

Pain

Quantifying the Unquantifiable

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**An unpleasant sensory and emotional
experience associated with actual and potential
damage**

International association of study of pain, 1979

Pain is fundamental to human existence. It has shaped our evolution and aids our ability to avoid dangerous hazards. Nevertheless, striving to alleviate such suffering is at the heart of medicine.

It is the **most common reason for individuals seek health care attention.**

After years of neglect, issues of pain assessment and management have captured the attention of both health care professionals and the public.

I am fascinated by the range of sincere opinions when it comes to the question of assessing pain. But in all the discussions one little fact was consistently overlooked, a fact that was stated most clearly by Eldon Tunks 30 years ago: you can't measure pain. It was true then, and it is equally true now.

As pain is a subjective experience and **the patient, not clinician, is the authority on the pain and that his or her self-report is the most reliable indicator of pain.**

As pain is a subjective experience

The patient, not clinician, is the authority on the pain and that his or her self-report is the most reliable indicator of pain.

Factors that prompted such attention include -

- The high prevalence of pain
- Continuing evidence that pain is undertreated
- A growing awareness of the adverse consequences of inadequately managed pain.

Because pain itself can't be measured, the temptation has been to set up surrogates, all of which suffer from the same logical flaw: to establish correlations with pain intensity and pain relief we have to be able to measure pain.

Of course, if we could measure pain none of these surrogates would be necessary.

The nature of the assessment varies with multiple factors -

purpose of the assessment

the setting

patient population

Clinician

so no single approach is appropriate for all patients or settings.

Three keynotes

- History
- Clinical examination
- Investigations

Numerous pain scales for practical assessment of pain intensity in clinical studies have been developed

Instruments for intensity assessment

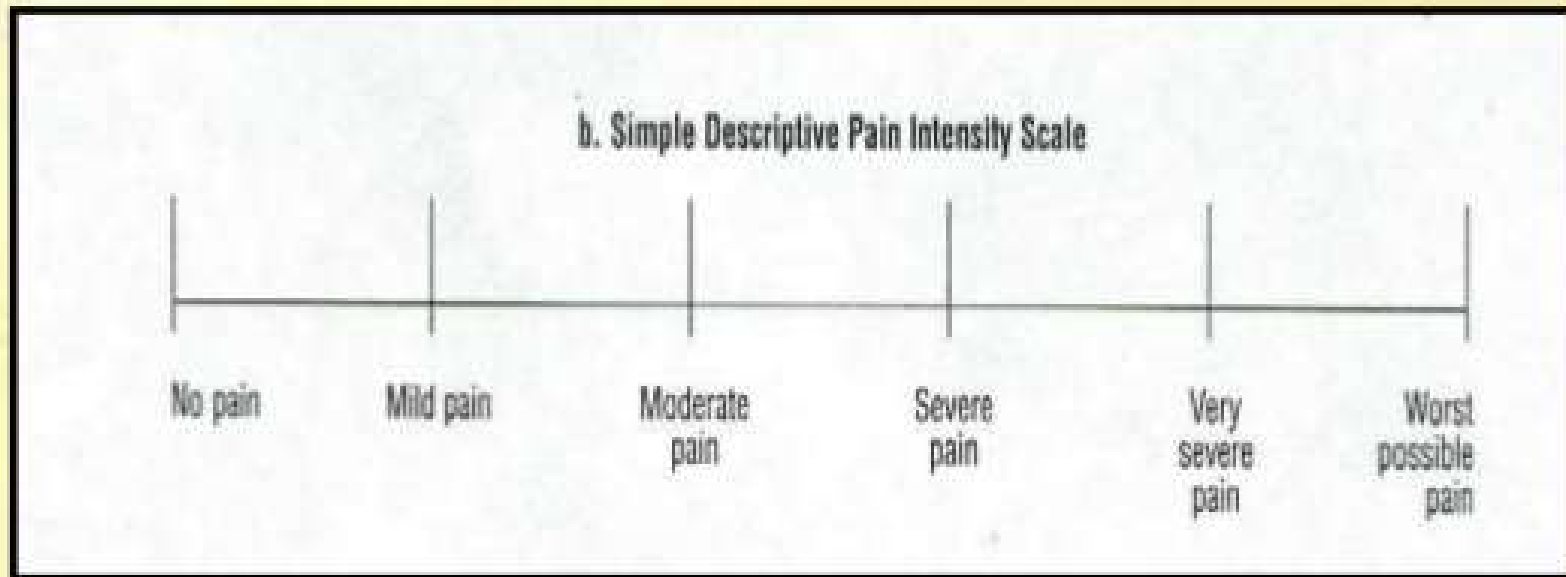
Unidimensional	Multidimensional
<ol style="list-style-type: none">1. Verbal rating scale2. Binary scale3. Numerical rating scale4. Faces rating scale5. Visual analog scale	<ol style="list-style-type: none">1. Mc Gill pain questionnaire2. Brief pain inventory3. West Haven-Yale multidimensional pain inventory4. Medical outcome study 36 items short form (SF-36) health survey

