Medisinstudiet 2B Anestesi 5

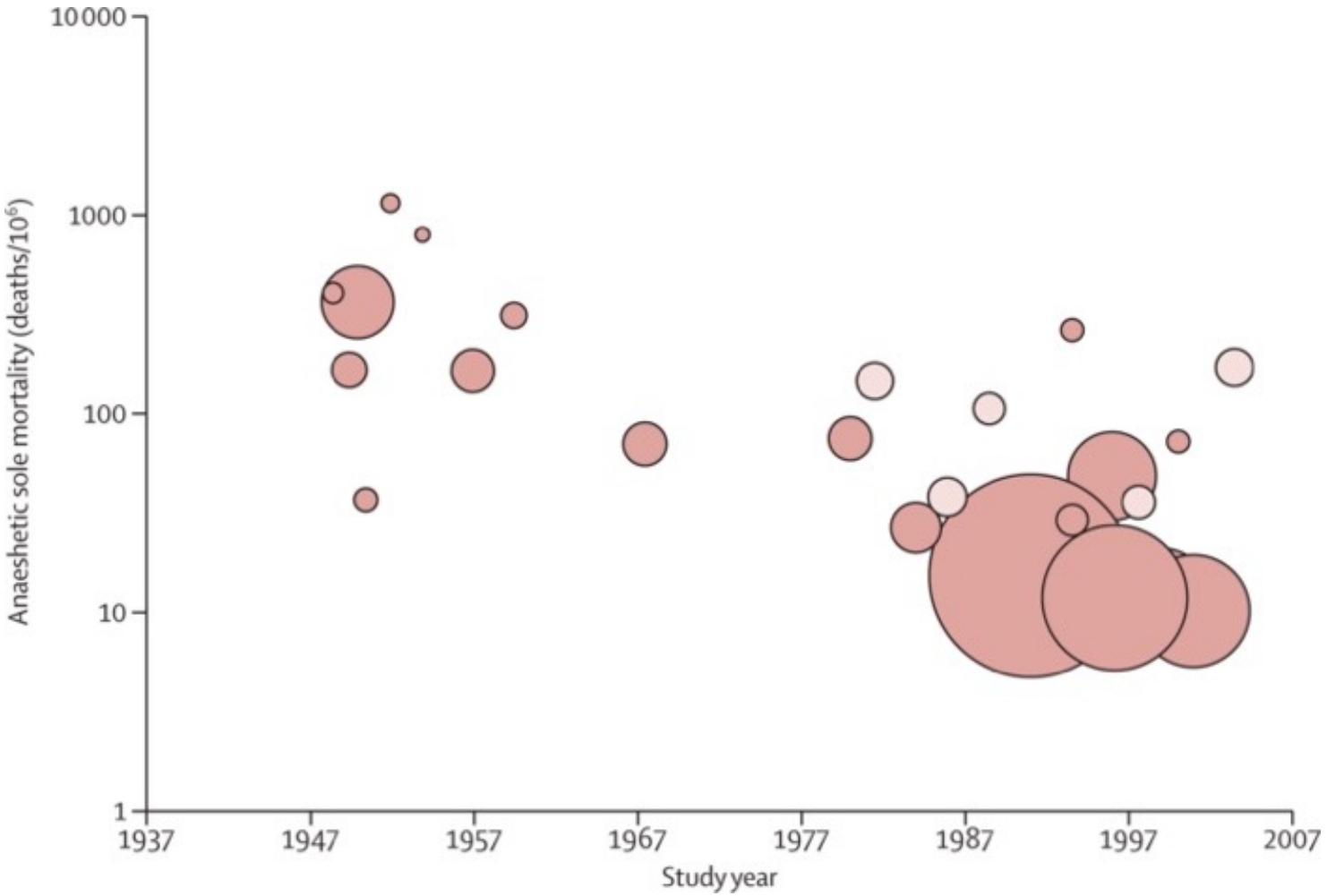
Anestesiologiske risikovurderinger
MODS
Frailty

08. april 2022

Nils Kristian Skjærvold

Overlege Avdeling for Thoraxanestesi og –intensivmedisin

Førsteamanuensis Institutt for Sirkulasjon og Bildebehandling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Anaeshetic sole mortality (deaths/10⁶)
1937
1947
1957
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1997
2007
Study year

ANESTHESIOLOGY

The Evolution, Current Value, and Future of the American Society of Anesthesiologists Physical Status Classification System

Balazs Horvath, M.D., F.A.S.A., Benjamin Kloesel, M.D., M.S.B.S., Michael M. Todd, M.D., Daniel J. Cole, M.D., F.A.S.A., Richard C. Prielipp, M.D., M.B.A., F.C.C.M.

