Anesthesia Management for the Aging Population

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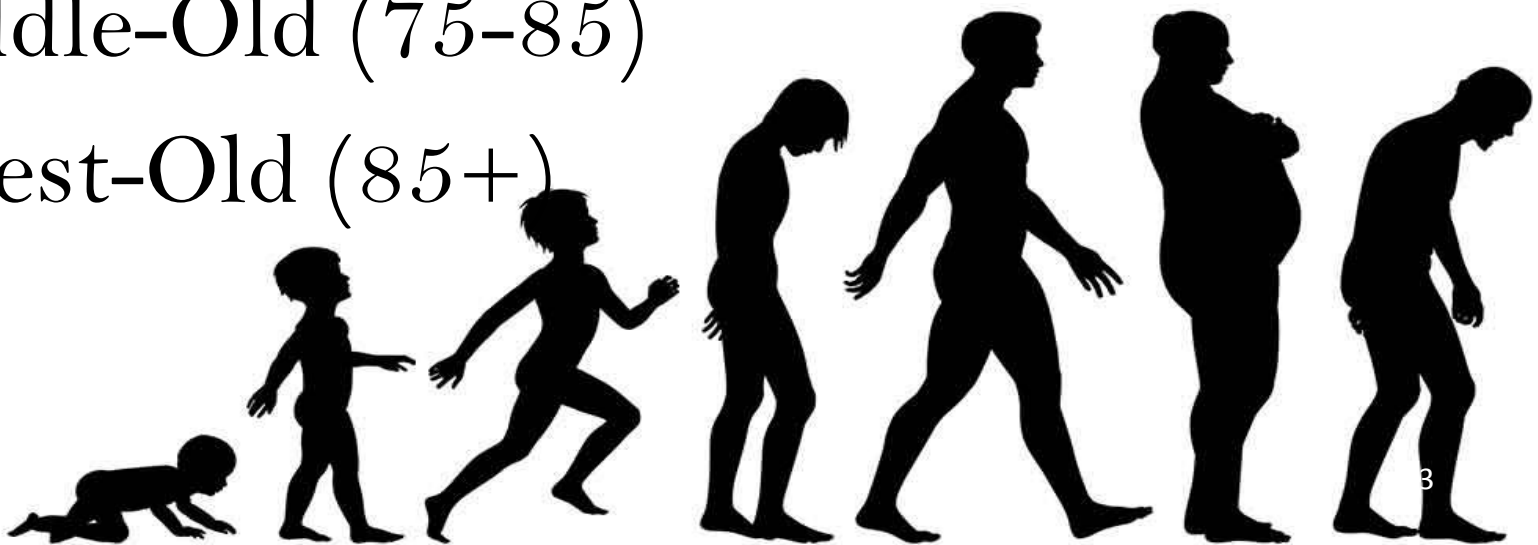
York College of Anesthesia

Objectives

- Demographics
- Physiologic changes
- Perioperative phase
  - Current Research and EBP Practice Guidelines
- Summary

Growth of the Older Population

- ***"Old age*** **consists of ages nearing or surpassing the life expectancy of human beings, and thus the end of the human life cycle."**
  - Young-Old (65-74)
  - Middle-Old (75-85)
  - Oldest-Old (85+)

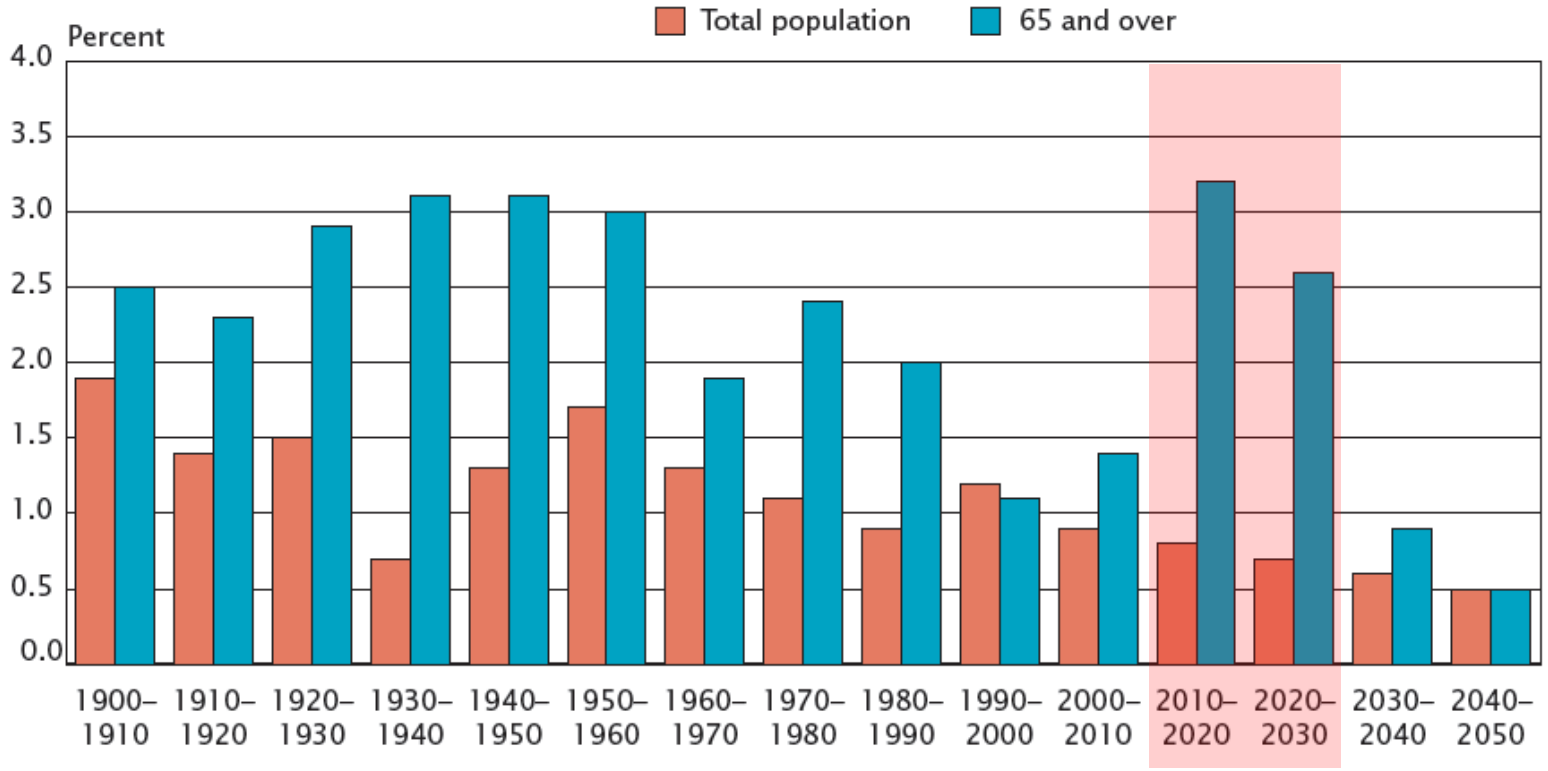


Demographics

Figure 1-2.

Average Annual Growth Rate of the Total Population and Population Aged 65 and Over by Decade: 1900–1910 to 2040–2050

(For information on confidentiality protection, nonsampling error, and definitions, see *www.census.gov/prod/cen2010/doc/sf1.pdf*)



