

## WHO disability grading: operational definitions

J. WIM BRANDSMA\* & WIM H. VAN BRAKEL\*\*

*\*Green Pastures Hospital and Rehabilitation Centre, PO Box 5,  
Nepal*

*\*\*KIT Leprosy Unit, Wibautstraat 137 J, 1097 DN Amsterdam,  
Netherlands*

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*Summary* The WHO disability grading has been in use for many years. Its main use has been as an indicator for early case detection/reporting. More recently, the WHO grading has also been used as a change indicator of impairments for patients while on treatment. In such instances, the individual scores for eyes hand, and feet are added to obtain the so-called EHF sum score. A major drawback in the use of the grading system has been the lack of operational definitions of the descriptions for the grades. This may result in data and results of comparisons of data across programs and countries being flawed. The paper discusses the WHO grading in the light of its dual use: as an indicator for early case detection and as an indicator for change in impairments. The paper presents operational definitions for the grading options.

### Introduction

A 'disability classification' for use in leprosy has been advocated by WHO since 1960.<sup>1</sup> Two revisions of this grading system were subsequently published, a 4-point scale in 1970<sup>2</sup> and a 3-point scale in 1988.<sup>3</sup> The original purpose was to record a baseline 'disability' status to monitor changes during follow up.<sup>1</sup> The grading system was therefore quite elaborate. However, by 1988, the main purpose of the grading had changed to being a case finding indicator, to estimate delay in case finding.<sup>3</sup> The earlier patients report for treatment, the fewer impairments may be present at the time of diagnosis. Low prevalence rates of impairment in new patients at the time of diagnosis are interpreted as an indication of early case reporting. This may be the result of improved health services or raised community or professional awareness.

In several studies, the WHO disability grading has been used to evaluate and monitor patients' 'disabilities' while on treatment.<sup>4–7</sup> In these studies, the grading is repeated at the end of treatment and compared to the grades given at diagnosis. In cohort studies, the incidence rates of impairments may be compared across programmes and countries. In those instances, the disability grading is used as a proxy indicator for 'effects of care after

**Table 1.** Objectives of 'disability' (impairment) grading 11

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- To assess the disability burden attributable to leprosy in the community so as to plan the necessary actions;
  - To use it as an indicator for assessing the performance of the elimination programme;
  - To grade the potential for preventing disabilities in individual patients.
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diagnosis' to assess to what extent disability grades improve or deteriorate, as a result of, or lack of, timely interventions.<sup>8</sup> Table 1 reproduces the main objectives as given in the 7th report of the WHO Expert Committee on Leprosy.

Usually, the maximum impairment grade, the highest score for eye, hand or feet, is used as an indicator of severity of impairment.<sup>3</sup> In more recent studies, the individual impairment grades for eyes hands, and feet are summed to compute an impairment 'sum-score', the so-called EHF score (Table 2).<sup>9</sup> The maximum sum score would then be 12 (2 for each eye, hand and foot).

The purpose of this paper is to provide operational definitions for the WHO impairment grading. This is needed as the WHO definitions are interpreted differently in different programmes. The benefit of clear operational definitions would be 2-fold. First, when programmes/projects follow definitions that are less prone to misunderstanding and different interpretations, the data obtained will be more reliable and thus more reliable comparisons can be made between programmes or cohorts of patients over time. Second, studies that use the EHF (eyes, hands, feet) sum-score or the Impairment Summary Form (ISF) also depend on the interpretation of the definitions of the WHO 'disability' grades.

## Terminology

In the International Classification of Functioning, Disability and Health (ICF, formerly ICIDH), 'Impairments' are defined as 'problems in body *function* or *structure* such as a significant deviation or loss' (Table 3).<sup>10</sup> An example of an impairment in *body function* would be loss of sensation; examples of impairments in *body structure* would be contractures and absorption. A 'deformity' is a structural, usually visible, impairment. A 'defect' could be either a functional or structural impairment. In the ICF, 'Disability' is used as an umbrella term for impairments, activity limitations and participation restrictions.<sup>10</sup> It is evident from these current definitions that the WHO disability grading system grades impairments rather than the overall disability status of a person.

