Adding Examples to the ASA-Physical Status Classification Improves Correct Assignment to Patients

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ABSTRACT

Background: Despite its widespread use, the American Society of Anesthesiologists (ASA)-Physical Status Classification System has been shown to result in inconsistent assignments among anesthesiologists. The ASA-Physical Status Classification System is also used by nonanesthesia-trained clinicians and others. In 2014, the ASA developed and approved examples to assist clinicians in determining the correct ASA-Physical Status Classification System assignment. The effect of these examples by anesthesia-trained and nonanesthesia-trained clinicians on appropriate ASA-Physical Status Classification System assignment in hypothetical cases was examined.

Methods: Anesthesia-trained and nonanesthesia-trained clinicians were recruited *via* email to participate in a web-based questionnaire study. The questionnaire consisted of 10 hypothetical cases, for which respondents were first asked to assign ASA-Physical Status using only the ASA-Physical Status Classification System definitions and a second time using the newly ASA-approved examples.

Results: With ASA-approved examples, both anesthesia-trained and nonanesthesia-trained clinicians improved in mean number of correct answers (out of possible 10) compared to ASA-Physical Status Classification System definitions alone ($P < 0.001$ for all). However, with examples, nonanesthesia-trained clinicians improved more compared to anesthesia-trained clinicians. With definitions only, anesthesia-trained clinicians (5.8 ± 1.6) scored higher than nonanesthesia-trained clinicians (5.4 ± 1.7; $P = 0.041$). With examples, anesthesia-trained (7.7 ± 1.8) and nonanesthesia-trained (8.0 ± 1.7) groups were not significantly different ($P = 0.100$).

Conclusions: The addition of examples to the definitions of the ASA-Physical Status Classification System increases the correct assignment of patients by anesthesia-trained and nonanesthesia-trained clinicians. (ANESTHESIOLOGY 2017; 126:614-22)

FOR more than 50 yr, anesthesiologists have used the American Society of Anesthesiologists (ASA)-Physical Status Classification System to stratify a patient's preoperative comorbid conditions.[1,2] Originally created as a tool to collect statistical data related to anesthesia care,[3] its use in the current day has expanded outside its original scope[4] and is currently used worldwide not only by anesthesiologists, but also by other clinicians. Despite its widespread use, the ASA-Physical Status Classification System has been criticized due to its subjective nature and lack of interrater reliability when used to evaluate hypothetical cases and in clinical practice.[5–7]

In 2014, the ASA developed and approved examples for each ASA-Physical Status Classification System class to provide guidelines in determining the appropriate ASA-Physical Status for patients.[8] With these examples, it is not clear if there will be improved application of ASA-Physical Status Classification System assignments among all clinicians—anesthesia trained and nonanesthesia trained. In this study, we examined if the addition of the publicly available ASA-approved examples for each ASA-Physical Status classification improves correct assignment of ASA-Physical Status for hypothetical cases by anesthesia-trained clinicians and nonanesthesia-trained clinicians.

What We Already Know about This Topic

- Anesthesiologists have used the American Society of Anesthesiologists (ASA)-Physical Status for decades to stratify patients based upon their disease burden. However, there have been concerns that the ASA-Physical Status designations are somewhat subjective and that interrater reliability is suboptimal.

What This Article Tells Us That Is New

- This study demonstrates that the use of American Society of Anesthesiologists (ASA)–approved examples of ASA-Physical Status designations in addition to the descriptions enhances correct assignments of ASA-Physical Status to patients.

Materials and Methods

After receiving Institutional Review Board approval (The University of Texas Medical Branch, Galveston, Texas), clinicians were recruited *via* email to participate in a web-based questionnaire study. Investigators sent invitations to participate in the study and requested in that invitation that the participants help recruit others by distributing the email to their departments or other appropriate contacts. The study participants were classified as anesthesia-trained clinicians and

Corresponding article on page 577. Supplemental Digital Content is available for this article. Direct URL citations appear in the printed text and are available in both the HTML and PDF versions of this article. Links to the digital files are provided in the HTML text of this article on the Journal's Web site (www.anesthesiology.org).

Submitted for publication February 16, 2016. Accepted for publication January 5, 2017. From the Department of Anesthesiology and Pain Management (E.E.H.) and Department of Clinical Sciences (A.M.), University of Texas Southwestern Medical Center, Dallas, Texas; and Department of Anesthesiology, The University of Texas Medical Branch, Galveston, Texas (M.S., S.R.V., C.F.Z., S.M.S., A.E.A.). Department to which work attributed: University of Texas Medical Branch, Galveston, Texas.