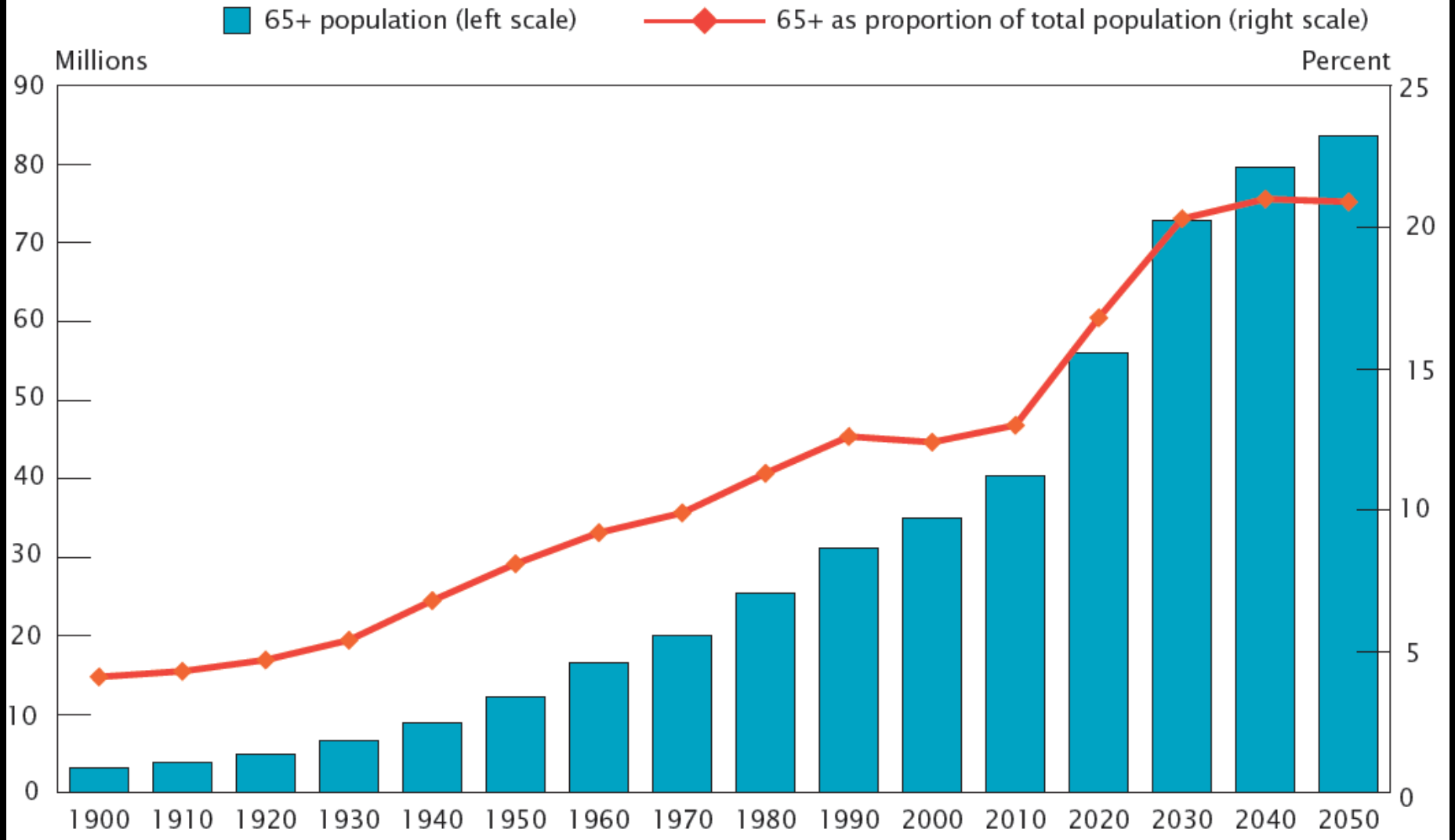
Note: Average annual growth rates for 1900–1910 through 2000–2010 are based on reported census populations. Average annual growth rate for 2010–2020 is based on 2010 census data and projections data; 2020–2030 through 2040–2050 are based on projected populations.

Sources: 1900 to 1940, and 1960 to 1980, U.S. Bureau of the Census, 1983; 1950, U.S. Bureau of the Census, 1953; 1990, U.S. Bureau of the Census, 1992; 2000, U.S. Census Bureau, 2001; 2010, U.S. Census Bureau, 2011; 2020 to 2050, U.S. Census Bureau, 2012a; 1900 to 2010, decennial census; 2020 to 2050, *2012 National Population Projections*, Middle series.

http://www.census.gov/content/dam/Census/library/publications/2014/demo/p23-212.pdf

Population Aged 65 and Over: 1900 to 2050

(For information on confidentiality protection, nonsampling error, and definitions, see *www.census.gov/prod/cen2010/doc/sf1.pdf*)



Sources: 1900 to 1940, and 1960 to 1980, U.S. Bureau of the Census,1983; 1950, U.S. Bureau of the Census, 1953; 1990, U.S. Bureau of the Census, 1992; 2000, U.S. Census Bureau, 2001; 2010, U.S. Census Bureau, 2011; 2020 to 2050, U.S. Census Bureau, 2012a; 1900 to 2010, decennial census; 2020 to 2050, *2012 National Population Projections*, Middle series.

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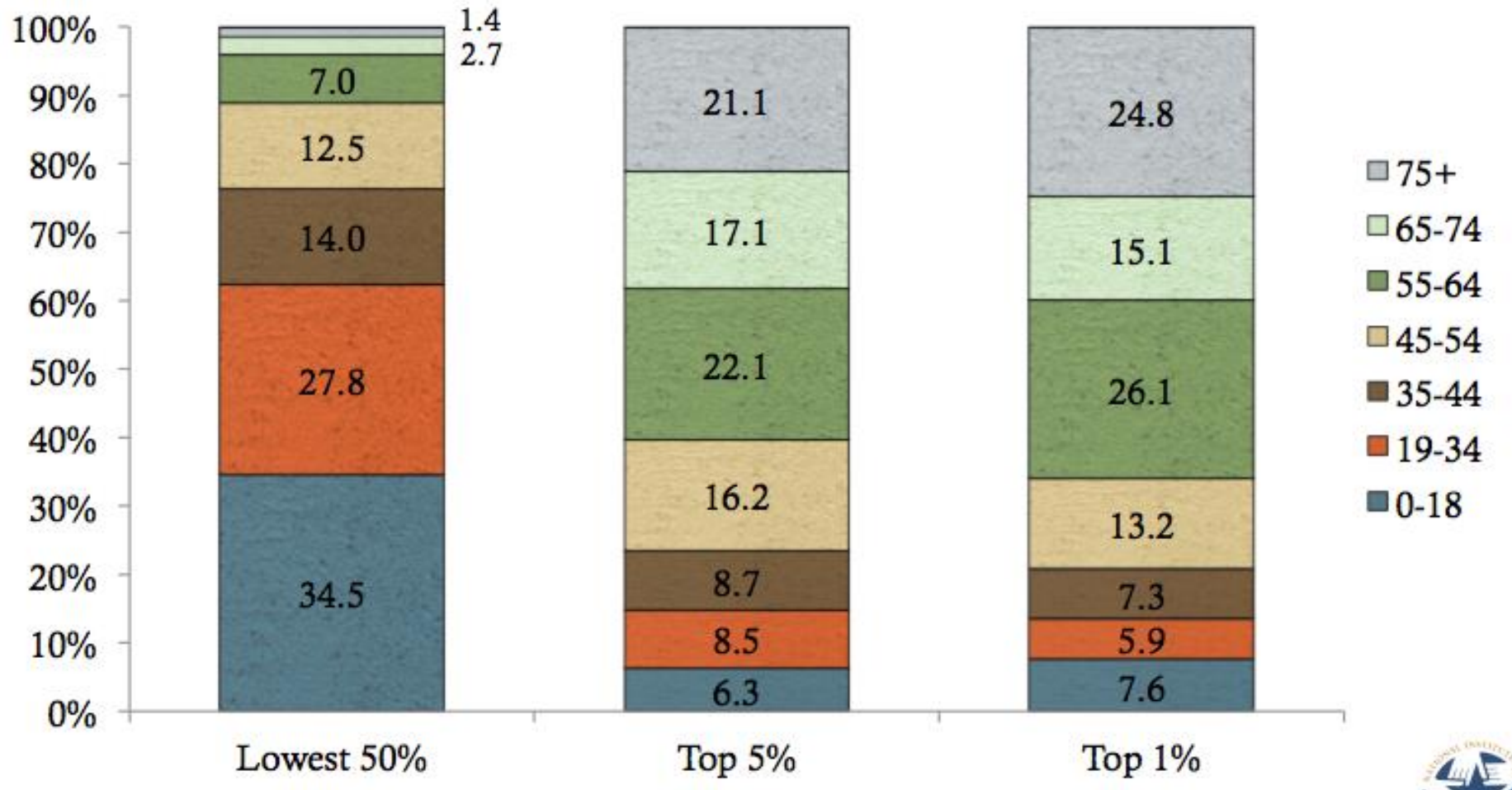
High Spenders are Older



NIHCM Foundation analysis of data from the 2009 Medical Expenditure Panel Survey.

