

# Diagnostic Criteria and Staging of Hand-Arm Vibration Syndrome in the United Kingdom

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**Abstract:** In the United Kingdom the diagnosis of Hand-arm Vibration Syndrome varies depending on the purpose of that diagnosis. The criteria differ in three situations. More than 100,000 miners and ex-miners with claims for HAVS have been examined using a Medical Assessment Process which included the use of standardised tests. This contract is unique but it has had significant effects on the two other processes. The Industrial Injuries Disablement Benefit Scheme provides a benefit that can be paid to an employed earner because of an accident or Prescribed Disease. New recommendations have been published to remove the anomalies in the present format for assessing HAVS. If implemented the new scheme will recognise the Stockholm Workshop Scales and workers with neurological problems will also be compensated. The Health and Safety Executive will issue new guidance in the near future on the hazards of hand-arm vibration. Health surveillance in the workplace will be fundamental and the HSE propose a tiered approach with levels 1 to 5. Specialist occupational nurses and doctors with training in the diagnosis and assessment of HAVS will be needed for levels 3 and 4. Only at this level may a diagnosis of HAVS be made. The Medical Assessment Process has demonstrated that it is possible to examine a large number of claimants in a standardised manner. The IIAC and HSE recommendations contain very important improvements on the existing positions in the UK and it must be hoped that they will be implemented in the near future.

**Key words:** Hand-arm vibration syndrome, Compensation claims, Health and safety advice

## Introduction

There are a variety of diagnostic criteria and staging for hand-arm vibration syndrome (HAVS) in the United Kingdom (UK). There are three separate processes that have developed as a result of differing medico-legal and regulatory requirements. There is a civil claim for compensation scheme, a state scheme and there is enforcing authority guidance.

The Department of Trade and Industry contract to examine miners and ex-miners with claims for HAVS. This contract has been running since 1998 and is gradually coming to an end. However it has had a major influence on the Disablement Benefit Scheme recommendations and on the new Health and Safety Executive's guidance on hand-arm vibration

The Industrial Injuries Disablement Benefit Scheme.

This scheme, based on an Act of Parliament 1985, is currently under review and details of the new recommendations are given in this paper. The date of implementation has not been finalised.

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**Table 1. Modification of the neurological component of the Stockholm Workshop Scales**

STAGE	CRITERIA	ASSESSMENT	
		Left Hand	Right Hand
0 SN	Vibration exposure but NO symptoms		
1 SN	Intermittent numbness and/or tingling with a sensorineural score of $\geq 3 < 6$		
2 SN (early)	Intermittent or persistent numbness, and/or tingling, reduced sensory perception with a score of $\geq 6 < 9$		
2 SN (late)	As 2 SN (early) but with a score of $\geq 9 \leq 16$		
3 SN	Intermittent or persistent numbness and/or tingling, reduced manipulative dexterity and a SN score of $\geq 19$		

**Table 2. Modification of the vascular component of the Stockholm Workshop Scales**

STAGE	CRITERIA	ASSESSMENT	
		Left Hand	Right Hand
0V	No attacks		
1V	Attacks affecting only the tips of the distal phalanges of one or more fingers—usually a blanching score of 1–4		
2V	Occasional attacks of whiteness affecting the distal and middle (rarely also the proximal) phalanges of one or more fingers—usually a blanching score of 5–16		
3V	Frequent attacks of whiteness affecting all of the phalanges of most of the fingers—usually a blanching score of 18 or more		
4V	As 3v and trophic changes		

Health and Safety Executive's guidance on hand-arm vibration.

The current guidance was published in 1994 but new guidance will be issued within the next few months. This paper describes in detail the contents of the 2005 guidance.

### Department of Trade and Industry Coal Miners Contract

This contract is on behalf of the Department of Trade and Industry (DTI). So far over 100,000 miners and examiners with claims for hand-arm vibration syndrome (HAVS) have been examined. There are many factors which make this contract unique and which would not be applicable in other situations. Among these factors are:

- Tight timescales for the completion of the contract.
- A huge number of examinations to be completed.
- Many of the claimants are very old.
- The examination process has to be strictly standardised across the UK.

In order to address these factors a Medical Assessment Process (MAP) was created. 18 centres were opened across the UK and 195 doctors trained to perform the MAP in a

strictly controlled fashion. The MAP consists of:

- A questionnaire to ascertain the history of exposure to hand-arm vibration followed by a questionnaire regarding any history of symptoms of HAVS
- A questionnaire to help with the differential diagnosis and detection of any possible dual pathology
- Clinical examination of the claimant by the doctor to search for any other abnormalities in the hands, arms or neck.
- Performance of the standardised tests. In the MAP the five standardised tests are vibrotactile perception threshold test (VPT), thermal aesthesiometry, (TA), Purdue pegboard test (PPT), grip strength using a Jamar dynamometer and a cold provocation test (CPT).
- A scoring system to facilitate staging of the sensorineural and vascular components. Further details of the MAP and scoring system have been described elsewhere<sup>1</sup>.
- Staging using Stockholm Workshop Scales (SWS).