ANESTHESIOLOGY 2021; 135:904–19

ABSTRACT

The American Society of Anesthesiologists (ASA) Physical Status classification system celebrates its 80th anniversary in 2021. Its simplicity represents its greatest strength as well as a limitation in a world of comprehensive multisystem tools. It was developed for statistical purposes and not as a surgical risk predictor. However, since it correlates well with multiple outcomes, it is widely used—appropriately or not—for risk prediction and many other purposes. It is timely to review the history and development of the system. The authors describe the controversies surrounding the ASA Physical Status classification, including the problems of interrater reliability and its limitations as a risk predictor. Last, the authors reflect on the current status and potential future of the ASA Physical Status system.

(ANESTHESIOLOGY 2021; 135:904–19)

skewed measures of outcome.[12–18] One attempt to address this variation was made by the ASA with the addition of case examples, approved first in 2014 and updated in 2020. However, it appears that these examples have only marginally improved reproducibility.[19,20]

Given these issues, we will review the history and evo-

system celebrates its 80th anniversary in 2021. Its simplicity represents its greatest strength as well as a limitation in a world of comprehensive multisystem tools. It was developed for statistical purposes and not as a surgical risk predictor. However, since it correlates well with multiple outcomes, it is widely used—appropriately or not—for risk prediction and many other purposes. It

ASA Physical Status Classification	Definition	Adult Examples, Including, but Not Limited to, the Following:	Pediatric Examples, Including, but Not Limited to, the Following:	Obstetric Examples, Including, but Not Limited to the Following:
I	A normal healthy patient.	Healthy, nonsmoking, no or minimal alcohol use.	Healthy (no acute or chronic disease), normal body mass index percentile for age.	
II	A patient with mild systemic disease.	Mild diseases only without substantive functional limitations. Current smoker, social alcohol drinker, pregnancy, obesity (30 < body mass index < 40), well-controlled diabetes mellitus/ hypertension, mild lung disease.	Asymptomatic congenital cardiac disease, well-controlled dysrhythmias, asthma without exacerbation, well-controlled epilepsy, non–insulin-dependent diabetes mellitus, abnormal body mass index percentile for age, mild/moderate OSA, oncologic state in remission, autism with mild limitations.	Normal pregnancy,* well-controlled gestational hypertension, controlled pre-eclampsia without severe features, diet-controlled gestational diabetes mellitus.
III	A patient with severe systemic disease.	Substantive functional limitations; one or more moderate to severe diseases. Poorly controlled diabetes mellitus or hypertension, COPD, morbid obesity (body mass index ≥ 40), active hepatitis, alcohol dependence or abuse, implanted pacemaker, moderate reduction of ejection fraction, end-stage renal disease undergoing regularly scheduled dialysis, history (> 3 months) of MI, cerebral vascular accident, transient ischemic attack, or coronary artery disease/ 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.	Pre-eclampsia with severe features, gestational diabetes mellitus with complications or high insulin requirements, a thrombophilic disease requiring anticoagulation.
IV	A patient with severe systemic disease that is a constant threat to life.	Recent (< 3 months) MI, cerebral vascular accident, transient ischemic attack, or coronary artery disease/ stents, ongoing cardiac ischemia or severe valve dysfunction, severe reduction of ejection fraction, shock, sepsis, DIC, acute respiratory distress syndrome, or end-stage renal disease 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 syndrome of hemolysis, elevated liver enzymes, and low platelet count or other adverse event, peripartum cardiomyopathy with ejection fraction < 40, uncorrected/ decompensated heart disease, acquired or congenital.
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.
VI	A declared brain-dead patient whose organs are being removed for donor purposes.			

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).

* 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 Physical Status II for a woman with uncomplicated pregnancy.