<zdoi;10.1097/ALN.0000000000001541>

nonanesthesia-trained clinicians. Anesthesia-trained clinicians included physician anesthesiologists, resident/fellow physician anesthesiologists, nurse anesthetists, and anesthesiologist assistants. Nonanesthesia-trained clinicians included physicians and nurses in the fields of gastroenterology, pulmonary critical care, interventional radiology, and oral maxillofacial surgery. These specialty fields were chosen as they commonly utilize the ASA-Physical Status Classification System when evaluating patients for moderate sedation for procedures. A public web portal that utilized SurveyMonkey (http://www.surveymonkey.com) Internet-polling software was created to allow respondents to complete the questionnaire in an anonymous manner. Electronic submission of informed consent was obtained by all participants at the start of the study.

In the questionnaire, respondents were first given 10 hypothetical cases and asked to assign ASA-Physical Status using only the ASA-Physical Status Classification System definitions (table 1). They were then given the same 10 hypothetical cases in a different order and asked to assign the ASA-Physical Status, the second time using both the definitions and the newly ASA-approved examples. Respondents were not able to go back and change answers to previous questions during the study.

The correct ASA-Physical Status for each hypothetical case was previously determined by consensus among the investigators using objective interpretation of the definitions of ASA-Physical Status Classification System and the ASA-approved examples (table 2). Cases were intentionally designed to have focus on patients who would be classified ASA I, II, or III. The cases were designed not to involve emergency, trauma, or pregnancy, respectively.

The hypothetical cases presented in the survey were the following:

Case 1

A 32-yr-old man presents for gastric banding weight loss surgery. He is currently 5′6″ and weighs 118 kg (body mass index [BMI] 42), after an intentional weight loss of 15 kg during the past 6 months. He has gastroesophageal reflux disease that is controlled on omeprazole. He currently walks 2 miles/day on a treadmill without chest pain or shortness of breath. Preoperative blood pressure is 118/70 mmHg, heart rate 84 beats/min.

Case 2

A 53-yr-old woman presents for bilateral breast augmentation. She has a past medical history of hypertension, esophageal reflux, and tobacco use. She is 5′5″ and weighs 80 kg (BMI, 29). Her blood pressure is usually controlled with her normal range of 120s/70s; however, this morning her blood pressure is 154/99 mmHg. She denies any chest pain or shortness of breath. She jogs 4 to 5 miles two to three times a week. Her reflux is well controlled on esomeprazole. She admits to smoking two to three cigarettes a day, which is down from her usual one-half pack a day; she has been smoking for the past 30 yr. No other significant medical history is obtained, and on examination, she is within normal limits.

Case 3

A 56-yr-old woman presents for vaginal hysterectomy for uterine fibroids. She is 5′4″ and weighs 73 kg (BMI, 28). She has hypertension controlled on metoprolol. She has a 20 pack-years smoking history but quit smoking 5 yr ago and denies any recent respiratory infections. She was recently diagnosed with noninsulin-dependent diabetes mellitus. Her most recent hemoglobin A1c is 10.5%, and her fasting blood glucose the day of surgery is 250 mg/dl.

Case 4

A 26-yr-old woman presents for ankle open reduction internal fixation after tripping on the sidewalk and fracturing her ankle. Her height is 5′2″ and weighs 91 kg (BMI, 37). She has a past medical history of asthma, for which she had an emergency room visit 1 yr ago, and has no previous hospital admissions for asthma. She has since been on a daily steroid inhaler and montelukast. Her symptoms are well controlled on this regimen, and she has not needed her rescue inhaler in greater than 6 months. She admits to snoring at night and being told she has mild obstructive sleep apnea (OSA) after a sleep study. She has been noncompliant with her continuous positive airway pressure machine due to intolerance of the nasal mask. She complains of occasional gastroesophageal reflux, mostly related to foods she eats. She has been told she has prediabetes and is trying to lose weight. She also has a history of epilepsy but has not had a seizure in 3 yr. The rest of her medical history is negative, and her examination is within normal limits.

Case 5

An 82-yr-old man presents for cataract surgery. He is 6′ and weighs 75 kg (BMI, 23). He is a nonsmoker but has a history of asthma for which he uses albuterol approximately three times per year. He has benign prostatic hypertrophy and controlled insulin-dependent diabetes with a hemoglobin A1c of 5%. He takes sildenafil for erectile dysfunction, citalopram for depression, and hydrocodone twice per day for chronic low back pain. He reports that he can walk three blocks before getting short of breath.

