

Whiplash-Associated Disorders

Clinical and medico-legal guidelines on the methods of ascertainment

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Abstract The manuscript presents the International Guidelines developed by the Working Group on Personal Injury and Damage under the patronage of the International Academy of Legal Medicine (IALM) regarding the Methods of Ascertainment of any suspected Whiplash-Associated Disorders (WAD).

The document includes a detailed description of the logical and methodological steps of the ascertainment process as well as a synoptic diagram in the form of Flow Chart.

Keywords International guidelines · Personal injury · Personal damage · IALM · Whiplash Associated Disorders (WAD) · Methods of ascertainment

Introduction

The term Whiplash-Associated Disorders (WAD) was introduced for the first time in 1995 by the Quebec Task Force [1, 2], which published the first systematic review on the subject of whiplash injuries.

The term “Whiplash” indicates the harmful mechanism of acceleration and deceleration with the transfer of energy to the structure of the neck, while “Associated Disorders” represent the related syndromic features of that injury.

The aforementioned harmful mechanism usually occurs in road accidents involving motor vehicles, in particular in the case of collisions or side impacts, and can cause a plurality of bone and soft tissue injuries that may result in a variety of clinical conditions.

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Within the category of Personal Injury and Damage compensation under Civil-Tort Law, WAD are a paradigmatic example of “disorder” easy to be simulated, whose determination, in most cases, is based only on the subjective symptoms complained and thus hard to objectify. For these reasons, WAD have been a continuous source of controversy due to their association with compensatory litigation claims [3].

Whiplash-Associated Disorders are a controversial issue also in the scientific literature [4] because they are not universally recognised as a nosographic entity in their own right, being considered by several authors as a manmade illness and a medico-legal illusion [3–5].

The 2008 comparative study carried out by the Comité Européen des Assurances (CEA), by the Association pour l'étude de la Réparation du Dommage Corporel (AREDOC) and by the Confederation Européen d'Experts en valuation et réparation du Dommage Corporel (CEREDOC) [6], further indicates that the number of disputes related to WAD varies depending on the legislative, operational and insurance framework in force in each European state [3].

The issue of medico-legal interest related to the assessment of WAD is, in fact, more prevalent in Germany, Britain and Italy, while in France, Greece, Lithuania and Portugal, claims related to this issue have only minimal impact [6].

Therefore, WAD constitute, especially in some European Jurisdictions, an issue of increasing importance, involving very high costs for society, as well as health consequences in the medium and long term.

The international interest in the topic under discussion is also evident from the growing number of publications by authors from different countries concerning the legal [7], medical and biomechanical aspects of minor trauma of the cervical spine [8].

The review of the International Literature and the comparison among Experts with regard to the different National realities has detected the presence of Clinical Guidelines related to the diagnosis and treatment of WAD produced by

authoritative International Scientific Societies, in the absence of International Medico-Legal Guidelines on WAD Ascertainment Methodology.

Therefore, there is a need to produce a Consensus Charter, based on rigorous and sound scientific data, shared by International Clinical and Medico-Legal Experts, in order to arrive at a strict and objective methodology to serve as standard procedure and to introduce an interdisciplinary approach that includes accident-analytic and biomechanical findings [3, 6]. It would also be useful to provide specialised training for Medical Experts, characterised by strict methodology that ensures its formal exactness and defines the objective quality standards to be applied by those responsible for settling personal injury claims and to ensure better collaboration between physicians, lawyers, insurers and Experts in bio-dynamics.

This document, which is the result of a scientific initiative promoted by the President of the International Academy of Legal Medicine, illustrates the International Medico-Legal Guidelines on the Ascertainment Methodology in cases of suspected Whiplash-Associated Disorders.

These Guidelines have been proposed and reviewed by a board of International juridical, clinical and medico-legal Experts from Belgium, Denmark, Estonia, France, Germany, Hungary, Italy, Lithuania, Portugal, Spain, Switzerland, UK.

Structure of the Guidelines

The Guidelines are subdivided into the following *items*.

