; 2005 June	chest / shoulder pain > 3 weeks dyspnoea > 3 weeks weight loss hoarseness > 3 weeks finger clubbing lymph-adenopathy	lung cancer
	pigmented skin lesions that: change in size irregular shape irregular colour largest diameter 7 mm or more inflammation change in sensation	skin cancer
	nodule increasing in size unexplained hoarseness or voice changes cervical lymph-adenopathy age < 12 or > 65	head and neck cancer
	progressive neurological deficit persistent headaches mental or cognitive changes new neurological signs	brain and central nervous system cancer
Guidelines for the management of oesophageal and gastric cancer. Allum W.H. et al. Gut 2002; 50	weight loss, vomiting longstanding history of reflux or dysphagia recent onset dyspepsia over the age of 50 non healing gastric ulcers	oesophageal and gastric cancer
AACE/AME Task Force. Guideline on diagnosis and management of thyroid nodules. Endocrine Practice Vol 12, No 1, 2006	prior head and neck irradiation family history of cancer age <20 years or >70 years growing nodule firm or hard consistency nodule ill-defined nodule margins on palpation fixed nodule on examination dysphonia, dysphagia and cough	thyroid cancer

Discussion

This review aimed to identify red flags for the neck-shoulder area that in the context of DA to PT in the Netherlands might assist clinical decision making during the screening process. Although the term red flag is quite common in everyday practice, as a search term in MEDLINE it yielded only 124 hits. A small portion (13/124) of these results dealt with red flags related to the musculoskeletal system; nine articles concerned low back pain and not one focussed on the cervical spine directly. Lamont et al (2003), Lincoff et al (2000) and Dodick (1997) use the term red flag in their studies on headache [18,19,20]. Expanding the term red flag with synonyms rendered a total of 23 possible red flags in the online search alone. The textbook and guideline search revealed 2 more potential flags.

The most frequently found potential red flags in this study are: 1) headache, 2) orofacial pain, 3) neck mass, 4) skin lesions and 5) hoarseness. With the exception of five (Beevor's sign, signs of Kernig and Brudzinski, neurological deficit, skin lesions, vertigo and history of cancer) all potential red flags were described in coexistence with other signs or symptoms. The included studies seem to deal with the broader clinical manifestation of a disease, not just single signs or symptoms. Studies on clinical decision strategies confirm that experienced health care professionals use pattern recognition and illness scripts in their diagnostic reasoning [21,22]. This finding raises questions about the strength and range of the term red flag. Is it a sign or symptom that by itself should lead to a practical decision, or is it merely a part of a pattern that gives direction to diagnostic thoughts? A study of van den Hoogen et al (1995) shows that a single red flag is not particularly accurate in a diagnostic sense [23]. For the application in DA to PT in the Netherlands this would make a great difference; reasoning based on recognising a clinical beacon (red flag) that by itself enables a practical decision requires a different competency than decision making based on recognising entire clinical patterns. In order to answer this question more knowledge is needed on likelihood ratios and predictive values of the various flags.

The review revealed a number of qualifying adjectives (qualifiers). The effect of these qualifiers varies from flag to flag. In some cases a single qualifier can overturn diagnostic thoughts from one pathology to another. For instance, a new headache in an elderly patient raises the suspicion of an intracranial neoplasm, whereas a unilateral headache in the same patient is a pointer for temporal arthritis (table 1). In other cases the qualifiers only seem to specify the common denominator without altering the type of pathology it refers to.

The red flag list of the educational program in the Netherlands distinguishes between general and specific red flags [6]. The literature found in this review does not support this division; not one study applied these terms. A possible explanation for this is the specific nature of this search; it only concentrated on one location. Although classifying red flags to location seems logical, it can be a problematic exercise; specific pathology located in the cervical spine can lead to more general symptoms. A neoplasm of the brain can cause a specific red flag (headache) accompanied by general signs and symptoms such as fatigue, fever, malaise and depression. Again this raises questions on the exact definition of the term red flag. Is headache in itself powerful enough to be called a red flag? Or is it a red flag only in the presence of fatigue, fever, malaise and depression? Or is none of these signs a 'genuine' red flag and is the cluster of symptoms a pattern?

There are several practical and methodological challenges to this review. In terms of publication type the online search shows great diversity. Besides reviews (n=93), clinical trials were found (n=4) and case reports (n=21). Many of the included reviews focussed on diagnosing well known life threatening diseases and described their clinical patterns of signs and symptoms [24,25,26,27,28]. Others dealt with exceptionally rare cases and their assessment [29,30,31]. A third category reviewed the evaluation of single signs or symptoms [32,33,34,35]. Since the full diversity of publications was accepted for this study and no additional quality assessment was executed, there is no possibility of 'weighing' the potential flags that are found.

Despite sensitizing the search with synonyms for red flags and tracing related articles, it is not impossible that eligible studies were missed. For example, unpublished studies or studies focussing on rare diseases were not included. To minimize the chance on missing relevant information handbooks and guidelines were searched as well. The level of saturation in the results supports the notion of thoroughness of this review; quick scanning CINAHL yielded no new possible flags and the textbook and guideline search showed many duplicate and triplicate findings.

The definition of the term red flag is problematic. In the car racing industry, the red flag is an obligatory and absolute stop sign in perilous situations. It is raised only in situations where danger is an actual fact. Following this analogy, the definition for red flag in medicine should incorporate the value "factual danger" and give rise to an absolute and invariable reaction [36]. This contrasts with the application of the term red flag in medical practice in two ways. First of all, a medical red flag does not represent the factual observation of danger. Seeing a swelling does not automatically mean that it is malignant. We can not actually see the underlying malignancy. The signs and symptoms generally referred to as red flags in medical literature indicate possible danger, not factual danger; they are merely derivatives of factual observations. Secondly, in medicine the imagery of red flags is used for cognitive processes (i.e. diagnostics), not for practical procedures (i.e. stop sign). Therefore it is not realistic to expect an absolute and invariable reaction in the broad domain of medicine. What could be an absolute 'stop sign' for a PT, can be an inclusion criterion for a medical specialist. Therefore –in contrast to the car racing industry- red flags in health care are thought-related instead of action-related and as a consequence responses to red flags are expertise- and domain specific instead of invariable.



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Another pitfall in the definition for red flag is the term 'serious disease'. What makes a disease 'serious' depends on perspective. From an epidemiological point of view a disease can be seen as serious if it has a high incidence or prevalence rate. From an economical perspective a disease is serious whenever its treatment is costly to the community. Although the literature found for this study was scattered over various health care disciplines, it was all written from a biomedical perspective. From this perspective it seems plausible to assume that the term serious disease is reserved for potentially disabling, chronic or life threatening pathologies. In defining the term red flag these exact delimitations must be clearly formulated.

Although the use of the red flag imagery in medicine is a logical one, it is not without handicap. Prior to labelling a symptom as a red flag, an unequivocal practical definition of the term "red flag" must be established. This should include a description of the perspective, clear

boundaries to its applicability (i.e. predictive value, likelihood ratio) and a classification for its notation (i.e. common denominator, qualifiers). Further research is needed to explore these possibilities and test the applicability of the red flags for direct access to physical therapy.

Conclusions

In this review a total of 25 potential red flags were found. The wording of the red flags is very diverse in terms of qualifying adjectives and coexisting signs and symptoms. Further agreement on exact wording as well as future research on practicality and appropriateness of red flags for use during PT-screening is needed.

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