Case 6

A 58-yr-old man presents for carpal tunnel release surgery. He denies any past medical history. He is 5′11″ and weighs 73 kg (BMI, 22). He has never had surgery and is not on any medications. He does smoke one pack of cigarettes a day for the past 38 yr. He says he used to smoke marijuana as a college student and drinks two to three beers every night. Physical exam and vital signs are within normal limits on the day of surgery.

Case 7

A 42-yr-old woman presents for outpatient umbilical hernia repair. She is 5′ and weighs 50 kg (BMI, 22). She has a history of uncontrolled hypertension in the past leading to end-stage renal disease (ESRD). She is currently compliant with her hemodialysis three times per week. Her last dialysis session was yesterday. She denies any other

Table 1. ASA-Physical Status Classification System

ASA-Physical Status Class	Definition	Examples, Including, but Not Limited to
I	A normal healthy patient	Healthy, nonsmoking, no or minimal alcohol use
II	A patient with mild systemic disease	Mild diseases only without substantive functional limitations. Examples include (but not limited to) current smoker, social alcohol drinker, pregnancy, obesity (30 < BMI < 40), well-controlled DM/HTN, mild lung disease
III	A patient with severe systemic disease	Substantive functional limitations; one or more moderate to severe diseases. Examples include (but not limited to) poorly controlled DM or HTN, COPD, morbid obesity (BMI ≥ 40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, ESRD undergoing regularly scheduled dialysis, premature infant PCA < 60 weeks, history (> 3 months) of MI, CVA, TIA, or CAD/stents
IV	A patient with severe systemic disease that is a constant threat to life	Examples include (but not limited to) recent (< 3 months) MI, CVA, TIA, or CAD/stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, sepsis, DIC, ARDS, or ESRD not undergoing regularly scheduled dialysis
V	A moribund patient who is not expected to survive without the operation	Examples include (but not limited to) 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
VI	A declared brain-dead patient whose organs are being removed for donor purposes	

The addition of "E" denoted 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.

ARDS = acute respiratory distress syndrome; BMI = body mass index; CAD = coronary artery disease; COPD = chronic obstructive pulmonary disease; CVA = cerebrovascular accident; DIC = disseminated intravascular coagulation; DM = diabetes mellitus; ESRD = end-stage renal disease; HTN = hypertension; MI = myocardial infarction; PCA = post conceptual age; TIA = transient ischemic attack.

Adapted from https://www.asahq.org/resources/clinical-information/asa-physical-status-classification-system.

Table 2. Correct ASA-Physical Status Classification for Each Case and Comorbidities from ASA-approved Examples

Case Number	ASA-Physical Status Class	Patient's Comorbidities from ASA-approved Examples
1	III	BMI > 40
2	II	Controlled HTN, current smoker
3	III	Poorly controlled DM, controlled HTN
4	II	Mild lung disease (controlled asthma, mild OSA), obesity (30 < BMI < 40)
5	II	Mild lung disease (controlled asthma), controlled DM
6	II	Current smoker, alcohol use
7	III	Controlled HTN, ESRD undergoing regularly scheduled dialysis
8	III	Obesity (30 < BMI < 40), controlled HTN, history of MI, COPD, poorly controlled DM, ESRD undergoing regularly scheduled dialysis
9	II	Obesity (30 < BMI < 40), controlled HTN
10	I	Healthy 81 yr old

BMI = body mass index; COPD = chronic obstructive pulmonary disease; DM = diabetes mellitus; ESRD = end-stage renal disease; HTN = hypertension; MI = myocardial infarction; OSA = obstructive sleep apnea.

end-organ damage related to her hypertension. For the past 6 months, her blood pressure has been controlled on lisinopril and atenolol. She denies chest pain or shortness of breath while doing yard work. Her blood pressure is 122/84 mmHg and potassium is 4.1 mEq/l the day of surgery.

Case 8

A 69-yr-old man comes to the operating room for an endovascular repair of an abdominal aortic aneurysm. He is 5′10″ and weighs 114 kg (BMI, 35). He has a history of hypertension that is under control on metoprolol and nifedipine. He had a myocardial infarction 6 yr ago and had two coronary stents placed at the time, for which he continues to take aspirin. He last saw his cardiologist 4 weeks ago, who felt that he was optimized from a cardiac standpoint. He is a former smoker (quit 6 yr ago) and has been diagnosed with chronic obstructive pulmonary disease. His chronic obstructive pulmonary disease is well controlled on his daily maintenance inhalers, and he has not had any exacerbations in more than 5 yr. He has type 2 diabetes mellitus, which is poorly controlled. He recently had insulin added to his regimen, but his blood glucose remains consistently above 250 mg/dl. He has ESRD and is on hemodialysis 3 days a week. On the day of surgery, his potassium is 5.2 mEq/l. He denies any other problems, and the review of systems is otherwise negative.