Expert definition and essential knowledge
Methods of ascertainment

1. Acute phase

- (a) Clinical examination
 - Case history
 - Accident and biomechanical analysis

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- (b) Identification of high-risk factors
- (c) Objective examination

2. Chronic phase

- (a) Collection of circumstantial, clinical and instrumental data
- (b) Systematic clinical examination
 - Case history
 - Psycho-physical examination
 - Pain drawing
- (c) Instrumental exams and/or specialist consultation
 - First-level exams
 - Second-level exams
- (d) Medico-legal epicrisis

Expert Definition and Essential Knowledge

Depending on the country in which the whiplash injury takes place, the Expert performing the ascertainment of Whiplash-Associated Disorders can be a Medico-Legal Examiner, a Clinician, a Specialist in Insurance Medicine or even not a physician.

The present Guidelines recommend that a clinical examination is mandatory and that the medical examiner, regardless of his/her basic training, should demonstrate the essential knowledge set out below:

- a. Notions of civil and administrative laws regarding personal injury and damage, with particular reference to the regulations in the Healthcare and insurance sectors.
- b. Theoretical and practical notions of Medico-Legal semeiotics as well as Medico-Legal ascertainment of psycho-physical validity in relation to civil and insurance laws.
- c. Theoretical notions on the subject of material causality, ascertainment methodology and criteria for the identification of the causal value/link between the traumatic event and the injury, and between this latter and the temporary/permanent impairment.

In addition, cervical spine injuries show the need for a multi-disciplinary approach enabling the problem to be viewed in its entirety, and therefore, the Medical Expert must avail him/herself of other Specialists and of interdisciplinary collaborations, such as those with Biomechanical Experts for the reconstruction of the dynamics of the harmful event.

Methods of Ascertainment

Although the regulations in various Countries are extremely heterogeneous—as, indeed, are the operational procedures—

Clinicians or Medico-legal Experts are involved in the majority of cases.

Apart from the specific framework (extra-judicial or judicial) in which the professional works, and apart from the fact that person acts as a consultant for the judge, the insurance company, the injured party or other Institutions or figures, the methods of ascertainment to be followed are the same, including analysis of clinical and documentary data and execution of clinical and instrumental examinations, described in detail in the following sections.

1. Acute Phase

a. Clinical examination

The medical ascertainment in the acute phase regards adult patients (i.e. over 14 years of age with fully developed spines [9, 10]) who undergo the initial ascertainment within 6 months from the trauma (Fig. 1).

• Case History

The first operation that the ascertaining Clinical or Medico-legal Expert must perform is the complete and detailed collection of all the available clinical and documentary data [11], including the medical history provided during the consultation between the doctor and the patient, clinical data deduced from the analysis of medical records, reports and/or instrumental images that may be present, believed to be useful for a diagnostic framework and for later identification of the clinico-pathological features, injuries, impairments and other damages. In particular, the expert will have to investigate what is listed below.

- *Age* of the patient at the time of the accident.
- *Work activities* performed by the patient before the accident and at the time of the medical ascertainment.
- *Any hobbies*.
- Possible *pre-existing diseases*, such as previous cerebral and/or cervical trauma, osteochondrosis, spinal disease and/or cerebrovascular disease.
- *Symptomatology* reported by the patient in the *immediate post-traumatic period*.
- *Symptomatology* arising in the period between the *time of the trauma* to the *time of the ascertainment*, with particular attention to the symptoms, such as pain (using the visual analogue scale) and/or cervical stiffness, headache, pain in the shoulders and in the interscapular area, disorientation, irritability, visual disturbances, cognitive impairments, postural impairments, dizziness, tinnitus, nausea, dorsal and/or

lumbar pain, paresthesia, dysesthesia and a tingling sensation in the upper arms, swallowing impairments and disturbances at the level of the temporo-mandibular joint [12].

- Any *sleep disturbances*.
- Any *pharmacological treatment* taken from the time of the trauma to the time of the ascertainment and the related results.
- Any *physio-rehabilitative treatments* from the time of the trauma to the time of the ascertainment and the related results.