Unidimensional instruments

Verbal rating scales (VRS)

- Response is noted as none, mild, moderate or severe
- Advantages – Simple & short,
 - **Easy to express** and understand specially in elderly
- Disadvantage – Lack of reproducibility
 - **Limited selection of descriptors**
 - Patient tend to select moderate grades than extremes

Verbal Rating Scale



The binary scale

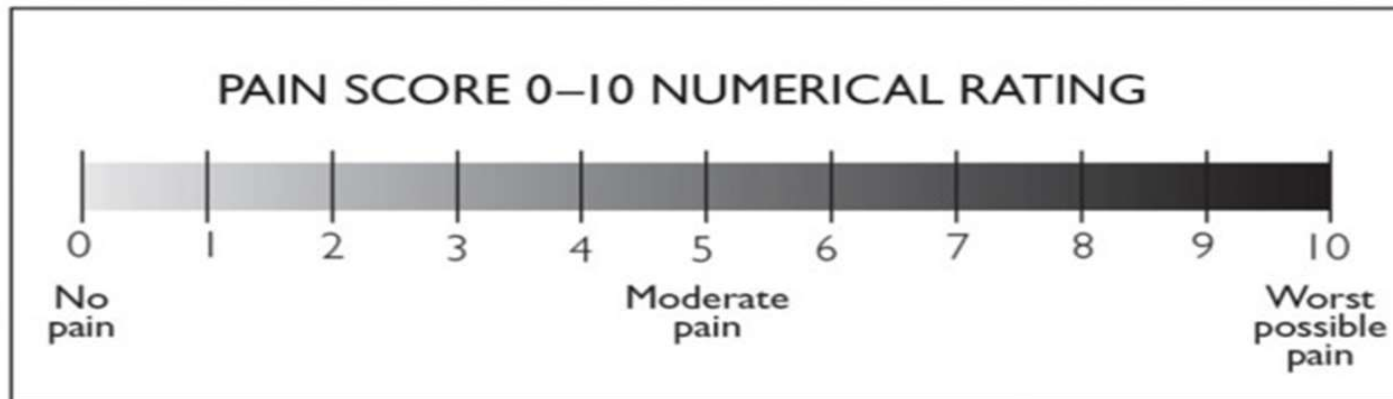
e.g. Do you have a 70% reduction of your pain?

“Yes/No”

- Advantages – Short, easy to express and understand
- Disadvantage - Lack of reproducibility

The Numerical rating scale (NRS)

- Most commonly used
- A reduction of 30% or 2 points and more from baseline – positive response for treatment



Advantage-

- Simplicity, reproducibility and easy comprehensibility
- Sensitivity to small changes to pain
- **Children at 5 years**, who can count and have concept about numbers can use this scale

Disadvantage-

- Digital scale reduces the capacity to detect subtle changes

The faces rating scale (Wong-Baker)

- Patient is asked to point at various facial expressions ranging from a **smiling face to an extremely unhappy face**.