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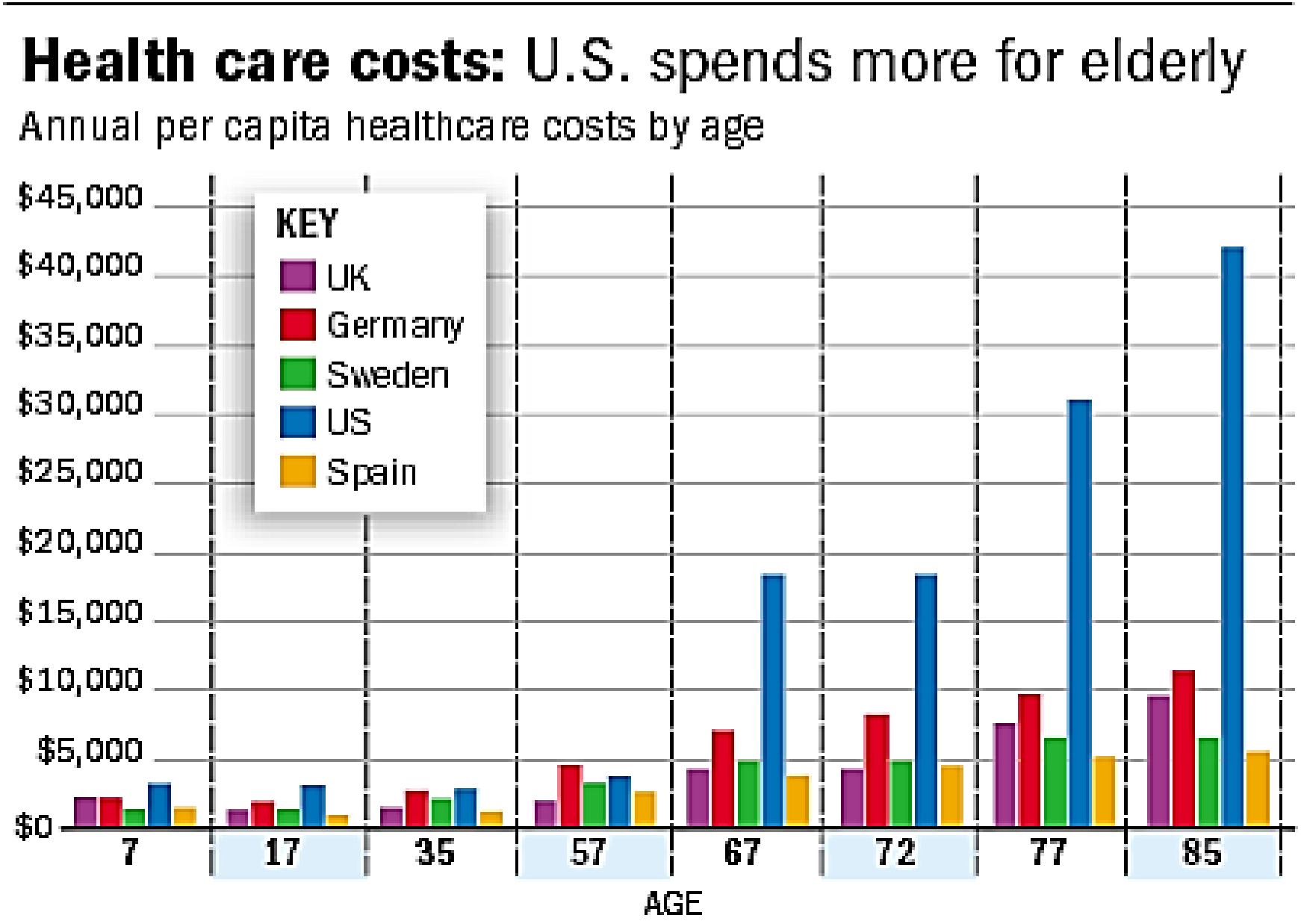

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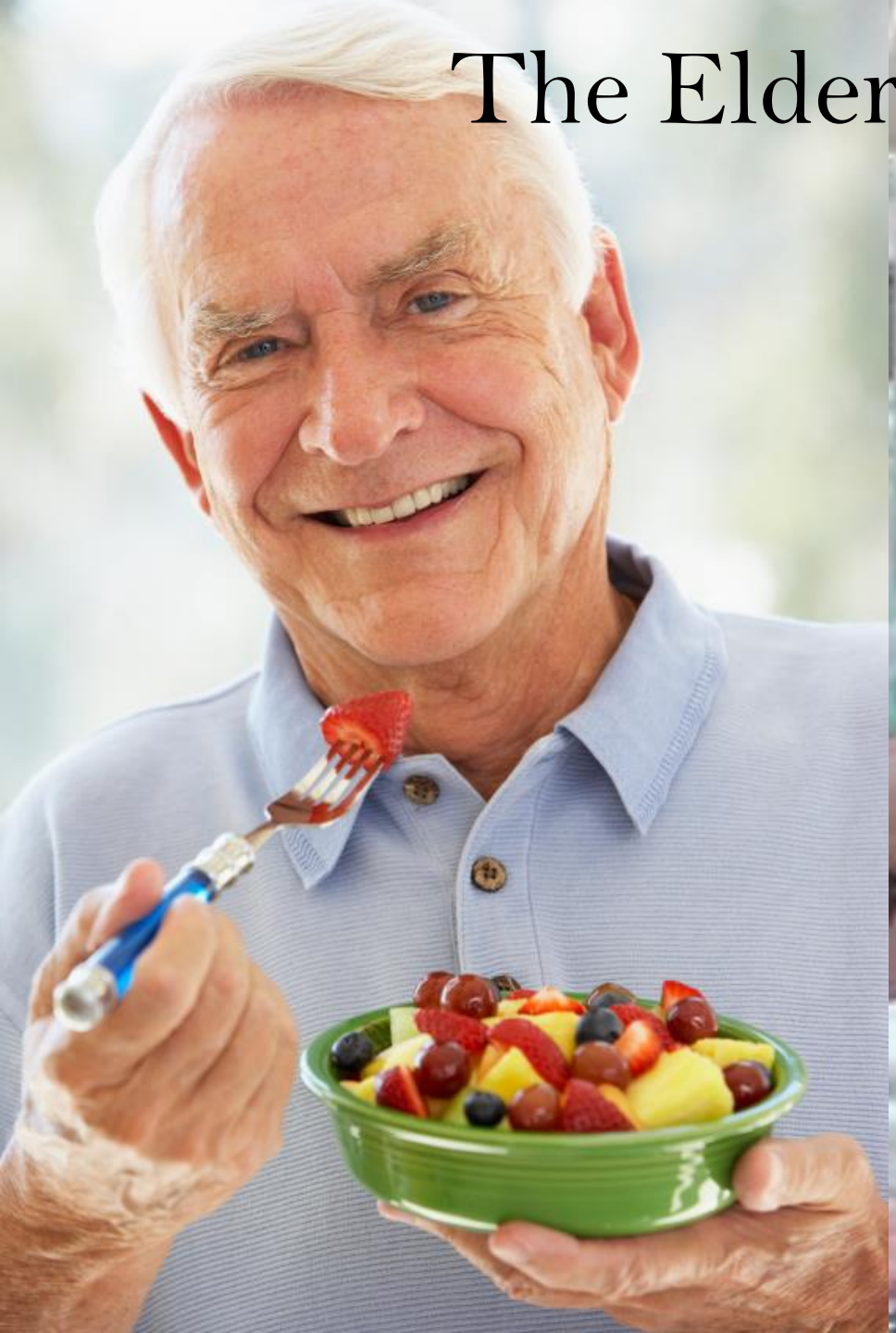
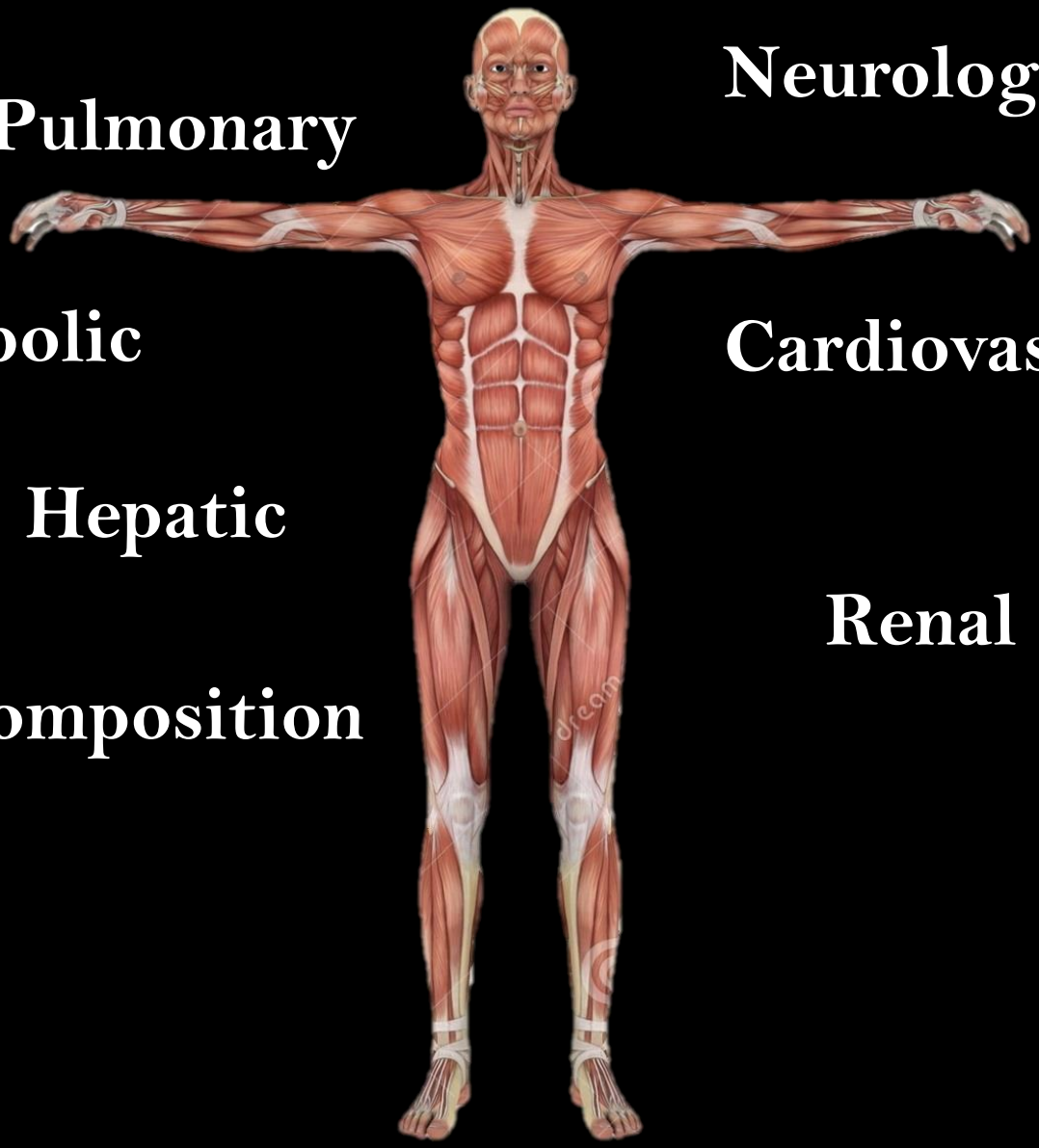
The Elderly Patient