Case 9

A 56-yr-old man presents for follow-up colonoscopy because of three adenomatous polyps found during previous colonoscopy. He is 5′11″ and weighs 120 kg (BMI, 37). He has a history of Crohn disease, controlled hypertension, and hyperlipidemia. His spouse reports that he snores loudly at night, but has not had a sleep study. His vital signs are heart rate 76 beats/min, blood pressure 142/82 mmHg, respiratory rate 16 breaths/min, temperature 37°C.

Case 10

An 81-yr-old woman comes in for cataract surgery. She is 5′4″ and weighs 55 kg (BMI, 20). She is an active volunteer in the library for 4 h/day. She says she has no medical problems, but she has not seen a doctor in 20 yr. The last time she saw a doctor was for knee pain, but it eventually got better. She has never had surgery. She does not take any medications. She lives alone and is able to go grocery shopping once a week and does take care of her daily activities on her own. The rest of her history, review of symptoms, and physical exam are within normal limits.

Statistical Analysis

The mean number of correct answers (out of possible 10) were determined with definitions and examples for anesthesia-trained and nonanesthesia-trained groups and compared using a repeated-measures ANOVA with one between and one within subject factor. This was followed by pairwise comparisons between definitions and examples as well as between anesthesia-trained and nonanesthesia-trained groups. Similar analyses were done to compare clinical roles among the anesthesia-trained and nonanesthesia-trained personnel. The proportions of correct answers for each case with definitions and examples were determined and compared using McNemar test for paired proportions. $P < 0.05$ was considered statistically significant with all pairwise comparisons adjusted for multiple comparisons using Bonferroni method. All analyses were done using SAS software 9.3 (SAS Inc., USA).

Results

In total, there were 1,029 anesthesia-trained respondents, with 779 anesthesia-trained completing the questionnaire in its entirety, for a 75.7% completion rate. One hundred seventy-one nonanesthesia-trained respondents participated in the study, with 110 nonanesthesia-trained respondents completing the questionnaire, for a 64.3% completion rate. Only respondents who completed the questionnaire in its entirety were used in analysis, for a total of 889 anesthesia-trained and nonanesthesia-trained respondents combined. The anesthesia-trained respondents were from 41 states and nonanesthesia-trained respondents were from 18 states, within all regions of the United States.

In figure 1, for anesthesia-trained, nonanesthesia-trained, and all respondents combined, the distribution of ASA-Physical Status Classification System assignment for each case for definitions and for examples can be found. In the figure, the correct ASA-Physical Status Classification System assignment is noted (fig. 1; table 2). In all groups and all cases, percentage of respondents with correct ASA-Physical Status assignment increased with examples as compared to definitions only.

For all respondents, repeated-measures ANOVA analyses showed that the increase in mean number correct answers with examples as compared to definitions alone was significant (table 3, see Supplemental Digital Content, Table, http://links.lww.com/ALN/B381, which is a table summarizing repeated-measures ANOVA model and results). *Post hoc* comparisons showed that both anesthesia-trained and nonanesthesia-trained respondents improved in mean number of correct answers with examples compared to definitions (all $P < 0.001$). Nonanesthesia-trained respondents improved more with examples compared to anesthesia-trained. With examples, there was no significant difference between anesthesia-trained and nonanesthesia-trained respondents ($P = 0.100$).

For anesthesia-trained, mean number of correct answers significantly improved with the addition of examples compared to definitions alone. However, the improvement in number of correct assignments was not dependent on the type of clinician. When adjusted for multiple corrections, there was no significant difference in performance among individual types of clinicians (table 3; Supplemental Digital Content, Table, http://links.lww.com/ALN/B381).

Analysis for nonanesthesia trained showed mean number of correct answers improved with examples compared to definitions alone for both clinician types. Nurses experienced a greater improvement in mean correct score with the addition of examples as compared to nonanesthesiology-trained physicians (table 3; Supplemental Digital Content, Table, http://links.lww.com/ALN/B381).

For all cases with the addition of examples, the proportion of correct assignment increased for anesthesia trained and nonanesthesia trained (fig. 2). There was a significant increase in proportion of correctly assigned ASA-Physical Status with the addition of examples for anesthesia trained and nonanesthesia trained in all cases except case 2 (fig. 2, McNemar test, $P < 0.05$ except for case 2). For anesthesia-trained respondents using definitions alone, 3 of 10 hypothetical cases had greater than 70% respondents with correct assignment. This increased to 7 of 10 cases with examples. Similarly, for nonanesthesia-trained respondents using definitions alone, 1 of 10 hypothetical cases had greater than 70% respondents with correct assignment, increasing to 8 of 10 cases with examples.

