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*The reintroduction of examples and subdivision into patient groups
facilitates correct risk stratification – and can correct persistent
misapprehension.*

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Summary

The American Society of Anesthesiologists (ASA) classification is renowned and used in many clinical and scientific contexts as a system for risk stratification of surgical patients. The updated version of the ASA classification attempts to facilitate the correct application of the ASA categories for users across all disciplines by providing approved examples of diseases and acute conditions. The addition of specific patient groups to the classification provides the user with further guidance.

Introduction and Background

The American Society of Anesthesiologists (ASA) classification has been available for more than 70 years. When it was first developed, the original aim was to provide a method of reliably and reproducibly describing the physical condition of a patient, taking their past medical history into account; it is for this reason that the classification is officially titled “American Society of Anesthesiologists Physical Status (ASA-PS) Classification” [1]. From the onset, the intention was to enable scientific and statistical analysis [2].

The classification has seen numerous relevant alterations over the past 70 years. When it originated in 1941 it encompassed 6 categories, of which ASA categories 5 and 6 were intended for patients undergoing emergency surgery [1]. This first edition even included examples

The updated ASA classification

of acute and chronic disease, and of injuries. ASA category 7, which was introduced later, initially described a moribund patient who was not expected to survive the next 24 hours with or without surgery [3]. This definition persists in the mind of many anaesthesiologists even today, despite the fact that it has long been revised several years ago. Further revisions followed in 1961–1963, reducing the number of ASA categories to 5 and eliminating the separate classification of emergency procedures. It was with this revision that the concept of providing examples was intentionally abandoned [4]. Finally, the addition in 1980 of ASA category 6 for patients declared brain-dead made for precise classification of this group of patients [2,5].

A further, highly significant change was made by the American Society in 1986 when it revised ASA category 5. This category was now to be used for patients who were seen as moribund and who were expected to die without surgery; the previously defined period of 24 hours was no longer specified. It is noteworthy that this substantial change, which focuses on the curative aspect of surgery, has quite obviously not become well established in clinical practice.

Whilst the ASA classification itself has changed over the years, so too has its use. Today the classification is not just used in everyday clinical practice but has become a standardised grading

Competing interests

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Keywords

ASA – Classification System – Risk Stratification – Obstetrics – Children

system to categorise patients with regard to their perioperative morbidity and mortality in clinical research. In addition, the ASA classification is a component of a multitude of scores for predicting postoperative complications [7–9]. It is, for example, a component of the **Myocardial Infarction and Cardiac Arrest (MICA)**-Score, which is listed in the current version of the Joint recommendation for “Preoperative evaluation of adult patients before elective, non-cardiothoracic surgery” as a method for stratification of cardiac risk [10,11].

The prognostic value of the ASA classification in everyday clinical practice has been documented by a number of investigations [12–14]. A retrospective study of more than 2.2 million patients, using multivariate regression analysis showed that the documented ASA classification was strongly associated with the incidence of postoperative complications and mortality [12].

However, the subjectivity of the assessment of the patient by the anaesthesiologist is a major weakness of the ASA classification as used in everyday clinical practice. Several studies have evaluated the consistency of the categorisation by different anaesthesiologists of both hypothetical patients and retrospectively of real patients [15–20]. These studies showed significant variability in some cases. That variability could be explained on the one hand by the lack of concrete examples [16]; on the other hand, certain conditions (e.g., pregnancy, suspected difficult airway), patient behaviour patterns (smoking) or disease states (trauma, tumours) seemed to influence the variability of the categorisation [19]. Anaesthesiologists’ insecurity and inconsistent classification of specific patients seemed to increase particularly with higher ASA categories [18].

Furthermore, differing versions of the classification are still being used today; these diverge from the current version mainly in the higher categories. Until 1986 the ASA category 5 was assigned to moribund patients who are not ex-

pected to survive the next 24 hours with or without surgery. While this category has been revised decades ago and is now obsolete, it is still commonly used, even in renowned textbooks and current scientific publications. The Oxford Handbook of Anaesthesia, for example, still uses the definitions from the period before 1986 [21] even though almost 35 years have passed since the revision. The authors of the 1986 revision pointed out the incorrect use of ASA category 5 in a letter to the editor almost 10 years ago [6]. In that context the authors also pointed out the relevance of using different versions of the ASA classification both for clinical and scientific use. Study results using different versions of the ASA classification are not or not fully comparable – especially taking into account the fact that many authors do not even provide information on the version used in their studies.