ASA, American Society of Anesthesiologists; COPD, chronic obstructive pulmonary disease; DIC, disseminated intravascular coagulation; ECMO, extracorporeal membrane oxygenation; MI, myocardial infarction; OSA, obstructive sleep apnea; PCA, patient-controlled analgesia.

Table 2. Rates of Deaths Totally or Partially Related to Anesthesia According to Age and ASA Physical Status

	Mortality Rate per 100,000 Anesthetic Procedures	95% Confidence Interval
Age		
0–7 yr	0.60	0.12–3.2
8–15 yr	1.20	0.30–3.2
16–39 yr	0.52	0.24–0.93
40–74 yr	5.20	2.7–8.1
≥ 75 yr	21.00	8.3–34.0
ASA physical status		
I	0.40	0.12–0.81
II	5.0	1.6–9.1
III	27.0	12.0–44.0
IV	55.0	1.1–130.0

ASA = American Society of Anesthesiologists.

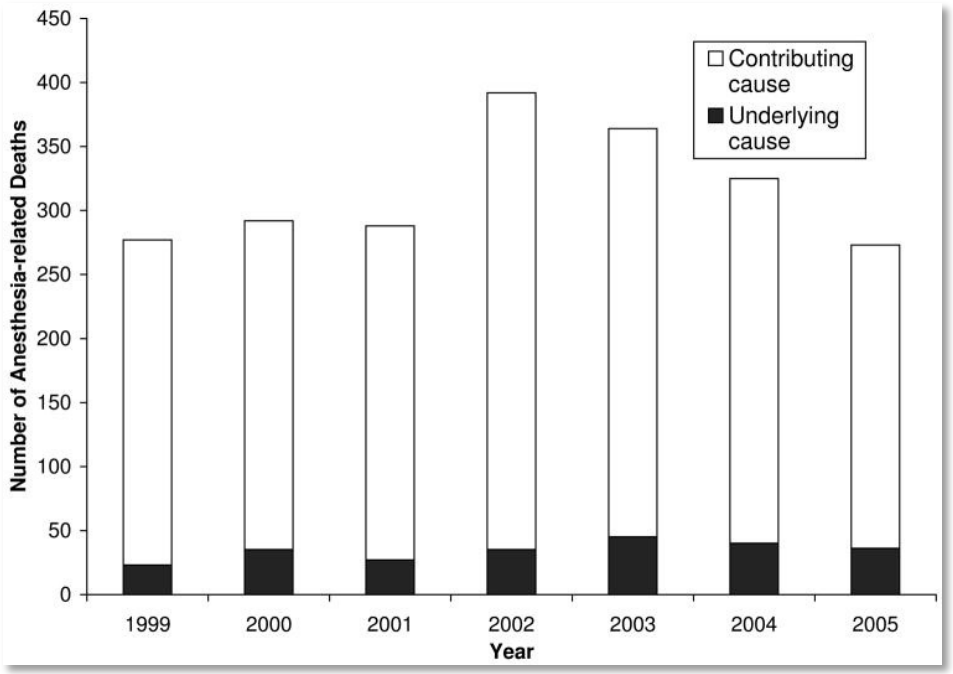
Hvorfor er anestesi farlig?