Three changes are made to the original Stockholm Workshop Scales<sup>2</sup>. The wording "numbness and/or tingling" is substituted for "numbness with or without tingling" to give equal strength to numbness and tingling as seen in Table 1. The software uses the combined VPT+TA scores to reach a sensorineural staging and divides 2SN into 2SN early and

2SN late as in Table 1. The blanching score gives guidance on the vascular staging as seen in Table 2. Distal phalanges score 1, middle phalanges 2 and proximal phalanges 3. Stage 2SN is thought to include claimants with relatively minor symptoms up to those with severe sensory loss without a loss of dexterity. For this reason this stage is subdivided. Claimants at 2SN late receive greater compensation than those at 2SN early. For the award of a 3SN staging there has to be a loss of dexterity in a warm environment.

*Diagnosis*

The crucial decision is the doctor’s diagnosis of the presence or absence of HAVS. This is based on history of vibration exposure, presence of symptoms suggestive of HAVS and the exclusion, as far as possible, of other diseases which could cause similar symptoms. All claimants undergoing the examination complete the MAP.

*Test performance*

The strength of the correlations for the thermal aesthesiometry and vibrotactile perception tests was investigated. The interpretation of correlations is shown in Table 3. For the thermal aesthesiometry tests the correlations are all high, and similar to one another—ranging from 0.77 to 0.80. For the vibrotactile perception tests, the correlations

show a similar set of relationships, although there is a greater range in the size of the correlations, from a maximum of 0.90, to a minimum of 0.59. The VPT and TA have been shown to be reliable tests with good internal consistencies<sup>3)</sup>. Unfortunately the CPT analysis of the results of two populations of more than 20,000 examinations failed to show a statistically significant association between the CPT results and the final vascular staging. The CPT was therefore removed from the MAP<sup>4)</sup>.

*Staging*

For the sake of standardisation the doctors’ ability to override the sensorineural software generated staging is strictly limited to stage 1SN<sup>3)</sup>. However following removal of the CPT, as there are no reliable vascular tests, the vascular staging is reliant on a detailed history.

*Results<sup>5)</sup>*

Although examinations are continuing at the last analysis the results of 95,599 examinations were as shown in Tables 4 and 5. A separate review process, which is part of a detailed audit programme, failed to confirm any of the 62 stage 4 cases and they have all been relocated to other grades.

**Industrial Injuries Disablement Benefit Scheme**

The Industrial Injuries Disablement Benefit (IIDB) Scheme provides a benefit that can be paid to an employed earner because of an accident or Prescribed Disease (PD). It is non-contributory and “no-fault”. The Prescribed Disease A11 Vibration White Finger has had a very chequered existence. Investigations by the Industrial Injuries Advisory Council (IIAC), an independent statutory body, failed to recommend prescription in 1954, 1970 and 1975 because no reliable means existed of confirming the diagnosis. In 1981 the IIAC, after collecting further evidence,

**Table 3. Strength of correlations**

0 – 0.19	very weak
0.2 – 0.39	weak
0.40 – 0.59	moderate
0.6 – 0.79	strong
0.8 – 1	very strong

Absolute values of r.

**Table 4. Sensorineural staging results for the right hand**

Stage	0SN	1SN	2SN (early)	2SN (late)	3SN	Number
Number of subjects	3,880	177,556	17,870	34,448	21,845	95,599
Percent	4.1	18.4	18.7	36.0	22.9	100

**Table 5. Vascular staging results for the right hand**

Stage	0V	1V	2V	3V	4V	Number
Number of subjects	23,782	14,582	36,005	21,168	62	95,599
Percent	24.9	15.3	37.7	22.1	0.1	100

recommended prescription and Vibration White Finger became PD A11 in 1985. The prescription applies only to certain occupations and only to vascular symptoms. Claimants with only sensorineural symptoms do not receive any benefit. The Social Security Contributions and Benefits Act 1992 states that the Secretary of State may prescribe a disease where he is satisfied that the disease:

- a) ought to be treated, having regard to its causes and incidence and any other relevant considerations, as a risk of the occupation and not as a risk common to all persons; and
- b) is such that, in the absence of special circumstances, the attribution of particular cases to the nature of the employment can be established or presumed with reasonable certainty.

The disease can only be prescribed if there is a recognised risk to workers in an occupation, and the link between the disease and occupation can be established or reasonably presumed in individual cases. In epidemiological terms this translates as a doubling of relative risk.

