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Perspective

From subjective scores to structured stratification: development of the Objective Pain Assessment Scale (OPAS): a clinical observation

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Abstract

Pain assessment remains a fundamental yet challenging component of clinical practice. The Visual Analog Scale (VAS) is widely used pain assessment tool in research and clinical practice; however, reliance on a unidimensional self-reported numeric score risks oversimplifying a complex and multidimensional experience. Subjective pain ratings are influenced by cognitive, emotional, cultural, and contextual factors, which may limit their reliability when used in isolation to guide analgesic therapy.

This article critically examines the limitations of VAS and situates them within the broader landscape of multidimensional pain assessment tools. Based on multicenter clinical observations across emergency departments and thoracic surgical services in Sweden, the Objective Pain Assessment Scale (OPAS) is introduced as an original conceptual framework designed to complement self-report tools. OPAS integrates physiological trends, behavioral indicators, and contextual clinical judgment into a structured grading system intended to support more consistent pain stratification.

OPAS is presented as a hypothesis-generating model derived from longitudinal clinical experience and requires formal psychometric validation before widespread implementation.

Keywords: Pain measurement, Pain assessment, Multidimensional pain, Vital signs, Clinical decision-making, Analgesics

Introduction

Pain assessment is a critical component of patient care in clinical practices especially postoperative pain and cancer pain. Accurate pain measurement is essential to guide appropriate pain management strategies. Pain assessment tools range from unidimensional measures like single-item scales to multidimensional measures like the multidimensional pain inventory (MPI). Among the various pain assessment tools, the visual analog scale (VAS) presented in the early 1920s is one of the most commonly used [1].

The VAS is a simple numeric scale ranging from 0 to 10 that allows patients to rate their pain intensity either by marking a point on a line or by providing a self-assessed numerical value that reflects their current state [2].

While tools such as VAS have been widely adopted due to their simplicity, growing evidence highlights significant limitations in their reliability and clinical applicability. Patients may interpret scale endpoints inconsistently, and scores are influenced by cognitive status, emotional state, cultural background, and prior pain experiences. These factors raise concerns regarding the sole reliance on subjective numeric ratings in guiding analgesic therapy. Recent systematic reviews have further

demonstrated that multidimensional pain scales may more accurately reflect analgesic requirements in acute care settings compared to unidimensional tools such as VAS or NRS, underscoring the potential limitations of relying solely on numeric intensity ratings for clinical decision-making [3].

Today, the experience of pain can be influenced by a significantly broader range of factors compared to over half a century ago. A substantial number of individuals grappling with mental health conditions, particularly generalized anxiety and depression, attribute their distress to a range of visual and auditory stimuli stemming largely from the incessant and accelerated dissemination of often unrealistic content through various media channels, notably social media platforms. According to the findings of the Royal Society for Public Health and the Young Health Movement, the incidence of anxiety and depression in the younger demographic has surged by 70% over the course of the past quarter-century [4].

During clinical work in emergency departments and surgical wards in Uppsala, Västerås, and Gävle, as well as in postoperative thoracic surgery units at Karolinska University Hospital in Stockholm, recurrent discrepancies were observed between VAS scores and objective clinical presentation. These observations motivated the development of the Objective Pain Assessment Scale (OPAS).

Limitations of the Visual Analog Scale

Despite its widespread use, recent research has highlighted the limitations of the VAS in measuring pain accurately. Firstly, there is a lack of standardization in the use of the VAS. Patients and healthcare providers may have different interpretations of the anchor points such as "no pain" or "worst pain imaginable". It is also possible that one patient's interpretation of "7 out of 10" may not be the same as another patient's interpretation of the same rating [1,5]. Moreover, the VAS assumes that patients can reliably conceptualize and quantify pain intensity along a linear continuum. The limitations of self-reported scales become particularly evident in populations with communication challenges, where reliance on subjective reporting may compromise assessment accuracy. A recent systematic review highlighted substantial variability and limitations of pain assessment tools in adults with communication disorders, further supporting the need for complementary objective or observational frameworks [6]. However, this assumption is not always valid, particularly in acute care settings, among individuals with cognitive impairment, in the presence of language barriers, or during emotionally charged clinical situations. In addition, VAS scores do not consistently correlate with physiological stress responses or actual analgesic requirements, which may result in the under- or overtreatment of pain.

Furthermore, asking patients to objectify their experience of pain is very similar to asking them to describe a color. While a few may label it as indigo, and a smaller number might opt for turquoise, the majority would likely settle on blue. On the Visual Analog Scale, this 'blue' sensation typically falls within the range of 4 to 6, as seems to be the most frequently reported levels.