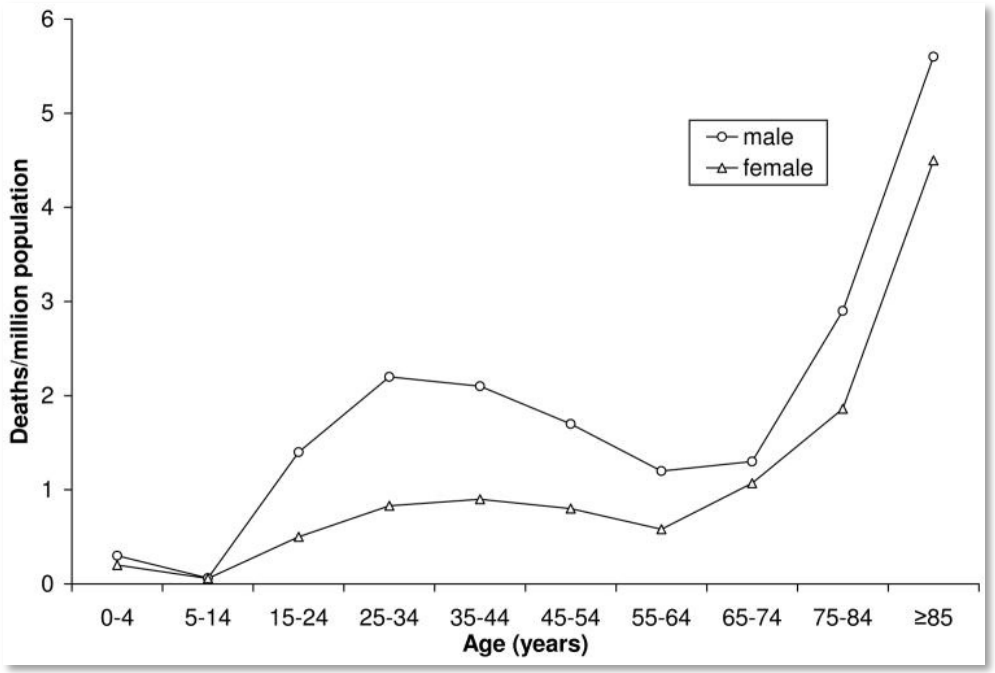
- Kardiovaskulært deprimerende
- Respiratorisk deprimerende
- CNS deprimerende
- Trolig påvirker det alle organsystemer og samspillet mellom dem...

Anesthesiology 2009; 110:759–65

Epidemiology of Anesthesia-related Mortality in the United States, 1999–2005

Guohua Li, M.D., Dr.P.H., Margaret Warner, Ph.D.,† Barbara H. Lang, B.S.,‡ Lin Huang, M.S.,§ Lena S. Sun, M.D.‖*