#### *Diagnostic Criteria*

In 1995 the IAC recommended that<sup>6)</sup>: Prescription should be extended to cover peripheral neurological effects of hand-arm vibration syndrome (HAVS) on the thumb and fingers. The Stockholm Workshop Scales (SWS) should be used to grade the severity of HAVS. The list of prescribed occupational exposures should be replaced by a list of prescribed tools and rigid materials held against such tools. The recommendations were accepted by the Conservative Government of the day but not implemented because of concerns about the reliability and cost-effectiveness of objective tests suggested for the diagnosis of HAVS. More recently the sensory effects of HAVS have been assessed but only once the vascular symptoms are severe enough to fulfil the criteria for PD A11.

To complicate matters benefit is only paid if:

The assessed disablement is 14% or more. However if the assessed disablement is between 1–13% and aggregation with another injury or other prescribed disease, the total disability reaching 14% or more compensation will be paid. In 2002 93% of PD A11 cases fell below the 14% threshold. In a recent command paper in July 2004 the IAC recommends<sup>7)</sup>: Both the vascular and sensorineural components of HAVS should be compensated and that only one component may be involved. For the vascular component the gold standard for diagnosis remains a carefully recorded patient history. IAC does not recommend either a cold water

provocation test or a finger systolic blood pressure test. For the sensorineural component IAC recommends compensation for claimants with a good clinical history supported by positive results from the vibrotactile perception threshold test, the thermal threshold test and a Purdue pegboard test. This report states that the diagnostic criteria and medical assessments differ substantially between the IIDB Scheme and the DTI coal board compensation scheme. The new recommended terms of prescription are described in Appendix 1. These recommendations have still to be implemented as regulations.

### **Health and Safety Executive Guidance on Hand-Arm Vibration**

Following the prescription of vibration white finger in 1985 the Health and Safety Executive (HSE) published its Hand-Arm Vibration booklet in 1994<sup>8)</sup>. This very useful book gives guidance on the hazard and control programmes including, technical ways to measure and reduce vibration. It also gives the following advice “It is not advisable for workers to continue exposure if this is likely to result in the disease progressing to Stockholm stage 3 vascular or sensorineural”. With increasing knowledge<sup>9–11)</sup> and the approach of Regulation 7 of the Control of Vibration at Work Regulations 2005 (in draft) the HSE has embarked on an extensive consultation process. The above regulation requires workers exposed in excess of the daily exposure action value (EAV) of 2.5 m/s<sup>2</sup> A(8) to be under suitable health surveillance. The final HSE document has yet to be published but its main thrusts are known. Only those aspects which directly involve the diagnosis of HAVS and fitness for work with HAV are addressed in this paper. Quotes likely to be in the final document have been liberally included in the following text with the HSE’s permission. Health surveillance involves systematic, regular and appropriate procedures to detect work-related ill-health at an early stage and acting on the results.

Health surveillance should be instituted for:

- a) workers who are regularly exposed above the EAV.
- b) workers likely to be occasionally exposed above the EAV where the risk assessment identifies that the frequency and severity of the exposure may pose a risk to health.
- c) workers who have a diagnosis of HAVS (even when exposed below the EAV)

#### *A tiered approach to health surveillance*

The HSE proposed use of a tiered approach (Appendix

2). The roles involved for each level of surveillance are as follows:

- Level 1 & 2 A responsible person - a worker chosen for training in the symptoms of HAVS who will administer the questionnaires.
- Level 3 A qualified person - Usually an occupational health nurse.
- Level 4 A registered medical practitioner - A specialised health professional, usually an occupational physician competent to diagnose HAVS.

These doctors are responsible for the formal diagnosis of HAVS and fitness for work decisions. Level 1 gives a baseline for the assessment of any new employee or existing employee transferring to vibration exposure work. Level 2 is the annually repeated routine self-administered health surveillance questionnaire. Level 3 follows if symptoms are reported at level 2. This involves a clinical questionnaire completed by the qualified person although the medical practitioner may also be involved at this level. A simple clinical examination is also recommended at this level.

#### *Diagnosis and Staging*

Level 4: It is only at this level that a diagnosis of HAVS can be made. Level 4 is activated when relevant symptoms or clinical effects are found at level 3. Level 5: Additional tests either on site or by referral may be used to introduce a quantitative assessment.

The document will refer to:

Vascular tests.

- a) Cold provocation test.
- b) Finger systolic blood pressure test.

It will state that there is no consensus among UK testing practitioners on a vascular test that is sufficiently robust to be recommended for the diagnosis of HAVS in a worker undergoing health surveillance.

Sensorineural tests:

- a) Vibrotactile perception threshold (VPT)
- b) Thermal (temperature) perception threshold (TA)
- c) Purdue pegboard test

These tests are considered to be useful. The HSE will note that the separation into 2SN early and 2SN late relies to a large extent on these tests. They will suggest that the results of these tests can be used as an important part of the fitness to work decision. The HSE will also suggest that if these tests are not used for the division of stage 2SN into 2SN early and 2SN late a history of intermittent symptoms

becoming persistent may be used but notes that this will be less effective.