Therefore, it is easy, for an experienced clinician, to perceive the provided numbers as exaggerated. Most patients tend to lower the reported scores by at least two digits when describing the pain of a heart attack as VAS 4 or the discomfort of childbirth as VAS 8. Secondly, there is intra-individual variability in pain perception, making it difficult to use a single measurement tool like the VAS to measure pain continuously. Pain is a subjective experience and can be influenced by many factors such as mood, anxiety, sleep, and cultural factors. These factors can result in variability in pain perception and, consequently, inaccurate pain measurements using the VAS [2].

Thirdly, the use of the VAS does not consider the temporal characteristics of pain. Patients may experience pain at different times of the day or with different activities, resulting in variability in pain intensity and duration. Using the VAS to measure pain at a single point in time may not provide an accurate representation of the patient's true pain experience [2,7].

Research has shown that the use of the VAS can result in inaccurate pain measurements due to a variety of factors, including individual variability and measurement error [1,2,7].

A patient lying comfortably in bed with normal vitals, expressing discontent with current pain medication while rating pain as VAS 7–8 prompts us to contemplate whether our emphasis should be on prompting patients to quantify their pain or allowing them to articulate and describe their pain, enabling us to systematically objectify their experience for a more comprehensive assessment.

A preliminary observation of the Swedish patient population has unveiled intriguing hypotheses. It seems that elevated alcohol consumption may lower the pain threshold while simultaneously increasing the threshold for analgesics. For instance, approximately 87% of middle-aged male patients report a VAS scores of 8 for a comparable situation and medication, whereas females who have undergone childbirth and exhibit very low to moderate alcohol consumption indicate a VAS scores of 4.

The other major observation is that ethnicity and cultural background significantly impacted VAS levels. Individuals with Middle Eastern background reported VAS scores of 9–10 and required almost double the dosage analgesics compared to individuals with a Finish background, who reported VAS scores of 3 for a comparable situation.

Clinical Observations Motivating the Development of OPAS

Several recurring patterns were observed across institutions and patient populations:

Younger patients frequently reported higher VAS scores relative to physiological stability and observable behavioral distress compared to older patients undergoing comparable procedures.

Gender-related differences in reporting patterns were also noted, with some younger female patients tending to report higher VAS scores than age-matched males or older females despite similar clinical findings.

Variability in pain reporting across cultural and linguistic backgrounds was observed. Differences appeared to reflect sociocultural norms regarding pain expression, communication styles, and expectations surrounding medical care rather than inherent differences in pain perception. These observations are consistent with existing literature demonstrating that pain reporting is shaped by socialization, cultural frameworks, and contextual interpretation.

A consistent anchoring effect was also observed. When VAS questions were reframed using contextual anchors (e.g., referencing

commonly understood painful experiences), reported scores frequently decreased by approximately two points. This suggests that numeric pain ratings are sensitive to question framing and cognitive anchoring.

These patterns raised concerns regarding sole reliance on unidimensional numeric self-report when making analgesic decisions.

Alternative Pain Assessment Tools

Recognizing the multidimensional nature of pain, several validated instruments have been developed.

The Brief Pain Inventory (BPI) evaluates pain intensity, location, and interference with daily functioning. The McGill Pain Questionnaire (MPQ) assesses sensory and affective qualities of pain using descriptive categories. The Pain Catastrophizing Scale (PCS) evaluates cognitive-emotional responses associated with pain amplification and maladaptive coping.

In critical care and non-verbal populations, behavioral and observational tools are frequently used, incorporating facial expression, motor response, and physiological parameters.

Although these instruments provide richer multidimensional assessment compared to VAS, most remain dependent on patient self-report and may be impractical in acute, time-sensitive, or communication-limited settings. Few tools explicitly integrate physiological deviation from baseline into a structured, graded clinical stratification model designed to guide analgesic decision-making. A comparative overview of the principal characteristics, domains assessed, feasibility considerations, and key limitations of these instruments is presented in (**Table 1**). OPAS was developed to address this gap.

Development of the Objective Pain Assessment Scale (OPAS)

The Objective Pain Assessment Scale (OPAS) was conceptualized and developed by the author based on longitudinal clinical exposure and structured observational patterns across three Swedish hospitals and a tertiary thoracic surgery center.

