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ASA Physical Status Classifications:

A Study of Consistency of Ratings

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The American Society of Anesthesiologists' (ASA) Physical Status Classification was tested for consistency of use by a questionnaire sent to 304 anesthesiologists. They were requested to classify ten hypothetical patients. Two hundred fifty-five (77.3 per cent) responded to two mailings. The mean number of patients rated consistently was 5.9. Four patients elicited wide ranges of responses. Age, obesity, previous myocardial infarction, and anemia provoked controversy. There was no significant difference in responses from different regions of the country. Academic anesthesiologists rated a greater number identical than did those in private practice ($P < 0.01$). There was no difference in ratings between those who used the classification for billing purposes and those who did not. The ASA Physical Status Classification is useful but suffers from a lack of scientific precision. (Key words: Anesthesia: risk. Records, anesthetic: ASA Classification.)

THE American Society of Anesthesiologists (ASA) Physical Status Classification was originally designed to standardize physical status categories for statistical studies and for hospital records so that uniform interpretation would be possible. The concept of physical status classification was suggested in 1940 by a committee of the American Society of Anesthetists,[1] the predecessor organization of the American Society of Anesthesiologists. The committee, composed of Drs. E. A. Rovenstine, Meyer Saklad, and Ivan B. Taylor, was originally charged with the task of devising a system for the collection and tabulation of statistical data in anesthesia. One of the variables considered was "operative risk."

Early on, it was realized that the term "operative risk" was not suitable, since it was altered by the magnitude of the surgical procedure. The committee substituted the phrase "Physical State," and proposed six categories. The Society adopted and published this classification. Class 7 was added later to include the moribund patient who was expected to die within 24 hours with or without surgical treatment. In 1961, Dripps *et al.*[2] proposed a classification consisting of five categories.

Minor rhetorical changes were made by the 1974 House of Delegates of the ASA§:

Class 1	A normally healthy patient.
Class 2	A patient with mild systemic disease.
Class 3	A patient with severe systemic disease that is not incapacitating.
Class 4	A patient with an incapacitating systemic disease that is a constant threat to life.
Class 5	A moribund patient who is not expected to survive for 24 hours with or without operation.

Emergency cases are designated by the addition of "E" to the classification number.

Many investigators have utilized the ASA classification in statistical analyses.[2–4] The system itself, however, has not been tested: would the majority of anesthesiologists place the same patient in the same class? If not, does use vary with identifiable factors concerning the anesthesiologist and his practice? The purpose of this study was to explore these questions.

Method

Brief descriptions of ten hypothetical patients (see Appendix) were composed and mailed to 304 Board-certified anesthesiologists selected at random from the 1976 ASA Directory of Members. The recipients were asked to classify each patient according to the ASA Physical Status Classification. A questionnaire was included to elicit information concerning the respondent's practice, years since completion of residency training, and mode of use of the Physical Status Classifications. A follow-up letter was sent to those who did not respond to the first questionnaire.

The responses were tabulated and subjected to statistical analysis, primarily using Student's t test, chi-square test, and analysis of variance.

Results

A total of 235 (77 per cent) of the questionnaires was returned after two mailings: 199 anesthesiologists responded to the first mailing. All districts of the ASA were proportionately represented. Characteristics of the respondents are listed in Table 1.

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§ American Society of Anesthesiologists: Handbook for Delegates: 416-3.2, 1974, page 3.

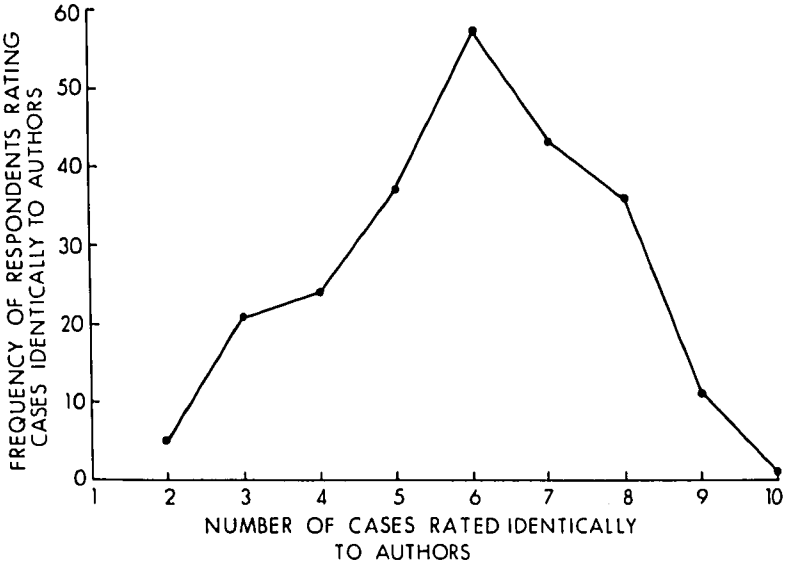

FIG. 1. Distribution of the numbers of identical responses.