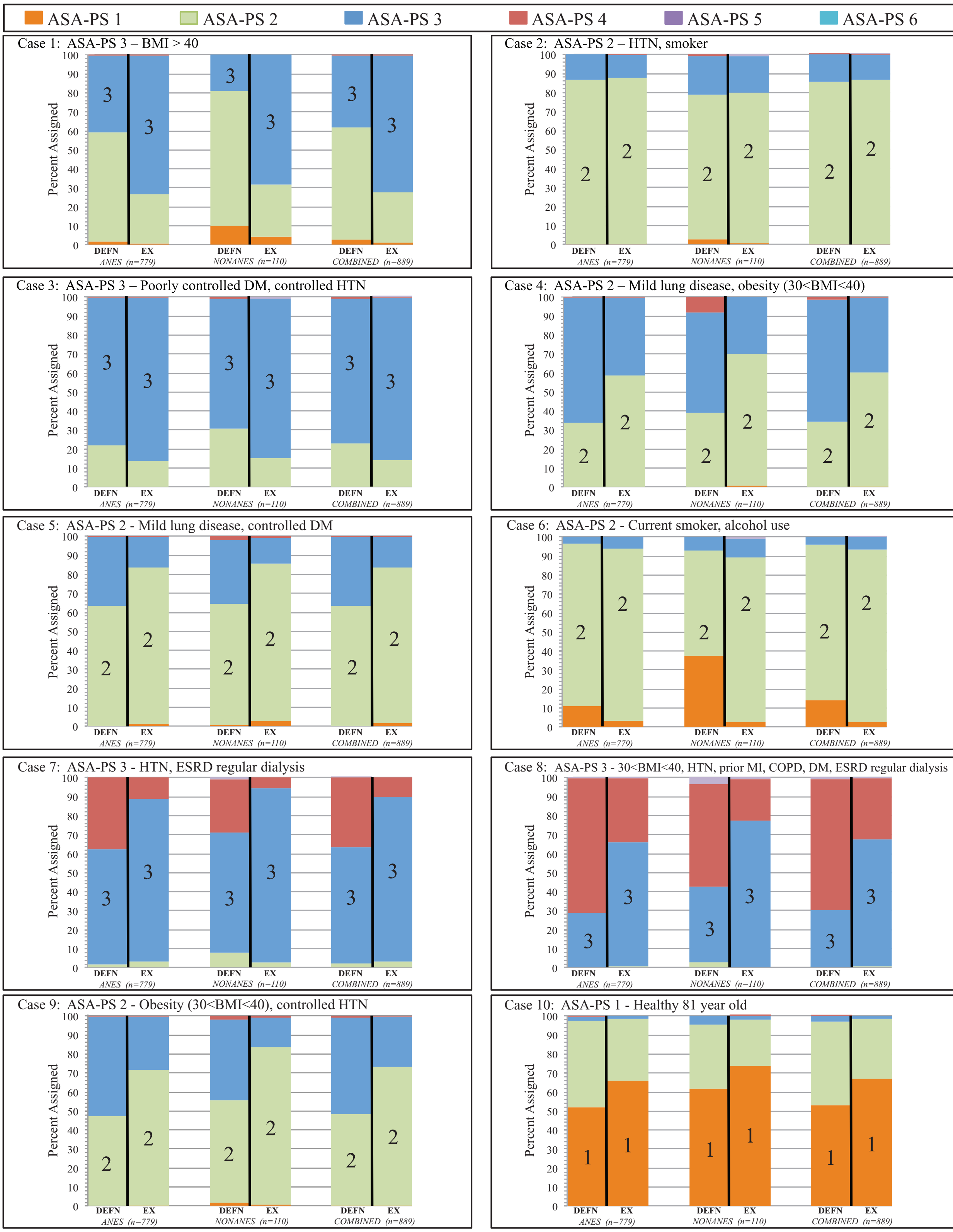

Fig. 1. Percentage of responses for each American Society of Anesthesiologists-Physical Status (ASA-PS) Classification System separated by case and clinical role. Number of respondents in each category shown. Comorbidities from ASA-approved examples listed for each case. Correct ASA-Physical Status Classification System for cases noted on each column. ANES = anesthesia-trained respondents; BMI = body mass index; Combined = anesthesia-trained and nonanesthesia-trained respondents combined; COPD = chronic obstructive pulmonary disease; DEFN = definitions only; DM = diabetes mellitus; ESRD = end-stage renal disease; EX = definitions and examples; HTN = hypertension; MI = myocardial infarction; NONANES = nonanesthesia-trained respondents.

