

Medical risk assessment in dentistry: use of the American Society of Anesthesiologists Physical Status Classification

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IN BRIEF

- Improved awareness of ASA PS Classification as a tool for assessment and communication between settings.
- Exploration of ASA PS strengths and limitations for dentists and anaesthetists in everyday practice.
- Increased knowledge of alternative medical and dental patient risk assessment tools.

Background Medical risk assessment is essential to safe patient management and the delivery of appropriate dental care. The American Society of Anesthesiologists Physical Status (ASA PS) Classification is widely used within medicine and dentistry, but has received significant criticism. This is the first UK survey to assess the consistency of medical risk assessment in dentistry. **Aims** (i) To determine the use and consistency of the ASA PS among dentists and anaesthetists. (ii) To consider the appropriateness of the ASA PS in relation to dental treatment planning and delivery of care.

Method A cross-sectional online questionnaire was distributed to anaesthetists and dental practitioners in general practice, community and hospital dental services. Questions focused on professional backgrounds, use of the ASA PS, alternative approaches to risk assessment in everyday practice and scoring of eight hypothetical patients using ASA PS.

Results There were 101 responses, 82 were complete. Anaesthetists recorded ASA PS score more frequently than dental practitioners and found it more useful. Inconsistencies were evident in the assignment of ASA PS scores both between and within professional groups. **Conclusion** Many dental practitioners did not use or find ASA PS helpful, with significant inconsistencies in its use. An awareness of alternative assessment scales may be useful across settings. Accepting its limitations, it would be helpful for all dentists to be educated in ASA PS and its use in medical risk assessment, particularly in relation to conscious sedation.

BACKGROUND

Recent years have seen an increase in life expectancy resulting from the advancements in healthcare.¹ Patients now attend for dental examination and treatment with more complex medical histories, often reporting multiple co-morbidities² and polypharmacy.³ Patient risk assessment is therefore essential to their safe management and the delivery of appropriate dental care.

Within medicine, risk prediction tools are widely used and contribute towards clinical decision making.⁴ Many of these tools focus on the overall physical status of the patient, although some are more specific to the physiological and operative management of a particular disease or procedure.⁵

One of the most widely accepted assessment tools in medicine and dentistry is the American Society of Anesthesiologists Physical Status (ASA PS) Classification.⁶

ASA PS was introduced as a system for the collection and tabulation of statistical data in anaesthesia^{7,8} aimed at linking operative risk and prognostic outcomes of surgery. It was found, however, to be dependent upon too many variables, such as the planned operative procedure, the skill of the surgeon, attention to post-operative care and the experience of the anaesthetist.^{7,8}

The classification offered a method of recording the overall physical status of a patient before surgery and aimed to encourage adoption of common terminology that would make statistical comparisons possible across settings and medical literature.^{7,8} This

has been subsequently modified to the more familiar 6-point scale used today (Table 1).

This classification is used extensively in medicine not only for anaesthetic assessment, but for performance evaluation, clinical research and to inform policy making. In dentistry it is used to summarise patients' general health, though more often used in patients receiving dental treatment under conscious sedation. Recent guidance⁹ states that dentists who undergo training in conscious sedation techniques are expected to know the relevance of the patient's ASA status and this should be documented in the patient's record.¹⁰ Although not mentioned

Table 1 American Society of Anesthesiologists Physical Status Classification⁶

	Definition
I	A normal healthy patient
II	A patient with mild systemic disease
III	A patient with severe systemic disease
IV	A patient with severe systemic disease that is a constant threat to life
V	A moribund patient who is not expected to survive without the operation
VI	A declared brain-dead patient whose organs are being removed for donor purposes
E	Emergency surgery

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in the guidance, it is generally accepted that dental patients who are ASA III or graver are not suitable for the provision of conscious sedation in primary care.¹¹ Despite this it is acknowledged that some Community Dental Services (CDS) may treat patients with additional needs in primary care that are considered to be ASA III.

Despite its popularity, ASA PS has received criticism regarding the accuracy and usefulness of information that it yields.^{7,12,13}

AIMS

This paper aims to determine the use and consistency of the ASA PS among dentists and anaesthetists, and consider the appropriateness of the ASA PS in relation to dental treatment planning and delivery of care.