Analysis was performed in two steps. The first analysis arbitrarily considered the classifications provided by two of the authors (W.D.O. and J.A.F.) to be the appropriate ratings. The mean number of patients rated identically by the authors and the respondents was 5.9 (SE ± 0.1), with a mode of 6. The distribution of the numbers of identical responses was a bell-shaped curve, ranging from 2 to 10 correct (fig. 1).

The second analysis was done with a subset of the original ten patients, obtained by a method similar to "item analysis" in test construction[5]: each answer (right *vs.* wrong) was compared with the respondent's score for the remaining nine cases by means of a Student's t test. Classifications of four of the ten patients (Patients 1, 3, 7 and 9) were found to have no significant relationship to the corresponding nine-patient scales. t values of these four ranged from −1.47 to +1.20, where an absolute value of at least 1.96 was required for significance at the .05 level.

Thus, these four cases may represent areas of controversy in which many anesthesiologists have departed from the strict definition of physical status. These cases were set aside for further scrutiny, and the basic analysis was repeated using a scale made of the classifications of the remaining six patients (Patients 2, 4, 5, 6, 8 and 10). The results showed strong consistency (t values ranging from +2.5 to +5.1 when tested against the classifications of the remaining nine patients). For the six, the mean number correct was 4.0 ± SE 0.1, with a mode of 5.

The ASA districts were combined into the eight regions recognized by the Department of Commerce. There was no significant difference among regions of the country with either analysis. Categorization according to the respondents' choices and types of practice showed a significant difference between those in private practice and those in academic medicine. The latter rated a greater mean number identically (5.9 *vs.* 6.4) ($P < 0.01$) in the first analysis, as well as in the analysis of only six patients (4.0 *vs.* 4.4) ($P < 0.05$).

Table 2 lists the mean numbers of patients rated consistently, using both analyses, by the use (or nonuse) of the classifications. The responses for each patient were analyzed to compare those respondents who used the classification for billing purposes and those

TABLE 1. Characteristics of Respondents

	Per Cent
Years since completion of training	
1–5 years	14
6–10 years	27
11–20 years	35
21–35 years	24
Unknown	<1
Type of practice	
Private practice	77
Academic practice	19
Government practice	2
No response	2
Use of Physical Status Classification*	
Routinely used	92
Used in preanesthetic note	69
Used on anesthesia record	83
Used for billing purposes	43
Last read definitions of classifications	
<6 months	40
6–23 months	35
2–5 years	17
>5 years	8
Never	<1

* This total is greater than 100 per cent because many respondents use the classification in two or more ways.

who did not. There was no significant difference for any one patient. The sum of the means of the ratings for all ten patients combined was 27.6 ± SE 0.2 for those using it for billing and 27.3 ± SE 0.2 for those who did not do so.

Analysis of variance and the Duncan multiple-range test revealed that recent perusal of the categories enabled one to score more consistently, although this was significant ($P < 0.005$) for the six patients with internal agreement only (Table 3).

Discussion

Although these classifications used to describe preoperative physical status have never been intended to indicate anesthetic "risk," many anesthesiologists are unable to separate the two concepts. Indeed, many physicians refer to them as "risk" classifications. An example of this dilemma is the patient with severe heart disease, for whom excision of a sebaceous cyst with local anesthesia represents a minor risk, while resection of an aortic aneurysm is an undertaking of great magnitude. On the other hand, studies in one hospital[¶] indicate that physical status does correlate with outcome when considered by individual operations, and therefore, could be considered an index of operation-specific risk. This problem should probably be clarified in future revisions of the classification.

The similarity of responses from the eight regions of the country indicate rational ratings by the individuals responding. Areas that have high medical liability premiums did not rate the patients higher. Apparently, high economic costs do not influence the physician's judgment concerning the severity of illness.

[¶] McPeek B, Gilbert JP, Owens WD: Physical status as a predictor of outcome from operation (abstr). American Society of Anesthesiologists Annual Meeting, 1973, page 257.