➤ Advantage –

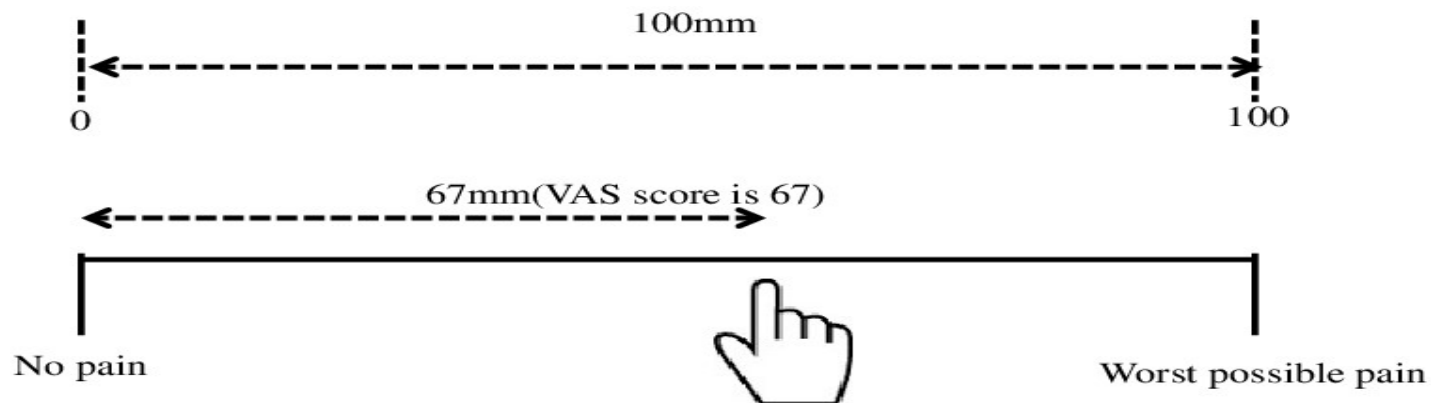
- When the communication with the patient is difficult as with the **pediatric and deaf and dumb** patients
- This pain scale is also appropriate for patients **who do not know how to count**

➤ Disadvantage –

- It may lead to **overestimation of pain** because children with no pain but with distress from other sources may be reluctant to choose the smiling face.

The visual analog scale (VAS)

- 10 cm horizontal line
- The distance from no pain to the patient mark indicates the severity of pain numerically
- Advantage – simple, efficient, valid and minimally intrusive
- Disadvantage – **More time consuming** than others and some difficulty in understanding in elderly



Multidimensional instruments

Melzack and Torgerson – 1971

1. Provides more complex information about patients pain
2. For assessing chronic pain
3. For elucidation of sensory components and also cognitive and psychological dimensions
4. Time consuming (Used in research settings)

The Mc Gill pain questionnaire (MPQ)

- Defines pain in **3 major dimensions** by 20 sets of descriptive words divided as –
 - a) 10 sets describes sensory-discriminative (nociceptive pathway)
 - b) 5 sets describe motivational – affective (reticular and limbic structure)
 - c) 1 set describe cognitive evaluative
 - d) 4 sets describe miscellaneous dimensions
- Advantage – Helps in diagnosis as choice of descriptive words that characterized the pain correlates well with pain syndromes
- Disadvantage – High level of anxiety and psychological disturbances can obscure the MPQ discriminative capacity