• *Accident and biomechanical analysis*

The Medical Expert will then have to proceed, through dialogue with the patient and the examination of documentary data relating to the circumstances and to the mechanism of injury [13] (e.g. records of the accident investigation drafted by the Police, complaint forms relating to the accident, etc.), to the acquisition of all the information related to the traumatic event, as listed below.

- *Date and place* of the event.
- *Type of vehicles* involved.
- *Role of the patient* (e.g. driver, front or back passenger, cyclist, pedestrian, etc.).
- Presence of correctly used *protection safeguards* (belt, helmet).
- *Material damages to the vehicles* involved.
- Description of the *dynamics of the accident*.

The acquisition of such data is essential for the *biomechanical reconstruction of the traumatic event* (with the help of an *Expert in Biomechanics*) and for the identification of possible *high-risk factors* of damage to the cervical anatomical structures, described in detail in the following paragraph.

b. *Identification of high-risk factors*

Included among *high-risk factors* [14–16] are as follows:

- The traumatic mechanisms with high potential for harm, such as vertical blows at the level of the head, road accidents with an impact speed of over 100 km/h, rollovers of vehicles and/or ejection of the victim outside of the passenger compartment
- Loss of sensitivity of the extremities
- The presence of pre-existing pathologies, particularly rheumatic diseases (e.g. rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, seronegative spondyloarthritis, etc.), previous

spinal surgeries and neoplastic diseases with or without metastases

The identification of **at least one high-risk** factor entails a specialised clinical ascertainment or a specialised clinical re-ascertainment (Fig. 2).

According to the guidelines of the American College of Radiology [10], the presence of **at least one high-risk factor** [14] among those described above, in patients older than 14 years, entails the performance of instrumental tests, such as computerised axial tomography (CT) of the cervical area [17].

In the absence of high-risk factors, the clinico-medico-legal ascertainment can be performed, evaluating the ability to actively rotate the head bilaterally by 45°. If an inclinometer is available, such a manual ascertainment may be replaced by an instrumental ascertainment (using the inclinometer), which must be regarded as positive if reduced by more than 40 %.

In cases where the patient is not able to actively rotate the head bilaterally by 45°, or presents a mobility reduction of ≥ 40 %, he will have to undergo a specialised clinical ascertainment of the cervical area, with possible instrumental investigation [18].

c. *Objective examination*

The *Objective Examination* (Fig. 3) consists of a comprehensive visit, including general, neurological, osteoarticular and musculoskeletal examinations and evaluation of the possible presence of injuries to each of the individual parts of the body (head, neck, chest, back, pelvis, upper and lower limbs), specifying for each injury where it is located, the type of injury and its morphometric characteristics.

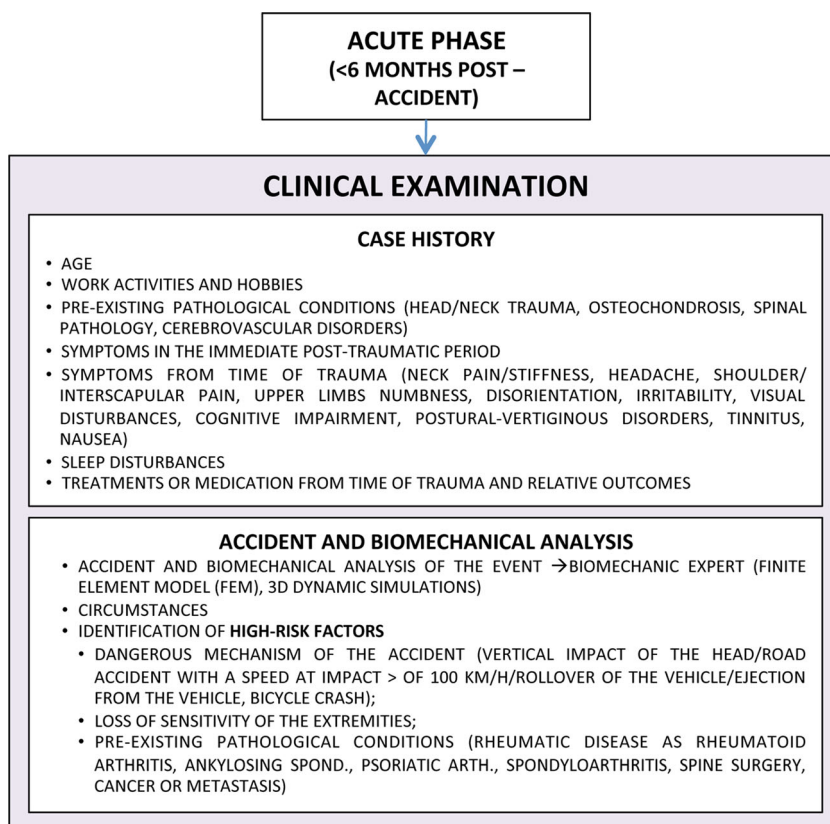
Subsequently, the Expert must focus on the injured area/areas performing a local osteoarticular and neurologic examination, including inspection, palpation and ascertainment of mobility, sensitivity and strength of the areas described below, using a problem-oriented medico-legal semeiotics (Fig. 3).