**Table 2.** Example of WHO grading and EHF score. Highest grade=2. EHF sum score=7 (1+2+0+2+1+1) (maximum score 12=6×2)

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Site	(R) Eye	(L) Eye	(R) Hand	(L) Hand	(R) Foot	(L) Foot
Grade	1	2	0	2	1	1

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**Table 3.** WHO definitions (ICF) 10

<i>Impairment:</i>	Problems in body function or structure such as a significant deviation or loss.
<i>Activity:</i>	Activity is the execution of a task or action by an individual.
<i>Activity limitations:</i>	Difficulties an individual may have in the executing activities.
<i>Participation:</i>	Involvement in a life situation.
<i>Participation restrictions:</i>	Problems an individual may experience in involvement in life situations.
<i>Functioning:</i>	An umbrella term encompassing all body functions, activities and participation.
<i>Disability:</i>	An umbrella term for impairments, activity limitations and participation restrictions.

**Operational definitions of the impairment grades (Tables 4–6)**

EYES (FACE)

The normal looking eye with a regular blink should be graded ‘0’. A regular blink is indicative of protective corneal sensation.

On testing sensation of the eye the WHO Expert Committee stated in its 7th report, ‘Although loss of sensitivity to touch is an important criterion for grading disabilities of the eyes, the Committee does not recommend testing the sensitivity of the cornea to touch under field conditions, for safety reasons’.<sup>11</sup> Vision, when tested, is graded according to the guideline in Table 6.

HANDS AND FEET

*Grade 0: normal sensation, no visible impairments*

Many common visible impairments, e.g. burns, ulcers and absorption, are indicative of loss of protective sensation. In most cases, a quick sensory test would confirm this. However, when there are no visible impairments the patient may or may not have impaired sensation, and sensory testing needs to be done to know if the hand should be graded ‘0’ or ‘1’.

**Table 4.** WHO disability grading 1988<sup>3</sup>

Hands and feet
Grade 0: no anaesthesia, no visible deformity or damage. Grade 1: anaesthesia present, but no visible deformity or damage. Grade 2: visible deformity or damage present.
Eyes
Grade 0: no eye problem due to leprosy; no evidence of visual loss. Grade 1: eye problems due to leprosy present, but vision not severely affected as a result of these (vision: 6/60 or better; can count fingers at 6 m). Grade 2: severe visual impairment (vision: worse than 6/60; inability to count fingers at 6 m).

Note: eye problems include corneal anaesthesia, lagophthalmos and iridocyclitis.

**Table 5.** WHO grading 1998 (changes since the 1988 grading are shown in **bold**)<sup>11</sup>

Hands and feet
Grade 0: no anaesthesia, no visible deformity or damage. Grade 1: anaesthesia present, but no visible deformity or damage. Grade 2: visible deformity or damage present.
Eyes
Grade 0: no eye problem due to leprosy; no evidence of visual loss. Grade 1: eye problems due to leprosy present, but vision not severely affected as a result of these (vision: 6/60 or better; can count fingers at 6 m). Grade 2: severe visual impairment (vision: worse than 6/60; inability to count fingers at 6 m) <b>also includes lagophthalmos, iridocyclitis and corneal opacities.</b>

*Grade 1: impaired sensation, no visible impairments*

Sensation (touch perception) is traditionally tested with a ballpoint pen. In some projects the so-called Semmes–Weinstein monofilaments are used. Some programmes use one filament for both hands and feet to determine ‘loss of sensation’;<sup>12,13</sup> other programmes use one specific filament for the hand and a different (thicker) one for the foot.<sup>14</sup> We propose that

**Table 6.** Proposed operational and expanded grading

Grade	Degree of impairment	Included	Excluded
Hands and feet			
0	No sensory impairment, no visible impairment	Scars of healed ulcers, when sensation is normal	
1	Sensory impairment present, no visible impairment	Scars of healed ulcers, when sensation is impaired Hands or feet following successful reconstructive surgery Muscle weakness without clawing <sup>a</sup>	Scars of healed ulcers when sensation is present Minor skin cracks
2	Visible impairments present	Ulcers, severe cracks, severe atrophy <sup>a</sup>	
Eyes			
0	No eye impairment; no visible or vision impairment		
1	Eye impairment present (vision: > 6/60)	Absence of (regular) blink	<sup>b</sup> Corneal sensation testing <sup>19</sup>
2	Severe visual impairment (vision: < 6/60)	Unable to count fingers at 6 m Lagophthalmos	Facial impairments due to lepromatous leprosy <sup>c</sup> Corneal opacities, uveitis <sup>19</sup>

<sup>a</sup> Muscle weakness based on muscle testing, not resulting in visible clawing is in some programs graded ‘2’. See text.