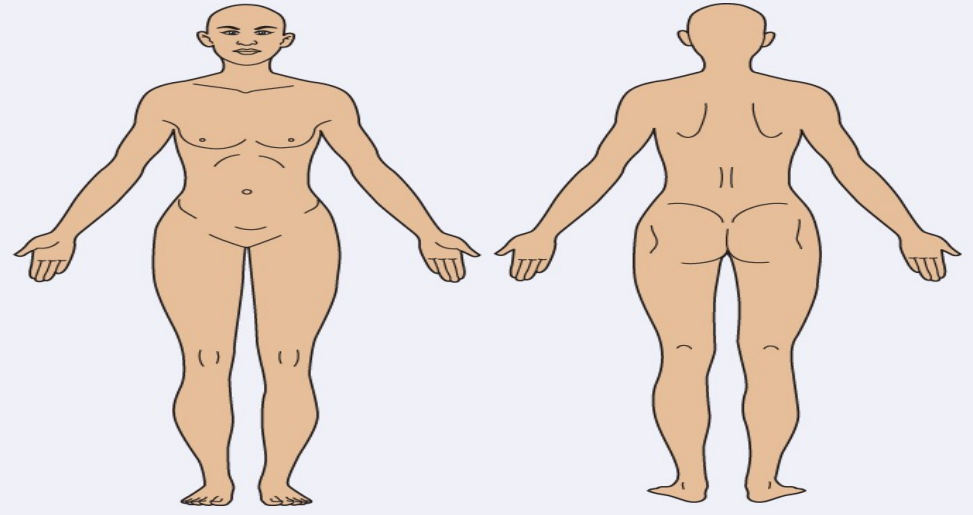
McGill Pain Questionnaire

Patient's Name _____ Date _____ Time _____ a.m./p.m.

PRI: S _____ A _____ E _____ M _____ PRI (T) _____ PPI _____
 (1-10) (11-15) (16) (17-20) (1-20)

1 Flickering Quivering Pulsing Throbbing Beating Pounding	11 Tiring Exhausting
2 Jumping Flashing Shooting	12 Sickening Suffocating
3 Pricking Boring Drilling Stabbing Lancinating	13 Fearful Frightful Terrifying
4 Sharp Cutting Lacerating	14 Punishing Gruelling Cruel Vicious Killing
5 Pinching Pressing Gnawing Cramping Crushing	15 Wretched Blinding
6 Tugging Pulling Wrenching	16 Annoying Troublesome Miserable Intense Unbearable
7 Hot Burning Scalding Searing	17 Spreading Radiating Penetrating Piercing
8 Tingling Itchy Smarting Stinging	18 Tight Numb Drawing Squeezing Tearing
9 Dull Sore Hurting Aching Heavy	19 Cool Cold Freezing
10 Tender Taut Rasping Splitting	20 Nagging Nauseating Agonizing Dreadful Torturing
PPI	
0 No Pain	1 Mild
2 Discomforting	3 Distressing
4 Horrible	5 Excruciating

Brief _____	Rhythmic _____	Continuous _____
Momentary _____	Periodic _____	Steady _____
Transient _____	Intermittent _____	Constant _____



E = External
I = Internal

Comments:

Brief pain inventory (BPI)

- It has become **one of the most widely used measurement tools for assessing clinical pain.**
- **Assessment areas:**
 - Severity of pain
 - impact of pain on daily function
 - location of pain
 - pain medications
 - amount of pain relief in the past 24 hours or the past week

➤ Two versions available-

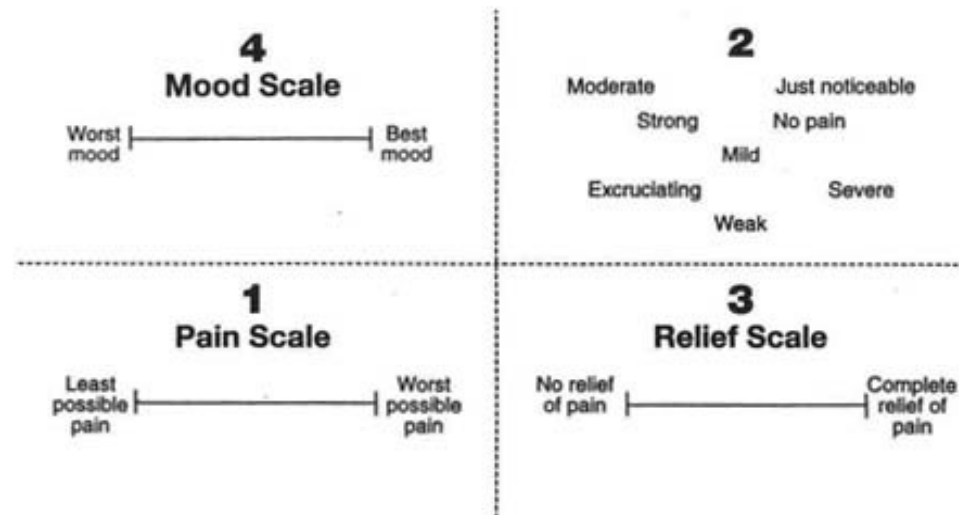
- Longer version of the BPI used a recall period of one week
- Shorter versions of the BPI uses a 24-hour recall period
- BPI long form is still used as a baseline measure in clinical trials, the shorter version has become the standard for use in clinical and research applications