Physiologic Changes with Aging



Neurologic

Pulmonary

Metabolic

Cardiovascular

Hepatic

Renal

Body Composition

Physiologic Changes with Aging

Neurologic

- **Central nervous system**
  - **Continual neuronal loss with aging**
  - **Gradual decline in basal metabolic rate, O2 consumption, and CBF**
  - **Increase effects of centrally acting medications**

Physiologic Changes with Aging

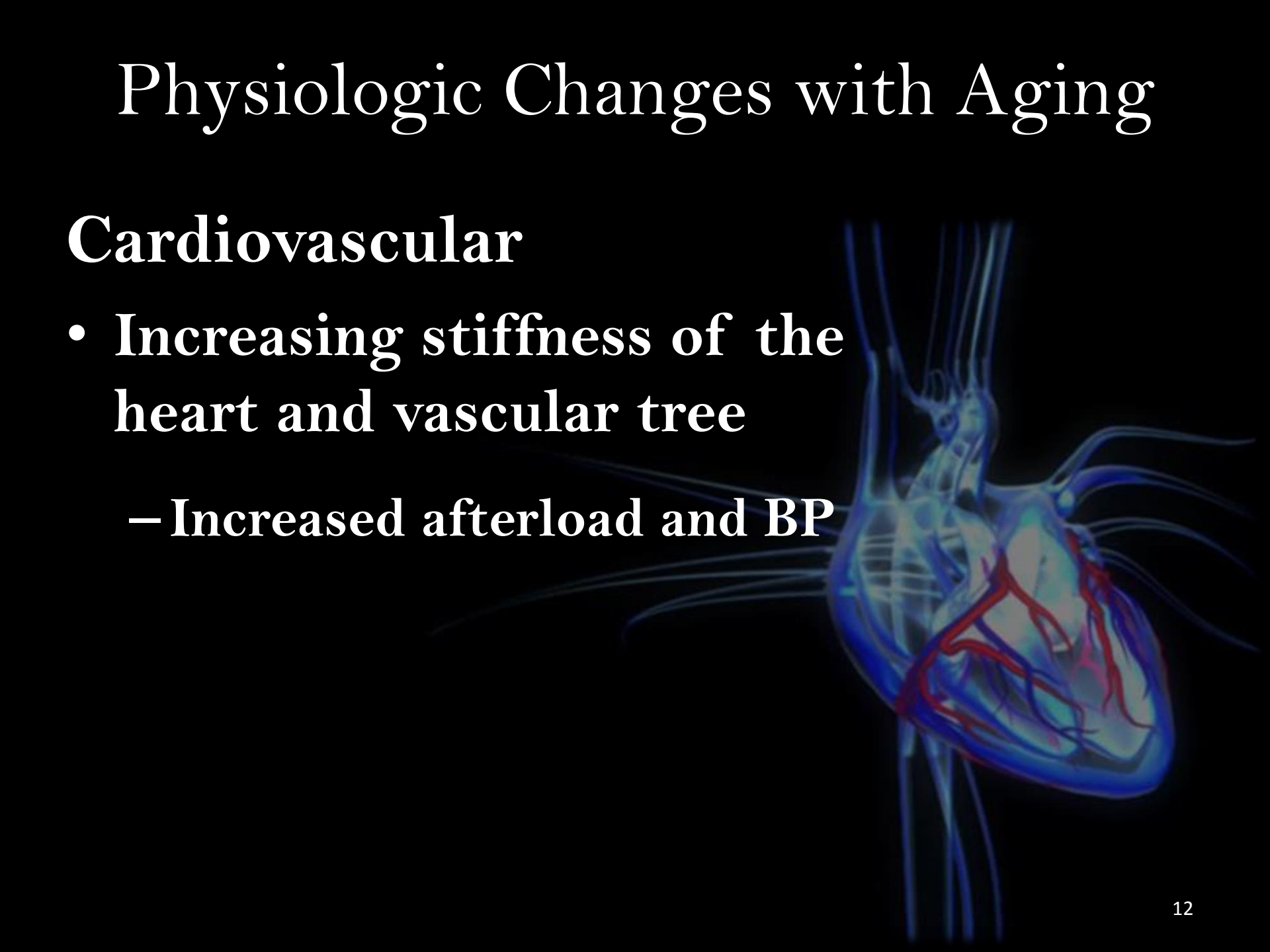
Neurologic

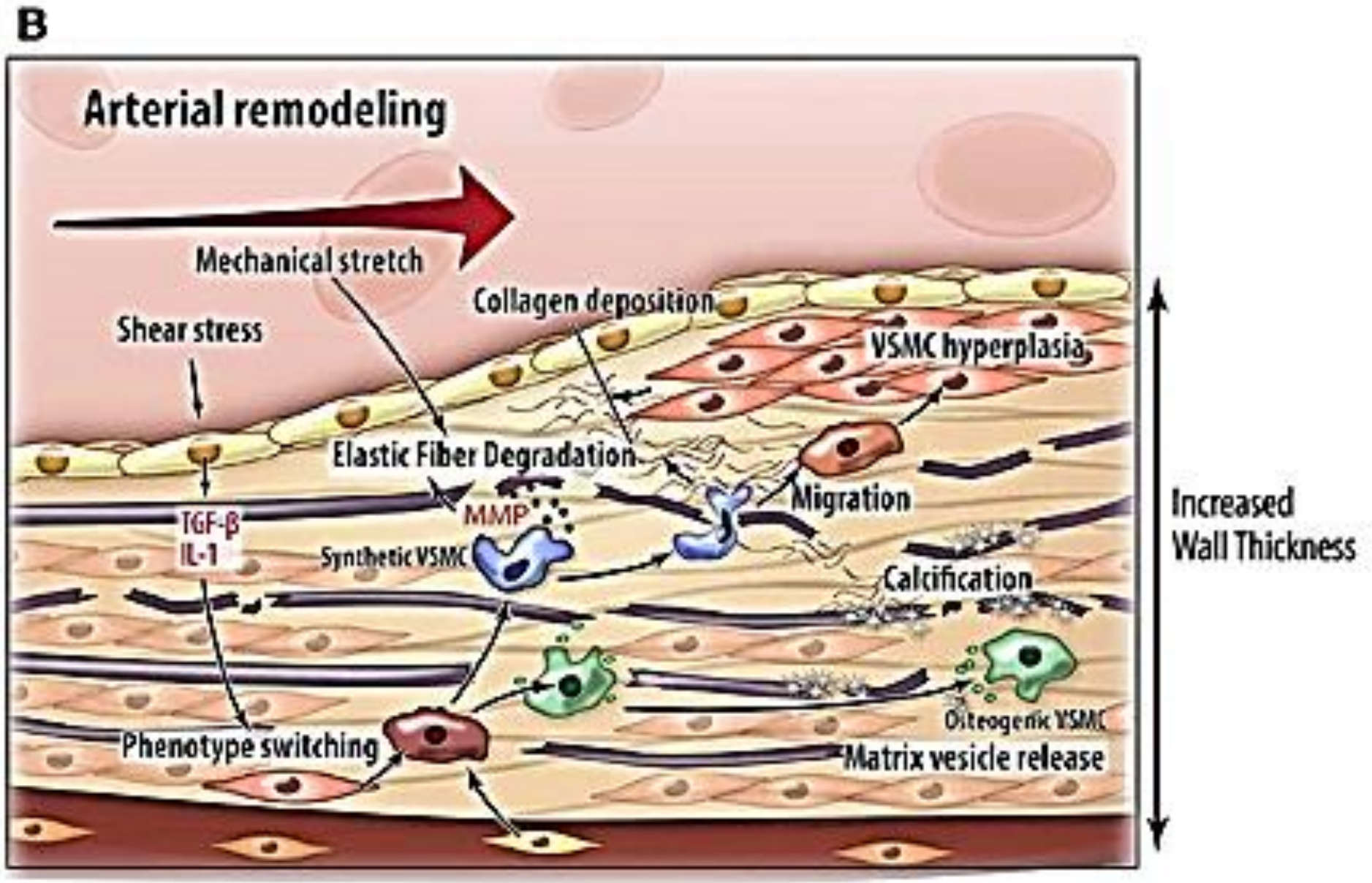