The Lancet · Saturday 12 August 1967

ACUTE RESPIRATORY DISTRESS IN ADULTS

DAVID G. ASHBAUGH
M.D. Ohio State
ASSISTANT PROFESSOR OF SURGERY

D. BOYD BIGELOW
M.D. Colorado

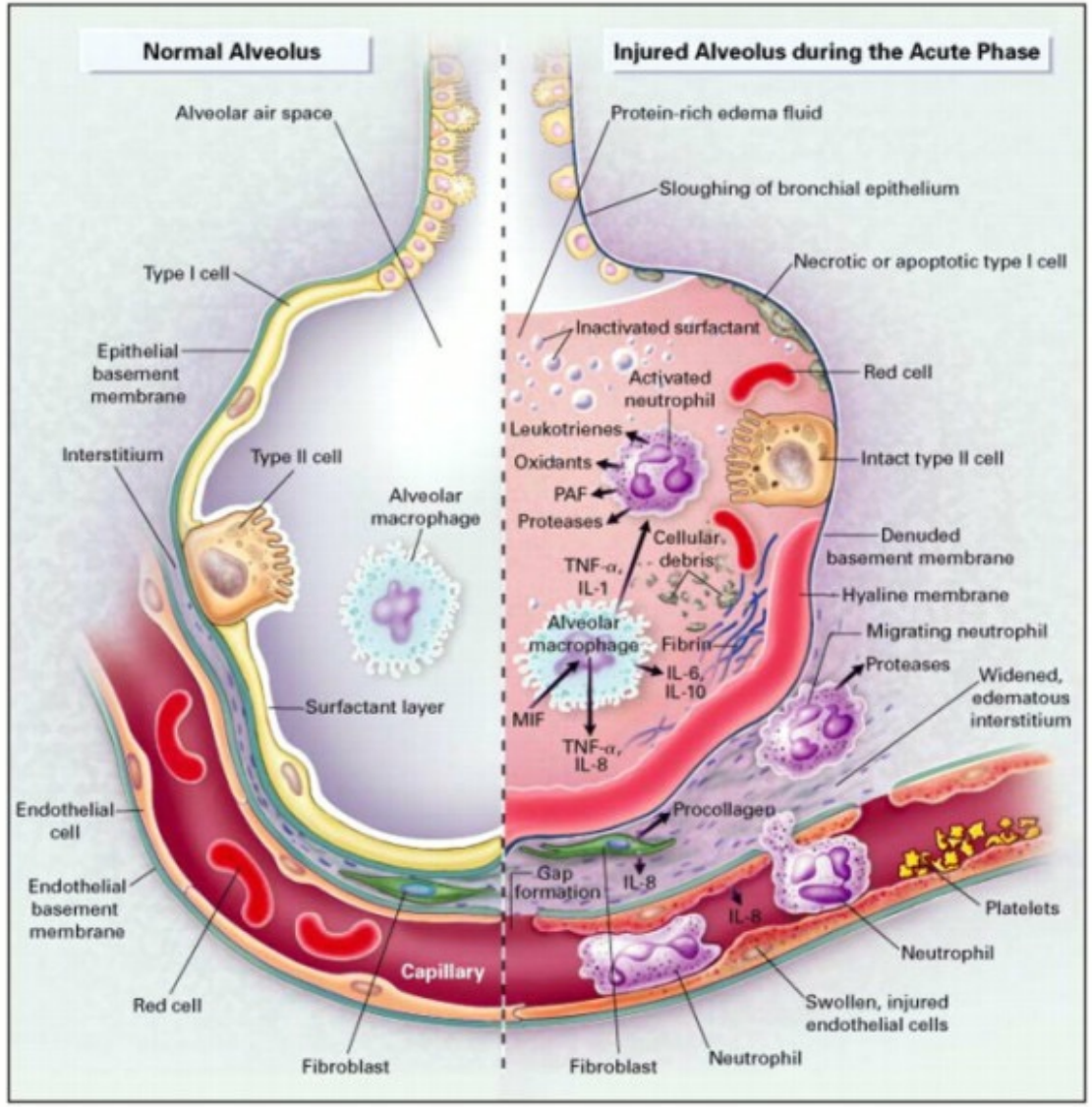
The respiratory-distress syndrome in 12 patients was manifested by acute onset of tachypnœa, hypoxæmia, and loss of compliance after a variety of stimuli; the syndrome did not respond to usual and ordinary methods of respiratory therapy. The clinical and pathological features closely resembled those seen in infants with respiratory distress and to conditions in congestive atelectasis and postperfusion lung. The theoretical relationship of this syndrome to alveolar surface active agent is postulated. Positive end-expiratory pressure was most helpful in combating atelectasis and hypoxæmia. Corticosteroids appeared to have value in the treatment of patients with fat-embolism and possibly viral pneumonia.

of lung compliance, and diffuse alveolar infiltration seen on chest X-ray.

No patient had a previous history of respiratory failure. 1 patient gave a history of mild asthma since childhood but had no disability or recent attacks. Another patient had a chronic cough that was attributed to cigarette smoking. The remaining 10 patients did not have any previous pulmonary disease.

Severe trauma preceded respiratory distress in 7 patients (table I). Viral infection in 4 patients and acute pancreatitis in

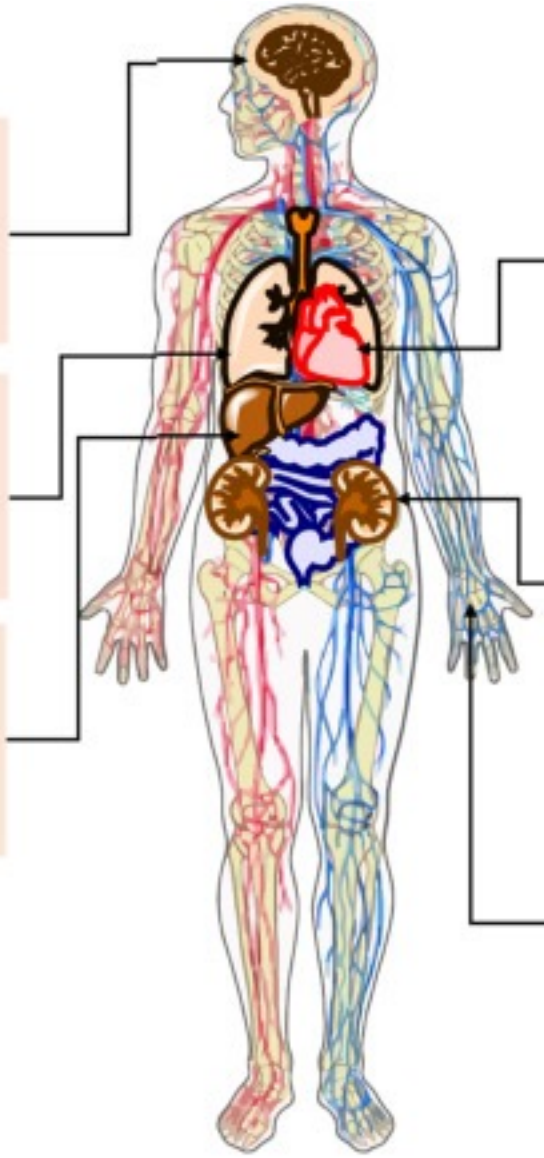
Case	Age (yr.)	Sex	Illness	Onset of acute respiratory distress	Possible contributory factors