METHOD

An online link to a cross-sectional questionnaire (Fig. 1) was disseminated via e-mail to a global list of anaesthetists and dentists across London including general dental practitioners (GDPs), hospital dental practitioners (HDPs), and community dental practitioners (CDPs). The questionnaire sought to collect information about the professional backgrounds of the respondents and their use of the ASA PS Classification or other approaches to patient assessment in everyday practice. Prior to this, a pilot questionnaire was distributed to two representatives from each professional group to minimise the risk of errors, in addition to ascertaining face and content validity.

For dentists, questions also focused on experience in conscious sedation and the classifications of patients that they felt would be most appropriately treated in primary or secondary care settings. For anaesthetists, this extended to questions relating to experience of working with dental teams and their perception of the accuracy of dentists using ASA PS scores.

The final section asked respondents to give their ASA PS scores to hypothetical patients. Following feedback from the pilot questionnaire, eight scenarios with varied medical histories were considered sufficient to show an outcome for this investigation.

In order to maximise the number of responses obtained, the link was sent on three occasions through the mailing list. Although the survey was anonymous, participants were prevented from responding more than once from the same e-mail account by software.

RESULTS

One hundred and one responses were initially received, of which 82 were complete. The professional backgrounds and number

of respondents from each group are demonstrated in Table 2.

The largest group assessed were the HDPs. Practitioners from all disciplines and stages of professional development ranging from dental core trainee through to consultant level were included. The GDP group was comprised of those recently qualified, in addition to more experienced practitioners, and CDPs ranged from dental officer to senior dental officer. The majority of the anaesthetist group were very experienced at specialist registrar or consultant levels. This is demonstrated for all groups by the spread of years in holding a primary qualification.

The ASA PS was used most frequently by anaesthetists, with a minority reporting never using it (5.3%, n = 1). Most GDPs reported

never using this tool (80.0%, n = 20), with many stating that the ASA PS was not useful (56.0%, n = 14). Approximately a third of HDPs (33.3%, n = 13) and CDPs (29.4%, n = 5) also agreed that the use of ASA PS Classification was not helpful in daily practice.

A large proportion of HDP (50.0%, n = 20) and CDP (52.9%, n = 9) groups were involved in the delivery of dental treatment under conscious sedation. These practitioners tended to find the ASA PS somewhat helpful, although only a small proportion reported always documenting the score in the patient's records (7.5%, n = 3 and 5.8%, n = 1 respectively), suggesting low compliance with guidance¹⁰ in relation to record keeping.

Q1: What is your profession?
 Q2: Which year did you obtain your primary medical/ dental qualification?
 Q3: If applicable, which year did you obtain your specialist registration?
 Q4: In the medical history, do you make a specific note of the patient's ASA Physical Status Classification?
 Q5: Do you find ASA Physical Status scores of patients helpful in daily practice?
 Q6: Are you aware of any other physical assessment classifications? If yes, please state
 Q7: Do you carry out any form of conscious sedation in your practice?
 Please select the types of conscious sedation you carry out
 Q8: Please select which ASA Physical Status score(s) you would consider referring a patient to Community Dental Services for treatment under conscious sedation?
 Q9: Please select which ASA Physical Status score(s) you would consider referring a patient to Hospital Dental Services for treatment under conscious sedation by dental staff
 Q10: Please select which ASA Physical Status score(s) you would consider referring a patient to Hospital Dental Services for treatment under conscious sedation by dental staff with an anaesthetist present

Additional Questions for Anaesthetists:
 Q1: Do you provide general anaesthesia for dental patients?
 Q2: Do you feel that the dentists you work with are accurate in assigning the correct ASA grades for patients you anaesthetise?

Hypothetical Patients:
 Please indicate the ASA Physical Status score you would assign in the following scenarios:
 1. 22 year old female, fit and well with dental anxiety and latex allergy
 2. 81 year old male with unstable angina
 3. 40 year old male with Down syndrome, BMI 43 kg/m², moderate heart failure, and previous myocardial infarction
 4. 32 year old male with well controlled type 1 diabetes, hypertension and chronic kidney disease that is well managed by haemodialysis
 5. 17 year old female who suffers from anorexia, BMI 12 kg/m², is being treated as an in-patient in a specialised eating disorder clinic
 6. 66 year old male who has smoked 3 packets of cigarettes/day for 40 years, with a productive cough for 5 years and has had 2 courses of antibiotics in the last 6 months for a chest infection. He has breathlessness on climbing 1 flight of stairs, symptomatic relief with ipratropium bromide and prophylactic beclomethasone
 7. 67 year old female with stage 4 nasopharyngeal carcinoma, with metastasis who is having palliative radiotherapy
 8. 57 year old male with a history of alcohol dependency, liver cirrhosis and mild asthma triggered by moderate exercise