- **Peripheral nervous system**
  - **Decreased sensory and motor pathways**
  - **Peripheral neurogenic atrophy**
  - **Increased risk of falls**
  - **Diminished taste, hearing, ability to detect smell, and thirst**

Physiologic Changes with Aging

Cardiovascular

- **Increasing stiffness of the heart and vascular tree**
  - **Increased afterload and BP**





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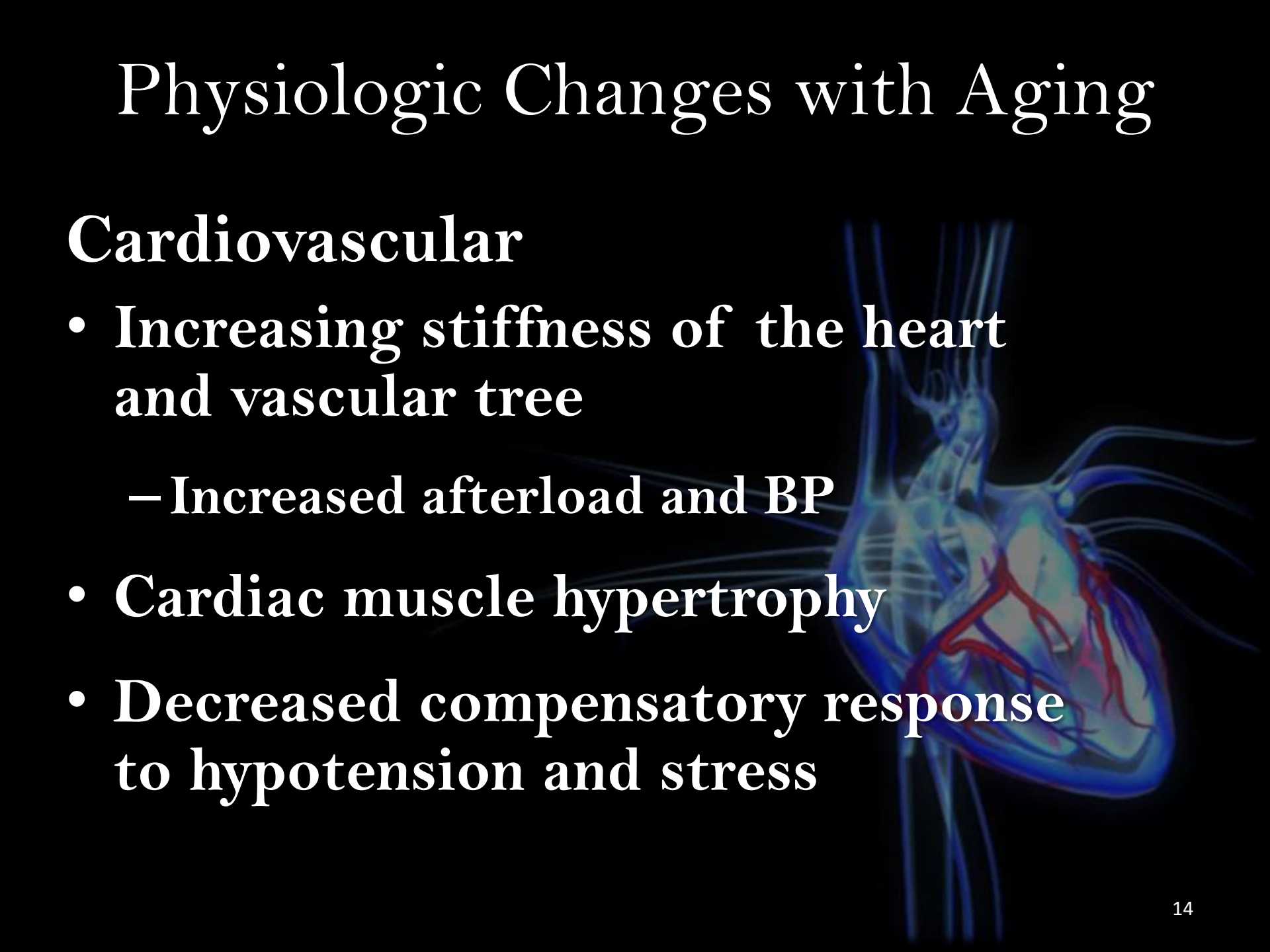
Physiologic Changes with Aging