Normal Alveolus
Injured Alveolus during the Acute Phase
Alveolar air space
Type I cell
Epithelial basement membrane
Interstitium
Type II cell
Alveolar macrophage
Surfactant layer
Endothelial cell
Endothelial basement membrane
Capillary
Red cell
Fibroblast
Protein-rich edema fluid
Sloughing of bronchial epithelium
Necrotic or apoptotic type I cell
Inactivated surfactant
Activated neutrophil
Red cell
Leukotrienes
Oxidants
PAF
Proteases
Intact type II cell
Cellular debris
Denuded basement membrane
TNF-α, IL-1
Hyaline membrane
Alveolar macrophage
Fibrin
Migrating neutrophil
Proteases
IL-6, IL-10
MIF
TNF-α, IL-8
Widened, edematous interstitium
Procollagen
Gap formation
IL-8
IL-8
Platelets
Neutrophil
Swollen, injured endothelial cells
Fibroblast
Neutrophil

Central nervous system
- Altered consciousness
- Confusion
- Psychosis

Respiratory system
- Hypoxia
- Tachypnea
- ↓ PaO_2 :FiO_2 ratio

Hepatic system
- Jaundice
- ↑ Bilirubin levels
- ↑ Liver enzymes
- ↓ Albumin

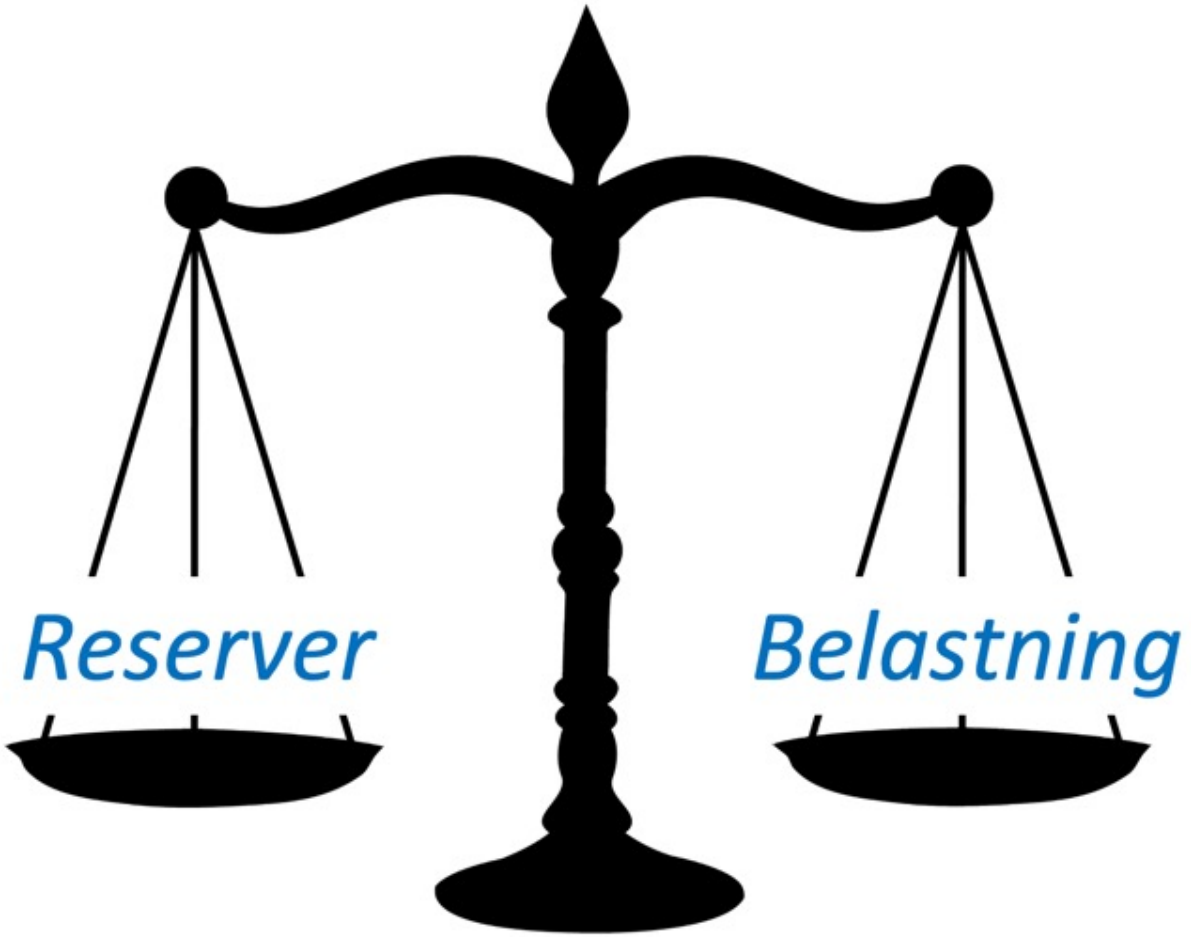


Cardiovascular system
- Tachycardia
- Hypotension
- ↑ Lactate levels
- Altered echocardiography variables

Renal system
- Oliguria
- ↑ Creatinine
- ↑ Blood urea nitrogen

Hematological system
- ↓ Platelets
- Petechiae
- ↓ Protein C
- ↑ D-dimer
- Disseminated intravascular coagulation

"…the development of potentially reversible physiologic derangement involving two or more organ systems not involved in the disorder that resulted in ICU admission, and arising in the wake of a potentially life threatening physiologic insult."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Clinical Frailty Scale*

1 **Very Fit** – People who are robust, active, energetic and motivated. These people commonly exercise regularly. They are among the fittest for their age.

2 **Well** – People who have **no active disease symptoms** but are less fit than category 1. Often, they exercise or are very **active occasionally**, e.g. seasonally.

3 **Managing Well** – People whose **medical problems are well controlled,** but are **not regularly active** beyond routine walking.

4 **Vulnerable** – While **not dependent** on others for daily help, often **symptoms limit activities.** A common complaint is being "slowed up", and/or being tired during the day.