During the **inspection**, the physician must, in particular, observe the patient's posture, with attention to the position of the head and neck.

The **palpation**, performed using digital pressure, must be performed in order to evaluate the presence of any algic reactions at the level of the spinous and transverse processes of the cervical and dorsal rachis and at the level of the cervical muscular structures, the trapezius muscles and chest muscles. The present Guidelines recommend the routine utilisation of quantitative "scales" for the objective recording of pain.

At the level of these algic areas, it is also

Fig. 1 Medical ascertainment in the acute phase. Clinical examination, including case history, accident and biomechanical analyses



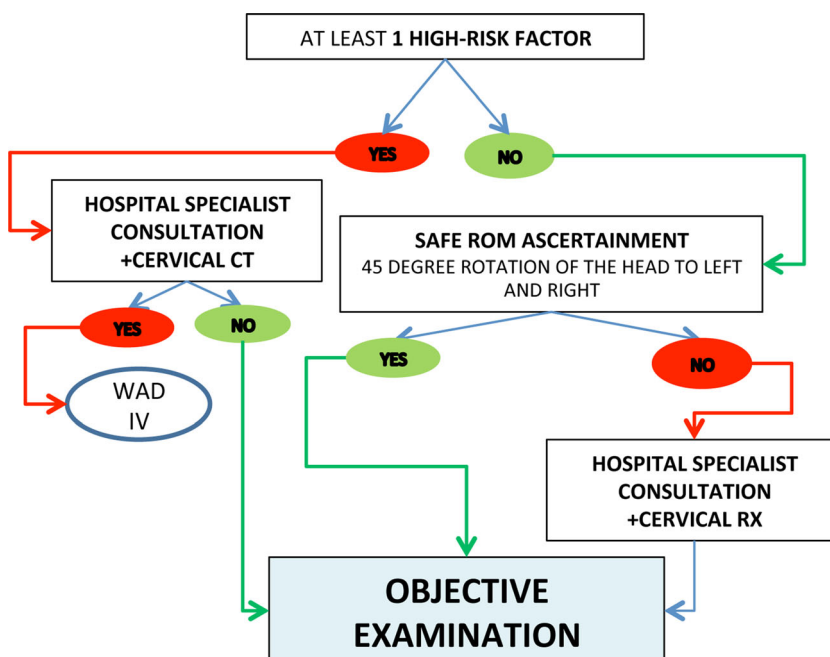
appropriate to perform an instrumental evaluation with an algometer using the visual analogue scale (VAS) to define pain, construing the algometric ascertainment as positive only at values above 5. The use of this scale also allows for comparison

with subsequent algometric ascertainment.

Subsequently, the following must be carried out:

- Complete examination of *active and passive motor function of the cervical spine*, possibly using an

Fig. 2 Medical ascertainment in the acute phase. Identification of high-risk factors and description of the clinical pathway



inclinometer, of the flexion and extension movements of the head and neck with simultaneous rotation and lateral flexion.