Moreover, the pre-1986 definition of ASA category 5 defines a patient for whom surgery is by definition not indicated. If the medical team rate the patient’s condition such that survival over the next 24 hours appears unlikely regardless of a surgical or non-surgical/conservative treatment, the question of the rationale for performing surgery arises. A patient in such a condition is instead more likely to require sufficient symptom control within the context of palliative care. It is worth mentioning at this point that the DGAI’s core dataset presents ASA category 5 correctly with regard to both content and examples [22]. However, it should not be expected that all anesthesia professionals will necessarily make themselves familiar with this dataset in addition to reading the common textbooks. For the future, it is especially important that the respective current version of the ASA classification is made known to a broad range of users via publications and continuing medical education. Only then can consistent use be ensured.

The American Society decided as early as 2010 to include examples of chronic disease or acute conditions for each

ASA category. This led to a significant improvement amongst both anaesthetists and non-anaesthetists when categorising hypothetical patients [23].

Numerous authors also pointed out uncertainties when assigning an ASA category to pregnant women and children. Following on from this, an adapted version of classification that is easier to apply to pediatric patients has been developed in a few studies [19,24–27].

Now, an updated version of the ASA classification has been made available [28]. This new version offers the user additional support when assigning an ASA category to certain groups of patients: it now also contains specific examples pertaining to pregnant women or those being prepared for gynaecologic or obstetric interventions and to paediatric patients.

The following table shows the updated ASA classification (Tabl. 1).

Discussion

The updated version of the ASA classification provides us with a valuable tool for use in everyday clinical practice to stratify the risk to our patients undergoing surgery and interventions. We are especially pleased to see the reintroduction of the adjunct “E” to denote emergency procedures, something which had previously already been incorporated into other risk classification systems. The score for predicting the risk of postoperative pulmonary complications [29], for example, previously adopted emergency surgery as a procedure-specific risk factor. Use of the denotation reinforces the message that the risk to the patient is increased just by the urgency of the procedure.

In addition, the listing of pathological conditions associated with pregnancy is helpful. The fact that pregnant women – irrespective of gestational age – cannot be assigned ASA category 1 does, however, leave some room for discussion. Pregnancy is not in itself a pathological condition; the ASA justified its decision to include patients undergoing uncomplicated (“normal”) pregnancy in

Table 1

Current Definitions and ASA-Approved Examples, this table is reprinted with permission of the American Society of Anesthesiologists, 1061 American Lane, Schaumburg, Illinois 60173–4973).

ASA PS Classification	Definition	Adult Examples, Including, but not Limited to:	Pediatric Examples, Including but not Limited to:	Obstetric Examples, Including but not Limited to:
ASA I	A normal healthy patient	Healthy, non-smoking, no or minimal alcohol use	Healthy (no acute or chronic disease), normal BMI percentile for age	
ASA II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Current smoker, social alcohol drinker, pregnancy, obesity ($30 < \text{BMI} < 40$), well-controlled DM/HTN, mild lung disease	Asymptomatic congenital cardiac disease, well controlled dysrhythmias, asthma without exacerbation, well controlled epilepsy, non-insulin dependent diabetes mellitus, abnormal BMI percentile for age, mild/moderate OSA, oncologic state in remission, autism with mild limitations	Normal pregnancy*, well controlled gestational HTN, controlled preeclampsia without severe features, diet-controlled gestational DM.
ASA III	A patient with severe systemic disease	Substantive functional limitations; One or more moderate to severe diseases. Poorly controlled DM or HTN, COPD, morbid obesity ($\text{BMI} \geq 40$), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, history (>3 months) of MI, CVA, TIA, or CAD/stents.	Uncorrected stable congenital cardiac abnormality, asthma with exacerbation, poorly controlled epilepsy, insulin dependent diabetes mellitus, morbid obesity, malnutrition, severe OSA, oncologic state, renal failure, muscular dystrophy, cystic fibrosis, history of organ transplantation, brain/spinal cord malformation, symptomatic hydrocephalus, premature infant PCA <60 weeks, autism with severe limitations, metabolic disease, difficult airway, long term parenteral nutrition. Full term infants <6 weeks of age.	Preeclampsia with severe features, gestational DM with complications or high insulin requirements, a thrombophilic disease requiring anticoagulation.
ASA IV	A patient with severe systemic disease that is a constant threat to life	Recent (<3 months) MI, CVA, TIA or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, shock, sepsis, DIC, ARD or ESRD not undergoing regularly scheduled dialysis	Symptomatic congenital cardiac abnormality, congestive heart failure, active sequelae of prematurity, acute hypoxic-ischemic encephalopathy, shock, sepsis, disseminated intravascular coagulation, automatic implantable cardioverter-defibrillator, ventilator dependence, endocrinopathy, severe trauma, severe respiratory distress, advanced oncologic state.	Preeclampsia with severe features complicated by HELLP or other adverse event, peripartum cardiomyopathy with EF <40 , uncorrected/decompensated heart disease, acquired or congenital.
ASA V	A moribund patient who is not expected to survive without the operation	Ruptured abdominal/thoracic aneurysm, massive trauma, intracranial bleed with mass effect, ischemic bowel in the face of significant cardiac pathology or multiple organ/system dysfunction	Massive trauma, intracranial hemorrhage with mass effect, patient requiring ECMO, respiratory failure or arrest, malignant hypertension, decompensated congestive heart failure, hepatic encephalopathy, ischemic bowel or multiple organ/system dysfunction.	Uterine rupture.
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes			