Fig. 1 Summary of questionnaire

Table 2 Professional backgrounds of participants

Professional group	Years holding primary qualification				Total
	1- 3 years	4 - 5 years	6- 9 years	≥ 10 years	
GDP	0	10	7	8	25
CDP	6	0	1	10	17
HDP	7	2	11	20	40
Anaesthetist	0	1	1	17	19

Dental practitioners from across settings had little awareness of other physical assessment scales (9.8%, n = 8) compared to anaesthetists (47.4%, n = 9).

GDPs were asked which ASA PS scores they felt should be suitable for treatment in the CDS. Many (54.6%, n = 29 combined responses) felt that ASA PS I and II patients were suitable for referral to this setting. A number (41.6%, n = 22 combined responses) believed that ASA PS III and IV were suitable. A small proportion felt that scores of V and VI were also suitable (3.8%, n = 2 combined responses). Similar results were also seen among members of the CDS and Hospital Dental Service (HDS) regarding ASA scores considered appropriate for treatment under conscious sedation in the dental hospital environment (Fig. 2 and Fig. 3).

All anaesthetists taking part in the study worked regularly with various dental teams, most commonly adult oral surgery (52.6%, n = 10), and least frequently adult special care dentists (15.8%, n = 3). Most of them felt that dentists were able to correctly assign ASA PS most of the time or sometimes (Table 3).

Participants were requested to assign an ASA grade to eight hypothetical patients, which showed considerable variation in results, not only between professional groups, but also within the same groups as summarised in Table 4.

DISCUSSION:

Eighty percent of GDPs (n = 20) never recorded patients ASA PS in the medical history compared to 94.7% of anaesthetists who always (68.4%, n = 13) or sometimes (26.3%, n = 5) documented this. Thirty five percent (n = 6) of CDPs and 55.0% (n = 22) of HDPs never recorded ASA PS scores.

A substantial proportion of anaesthetists within this study felt that dentists were only sometimes or not able to assign an accurate ASA score to patients, although the reason for this assumption is unclear. Inconsistencies were evident among anaesthetists, suggesting that this is likely due to inter-operator variability following the subjectivity of the classification, rather than a difference in applied clinical knowledge.

A particularly low response was received in relation to participant awareness of alternative physical assessment tools. This may be due to a lack of awareness, or the question may have been overlooked by respondents. Suggestions included Mallampati Score, Body Mass Index, Performance Status and the Goldman Index. Learning disability scales were also highlighted, but tended to relate to patient cognitive assessment, which has implications for consent rather than medical risk assessment.

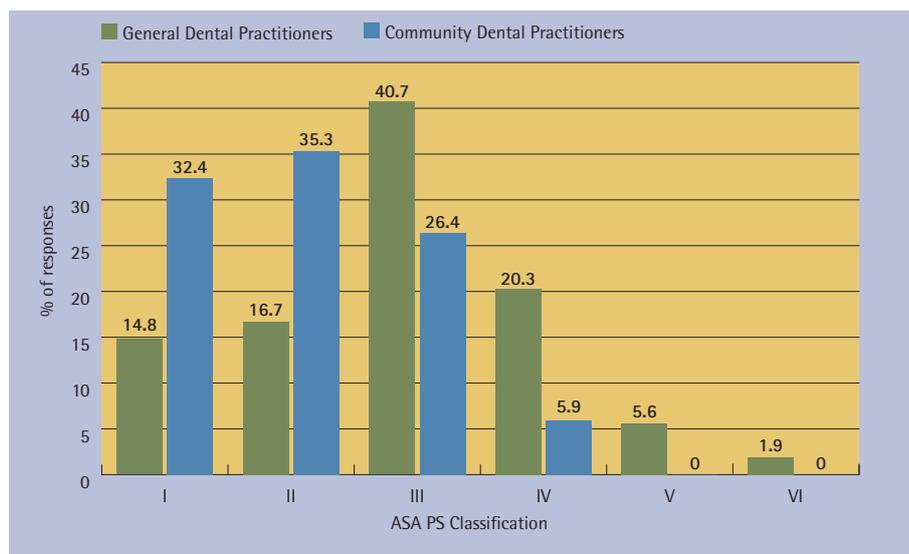


Fig. 2 ASA PS scores considered suitable for referral to the Hospital Dental Service for treatment under conscious sedation delivered by dentists