- Examination of *tactile, thermal and pain sensitivity* in the neck.
- Examination of *active and passive motor function* and *tactile, thermal and pain sensitivity* in the neck, shoulders and upper limbs.
- Examination of the bicipital (C5), tricipital (C6) and stiloradial (C7) *bone-tendon reflexes*.
- Examination of *muscle strength* in the *muscles of the neck, shoulders and upper limbs* by ascertainment of the movements against resistance.

In the event that the examination is negative, one proceeds only to the evaluation of pain according to the VAS and the classification of the injury according to the score obtained.

In particular, in the case of a score between 0 and 5, the injury is classified as a *whiplash-associated disorder (WAD) of degree 0* (absence of symptoms of the neck), while in case of a VAS score between 6 and 10, the injury is classified as a *WAD grade I* (neck pain), as indicated by the Quebec Task Force 1995 (QTF).

In the event that the *objective musculoskeletal loco-regional examination* detects the presence of positive signs and symptoms, such as *decreased range of cervical motion* or the presence of *points of tenderness*, the injury is classified as *WAD grade II*.

In the event that, during the *objective neurological examination*, there is evidence of reduced reflexes and/or the presence of loss of strength or sensitivity, the injury is classified as *WAD grade III*. In the examination of objective neurological disorders, even *chewing, swallowing, balance and/or coordination impairments, including visual disturbances* can be detected, which must be evaluated with particular attention and confirmed through the performance of specialist ascertainment (eye nose throat—E.N.T. ascertainment) with any further instrumental details indicated by the specialist. The discovery of the above disorders involves the classification of the injury as *WAD grade III*.

Evidence of fractures/dislocations from the cervical CT entails the classification of the injury as *WAD grade IV* according to the Quebec Task Force Classification 1995 (QTF) [1].

For *WAD grade 0, where no treatment is necessary*, the expert will have to re-examine the patient once stabilisation has occurred (6 months).

For *WAD grades I–III*, the expert must send the patient back to the attending physician for any prescription of drug treatments and/or physical therapy, advising the maintenance of an active lifestyle and indicating the performance of a *subsequent medico-legal ascertainment* in the event of persistence and chronicity of symptoms or, in any case, *once maximum medical improvement* has been reached (i.e. healing or stabilisation to a permanent sequela/e).

2. Chronic Phase

The ascertainment in the chronic phase must be performed on patients over 14 years of age who undergo the ascertainment for the first time after 6 months from the trauma and in patients who, despite drug and rehabilitation therapy prescribed during the acute phase, continue to complain about the persistence of symptoms *once the achievement of maximal medical improvement has been reached* (i.e. healing or stabilisation to a permanent sequela/e).

In the event that the clinical situation is still evolving (i.e. on-going disease), it is necessary to postpone the ascertainment until healing or stabilisation occurs.