<sup>b</sup> Corneal sensation testing: still practised in many programs; but not recommended.<sup>19</sup>

<sup>c</sup> Facial impairments (LL impairments) to be noted but not to be graded with eye. It would be useful as an indicator for (late) detection.

sensory impairment (WHO anaesthesia) be defined as ‘the inability to feel the chosen sensory testing instrument (ballpoint pen/appropriate filament) on two or more test sites’. We also propose that no more than 10 sites be used for each hand or foot to test sensation. Unpublished evidence suggests that six test sites on the palm of the hand and four on the sole of the foot would be sufficient.

For the hand we propose as minimum testing sites: ulnar nerve: distal pulp and proximal phalanx of the little finger and hypothenar (3); median nerve: distal pulp of the thumb and index finger, and thenar eminence (3).

For the foot, we propose as minimum four testing sites: big toe, 1st and 5th metatarsal heads and mid-lateral border of the foot. If the heel is included in the testing, it should not be taken into account for the purpose of grading. The heel is usually heavily calloused and has a higher threshold of normal sensation.<sup>15</sup>

With the ballpoint pen test, a light touch stimulus with a good degree of reliability can be achieved by applying very gentle pressure just enough to move the skin slightly.<sup>16</sup>

Loss of sensation should be called ‘partial’ if the patient cannot feel the stimulus on two or more test sites, but still has sensation on other sites within the same nerve distribution. Partial sensory impairment should still be graded ‘1’.

#### *Grade 2: visible impairments/deformity*

Most (see later) visible impairments should be graded ‘2’. This includes mild absorption of only one finger, a severe crack because of dryness and contractures.

Muscle atrophy of the first web-space is a sign of severe involvement of the ulnar nerve and should be graded ‘2’ even in the absence of obvious clawing of the fingers.

*Absorption (digital shortening)*: absorption is a definite visible impairment and should be graded ‘2’.

*Burns*: burns and burn scars (as a result of impaired sensation) resulting in skin/joint contractures should be graded ‘2’.

*Callous*: callous is hard skin that developed because of stress on the skin. Normal skin will adapt to stress by hardening. Callous should not be considered an impairment and should not be graded.

*Cracks*: minor cracks should not be graded. Many people develop small cracks, especially during certain times of the year when the weather is cold and/or dry. These occur especially on the side of the heel. Severe cracks should be graded 2. They may especially occur on the side of the heel and under the first metatarsal head. A severe crack can be defined as a crack where the skin is definitely broken, with ‘raw’ tissue exposed at the bottom.

*Scars*: a scar, or multiple scars, indicative of (a) healed ulcer(s) especially on the plantar surface of the foot, should be considered a grade 1 impairment only when sensation is impaired (see Discussion).

*Ulcers*: an ulcer (in areas of impaired sensation) should be graded ‘2’. An ulcer is ‘broken’ skin. The skin is discontinuous. No distinction needs to be made between mild and severe ulcers for the purpose of grading.

*Weakness*: weakness indicates impairment in nerve function. Severe weakness often also has functional implications. We propose that weakness be graded ‘1’ in the absence of ‘clawing’ or fixed contractures and ‘2’ if ‘clawing’ or contractures are present. If the nerve function recovers the eye, hand or foot can be upgraded again. Changes in nerve function may thus be reflected in the sum score. However, it should be remembered that the WHO

impairment grading is not a primary tool to monitor nerve function. Programmes that do grade weakness should still use regular VMT and ST to evaluate and monitor nerve function.

## Discussion

With the 'adoption' of other health conditions and extension of services into the community, some programmes and projects do now also use the WHO grading to grade impairments not related to leprosy. This can be done but two things have to be born in mind.

1. Only impairments of eyes, hands and feet can be graded; impairments of other parts of the body cannot be graded.
2. The WHO impairment grading was not developed for this purpose, as can be seen from the listed objectives (Table 1). If impairments other than those due to leprosy (neuropathy) are included it is advisable that the programme agrees on a way of recording these impairments so that they still can be distinguished from the leprosy related impairments. This could be done, e.g. by recording the grade in a different colour or writing NL (non-leprosy) under the appropriate box. Furthermore, the maximum impairment grade or the EHF score is *one*, but not necessarily the best indicator for monitoring and evaluation of (part of a) POD program. Indicators derived from a (modified) Impairment Summary Form (also called the District Disability Summary Form) may be more useful.<sup>17</sup>

Most people with a visible impairment will also have sensory impairment in the same limb. When grading the impairment severity in that limb, the sensory impairment will be 'hidden' in the grade 2, given for the deformity. However, from a prevention of disability point of view, sensory impairment should be assumed to be present and should be monitored separately. In some cases, an ulcer, paralysis or contractures may have been present at the time of grading, but because of appropriate interventions these have disappeared. In most cases this would result in an improved impairment grade on a later assessment.