➤ Advantage –

- Valid for cancer pain and various pain syndrome
- Helps in **comparing international trials with different cultures and population**

Memorial pain assessment card

- Pain assessment tool for **cancer patients**
- Consist of **three separate visual analog scales** and assess pain intensity, pain relief and mood of the patients.
- Card includes a set of eight objectives to describe pain intensity



Advantage -

Extremely quick to use, with only a few seconds needed in most cases, so repeated measures are not a burden to either the patient or the care provider.

Disadvantage -

It is not an extensively used or very well studied tool and has mostly been used only in cancer patients.

Assessment of quality or nature of pain

Important for diagnosing the nature or character of pain whether it is nociceptive or neuropathic or a mixed nature

1. Leeds assessment of neuropathic symptoms and signs

- It has two components in form of symptoms and signs
- For each item binary response is noted – yes/no
- Scores $\geq 12/24$ indicate pain is likely to be **neuropathic**

Use is limited – because of need for clinical examination and pinprick testing

Symptoms

Pricking, tingling, pins and needles sensation [5]

Electric shocks or shooting [2]

Skin color change [5]

Pain evoked by light touch [3]

Skin temperature – hot or burning [1]

Signs

Brush allodynia [5]

Raised pin prick threshold [3]

Scores in square brackets.

Neuropathic pain questionnaire (NPQ)

- The NPQ is a **self questionnaire** consisting of 12 items
 - 10 related to sensations or sensory response
 - 2 related to affect
- Each item is scored on a scale of 0 (no pain) to 100 (worst possible pain)

Burning pain

Squeezing pain

Overly sensitive to touch

Freezing pain

Shooting pain

Unpleasant (affect)

Numbness

Overwhelming (affect)

Electric pain

Increased pain to touch

Tingling pain

Increased pain to weather changes

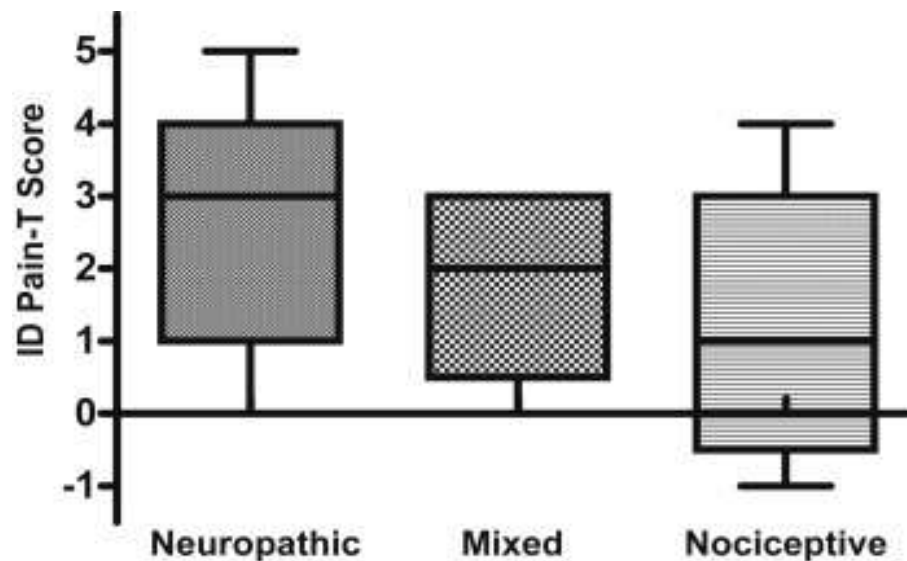
Douleur neuropathique 4 (DN 4) questions