5 **Mildly Frail** – These people often have **more evident slowing,** and need help in **high order IADLs** (finances, transportation, heavy housework, medications). Typically, mild frailty progressively impairs shopping and walking outside alone, meal preparation and housework.

6 **Moderately Frail** – People need help with **all outside activities** and with **keeping house**. Inside, they often have problems with stairs and need **help with bathing** and might need minimal assistance (cuing, standby) with dressing.

7 **Severely Frail** – **Completely dependent for personal care**, from whatever cause (physical or cognitive). Even so, they seem stable and not at high risk of dying (within ~ 6 months).

8 **Very Severely Frail** – Completely dependent, approaching the end of life. Typically, they could not recover even from a minor illness.

9. **Terminally Ill** - Approaching the end of life. This category applies to people with **a life expectancy <6 months**, who are **not otherwise evidently frail.**

Scoring frailty in people with dementia

The degree of frailty corresponds to the degree of dementia. Common **symptoms in mild dementia** include forgetting the details of a recent event, though still remembering the event itself, repeating the same question/story and social withdrawal.

In **moderate dementia**, recent memory is very impaired, even though they seemingly can remember their past life events well. They can do personal care with prompting.

In **severe dementia**, they cannot do personal care without help.

* 1. Canadian Study on Health & Aging, Revised 2008.
2. K. Rockwood et al. A global clinical measure of fitness and frailty in elderly people. CMAJ 2005;173:489-495.

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JAMA Surgery | Original Investigation

Association of Preoperative Patient Frailty and Operative Stress With Postoperative Mortality

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IMPORTANCE Patients with frailty have higher risk for postoperative mortality and complications; however, most research has focused on small groups of high-risk procedures. The associations among frailty, operative stress, and mortality are poorly understood.