TABLE 2. Patients Rated Consistently

Use of Physical Status Classification	Mean ± SE Consistent with Authors' Classification	Mean ± SE Consistent in Six Patients with Agreement
Use routinely		
Yes	5.9 ± 0.1	4.0 ± 0.1
No	6.5 ± 0.4	4.3 ± 0.4
Preanesthetic note		
Yes	5.9 ± 0.1	4.0 ± 0.1
No	6.0 ± 0.2	4.1 ± 0.2
Anesthesia record		
Yes	5.9 ± 0.1	4.0 ± 0.1
No	6.2 ± 0.3	4.1 ± 0.2
Billing purposes		
Yes	5.9 ± 0.2	4.1 ± 0.2
No	6.0 ± 0.1	4.0 ± 0.1

No comparison was significantly different.

TABLE 3. Recent Perusal and Consistency of Ratings

Time Since Last Reading Classifications	Mean ± SE Consistent with Authors' Classification	Mean ± SE Consistent in Six Patients with Common Agreement*
<6 months	6.2 ± 0.2	4.3 ± 0.1
6–23 months	6.1 ± 0.2	4.2 ± 0.2
2–5 years	5.5 ± 0.3	3.7 ± 0.3
>5 years	5.0 ± 0.4	3.0 ± 0.4
	NS	$P < 0.005$†

* In a Duncan multiple-range test at the 0.05 level, the following pairs of groups had statistically significant differences in means: 1 and 3, 1 and 4, 2 and 4.
† Analysis of variance.

The anesthesiologist who adjusts billing, *i.e.*, increases the amount as the physical status increases, does not rate the patients in higher categories (Table 2), an important consideration in light of third-party concern with the economics of the specialty.

One phase of the analysis was based on the thesis that the authors' classifications were the appropriate ones. This might be regarded as arbitrary and presumptious. However, the case summaries were composed in each instance with a specific classification in mind, according to the published classification rules. The authors' classifications thus provided not only a needed starting point, but also an interesting test to determine whether the same numbers would emerge from the responses. A majority (a plurality for Patient 3) of the respondents, indeed, classified each patient as did the authors, except for Patient 7. This patient elicited the widest scatter of answers. Further scrutiny of the responses revealed three additional patients that presented problems to the respondents. Testing for internal consistency, much like that done for testing the internal consistency in written examinations, revealed that Patients 1, 3, 7 and 9 presented confusing problems. Therefore, these four patients were set aside, and a repeat of the analysis was performed.

For all but one (Patient 3) of the ten original patients, the majority of board-certified anesthesiologists arrived at the same classification. However, the considerable variation in responses for three additional patients points out a major criticism of the system: predetermined opinions, often scientifically unfounded, may provide the impetus for a given rating.

The four "problem patients" are probably the most important to consider. They exemplify problems with the current classification system.

Patient 1 (see Appendix) was essentially healthy but was 75 years old. Perhaps the age can explain the diversity of opinion among respondents. Age, *per se*, is not one of the criteria for classifying patients. Dripps

et al.[6] state that extremes of age may increase the Physical Status rating, but this is an editorial comment and is not a part of the official ASA publication. An argument advanced in support of this theory is that older patients are more likely to have complicating diseases. The obvious answer to that statement is that such patients should be classified according to the presence or absence of such diseases, not according to age.

Patient 7 was classified 2 by most respondents. Those who made comments indicated that the mild anemia was the deciding factor—a mild systemic disease. Many others, including the authors, classified the patient 1 on the basis that this laboratory finding was of minor clinical significance in view of the normal vital signs. Others believed that the anemia was a severe problem and, accordingly, classified the patient 3.

Although many of the respondents and the authors were consistent in their classifications of Patients 3 and 9, there was a wide range among the "minority" answers. This diversity illustrates that some specific disease entities, such as previous myocardial infarction and obesity, still provoke controversy concerning their effects on the classification.

Obesity is the hallmark characteristic of Patient 9. The anesthesiologist is certainly aware of problems at the time of operation on the obese patient. Since the advent of gastrointestinal and jejunoileal bypass operations to aid these individuals, much more attention has been focused on their abnormalities, especially of the cardiovascular and respiratory systems. The basic question is to what extent does obesity impair health. Feinberg[7] has said this is "one of the worst possible anesthetic risks" and assigns these patients to Class 4. Dripps *et al.*[6] state that perhaps these patients should be in Class 2. The scientific evidence for the proper classification based on statistical anesthesia risk or difficulty is found wanting.