- Consists of 7 items related to symptoms and 3 items related to physical examination
- Each item is scored 1 (yes) or 0 (no)
- Sum of all 10 items is taken as total score
- Score of ≥ 4 as neuropathic pain

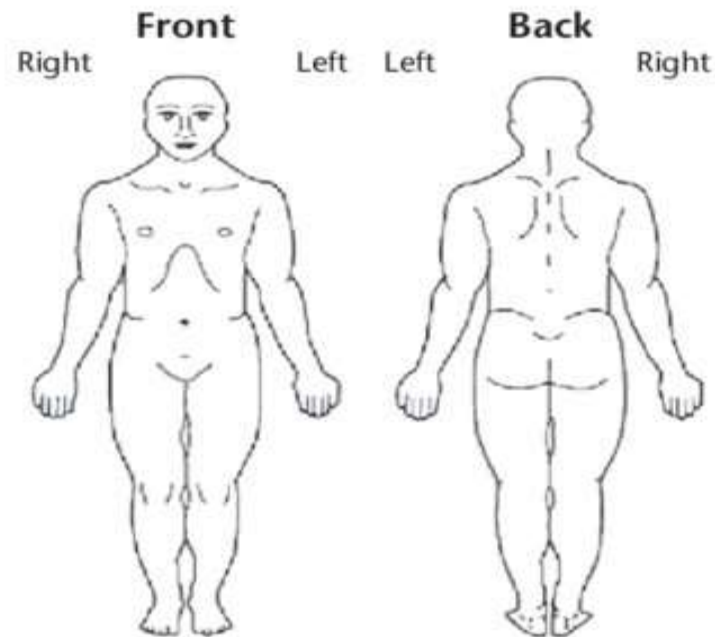
Symptoms	Signs
Burning	
Painful cold	
Electric shocks	Hypoesthesia to touch
Tingling	Hypoesthesia to prick
Pins and needles	Pain caused or increased by brushing
Numbness	
Itching	

ID pain

- It is a **self questionnaire** consisting of 5 sensory description and 1 item regarding pain located in the joints
- **Higher scores indicates neuropathic pain**



On the diagram, below, shade in the areas where you feel pain. If you have more than one area, circle the area that bothers you the most.



Mark 'Yes' to the following items that describe your pain over the past week and 'No' to the ones that do not.

Question	Score	
	Yes	No
1. Did the pain feel like pins and needles?	1	0
2. Did the pain feel hot/burning?	1	0
3. Did the pain feel numb?	1	0
4. Did the pain feel like electrical shocks?	1	0
5. Is the pain made worse with the touch of clothing or bed sheets?	1	0
6. Is the pain limited to your joints?	-1	0

Total score = 3-5: 69% probability of NeP (using c-index)

Sensitivity and Specificity of Neuropathic Pain Screening Tools

Name	Description	Sensitivity*	Specificity*
Interview-based			
NPQ	10 sensory-related items + 2 affect items	66%	74%
ID-Pain	5 sensory items + 1 pain location	NR	NR
painDETECT	7 sensory items + 2 spatial characteristics items	85%	80%
Interview + physical tests			
LANSS	5 symptom items + 2 clinical exam items	82–91%	80–94%
DN4	7 symptom items + 3 clinical exam items	83%	90%

Tests incorporating both interview questions **and** physical tests have higher sensitivity and specificity than tools that rely only on interview questions

*Compared with clinical diagnosis

DN4 = Douleur neuropathic en 4 questions; LANSS = Leeds Assessment of Neuropathic Symptoms and Signs;

NPQ = Neuropathic Pain Questionnaire; NR = not reported

Bennett MI *et al. Pain* 2007; 127(3):199-203.