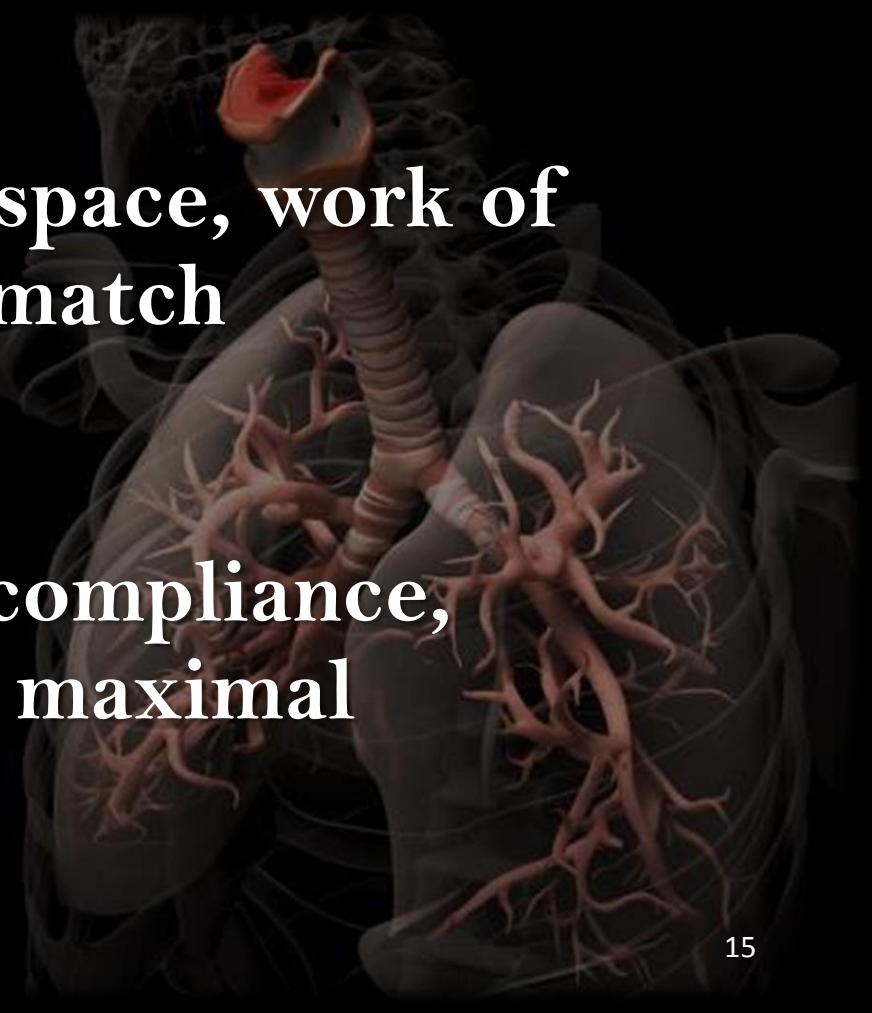
Cardiovascular

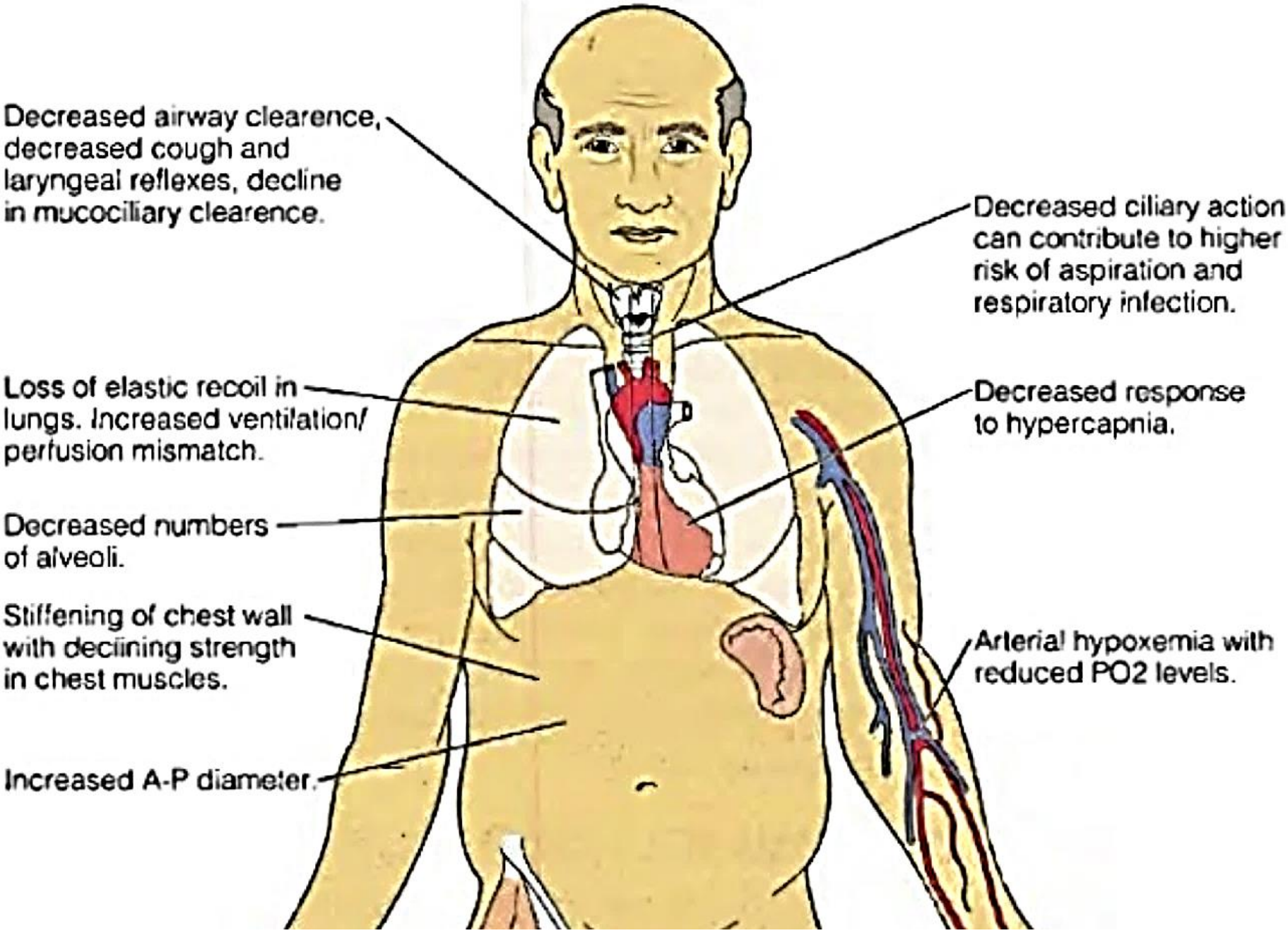
- **Increasing stiffness of the heart and vascular tree**
  - **Increased afterload and BP**
- **Cardiac muscle hypertrophy**
- **Decreased compensatory response to hypotension and stress**

Physiologic Changes with Aging

Pulmonary

- **Increased**
  - **RV, CC, FRC, Dead space, work of breathing, V/Q mismatch**
- **Decreased**
  - **FEV1, PaO2, HPV, compliance, elasticity, VC, TLC, maximal breathing capacity**





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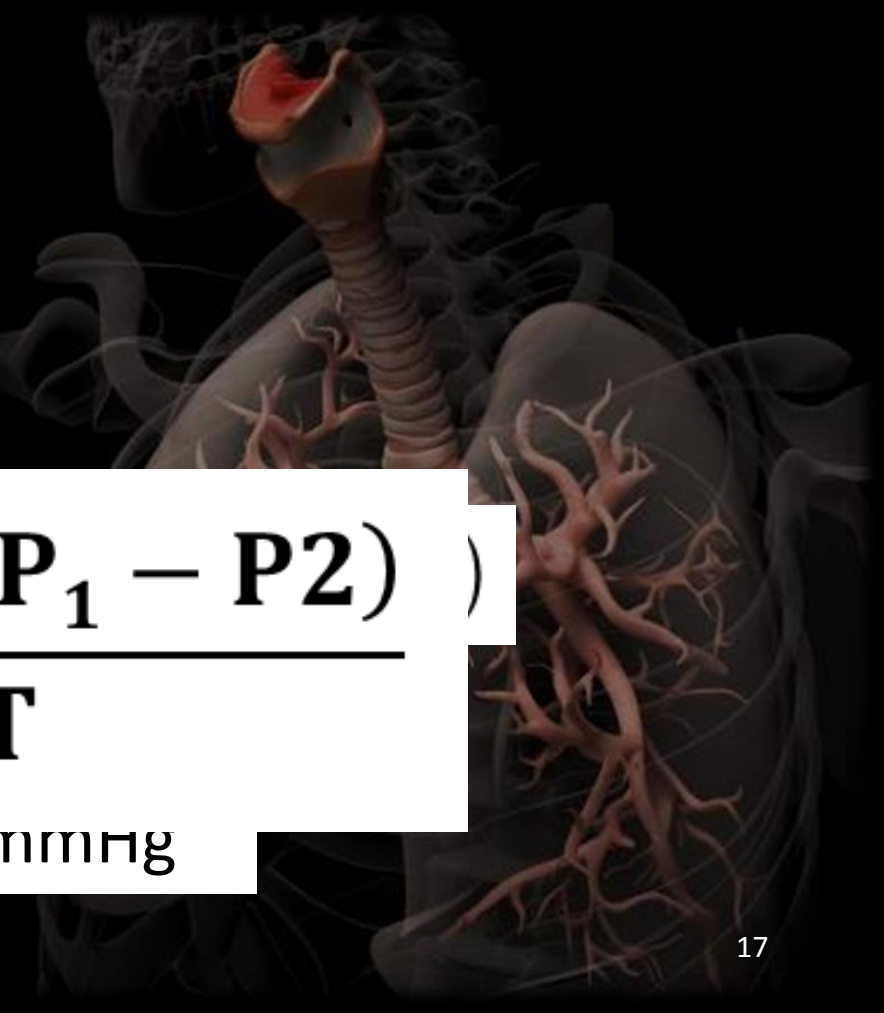
Physiologic Changes with Aging