Table 3. Mean Number (± SD) of Correct Assignment of ASA-Physical Status Classification System for DEFN and EX

Clinical Role	Overall	DEFN	EX
ANES (n = 779)	6.7 ± 1.9	5.8 ± 1.6	7.7 ± 1.8*
NONANES (n = 110)	6.7 ± 2.1	5.4 ± 1.7	8.0 ± 1.7*
All respondents (n = 889)		5.7 ± 1.7	7.7 ± 1.7*
ANES			
Physician anesthesiologists (n = 527)	6.8 ± 1.9	5.9 ± 1.6	7.7 ± 1.7
Resident/fellow anesthesiologists (n = 90)	6.7 ± 2.0	5.8 ± 1.8	7.7 ± 1.8
Nurse anesthetists (n = 125)	6.4 ± 2.0	5.4 ± 1.6	7.5 ± 1.8
Anesthesiologist assistants (n = 37)	6.5 ± 1.9	5.4 ± 1.2	7.5 ± 1.9
All ANES		5.8 ± 1.6	7.7 ± 1.8*
NONANES			
Physician (n = 69)	6.8 ± 2.0	5.7 ± 1.5	7.9 ± 1.8*
Nurse (n = 35)	6.5 ± 2.3	4.9 ± 1.9	8.0 ± 1.3*
All NONANES		5.4 ± 1.7	8.0 ± 1.7*

*Bonferroni adjusted $P < 0.001$.

ANES = anesthesia-trained respondents (physician anesthesiologists, resident and fellow anesthesiologists, nurse anesthetists, anesthesiologist assistants); DEFN = definitions only; EX = definitions and examples; NONANES = nonanesthesia-trained respondents (nonanesthesiology physicians and nurses).

Discussion

The ASA-Physical Status Classification System has undergone several iterations since its inception as originally proposed by Saklad[3] and in the current form as adapted by Dripps *et al.*[2] Despite its use for more than 50 yr, the subjective nature of the ASA-Physical Status Classification System has been criticized for inconsistent assignments in both adult and pediatric patients.[5–7,9–11] Suggested remedies include expansion to a seven-point system to stratify patients with moderate diseases or inclusion of modifiers for states with increased anesthetic considerations, such as pregnancy.[12,13] But, issues arise with significant modifications to the current ASA-Physical Status Classification System. The worldwide use of this system and the inclusion of the ASA-Physical Status Classification System definitions within the Current Procedural Terminology® code set (Current Procedural Terminology, Professional Edition, American Medical Association, USA) create barriers to a complete overhaul of the system. And, despite its limitations, for the purposes of describing a patient's preoperative physical status, the ASA-Physical Status Classification System has functioned reasonably well over time. The addition of specific examples for each classification addresses the concerns related to subjectivity without changing the basic framework or terminology to which many are accustomed.

We speculate that no additional information beyond the definitions was provided by the ASA before 2014 because the ASA felt that anesthesiologists would use their training and experience to supplement the definitions when assigning ASA-Physical Status. But with the recent increase in the use of ASA-Physical Status Classification System by nonanesthesia-trained clinicians, policy makers, and regulators,[4,14–16] the reliance on anesthesia education and experience was no longer possible. Further, many of these nonanesthesia care guidelines and regulations use an ASA-Physical Status assignment of I or II as criteria for nonanesthesia care. For example,