OBJECTIVE To assess the association between frailty and mortality at varying levels of operative stress as measured by the Operative Stress Score, a novel measure created for this study.

DESIGN, SETTING, AND PARTICIPANTS This retrospective cohort study included veterans in the Veterans Administration Surgical Quality Improvement Program from April 1, 2010, through March 31, 2014, who underwent a noncardiac surgical procedure at Veterans Health Administration Hospitals and had information available on vital status (whether the patient was alive or deceased) at 1 year postoperatively. A Delphi consensus method was used to stratify surgical procedures into 5 categories of physiologic stress.

EXPOSURES Frailty as measured by the Risk Analysis Index and operative stress as measured by the Operative Stress Score.

MAIN OUTCOMES AND MEASURES Postoperative mortality at 30, 90, and 180 days.

RESULTS Of 432 828 unique patients (401 453 males [92.8%]; mean (SD) age, 61.0 [12.9] years), 36 579 (8.5%) were frail and 9113 (2.1%) were very frail. The 30-day mortality rate among patients who were frail and underwent the lowest-stress surgical procedures (eg, cystoscopy) was 1.55% (95% CI, 1.20%-1.97%) and among patients with frailty who underwent the moderate-stress surgical procedures (eg, laparoscopic cholecystectomy) was 5.13% (95% CI, 4.79%-5.48%); these rates exceeded the 1% mortality rate often used to define high-risk surgery. Among patients who were very frail, 30-day mortality rates were higher after the lowest-stress surgical procedures (10.34%; 95% CI, 7.73%-13.48%) and after the moderate-stress surgical procedures (18.74%; 95% CI, 17.72%-19.80%). For patients who were frail and very frail, mortality continued to increase at 90 and 180 days, reaching 43.00% (95% CI, 41.69%-44.32%) for very frail patients at 180 days after moderate-stress surgical procedures.

CONCLUSIONS AND RELEVANCE We developed a novel operative stress score to quantify physiologic stress for surgical procedures. Patients who were frail and very frail had high rates of postoperative mortality across all levels of the Operative Stress Score. These findings suggest that frailty screening should be applied universally because low- and moderate-stress procedures may be high risk among patients who are frail.

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Key Points

Question Is frailty associated with increased risk of postoperative mortality across all levels of operative stress?

Findings In this cohort study of 432 828 unique patients, frailty was associated with increased 30-, 90-, and 180-day mortality across all levels of operative stress. Mortality among patients with frailty after low- and moderate-stress procedures was substantially higher than mortality rates usually associated with high-risk surgical procedures.

Meaning The findings suggest that even minor surgical procedures are associated with high risk for patients with frailty and that surgeons and referring physicians should consider whether the potential benefits of surgery warrant the increased risk.

Carlsen *et al. BMC Geriatrics* (2017) 17:249
DOI 10.1186/s12877-017-0646-6

BMC Geriatrics

CASE REPORT Open Access

A 95 year-old suffering circulatory arrest after accidental hypothermia: a case report

Anders Wetting Carlsen[1], Anders M. Winnerkvist[2] and Guri Greiff[1,3*]

Abstract

Background: The elderly are vulnerable to cold and prone to accidental hypothermia, both because of environmental and endogenous factors. The incidence of severe accidental hypothermia among the elderly is poorly described, but many cases probably go unrecorded. Going through literature one finds few publications on severe hypothermia among the elderly, and, to our knowledge, nothing about extracorporeal re-warming of geriatric hypothermia victims.

Case presentation: We present a case were a 95 year-old man with severe accidental hypothermia and circulatory arrest was brought to our hospital under on-going CPR, and was successfully resuscitated with extracorporeal circulation. He was discharged to his home without physical sequelae a few weeks later.

Conclusion: The decision whether or not to continue resuscitation of a nonagenarian can be difficult in many respects. Knowing that resuscitation with extracorporeal circulation is resource intensive may complicate the discussion. In light of our experience with this case we discuss medical and ethical aspects of modern treatment of severe accidental hypothermia.

Keywords: Accidental hypothermia, Resuscitation, Extracorporeal life support, Cardiopulmonary bypass, Extracorporeal circulation