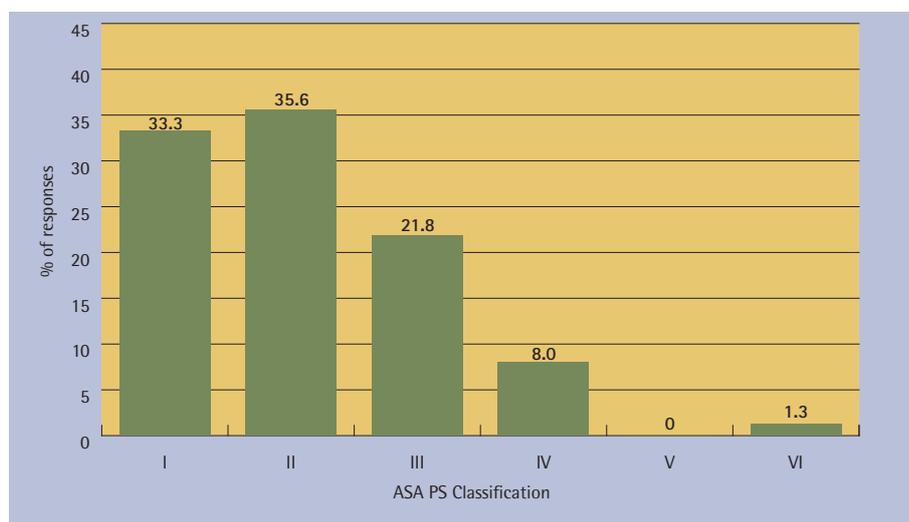


Fig. 3 ASA scores considered suitable by Hospital Dental Practitioners for treatment under conscious sedation in the Hospital Dental Service delivered by dentists

Table 3 Anaesthetist opinion on accuracy of dentist ASA PS Scores

Dentists accurate in ASA assignment	Yes: most of the time	Yes: sometimes	No
% Anaesthetists	42.1	42.1	15.8

An awareness of alternative assessment tools (Table 5) may be important when determining medical risk prediction, especially in a hospital and community setting where it can form the basis of inter-professional communication.

The majority of GDPs felt that patients of ASA PS I-III were appropriate for treatment under conscious sedation in the CDS. However, as CDS is a primary care service, it is not necessarily considered an appropriate setting for delivery of conscious sedation for those graded III and IV.¹¹

A small proportion of GDPs indicated that they would consider referring patients up to

score V (moribund) and VI (brain dead), both in the absence and presence of an anaesthetist to provide conscious sedation in the dental hospital environment, highlighting the lack of knowledge of the ASA PS scale. The ASA PS scale should therefore be used with caution as a means of communication with GDPs. Verbal feedback further emphasised this lack of awareness among GDPs following distribution of the questionnaire.

GDPs did not differ in their ASA PS referral criteria to Community and Hospital Dental Services for conscious sedation, indicating the potential for inappropriate referrals to CDS and secondary care. Additionally, this

would suggest that some GDPs are not aware that, generally, only ASA I and II patients are suitable for treatment in primary dental care¹¹. Ultimately, such confusion will potentially make it difficult for the commissioners of sedation services in dentistry.

In relation to the assignment of ASA PS scores to eight hypothetical patients, this study did not seek to compare responses to a predetermined correct answer in any of the cases, since the level of agreement between

professionals is the closest estimation of the most suitable score.¹³ In all instances, considerable variation was shown between and within each professional group, however, the anaesthetists tended to be more consistently in agreement. For seven of eight hypothetical patients, the predicted ASA PS scores spanned four or more categories.

There are a number of potential reasons for such variation which can be explored using the example of scenario 8: 57-year-old male

with a history of alcohol dependency, liver cirrhosis and mild asthma triggered by moderate exercise. Responses for this scenario spanned from ASA I (normal healthy patient) to ASA V (moribund), suggesting a general lack of awareness of the meaning of each ASA PS score. Taking the highest proportion of answers as the closest approximation of the most suitable score, this scenario would be ASA PS III. The ASA PS Classification has previously described ASA III as 'severe systemic disease that limits activity, but is not incapacitating'.¹⁴ However the term 'incapacitating' has been highlighted as poorly defined, open to interpretation and therefore a source of variability.¹² This ambiguous term has now been removed from the classification,⁶ however, respondents may be unaware of this change and have difficulties interpreting what constitutes 'severe disease'. Therefore, they may have scored with uncertainty due to the broad nature of the ASA PS categories.