a. Collection of circumstantial, clinical and instrumental data

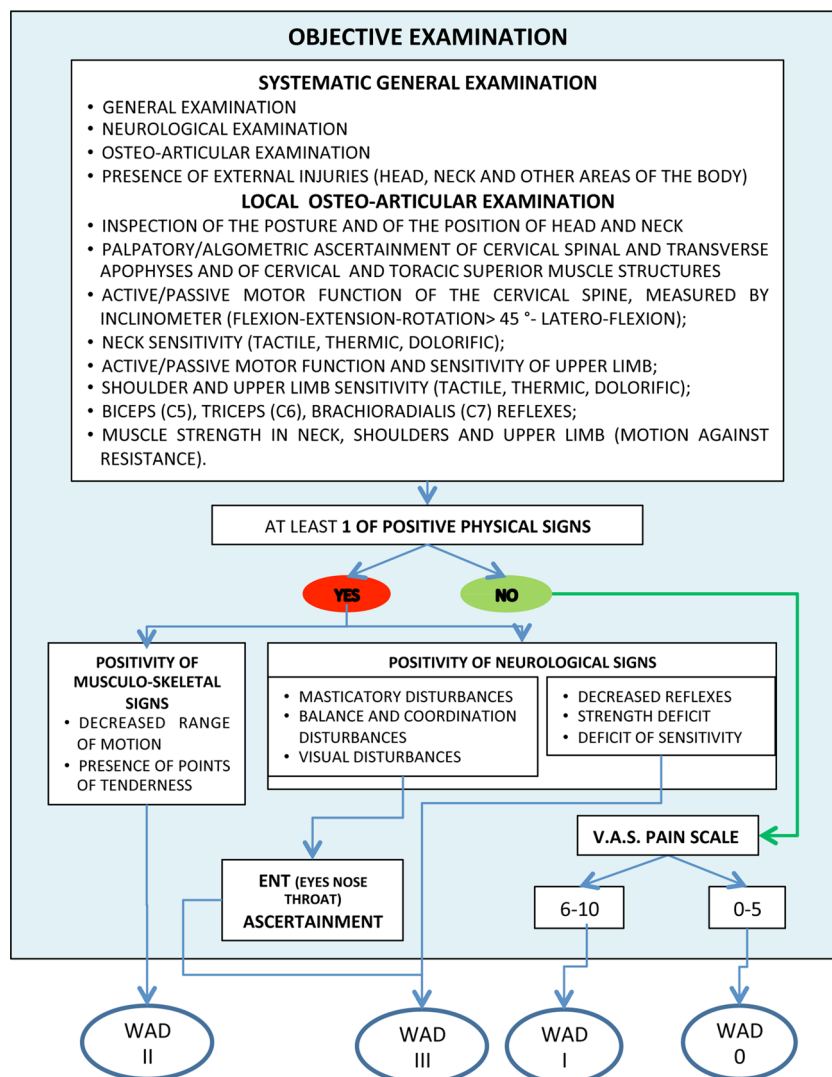
In the event that a previous ascertainment has already been carried out in the acute phase, the first operation which the Expert must perform is the collection of all circumstantial, clinical-documental (certificates of rehabilitation therapies performed, specifying the type of treatment carried out and the duration, medical expenses incurred and any medico-legal reports) and instrumental available data (reports of specialist visits and instrumental tests with relevant radiographs), retrieving all medical and healthcare information believed to be useful for a diagnostic framework, for later identification of the clinico-pathological features, injuries, impairments and other damages (Fig. 4). If, instead, it involves a first ascertainment, the Expert will proceed directly to the systematic clinical examination (Fig. 4).

b. Systematic clinical examination

• Case history

The Expert must carry out the complete and detailed collection of all clinical data and documents available to the examinee, related to the trauma and traumatic

Fig. 3 Medical ascertainment in the acute phase. Objective examination



mechanism, as well as the familial, physiological, work, remote (e.g. pre-existing pathologies, such as any previous traumatic brain and/or neck trauma, osteochondrosis, spinal diseases and cerebrovascular diseases) and recent case history of the subject examined [19].

In particular, an in-depth investigation must be made of the circumstances of the trauma (with identification of any high- and low-risk factors), the symptoms arising immediately after the trauma and those arising at a distance as well as more recently, specifying the periods of cervical collar immobilisation, drug therapies and/or rehabilitation services performed.

- *Psycho-physical examination*

The psycho-physical examination consists of a comprehensive Medico-legal visit, including

internistic, psycho-emotional, neurological, osteoarticular, musculoskeletal and eyes-nose-throat examinations, paying attention to any decreased reflexes, strength deficit, deficit of sensitivity, decreased range of motion, presence of points of tenderness, masticatory disturbances, balance and coordination disturbances and visual disturbances.