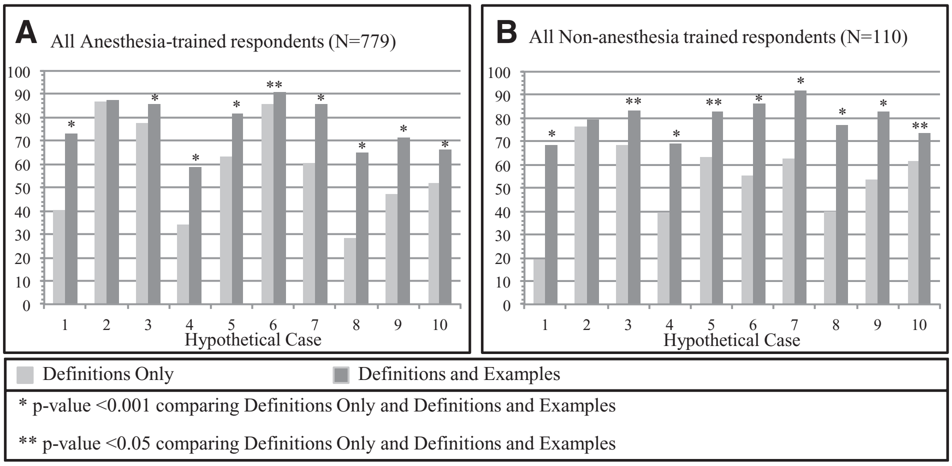

Fig. 2. Percentage of correct American Society of Anesthesiologists (ASA)-Physical Status Classification System assignment for each hypothetical case. (*A*) All anesthesia-trained respondents (n = 779). Anesthesia-trained respondents include physician anesthesiologists, resident and fellow anesthesiologists, nurse anesthetists, and anesthesiologist assistants. (*B*) All nonanesthesia-trained respondents (n = 110). Nonanesthesia-trained respondents include nonanesthesiologist physicians and nurses involved in moderate sedation. All cases had a statistically significant increase in the number of correct answers with the use of definitions and examples, except for case 2. Using definitions alone, 3 of 10 hypothetical cases for anesthesia-trained respondents and 1 of 10 for nonanesthesia-trained respondents had greater than 70% respondents with the correct answer. With definitions and examples, this increased to 7 of 10 cases for anesthesia-trained and 8 of 10 cases for nonanesthesia-trained respondents. *$P < 0.001$ comparing definitions only and definitions and examples. **$P < 0.05$ comparing definitions only and definitions and examples.

moderate sedation by a nonanesthesia-trained clinician and office-based anesthesia are often limited ASA-Physical Status I and II patients.[14,15] Many ambulatory facilities, such as ambulatory surgical centers require all ASA-Physical Status III patients to be reviewed and approved by the physician anesthesiologist medical director before allowing for care in the ambulatory surgical centers.[16]

In 2014, the ASA provided examples for each ASA-Physical Status Classification System classification as a guide for all clinicians. In practice, the examples should allow for nonanesthesia clinicians to better identify those patients who would be ASA-Physical Status I and II. More importantly, the examples give guidance on patients who should be assigned as ASA-Physical Status III during initial review. The list of comorbidities put forth by the ASA, however, is not all-encompassing. Additionally, the approved examples are not intended to supplant thorough medical review and decisions by trained anesthesia providers.

Because the issue of differentiating between ASA-Physical Status II and III is often the important one in clinical decision-making, we designed the cases used in this study to have correct ASA-Physical Status assignments I, II, or III. We did not include any ASA-Physical Status IV and V patients because we felt it unlikely that they would be screened ASA-Physical Status I or II and care would therefore likely involve a physician anesthesiologist.

The purpose of the study was to determine if including the publicly available ASA-approved examples would improve appropriate assignment of ASA-Physical Status by various clinicians for 10 hypothetical patients. This study was not designed to validate the ASA-approved examples as correct or evidence based. Additionally, as it has been stated that the ASA-Physical Status should not include judgment about operative risk,[2,17] we did not examine ASA-Physical Status and operative risk.

Our results for definitions are comparative to previous studies.[5,6,9] With definitions, both anesthesia trained and non anesthesia trained correctly assigned ASA-Physical Status with a mean of just more than 5 of 10 patients, with nonanesthesia trained scoring lower than anesthesia-trained. However, with the addition of the newly ASA-approved examples to the definitions, both anesthesia-trained and nonanesthesia trained correctly assigned ASA-Physical Status with a mean of almost 8 of 10 patients. In fact, with the addition of examples, there was no significant difference in the rate of correct assignment between anesthesia-trained and nonanesthesia-trained clinicians. In previous studies using hypothetical cases,[5,9] there was only a small minority of individual hypothetical cases in which greater than 65% of all respondents arrived at the same ASA-Physical Status. Using this as a benchmark, with definitions our results are similar with less than one third of cases for anesthesia trained and nonanesthesia trained meeting more strict criteria of greater than 70% correct assignment. The addition of examples improves correct assignment among respondents with 7 of 10 cases for anesthesia trained and 8 of 10 cases for nonanesthesia trained having greater than 70% respondents assigning the same ASA-Physical Status. Our data show that with these examples, improvement in the correct assignment of the ASA-Physical Status occurs for anesthesia-trained and nonanesthesia-trained clinicians alike.

One challenge in designing this study was the determination of the correct ASA-Physical Status Classification System for each hypothetical patient. Examination of our results shows that regardless of the correct assignment determined by the investigators, in 8 out of 10 cases, there was a larger percentage of all respondents arriving at any one ASA-Physical Status assignment with examples than with definitions alone. For two cases, the overall highest percentage of any one assigned ASA-Physical Status by respondents was not in agreement with the investigators' determined correct assignment. Examination of these cases highlights some considerations regarding the use of the ASA-approved examples.