Pulmonary

- **Decreased**
  - **Alveolar surface area**
  - **Diffusion capacity**
  - **Arterial PO2**

$$V \propto \frac{A \cdot D \cdot (P_1 - P2)}{T}$$

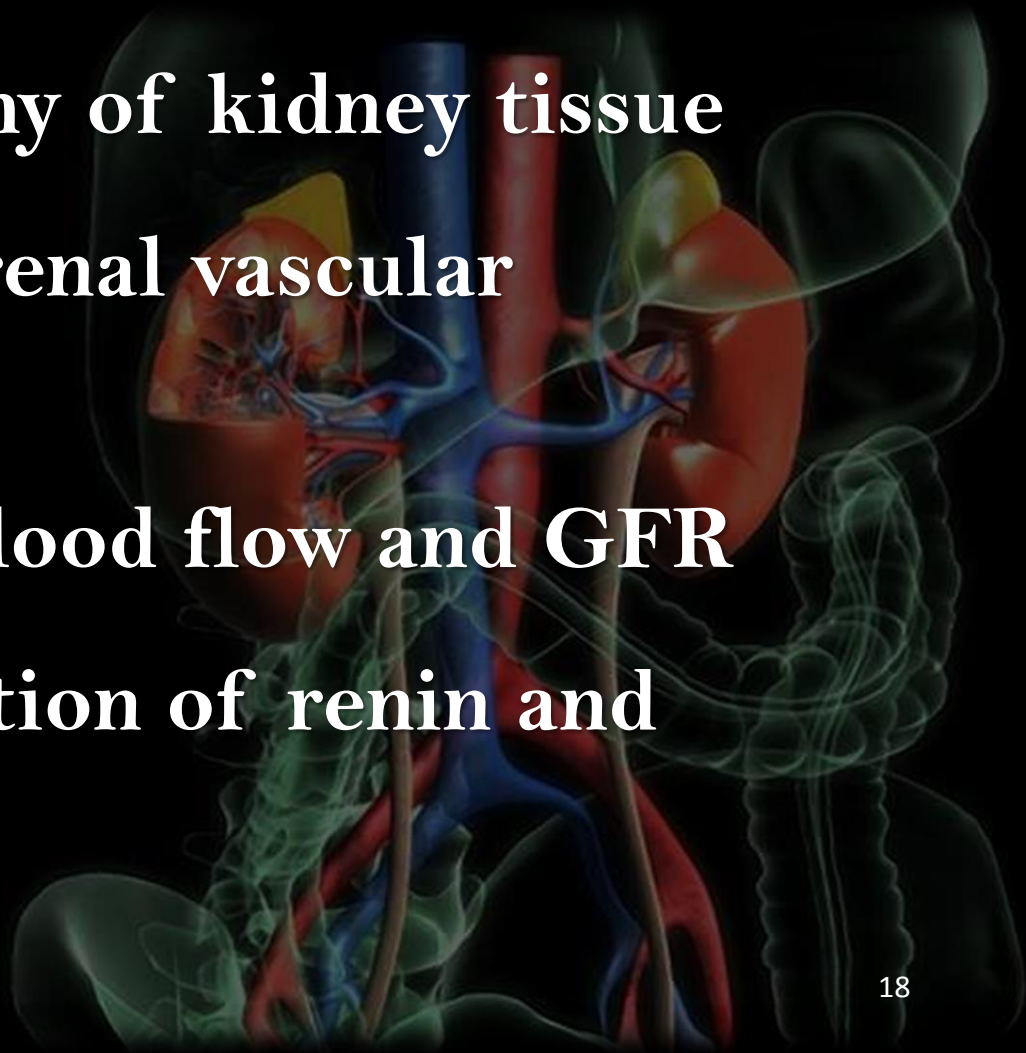
- 90 yo = 70mmHg



Physiologic Changes with Aging

Renal

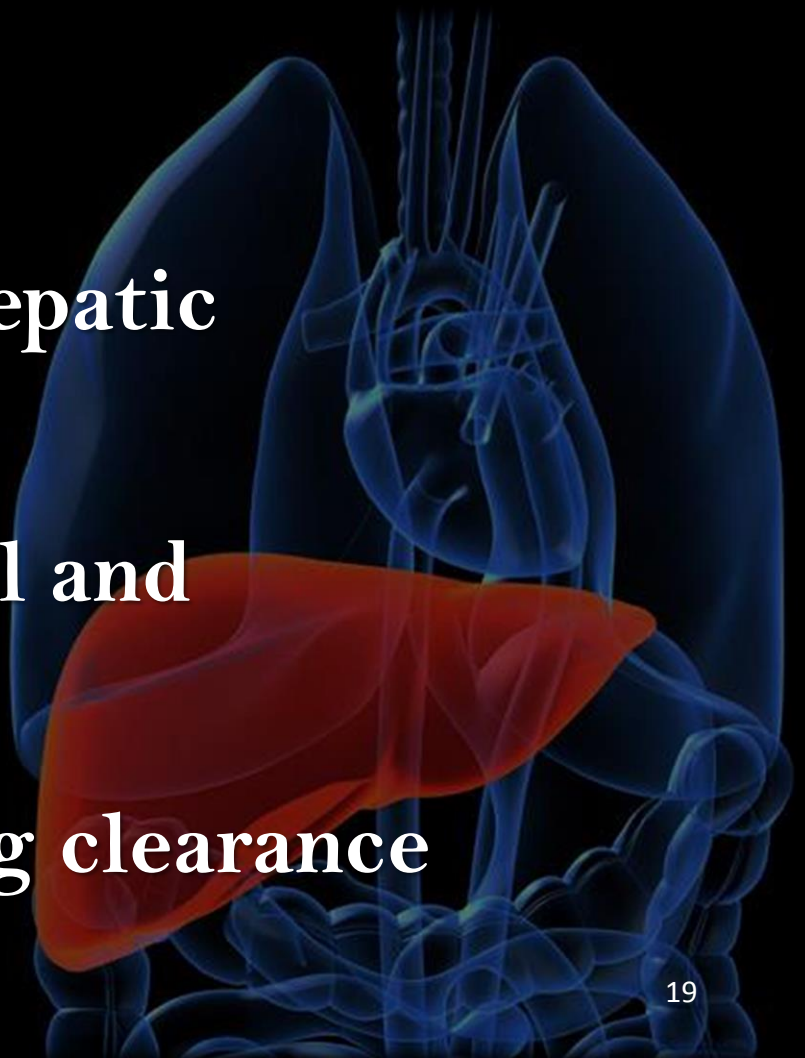
- **Progressive atrophy of kidney tissue**
- **Deterioration of renal vascular structures**
- **Decreased renal blood flow and GFR**
- **Decline in production of renin and aldosterone**



Physiologic Changes with Aging

Hepatic

- **Decreased liver mass**
- **Decreased portal and hepatic blood flow**
- **Decreased albumin level and enzyme activity**
- **Diminished rate of drug clearance**



Physiologic Changes with Aging

Body Composition

- **Musculoskeletal**
- **Malnutrition?**
- **Body fat and body water**
- **Increased risk for hypothermia**