After the aforementioned systematic clinical examination, the Expert must focus on the injured area/areas performing an analytical local examination using a problem-oriented medico-legal semeiotics, including inspection of the posture and position of the head and neck, palpatory/algometric ascertainment of cervical spinal and transverse apophyses, cervical and thoracic superior muscle structures, upper limb neurological ascertainment (motor function,

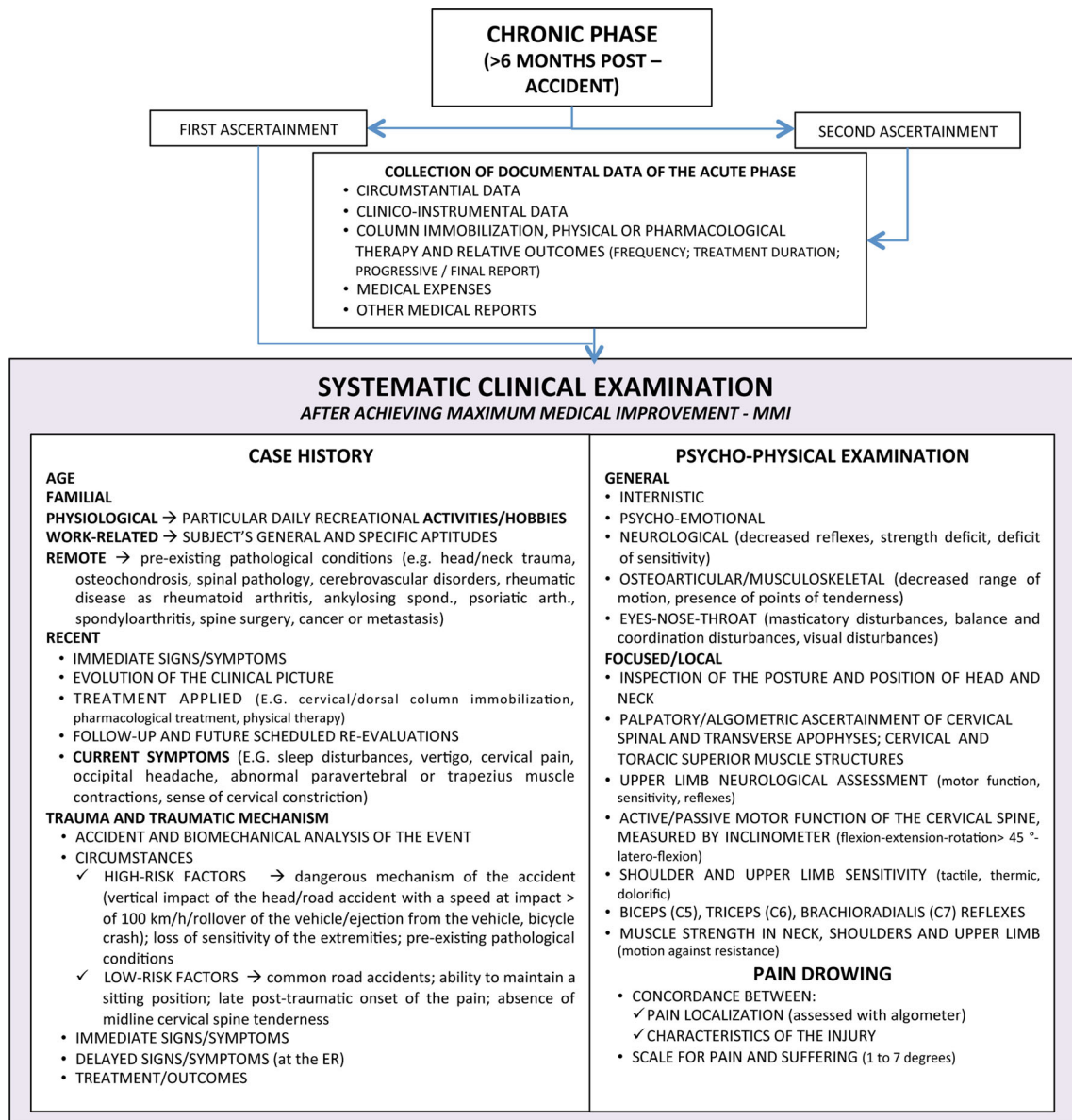


Fig. 4 Medical ascertainment in the chronic phase. Data collection and systematic clinical examination, including case history, psycho-physical examination and pain drawing

sensitivity, reflexes), active/passive motor function of the cervical spine measured by inclinometer (flexion-extension-rotation; latero-flexion), evaluation of shoulder and upper limb sensitivity (tactile, thermic, dolorific) of biceps (C5), triceps (C6) and brachioradialis (C7) reflexes and muscle strength in the neck, shoulders and upper limb (motion against resistance).