Patient 3 depicts a major concern of most anesthesiologists—a previous myocardial infarction. This patient's infarction had been uncomplicated and had occurred nine months prior to the scheduled operation. According to Tarhan *et al.*,[8] this patient would be expected to have a low reinfarction rate (4–5 per cent). Admittedly, there had been damage to the myocardium, but cardiovascular status has stabilized. Most of the respondents agree that this patient is in Class 2, but there was a range of responses from 1 to 4. This demonstrates the lack of uniformity of opinion concerning the extent of impairment following myocardial infarction.

In a broad perspective, the ASA Physical Status is a workable classification system. It does suffer from a lack of scientific definition. We are currently conducting a study of patients during the perioperative period. Perhaps findings concerning more precise preoperative status related to outcomes will lead to better, more precise definitions in a classification system.

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Appendix

For each of the following patients, values for serum electrolytes, hepatic enzymes, blood urea nitrogen (BUN), creatinine, blood sugar, hemoglobin, hematocrit, leukocyte count, and urinalysis have been obtained. In addition, a recent chest roentgenogram and electrocardiogram have been obtained. All are reported as normal unless otherwise specified.

Patient 1

A 75-year-old Caucasian male farmer, weighing 85 kg, is scheduled for an elective inguinal herniorrhaphy. He operates a 120acre farm with help only during harvest. Ten years ago he was ill with hepatitis with no known residual complication. The remainder of his history is noncontributory. On physical examination he appears younger than his stated age. Vital signs are normal. The right inguinal hernia is the only abnormality found.

Patient 2

A 45-year-old Caucasian female anesthesiologist is scheduled for a staging laparotomy for lymphoma. Her weight is 52 kg and represents a loss of 8 kg in the past three months. She has been treated with prednisone, 50 mg/day, and chlorambucil for the past two months. Past history includes infectious childhood diseases and an appendectomy at age 17, performed with an unidentified general anesthetic, with good recovery. She is gravida ii, para ii. She had spinal anesthesia without sequelae for both deliveries. An inguinal biopsy was done during uneventful balanced anesthesia two months ago. Physical examination reveals that the patient is thin, with the following abnormal findings: the spleen and liver are enlarged. A mass is palpable in the lower abdomen. Inguinal nodes are present on the right and a healed left inguinal scar is present.

Laboratory values include hematocrit, 30 per cent; hemoglobin, 10 g/100 ml; leukocyte count, 5,000/cu mm; platelet count, 125,000; alkaline phosphatase 250 mU/ml (normal 35–95); lactate dehydrogenase (LDH) 300 mU/ml (normal 100–250); creatine phosphokinase (CPK) 150 mU/ml (normal 25–145); serum glutamic oxaloacetic transaminase (SGOT) 80 mU/ml (normal 10–40).

Patient 3

A 56-year-old Caucasian man is scheduled for a hemorrhoidectomy. Past history reveals a myocardial infarction nine months ago,

uncomplicated by arrhythmias or heart failure. Review of systems is noncontributory. Physical examination shows no abnormality except prolapsed hemorrhoids.

ECG demonstrates an old anterior infarct and a normal sinus rhythm.

Patient 4

A 42-year-old Negro man is scheduled for a lumbar laminectomy for a herniated disc at L2–3. Past history and review of systems reveal a previous diagnosis of sickle-cell trait. The rest of the history is noncontributory. Physical examination shows no abnormality except neurologic findings compatible with the herniated lumbar disc.

Hemoglobin is 11.8 g/100 ml and hematocrit, 36.4 per cent.

Patient 5

A 50-year-old Caucasian salesman was hospitalized six days prior to operation with the complaint of substernal pain. During the next three days enzymatic and electrocardiographic changes compatible with myocardial infarction were found. During the first day norepinephrine infusion was necessary to maintain blood pressure in the normal range. From the second day on, mental confusion was noticed. On the fourth day the patient passed tarry stools and had two episodes of hematemesis. Transfusion of six units of blood was necessary to maintain blood pressure.

Past history includes childhood infectious diseases, a daily consumption of 12 ounces of 84-proof whiskey for 25 years, and 90 pack-years of cigarette smoking. The patient has had a productive cough and exertional dyspnea.

An hour preceding operation the patient vomits a liter of bright red blood; blood pressure is 70/40 torr and pulse rate, 120/min. An immediate exploratory laparotomy is proposed.