#### *Management of the affected worker, including fitness to work*

There will be detailed comments on the management of a worker diagnosed as suffering from HAVS. It is the responsibility of the registered medical practitioner to decide whether a worker is fit for work with HAV. A decision may have to be taken on safety grounds but in most cases a judgement that a worker is unfit for work with HAV will be to prevent deterioration that could cause further disability. If a worker is diagnosed at HAVS stage 2 the aim is to prevent HAVS stage 3 developing because it is a more severe form of the disease associated with significant loss of function and disability. Management of existing cases of stage 2 and stage 3 HAVS is potentially different. If there is no indication of rapid progression and a worker is approaching retirement it may be permissible to allow continuing exposure to HAV under regular review.

## **Discussion**

Of the three different diagnostic criteria groups the HSE guidance is by far the most important as it has the aim of preventing the damage seen in the DTI contract and with the disability claimants. Implementation of the new HSE guidance will require major changes in both large industries and small companies and quality assured training by a body such as the Faculty of Occupational Medicine. Only time will tell if the guidance will manage to halt or at least reduce the development of HAVS. As the DTI contract draws to a close it is interesting to observe that the MAP including its modifications of the Stockholm Workshop Scales and the use of the VPT and TA tests have had a significant impact on both IIAC and HSE recommendations. We believe that the rewording to read “numbness and/or tingling” is an improvement on the original text. We also believe that the use of the VPT and TA in HAV examinations has been justified in view of such a huge number of MAP tests and the related publications while waiting for truly objective tests to become available. The HSE’s recommendation that the tests are optional must be viewed critically. This suggests that an employee could be removed from their trade purely on the history and a simple clinical examination with all the ensuing consequences involving job security, and the financial implications. The suggestion that 2SN, without the use of the tests, could be divided into 2SN early and 2SN late if the symptoms become persistent is likely to lead to confusion and the authors believe that this division of

2SN into early and late should be used only where the tests are available. The modified SWS sensorineural component of HAVS and scoring system for the VPT and TA as seen in the DTI Medical Assessment Process has been accepted by the HSE. However they also suggest the division of stage 2 vascular into early and late using the blanching scores. This was not part of the DTI MAP. The importance of the finding of a lack of significant association between the CPT results and final vascular staging in some 40,000 MAP examinations cannot be overestimated. The removal of the CPT from the MAP was a very serious step as it left the vascular staging dependent on a detailed history. However publication of the findings left no choice<sup>4</sup>. Any attempt to create an ISO finger rewarming CPT Standard must await peer reviewed papers whose results differ from those found with the MAP.

## Conclusions

The MAP has demonstrated that it is possible to examine a large number of claimants in a standardised manner. The IIAC and HSE recommendations contain very important improvements on the existing position in the UK and it must be hoped that they will be implemented in the near future.

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**Appendix 1** New recommendations for prescribed disease A11 are –

Disease number	Name of disease or injury	Type of job
A11	<p>Hand-Arm Vibration Syndrome being defined as</p> <p>(1) Cold -induced, clearly delineated, episodic blanching occurring through the year, affecting the distal with the middle phalanges or proximal phalanges, or in the case of the thumb the proximal phalange of:</p> <p>(a) In the case of a person with 5 fingers (including thumb) on one hand, any 3 of these fingers: or</p> <p>(b) in the case of a person with only 4 such fingers, any 2 of those fingers: or</p> <p>(c) in the case of a person with less than 4 fingers, any one of those fingers or, as the case may be, the one remaining finger, and/ or</p> <p>(2) both of the following -</p> <p>i) persistent numbness or persistent tingling of the digits or both and:</p> <p>ii) a significant and demonstrable reduction in both sensory perception and manual dexterity of the digits, and</p> <p>(3) whose onset occurs after work involving one or more of the tools or occupational exposures listed in the third column of this table.</p>	<p>(a) the regular use of chainsaws: or</p> <p>(b) the use of hand-held rotary tools in grinding, or in sanding, or polishing of metal, or the holding of metal, or the holding of material being ground, or metal being sanded, polished by rotary tools: or</p> <p>(c) the use of hand-held percussive tools, or holding of metal being worked upon by percussive tools, in riveting , caulking, chipping, hammering, fettling or swaging: or</p> <p>(d) the use of hand-held powered percussive drills or hand-held percussive hammers in mining , quarrying demolition or on roads or footpaths including road construction: or</p> <p>(e) the holding of material being worked upon by pounding machines in shoe manufacture.</p>

**Appendix 2** Tiered approach to health surveillance for HAVS
 

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