• Pain drawing

The Expert must finally carry out the Pain Drawing, namely the ascertainment of correlation between pain

localization (assessed with an algometer) and the characteristics of the injury.

This is a subjective mapping, by the examinee, of the points of greatest tenderness, followed by a manual and instrumental evaluation by the physician of the pain intensity at the indicated locations, using acupuncture, the algometer and the VAS scale. A comparison between the points specified by the examined person and the characteristic areas of tenderness in WAD (i.e. myofascial trigger points) must be performed.

In the presence of at least one significant symptom (e.g. cervical pain, occipital headache, sense of cervical constriction) or sign (e.g. paraspinal muscle contractures, trapezius muscle contractures, alteration in the range of active and passive cervical motion possibly measured by inclinometer), the examining physician can proceed to any instrumental tests and/or any Expert consultation aimed at obtaining additional anatomical and functional data, if necessary (Fig. 5).

c. Instrumental exams and/or specialist consultation

In the case that further anatomic-functional data are needed, the Expert can involve a Specialist and advise the performance of instrumental exams, which can be divided into two categories (first and second levels) and can be prescribed directly by the expert or by the specialist (Fig. 5).

First-level exams

Non-invasive exams, not based on the use of ionising radiation, are categorised as first level.

- *Magnetic Resonance Imaging* (MRI) to be performed in order to highlight the presence of fatty infiltration [20, 21] at the level of the extensor muscles of the neck. MRI can also detect any disc abnormalities, fractures or ligament damage bone marrow.
- Other instrumental tests, such as *cochleovestibular examination*, *electronystagmographic* and *angio magnetic resonance*, indicated on the basis of a clinical suspect.

Second-level exams

Exams based on the use of ionising radiation and other invasive exams, such as the *electromyography* (EMG), to be performed in order to confirm the clinical suspicion of radiculopathy, loss of sensitivity, weakness/lack of muscle strength, inability to elicit bicep, tricep and stiloradial deep tendon reflexes.

In both cases (first- and second-level exams), the interpretation of the results can be performed by the expert only if he/she has proven experience and expertise in that specific field.

d. Medico-legal epicrisis

At this point, the Expert must collect all the available data and perform a comparative analysis aimed at assessing the pre-existing health status, reconstructing the damaging event with the help

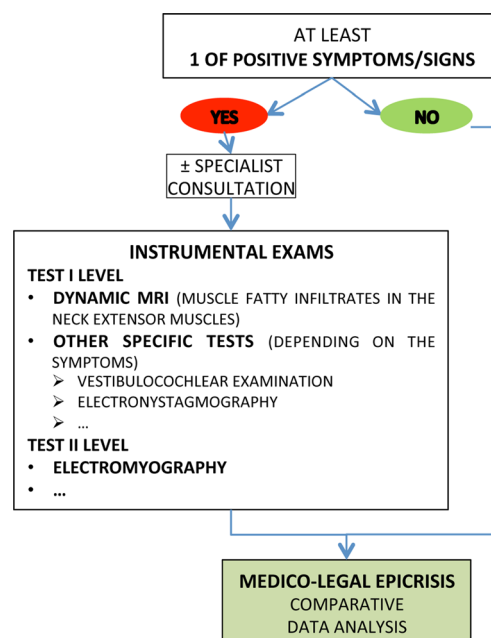


Fig. 5 Medical ascertainment in the chronic phase. Identification of positive symptoms and description of the clinical pathway, including instrumental exams and/or specialist consultations

of a Biomechanical Expert, identifying the clinico-pathological diagnosis, and the corresponding Medico-Legal diagnosis, in terms of temporary/permanent impairment or other damages (e.g. pain and suffering, etc.) (for the detailed illustration of which, see the General Guidelines on the subject of Personal Injury and Damage).

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