Psychological assessment

- Patient in pain can have some psychological disorder like anxiety or depression
- Tools available are
 - ✓ Patient health questionnaire (PHQ-9)
 - ✓ Becks depression inventory (BDI)
 - ✓ Hamilton depression scale
 - ✓ Hospital anxiety and depression scale (HADS)
 - ✓ Pain catastrophizing scale (PCS)
 - ✓ The Tempa scale of Kinesophobia

PATIENT HEALTH QUESTIONNAIRE - 9

Over the <u>last 2 weeks</u> , how often have you been bothered by any of the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead or of hurting yourself in some way	0	1	2	3

FOR OFFICE CODING

_____ 0 _____ + _____ + _____ + _____
 =Total Score: _____

If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

**Not difficult
at all**

**Somewhat
difficult**

**Very
difficult**

**Extremely
difficult**

Becks depression inventory

- 21 parameters and each are graded from 0 to 3, total score of 63
- Results
 - ✓ 1-10 = Normal
 - ✓ 11-16 = Mild mood disturbance
 - ✓ 17-20 = Borderline
 - ✓ 21-30 = Moderate depression
 - ✓ 31-40 = Severe depression
 - ✓ > 40 = Extreme depression

Hamilton depression scale

- 17 parameters with score grade of 0 to 4
- i.e. symptom is absent, mild, moderate, severe
- Total score 54

Hospital Anxiety and Depression Scale (HADS)

- 14 parameters
- 2,4,6,8,11,12,14 = Anxiety
- 1,3,5,7,9,10,13 = Depression

Results

- 0-7 = non case
- 8-10 = borderline case
- 11 or above = case

Furthermore, available evidence on the most promising current approaches and areas for possible future developments can be focused on five main strategies, each with its own advantages and disadvantages where each strategy has shown areas of promise.

These encompass:

- (i) monitoring changes in the autonomic nervous system
- (ii) biopotentials
- (iii) neuroimaging
- (iv) biological (bio-) markers
- (v) composite algorithms

Autonomic nervous system changes for pain assessment

Pain is thought to exacerbate the autonomic response to stress and increases in circulating stress hormones in response to pain.

A number of potentially objective assessment tools have been developed that utilize the assumption that pain induces alterations in the autonomic nervous system. These include-

- heart rate variability
- patterns of blood pressure and heart rate responses
- pulse wave amplitude and pulse beat interval
- skin sweating
- pupillary changes

Biopotentials

Biopotentials are electric potentials that transfer information between living cells. They are measured as electrocardiography, electro-encephalography (EEG) or electromyography (EMG), and can be incorporated into methods that aim to assess responses to nociception and pain.

- Nociception flexion reflex threshold
- Evoked potentials (less expensive, and more clinically practical)
- Magneto-encephalography and electro-encephalography (clinically impractical)
- Processed electro-encephalography

Neuroimaging and related methods

Neuroimaging is increasingly used to assess the correlation between functional and morphological status of the nervous system, and painful stimuli or conditions.

All assess neuronal function, and allow investigation of how activity in the spinal cord and brain changes depending on the quality , intensity location and duration of painful stimuli.

Common methods include-

- **positron emission tomography (PET)**
- **Magnetic resonance imaging (MRI)**
- **Functional near-infrared spectroscopy** (lack of exposure to ionising radiation, which allows for repeated use over extended periods of time)

Biomarkers

biomarker research has the potential to develop truly objective pain measures, by using an integrated systems approach that focuses on the 'onomics': measuring genetic or protein responses, or metabolic products, at cellular level.

A number of avenues could be exploited to develop pain biomarkers.

The most obvious are-

- Stress hormonal and metabolic changes
- Noxious stimulation response index (NSRI)
- Serum lipid levels
- Immunoassays

Composite algorithms

As individual physiological variables are unlikely to become validated markers of nociception alone, algorithms that encompass several parameters might provide an alternative solution.

Furthermore, combining multiple physiological parameters better reflects the complex nature of pain.

These multi-variable approaches appear to be superior predictors of pain intensity and intra-operative nociception to any individual parameter alone.

- ECG, PPG, EEG (RE)
- HRV, SE, RE, PPG (RN)
- HRV, SE, RE, PPG (RN)
- HR, HRV, NFSC, PPG (NoL)

Developing an objective method of pain assessment therefore needs to ensure tools that are sensitive and specific to pain.

They need to be observer-independent, not reliant on the patient's ability to communicate and not influenced by disease characteristics.

THANK YOU

For

Bearing pain