On physical examination the patient is cold, sweaty, and dyspneic. He is unresponsive to verbal commands. Blood pressure is 60/40 torr, pulse rate 130/min, hemoglobin 8.5 g/100 ml, and hematocrit 24 per cent.

Patient 6

A 55-year-old Caucasian man is scheduled for a transurethral resection of the prostate to relieve obstructive uropathy. He has an accompanying diagnosis of aortic stenosis. Past history is noncontributory. Review of systems reveals frequent, severe pain, which is anginal in nature and is relieved by nitroglycerin. The patient has had two episodes of congestive heart failure necessitating hospitalization, the most recent being three months ago. Medications prescribed were nitroglycerin, digoxin, and furosemide. He has been advised to quit his job as an accountant and to restrict his work at home. On physical examination, the patient, who was thin, was resting in bed using three pillows. Blood pressure is 115/90 torr. There is a harsh systolic murmur at the aortic area with radiation to the neck, accompanied by a systolic thrill. The second heart sound in the aortic area is decreased in intensity. The lungs are clear to auscultation. The balance of the physical examination is noncontributory.

Blood studies reveal SGOT, 55 mU/ml (normal 10–40); potassium, 3.2 mEq/l (normal 3.5–5). Roentgenogram of the chest shows left ventricular enlargement. The EKG shows changes characteristic of left ventricular hypertrophy and a normal sinus rhythm, with a rate of 66/min.

Patient 7

A 24-year-old Caucasian housewife, weighing 60 kg, is scheduled for dilatation and currettage. Seven weeks following her last menstrual period, vaginal bleeding developed. Three days following the onset of bleeding an abortus was passed. The bleeding has continued, and has saturated five napkins over the past 24 hours. This was the patient's first pregnancy. She has been NPO for 8 hours and had only clear liquids for the preceding 6 hours. Past history and review of systems are noncontributory. Physical examination reveals a normal blood pressure, 100/60 torr, and a pulse rate of 84/min. Vaginal bleeding is evident and a slight pallor is recorded.

The hemoglobin is 9.5 mg/100 ml and the hematocrit is 26 per cent.

Patient 8

A 67-year-old Caucasian man is scheduled for gastric resection to remove a mass in the greater curvature of the stomach. Past history reveals previous anesthetization two years ago for right colectomy, which was complicated by respiratory failure, necessitating five days of mechanical ventilation. The patient has smoked two packages of cigarettes per day for 47 years. He becomes short of breath after six steps, has had a chronic cough for 20 years, and produces half a cup of sputum each morning. On physical examination the patient is obviously short of breath and is sitting up in bed. He exhales with pursed lips, cannot blow a match at 4 inches, and becomes dyspneic after walking 20 feet. Examination of the chest reveals increased anteroposterior (A-P) diameter, use of accessory respiratory muscles, and basilar rhonchi, which clear with a cough. Clubbing of the fingers is observed. The rest of the physical examination is normal.

Hemoglobin is 15 g/100 ml, with hematocrit 49 per cent. Roentgenogram of the chest reveals increased A-P diameter but no acute process. ECG reveals right ventricular hypertrophy. Results of pulmonary function tests include FEV_1 25 per cent, maximum mid-expiratory flow 0.28 l/sec, and FRC 120 per cent of predicted. Arterial blood-gas values during breathing of room air are Pa_{O_2} 45 torr, Pa_{CO_2} 51 torr, and *p*H 7.39.

Patient 9

A 37-year-old Caucasian woman is scheduled for an elective Marshall-Marchetti procedure for urinary incontinence. Review of systems and past history are otherwise noncontributory. Physical examination reveals that the patient is 5 feet, 3 inches tall, weighs 268 pounds, and has signs and symptoms consistent with a cystocele. The balance of the examination is noncontributory.

Patient 10

A 55-year-old Caucasian male executive is scheduled for elective cholecystectomy. His present complaints are all related to gallbladder disease. Five years ago he had a proven anterior myocardial infarction. He subsequently has had angina while walking uphill or in a cold wind. Six years ago his blood pressure was measured at 160/100 torr. He has been treated with hydrochlorothiazide since then and his blood pressure has been in the range of 125 to 135 torr systolic and 90 to 95 torr diastolic since treatment was started. ECG shows an old infarction with no recent change when compared with old tracings. Cholelithiasis is demonstrable radiographically. Physical examination reveals a weight of 80 kg and normal vital signs. The only abnormalities are tenderness in the right upper quadrant and a congenitally short left arm.