Within the professional groups, respondents have different knowledge bases, with some perhaps thinking beyond the information provided in the scenario. For example, some may think of the co-morbidities associated with liver cirrhosis such as portal hypertension and encephalopathy, which may influence their decision making. In these hypothetical scenarios, respondents were unable to ask patients further questions or consult with medical professionals, however, in the clinical situation this could influence scoring.

Variations were not apparently related to years of experience, which is in agreement with findings from a number of external studies,^{12,13} suggesting that education in ASA PS would be beneficial at all levels of each professional group.

Investigations conducted among anaesthetists have highlighted subjectivity and poor reproducibility of the ASA PS Classification.^{7,12,13,25} Specific studies among dental practitioners are lacking, although variability among dental practitioners has been shown when compared to a computer model.²⁶

There are inherent difficulties associated with the subjective nature of this scale.²⁵ It does not include factors such as age, sex, weight, pregnancy, intended surgery, expertise of the anaesthetist or surgeon, degree of pre-surgical preparation or the facilities for postoperative care. The term 'systemic' can be misleading since local disease can cause a significant change in physical status, but is not included in the classification.²⁷ Patients may also fluctuate between ASA PS scores depending on the management of their disease.

Table 4 Participant ASA PS scores for hypothetical patients

Hypothetical patient	Professional group	ASA I (%)	ASA II (%)	ASA III (%)	ASA IV (%)	ASA V (%)	ASA VI (%)
1	GDP	83.3	16.7	-	-	-	-
	CDP	73.3	26.7	-	-	-	-
	HDP	65.0	30.0	5.0	-	-	-
	Anaesthetists	60.0	40.0	-	-	-	-
2	GDP	-	-	83.4	8.3	8.3	-
	CDP	-	13.3	80.0	6.7	-	-
	HDP	2.5	10.0	60.0	22.5	5.0	-
	Anaesthetists	-	-	66.7	33.3	-	-
3	GDP	-	16.7	50.0	25.0	8.3	-
	CDP	-	6.7	53.3	33.3	6.7	-
	HDP	2.5	5.0	62.5	27.5	-	2.5
	Anaesthetists	-	-	73.3	26.7	-	-
4	GDP	8.3	25.0	50.0	16.7	-	-
	CDP	-	33.3	60.0	-	6.7	-
	HDP	2.5	40.0	47.5	10.0	-	-
	Anaesthetists	-	20.0	73.3	6.7	-	-
5	GDP	16.7	16.7	33.3	33.3	-	-
	CDP	-	26.7	46.6	26.7	-	-
	HDP	12.5	32.5	30.0	22.5	2.5	-
	Anaesthetists	6.7	13.3	46.7	33.3	-	-
6	GDP	-	8.3	41.7	50.0	-	-
	CDP	-	6.7	66.6	26.7	-	-
	HDP	2.5	15.0	50.0	30.0	2.5	-
	Anaesthetists	-	-	93.3	6.7	-	-
7	GDP	-	16.7	16.7	16.7	41.6	8.3
	CDP	-	6.7	26.7	26.7	39.9	-
	HDP	2.5	7.5	12.5	50.0	22.5	5.0
	Anaesthetists	-	-	33.3	60.0	6.7	-
8	GDP	-	25.0	33.3	25.0	16.7	-
	CDP	-	6.7	80.0	13.3	-	-
	HDP	2.5	15.0	65.0	12.5	5.0	-
	Anaesthetists	-	6.7	73.3	20.0	-	-

From a dental perspective, anxiety related to examination and treatment can have a substantial effect on underlying medical comorbidity. This should be taken into consideration when assessing a patient's physical status, however, should not affect the ASA

PS score. Consequently a number of dental physical assessment tools have been developed (Table 6).

Dental practitioners in this study did not demonstrate any knowledge of dental specific risk assessment tools. They have

not become widely adopted within dentistry, possibly due to problems brought by the subjective foundation of the ASA PS Classification or simply a lack of awareness.