Case 4 demonstrates a potential pitfall of the ASA-Physical Status Classification System examples and shows that when a case contains comorbidities not included in the ASA examples, inconsistency in assignment persists. This case describes a patient with several diseases described as mild or controlled, with an intended correct ASA-Physical Status II. The largest percentage (64%) of respondents selected ASA-Physical Status III for case 4 when using definitions. Using examples, 60% of all respondents assigned ASA-Physical Status II. While we are limited to speculation, it is possible that the combination of several comorbidities such as asthma, obesity, OSA, gastroesophageal reflux disease, and epilepsy present in this case may have been perceived as sufficient for ASA-Physical Status III using definitions alone. However, when several of these comorbidities were not present in the example list, the ASA-Physical Status assignment was made based only on the ASA-Physical Status II appropriate comorbidities listed in the examples, and thus the outliers were no longer considered. As the ASA-approved examples are not an all-encompassing list, this creates a potential for comorbidities to be undervalued or not considered when not present on the ASA example list.

Case 8 is another case in which the ASA-Physical Status assignment with the highest overall percentage by respondents differed from what the investigators considered to be the appropriate ASA-Physical Status. The intended correct ASA-Physical Status for this case was III as the patient had several comorbidities specific to the ASA-Physical Status Classification System III examples and no listed comorbidities for ASA-Physical Status IV. The largest percentage (69%) of respondents selected ASA-Physical Status IV for case 8 when using definitions. With the addition of examples, 67% of all respondents assigned ASA-Physical Status III, but there remained 32% of respondents assigning ASA-Physical Status IV. One consideration not addressed within the ASA-Physical Status Classification System is how multiple comorbidities from one ASA-Physical Status Classification System category may influence ASA-Physical Status Classification System assignment. In this case, it is possible that to many respondents, multiple ASA-Physical Status

III comorbidities are sufficient for increasing ASA-Physical Status to class IV. Alternatively, the presence of peripheral arterial disease, which is not listed in the ASA-approved examples, may be considered appropriate for ASA-Physical Status IV to many clinicians.

One way to address inappropriate assignments for disease states not included in the ASA-approved examples would be for individual facilities to create their own examples, which are relevant to that facility. To a pediatric anesthesiologist, the presence of hypertension requiring medication in a 9 yr old, even if controlled, may constitute a severe systemic disease and ASA-Physical Status III, whereas there would be little argument against ASA-Physical Status II for the same in an adult. The ASA-approved examples specify that ESRD on regular dialysis constitutes an ASA-Physical Status III. However, without objective criteria, the point at which chronic kidney disease migrates from ASA-Physical Status II to III could be left to subjective interpretation of individuals. Comorbidities such as OSA or calculated STOP-BANG (snoring, tiredness, observed apnea, blood pressure, BMI, age, neck circumference, gender as a screening tool for OSA) score, malignancy, or pediatric-specific conditions may all be reasonable scenarios for individual departments to determine their own criteria to increase objective and consistent assignments.

Although this was a nationally distributed online study, it is not without limitations. With the method that was used to recruit participants, we are unable to accurately estimate the total number of people invited to participate and thus we cannot report on a true response rate. It is possible that respondents had a motivation to participate making them different than nonresponders. We analyzed only responses for those who completed the survey. It is possible that exclusion of incomplete responses introduced a potential bias to the results. The use of hypothetical cases has potential to not be representative of clinical practice where there is likely additional clinical information available to influence judgment. A limitation of the study may have been the inability of respondents to change their answers after moving on to the next question, but this was a specific design of the study to avoid changes to responses once the ASA-Physical Status Classification System examples were introduced. As previously mentioned, the assignment of a correct ASA-Physical Status may be viewed as overreaching. However, it stands that with examples, there was a larger percentage of respondents arriving at any one ASA-Physical Status than with definitions for 8 of 10 cases. As the approved examples are used clinically, further studies within and among institutions may determine if objective ASA-Physical Status Classification System assignments have utility in practice.

The addition of examples to the definitions of the ASA Physical Status Classification System increases the number of appropriate ASA-Physical Status assignments among all clinicians—both anesthesia trained and nonanesthesia trained and allows both groups to perform without differences. By incorporating use of these ASA-approved examples, assignment of patients into categories of ASA-Physical Status II and III can be improved.

Research Support

Support was provided solely from institutional and/or departmental sources.

Competing Interests

The authors declare no competing interests.

Correspondence

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