In some programmes, a reversible impairment, e.g. an ulcer, is not graded '2'. It is assumed that the ulcer will heal and therefore a grade '1' will be given. We feel that the fact that an impairment may be reversible should not be taken into account at the time of grading. An ulcer, but also, e.g. a recent footdrop that may recover, should be graded '2'.

In the absence of protective sensation, a foot with a scar is at risk of repeated ulceration. All visible impairments should be graded '2'. Even though a scar is a visible impairment, we propose to make an exception to the rule. Ulcers are a major problem in many leprosy projects and POD programs. If the foot score on its own, or as part of the EHF score, is used as an indicator for the (re)occurrence of plantar ulcers and is also used to monitor the effect of POD interventions, distinguishing a scar from an ulcer will make the indicator more sensitive. If both are given the same grade (2) the (re)occurrence of ulcers or healing of ulcers will not be reflected in the score. Therefore we propose that a scar be graded '0' when sensation is present and '1' when sensation is impaired.

To date, no studies have been reported investigating the reliability of the WHO 'disability' grading, while there is only one brief report on the reliability of the (E)HF sum-score.<sup>18</sup> Reliability of either the WHO disability grading or the EHF score, which is based on the former, depends on the operational definitions of the grades and the impairments to be graded. It is therefore important that the definitions are unambiguous and leave as little room as possible for multiple interpretations. Two reliability studies using the definitions

presented in this paper have recently been completed (Brandsma *et al.* and Nienhuis *et al.*, in press).

The 7th meeting of the WHO Expert Committee on Leprosy in 1997 endorsed the simplified grading (three grades; 0–1–2) of the 1987 meeting with the amendment that lagophthalmos, iridocyclitis and corneal opacities be considered grade 2.<sup>11</sup> The Committee recommended that, for safety reasons, testing of touch sensibility of the cornea should not be done under field conditions. In our opinion, presence of corneal sensation can be assessed through observation. If a regular blink is present, adequate corneal sensation can be assumed. Whether this indicates protective sensation remains to be studied. Patients with facial weakness or lagophthalmos may still have protective corneal sensation. Such patients will make use of Bell's phenomenon: every now and then the patients eyeball(s) will move up and thus the cornea will be cleaned.

Facial impairments due to lepromatous leprosy are visible, but they are not included in the current grading system, nor are they mentioned in the recent WHO Expert Committee report. They include loss of eyebrows, enlarged earlobes, and collapse of nose. Perhaps the current grading system could be expanded with a category for 'facial impairments'.

Currently, the WHO definition of visual impairment uses a different cutoff for visual impairment than do ophthalmologists. WHO considers a visual acuity of < 6/60 to be severe visual impairment, while ophthalmologists use a cutoff of < 6/24 to define 'impaired vision'. The advantage of the former is that finger counting can be used to grade the eye. To use the latter cutoff, an E-chart would be needed. For the time being, we recommend the current WHO definition. Blindness should be graded '2'.

In a recent ILEP-supported meeting for the management of eye care in leprosy, the WHO grading was also discussed. The committee stated 'The current WHO leprosy disability grading scheme is impractical for most programmes and is rarely implemented. Accordingly, it is recommended that visual acuity and lagophthalmos should become the primary indicators for monitoring disability (grade 2) and that corneal hypoaesthesia, corneal opacities, and uveitis should be removed from the leprosy disability-grading scheme'.<sup>19</sup>

In some programmes, muscle weakness is graded '2'. This is done to indicate the potential severity of the impairment. A paralysed hand or foot that has undergone surgical correction could still be considered to have visible impairment, because of residual atrophy. However, we propose that after successful tendon transfer surgery, the eye, hand or foot be upgraded, provided there are no other grade 2 impairments present. The new grade would be '1' in case of residual sensory impairment, otherwise the grade would be '0'.

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