LIMITATIONS

The comparatively small sample has its limitations. Equal proportions of professional groups would have been more ideal, but based on the demographic information of the participants, it is believed that the responses adequately represent the views of the professional groups desired in the sample.

ASA PS has been evaluated among dentists in one previous investigation only.²⁶ It is not possible to directly compare results from this study due to differences in methodologies.

Due to the online basis of the questionnaire, it is possible that participants may have used online resources or collaborated to inform in their decision making, which may not be possible in the clinical situation. Technical errors in saving responses could have also reduced the response rate.

This study could be expanded to explore the rationale behind the ASA score decision making process among professionals and reasons for scoring variability, perhaps on a qualitative basis.

CONCLUSION

Many dental practitioners do not find ASA PS Classification helpful and a poor understanding was demonstrated. There is a lack of consistency in the use of the ASA PS between and within different dental and anaesthetist groups. This does not seem to be related to professional development, but is more so due to the inherent subjective nature of the classification. This may lead to confusion among some GPs as to where they can appropriately refer patients.

An awareness of alternative medical risk assessment scales may be useful, particularly when communicating with other teams involved in patient care. However, there is a poor general awareness among dental professional groups. Adoption of an assessment tool incorporating dental anxiety may be more relevant to patients requiring conscious sedation within the dental setting. This would not only apply to clinical risk assessment, but also the wider considerations of research, service development and performance evaluation.

In summary, accepting its limitations, it would be helpful for all dentists to be educated in the use of ASA PS Classification and its application in medical risk assessment, particularly in relation to conscious sedation.

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Risk assessment tool	Specialty	Description
Mallampati ¹⁵	Anaesthesia	To predict ease of intubation based on the anatomy of the oro-pharynx. Grades 0 (easy) to IV (severe)
Cardiopulmonary Exercise Testing (CPET/CPEX) ¹⁶	Anaesthesia Cardiology Respiratory medicine	Non-invasive observation of the cardiovascular and respiratory systems during symptom-limited exercise. Based on measurements of physiological parameters such as oxygen uptake, carbon dioxide production, ventilatory measures compared to a normal.
Physiological and Operative Severity Score for the Enumeration of Mortality and Morbidity (POSSUM) ¹⁷	General surgery	Compares morbidity and mortality in a wide range of general surgical procedures adjusted for the patient's physiological condition. Based on mathematical calculations.
European System for Cardiac Operative Risk Evaluation (Euroscore) ¹⁸	Cardiology	Considers patient factors, the state of the heart and the anticipated operation to determine the associated risk of death. Based on mathematical calculations.
Goldman Index Revised Cardiac Risk Assessment ¹⁹	General surgery	Risk factors, such as age, general health status and ECG findings evaluated on a point scale. Patients with scores >25 have a high risk of death.
New York Heart Association Functional Classification (NYHA) ²⁰	Cardiology	Combines how limited the patient feels during physical activity (1: no activity limitation – 4: unable to carry out activity without discomfort) and objective evidence of heart disease (A: no evidence of cardiovascular disease – D: evidence of severe cardiovascular disease). Opinion based.
Performance status	Oncology	Quantification of oncology patient general wellbeing, by assessing how the disease is affecting their daily living abilities, which can influence decisions on treatment and prognosis. Various models described:
		Karnofsky score: ²¹ 0 = death, 100 = perfect health
		Eastern Co-operative Oncology Group (ECOG): ²² 0 = perfect health, 5 = death
Roizen's Dyspnoea Classification ²³	Respiratory medicine	Patient opinion of activity limitation 0 = no dyspnoea – 4 = dyspnoea at rest
		Measure of relative size.
Body Mass Index (BMI) ²⁴	General medicine	Mathematical calculation: weight (kg)/height (m ²).
		Numerical based descriptors: <18.5 = underweight >25 = overweight

Scale	Description
McCarthy and Malamed, 1979 ²⁸	Structured on ASA PS Classification, with a focus on stress reduction and treatment modifications
Goodchild and Glick, 2003 ²⁹	Parallel medical complexity status and dental modification status scales, based on medical stability, anticipated dental complications, timing of modifications and treatment setting
Fehrenbach, 2015 ³⁰	Based on ASA PS Classification, with green/yellow/red flags assigned to the patient depending on their underlying systemic disease and level of dental anxiety

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