* Although pregnancy is not a disease, the parturient's physiologic state is significantly altered from when the woman is not pregnant, hence the assignment of ASA 2 for a woman with uncomplicated pregnancy.

**The addition of "E" denotes Emergency surgery: (An emergency is defined as existing when delay in treatment of the patient would lead to a significant increase in the threat to life or body part)

ASA category 2 with the physiological changes which take place with pregnancy and which deviate significantly from the physiology of the non-pregnant patient.

Finally, the expansion of the classification to include paediatric patients is expedient, as risk stratification in this group of patients seems to be particularly associated with uncertainty. A previous investigation showed that when children were re-categorised by experienced senior anaesthesiologists, a higher ASA category was assigned in approx. 30 % of cases [27]. Especially the inclusion of concrete examples for this group of patients will help guide users.

The ASA specifically points out that the examples provided for the individual groups and categories are just that: examples. Whilst the groups and categories include those examples, they are not in any way limited to them. The use of further examples is easy to imagine; as such, we would like to see patients with chronic pain categorised. Furthermore, inclusion of geriatric patients as a group should be considered in the long-term. In analogy to children, geriatric patients undergo physiological changes which are not in and of themselves pathological. Some changes, however, are more rapidly or of more intense pathological relevance to geriatric than to non-geriatric patients.

Despite all the conceivable extensions to the ASA classification, its original intention should not be forgotten. As an universal tool for risk stratification, it should remain easy to use and to comprehend in the future. If the lists of patient groups or specific conditions were to become too detailed, its everyday use in clinical practice would likely be impeded.