OPAS was designed to:

- Reduce interpretive variability associated with isolated numeric scales
- Integrate objective physiological trends
- Preserve clinician judgment
- Support standardized yet context-sensitive pain stratification

At its current stage, OPAS represents a hypothesis-generating framework requiring formal validation prior to broad implementation.

Components of OPAS

Objective indicators incorporated into OPAS include:

- Heart rate trends relative to baseline
- Blood pressure deviations
- Respiratory rate
- Autonomic signs such as diaphoresis
- Observable motor and behavioral responses

These indicators are interpreted within clinical context to avoid misattribution of physiological changes unrelated to pain (e.g., infection, anxiety, medication effects).

Table 1. Comparative overview of pain assessment instruments.

Instrument	Primary Domains Assessed	Self-Report vs Objective	Time Requirement	Clinical Setting Suitability	Key Limitations
Visual Analog Scale (VAS)	Pain intensity (unidimensional)	Self-report only	Very brief (<1 min)	Emergency, outpatient, postoperative	Subject to anchoring bias; no multidimensional assessment; limited physiological correlation
Brief Pain Inventory (BPI)	Pain severity; interference with mood, sleep, work, function	Self-report	5–10 minutes	Oncology, chronic pain clinics	Requires literacy; less practical in acute or time-sensitive settings
McGill Pain Questionnaire (MPQ)	Sensory, affective, evaluative pain descriptors	Self-report	10–20 minutes	Chronic pain evaluation, research settings	Time-intensive; complex scoring; limited emergency feasibility
Pain Catastrophizing Scale (PCS)	Cognitive-emotional amplification of pain	Self-report	5–10 minutes	Chronic pain, psychological assessment	Does not measure physiological or acute pain intensity directly
Behavioral Pain Scales (ICU tools)	Facial expression, motor response, ventilator compliance	Observational	2–3 minutes	ICU, non-verbal patients	Limited applicability to communicative patients; does not integrate patient narrative
Objective Pain Assessment Scale (OPAS)	Physiological trends; behavioral markers; contextual judgment; graded stratification (0–4)	Hybrid (self-report + objective indicators)	2–5 minutes	Emergency, postoperative, acute care	Requires formal validation; vital signs may be influenced by non-pain factors

Table 2. Integrating objective and subjective measures for an enhanced pain estimation using the Objective Pain Assessment Scale (OPAS).

OPAS	Description
0	No subjective or objective pain
1	Cardiological and respiratory functions are normal despite experiencing unspecified pain, which appears to have no subjective impact
2	Can identify the pain's specific location when it influences movement, but not when the body is at rest
3	Affected by pain at rest without influencing vital signs such as blood pressure, heart rate, and respiratory rate
4	Affected by pain, which evidently influences vital signs

OPAS categorizes pain into five grades (0–4, **Table 2**) based on structured integration of physiological deviation, behavioral markers, and clinical context. It is intended to complement—not replace—patient self-report.

Cultural and Individual Considerations

Pain expression varies across individuals and populations. Sociocultural background, language, prior medical experiences, and health beliefs can influence how pain is described and quantified. These differences do not imply variation in pain validity but rather reflect diverse communication frameworks.

OPAS does not seek to override patient self-report. Instead, by integrating physiological and behavioral indicators with contextual clinical assessment, it aims to reduce sole reliance on culturally influenced numeric scales while maintaining sensitivity to individual experience. Future validation studies will include diverse populations to ensure equitable calibration and to minimize systemic bias.

Discussion

The implementation of a new approach to measure pain using the Objective Pain Assessment Scale (OPAS) in clinical settings can offer several advantages for pain management. OPAS emerged from repeated clinical observations in which Visual Analog Scale (VAS) scores did not consistently align with observable clinical presentation or analgesic requirements. OPAS provides a rapid and structured assessment of pain levels without relying solely on patient self-report.

Unlike VAS, which is exclusively self-reported, OPAS integrates subjective and objective parameters into a structured grading model. Emerging research increasingly explores the incorporation of physiological signals and multimodal parameters in pain assessment, reflecting a broader movement toward objective augmentation of subjective reporting [8]. These developments align conceptually with the rationale underlying OPAS, although OPAS remains a clinically derived framework pending formal validation. Rather than replacing VAS, OPAS is introduced as a complementary framework grounded in clinical observation and designed for formal validation. By categorizing pain into specific grades based on combined criteria, OPAS allows for a more comprehensive understanding of the patient's pain experience.