References

1. Saklad M: Grading of patients for surgical procedures. *Anesthesiology* 1941;2:281–284
2. Irlbeck T, Zwißler B, Bauer A: ASA-Klassifikation: Wandel im Laufe der Zeit und Darstellung in der Literatur. *Anaesthesist* 2017;66:5–10
3. Keats AS: The ASA Classification of Physical Status – A Recapitulation. *Anesthesiology* 1978;49:233–5
4. Dripps RD: The Role of Anesthesia in Surgical Mortality. *JAMA* 1961;178:261
5. Fitz-Henry J: The ASA classification and peri-operative risk. *Ann R Coll Surg Engl* 2011;93:185–187
6. Thackray NM, Gibbs NM: American Society of Anesthesiologists P5: “With or without” Definition? *Anesthesiology* 2011;114:467–468
7. Bilimoria KY, Liu Y, Paruch JL, et al: Development and Evaluation of the Universal ACS NSQIP Surgical Risk Calculator: A Decision Aid and Informed Consent Tool for Patients and Surgeons. *J Am Coll Surg* 2013;217:833–842.e3
8. Sutton R, Bann S, Brooks M, Sarin S: The surgical risk scale as an improved tool for risk-adjusted analysis in comparative surgical audit: Risk-adjusted analysis in comparative surgical audit. *Br J Surg* 2002;89:763–768
9. Mayhew D, Mendonca V, Murthy BVS: A review of ASA physical status – historical perspectives and modern developments. *Anaesthesia* 2019;74:373–379
10. Gupta PK, Gupta H, Sundaram A, et al: Development and validation of a risk calculator for prediction of cardiac risk after surgery. *Circulation* 2011;124:381–387
11. Zwißler B, Deutsche Gesellschaft für Anästhesiologie und Intensivmedizin (DGAI), Deutsche Gesellschaft für Innere Medizin (DGIM), Deutsche Gesellschaft für Chirurgie (DGCH): Präoperative Evaluation erwachsener Patienten vor elektiven, nicht Herz-Thorax-chirurgischen Eingriffen. *Anästhesiemed* 2017;58:349–364
12. Hackett NJ, De Oliveira GS, Jain UK, Kim JYS: ASA class is a reliable independent predictor of medical complications and mortality following surgery. *Int J Surg* 2015;18:184–190
13. Koo CY, Hyder JA, Wanderer JP, Eikermann M, Ramachandran SK: A meta-analysis of the predictive accuracy of postoperative mortality using the American Society of Anesthesiologists’ physical status classification system. *World J Surg* 2015;39:88–103
14. Skaga NO, Eken T, Søvik S, Jones JM, Steen PA: Pre-injury ASA physical status classification is an independent predictor of mortality after trauma. *J Trauma* 2007;63:972–978
15. Owens WD, Felts JA, Spitznagel EL: ASA physical status classifications: a study of consistency of ratings. *Anesthesiology* 1978;49:239–43
16. Aronson WL, McAuliffe MS, Miller K: Variability in the American Society of Anesthesiologists Physical Status Classification Scale. *AANA J* 2003;71:265–274
17. Sankar A, Johnson SR, Beattie WS, Tait G, Wijeyesundera DN: Reliability of the American Society of Anesthesiologists physical status scale in clinical practice. *Br J Anaesth* 2014;113:424–432
18. Riley R, Holman C, Fletcher D: Inter-rater reliability of the ASA physical status classification in a sample of anaesthetists in Western Australia. *Anaesth Intensive Care* 2014;42:614–618
19. Barbeito A, Muir HA, Gan TJ, et al: Use of a modifier reduces inconsistency in the American Society of Anesthesiologists Physical Status Classification in parturients. *Anesth Analg* 2006;102:1231–1233
20. Haynes SR, Lawler PG: An assessment of the consistency of ASA physical status classification allocation. *Anaesthesia* 1995;50:195–199
21. Allman KG, Wilson IH (eds.): Oxford Handbook of Anaesthesia. Fourth Edition. Great Clarendon Street, Oxford, OX2 6DP, United Kingdom: Oxford University Press 2016 (Oxford Handbooks)
22. Heinrichs W, Blumrich W, Deil S, Freitag M, Kutz N, Lüdtke I et al: Kerndatensatz Anästhesie Version 3.0/2010. *Anästhesiemed* 2010;51:S33–S55
23. Hurwitz EE, Simon M, Vinta SR, et al: Adding Examples to the ASA-Physical Status Classification Improves Correct Assignment to Patients. *Anesthesiology* 2017;126:614–622
24. Aplin S, Baines D, DE Lima J: Use of the ASA Physical Status Grading System in pediatric practice. *Paediatr Anaesth* 2007;17:216–222
25. Burgoyne LL, Smeltzer MP, Pereiras LA, Norris AL, De Armendi AJ: How well do pediatric anesthesiologists agree when assigning ASA physical status classifications to their patients? *Paediatr Anaesth* 2007;17:956–962
26. Leahy I, Berry JG, Johnson CJ, Crofton C, Staffa SJ, Ferrari L: Does the Current American Society of Anesthesiologists Physical Status Classification Represent the Chronic Disease Burden in Children Undergoing General Anesthesia? *Anesth Analg* 2019;129:1175–1180
27. Ferrari LR, Leahy I, Staffa SJ, et al: One Size Does Not Fit All: A Perspective on

the American Society of Anesthesiologists Physical Status Classification for Pediatric Patients. *Anesth Analg* 2020;130:1685–1692

28. American Society of Anesthesiologists: ASA Physical Status Classification System. In 2020. <https://www.asahq.org/standards-and-guidelines/asa-physical-status-classification-system> (Accessed on: 12.01.2021)
29. Canet J, Sabaté S, Mazo V, et al: Development and validation of a score to predict postoperative respiratory failure in a multicentre European cohort: A prospective, observational study. *Eur J Anaesthesiol* 2015;32:458–470.

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