This structured grading model enables healthcare providers to better interpret the nature, intensity, and functional impact of pain. Such stratification may support more consistent analgesic titration, reduction of overtreatment, improved opioid stewardship, and enhanced longitudinal tracking of pain trends. OPAS incorporates objective indicators such as vital signs alongside patient-reported symptoms, providing an additional clinical reference point when determining appropriate pain management strategies.

Because VAS relies heavily on subjective self-reporting, scores may be influenced by factors such as individual pain tolerance, emotional state, or communication barriers. Recent innovations, including multimodal digital pain assessment platforms integrating visual, auditory, and tactile components, further highlight ongoing efforts to transcend purely numeric scales [9]. Such approaches reflect growing recognition that pain assessment requires multidimensional integration beyond intensity alone. OPAS offers a more standardized framework that may reduce subjective variability and improve clinical consistency in assessment.

Opioid prescriptions carry inherent risks, including misuse, dependency, and overdose. By using OPAS, healthcare providers may better differentiate between patients who require higher-intensity analgesia and those who may benefit from alternative or lower-intensity treatments. This structured approach may contribute to more responsible opioid prescribing practices without implying automatic escalation based solely on numerical self-report scores. For example, patients with higher OPAS grades (e.g., 3 or 4) may warrant closer evaluation for more aggressive pain management strategies, whereas lower grades may support non-opioid interventions or multimodal approaches.

Moreover, OPAS facilitates clearer longitudinal monitoring of pain progression. Tracking graded scores over time enables clinicians to adjust treatment plans responsively, ensuring that pain management strategies remain appropriate and effective.

Importantly, this manuscript does not claim superiority of OPAS over VAS. Instead, it presents OPAS as a structured, observation-based model intended to complement existing tools and serve as a foundation for future clinical validation studies.

Limitations

Vital signs may be influenced by factors other than pain, including anxiety, infection, or medication effects. OPAS mitigates this limitation by requiring contextual interpretation.

A major limitation is the absence of prospective comparative validation. Current conclusions are based on structured clinical observations rather than controlled trials.

Proposed Validation Study Protocol

Study design

A prospective, multicenter observational cohort study comparing OPAS and VAS in adult postoperative and emergency department patients.

Objectives

Primary objective

To evaluate the predictive validity of OPAS compared to VAS in relation to total analgesic consumption within 24 hours.

Secondary objectives

- Correlation with opioid consumption (morphine milligram equivalents)
- Association with length of hospital stay
- Incidence of pain-related complications
- Patient satisfaction scores
- Inter-rater reliability
- Test–retest reliability

Population

Inclusion

- Adults ≥18 years
- Postoperative or acute pain presentation

Exclusion

- Hemodynamic instability unrelated to pain
- Severe cognitive impairment precluding assessment

Data collection

At predefined intervals

- VAS score
- OPAS grade
- Vital signs
- Analgesic administration
- Clinical outcomes

Statistical framework for comparative trials

Sample size calculation

Power analysis based on detecting a moderate effect size (Cohen's $d = 0.5$) in opioid consumption between stratification groups, with $\alpha = 0.05$ and power = 0.80.

Reliability

- Inter-rater reliability: Intraclass correlation coefficient (ICC)
- Internal consistency (if composite scoring refined): Cronbach's alpha

Validity

- Construct validity: Spearman or Pearson correlation between OPAS and VAS
- Predictive validity: Multivariable linear regression modeling opioid consumption
- Discriminative validity: ROC curve analysis comparing predictive accuracy for high analgesic requirement

Multivariable modeling

Adjust for:

- Age
- Sex
- Ethnicity
- Baseline comorbidities
- Psychological history

Sensitivity analyses

- Stratified analysis by surgical type
- Subgroup analysis by age group
- Adjustment for baseline vital variability

Future Directions

Following observational validation, a randomized controlled trial may evaluate whether OPAS-guided analgesic protocols reduce opioid exposure without compromising patient satisfaction or pain control.

Health-economic modeling may assess cost-effectiveness in relation to admission duration and analgesic utilization.

Conclusion

The Visual Analog Scale remains widely used but has interpretive limitations. The Objective Pain Assessment Scale (OPAS), developed from clinical observations, offers a structured framework integrating physiological, behavioral, and contextual indicators. OPAS should be considered a conceptual model pending formal validation. Its potential lies in enhancing consistency of pain stratification while preserving the subjective voice of the patient within a broader clinical framework.

Ethics Approval and Consent to Participate

Not applicable.

Availability of Supporting Data

Not applicable.

Conflict of Interest

The author has no conflicts of interest to declare.

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