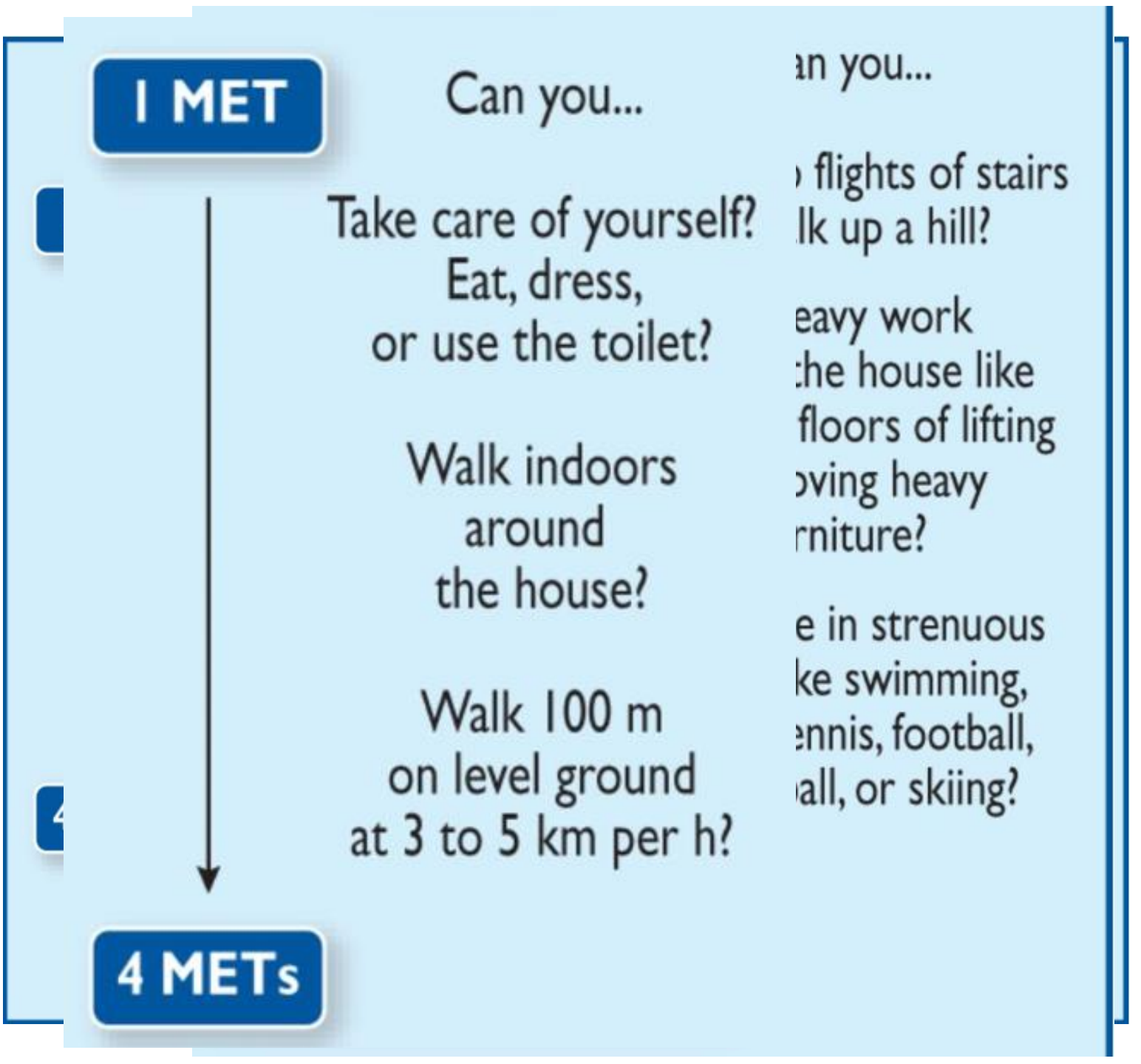
Preoperative Assessment

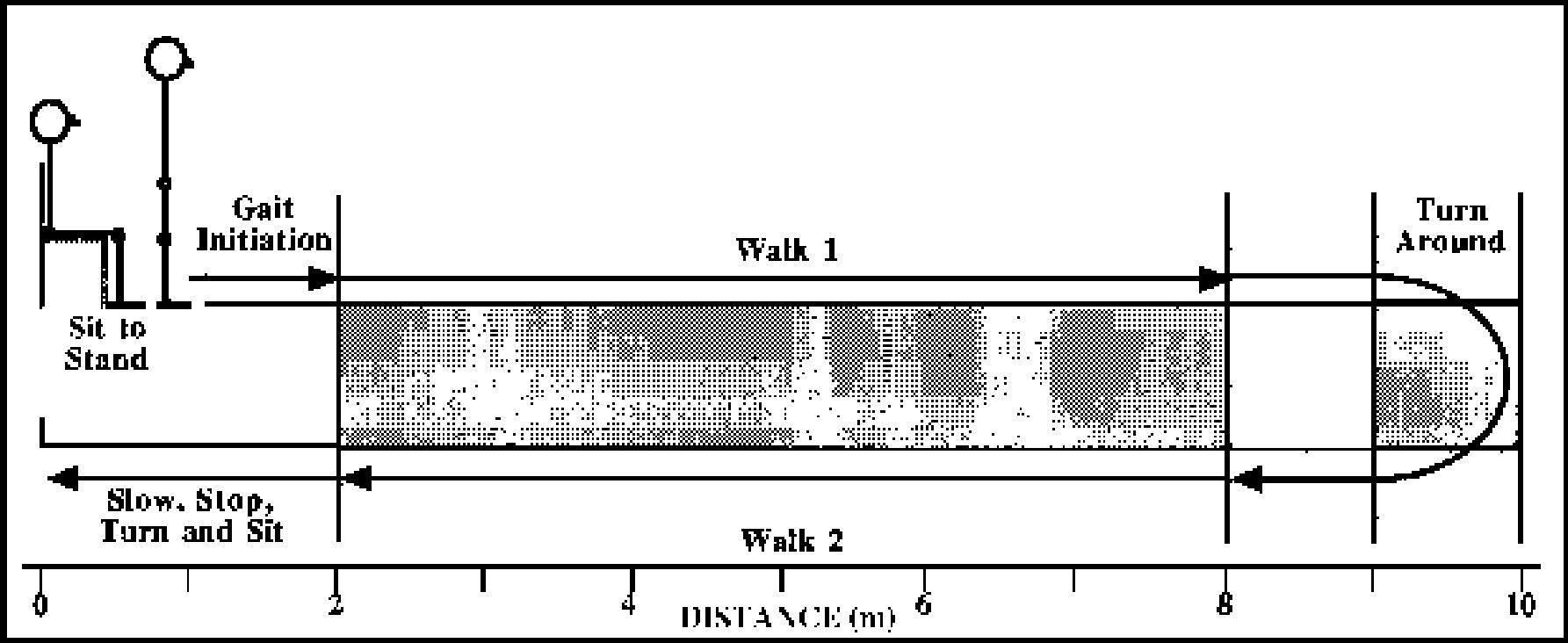
Preoperative Assessment

- Assess functional capacity and frailty index
- Assess risk factors for post op delirium
- Medication management and assessment for polypharmacy
- Thorough assessment of comorbidities

ACS NSQIP®/AGS BEST PRACTICE GUIDELINES:

Optimal Preoperative Assessment of the Geriatric Surgical Patient


1 MET
Can you...
Take care of yourself?
Eat, dress,
or use the toilet?
Walk indoors
around
the house?
Walk 100 m
on level ground
at 3 to 5 km per h?
4 METs
an you...
flights of stairs
lk up a hill?
eavy work
the house like
floors of lifting
oving heavy
rniture?
e in strenuous
ke swimming,
nnis, football,
all, or skiing?


Gait Initiation
Walk 1
Turn Around
Sit to Stand
Slow, Stop, Turn and Sit
Walk 2
0
2
4
DISTANCE (m)
6
8
10

FRAILTY SCORE: OPERATIONAL DEFINITION[89]

Criteria	Definition
Shrinkage	Unintentional weight loss ≥10 pounds in past year
Weakness	Decreased grip strength
Exhaustion	Self-reported poor energy and endurance
Low physical activity	Low weekly energy expenditure
Slowness	Slow walking

Interpretation of the Frailty Score

The patient receives 1 point for each criterion met.

0–1 = Not Frail
2–3 = Intermediate Frail (Pre-frail)
4–5 = Frail

Frail patients are at much higher risk of adverse health outcomes.

Intermediate frail patients are at elevated risk (less than frail ones) but are also at more than double the risk of becoming frail over three years.

Preoperative Assessment

- Assess functional capacity and frailty index
- Assess risk factors for post op delirium
- Medication management and assessment for polypharmacy
- Thorough assessment of comorbidities

COGNITIVE ASSESSMENT: MINI-COG

Mini-Cog: 3 Item Recall and Clock Draw[19]

1. GET THE PATIENT'S ATTENTION, THEN SAY:

"*I am going to say three words that I want you to remember now and later.*
The words are **Banana** **Sunrise** **Chair**

Please say them for me now."

Give the patient 3 tries to repeat the words. If unable after 3 tries, go to next item.

2. SAY ALL THE FOLLOWING PHRASES IN THE ORDER INDICATED:

"*Please draw a clock in the space below. Start by drawing a large circle. Put all the numbers in the circle and set the hands to show 11:10 (10 past 11).*"

If subject has not finished clock drawing in 3 minutes, discontinue and ask for recall items.

3. SAY: "*What were the three words I asked you to remember?*"

RISK FACTORS FOR POSTOPERATIVE DELIRIUM[12,13,20,21,31-38]

Risk Factors

Cognitive and Behavioral Disorders

- Cognitive impairment and dementia
- Untreated or inadequately controlled pain
- Depression
- Alcohol use
- Sleep deprivation

Disease/Illness Related

- Severe illness/comorbidities
- Renal insufficiency
- Anemia
- Hypoxia

Metabolic

- Poor nutrition
- Dehydration
- Electrolyte abnormalities

Functional Impairments

- Poor functional status
- Immobilization
- Hearing or vision impairment

Other

- Older age ≥ 70 years
- Polypharmacy and use of psychotropic medications (benzodiazepines, anticholinergics, and antihistamines)
- Risk of urinary retention or constipation, presence of urinary catheter

Preoperative Assessment

- Assess functional capacity and frailty index
- Assess risk factors for post op delirium
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GUIDELINES FOR MODIFYING PERIOPERATIVE MEDICATIONS

Discontinue before surgery:

- Nonessential medications that increase surgical risk should be discontinued.[96]
- Medications with potential for drug interactions with anesthesia should be discontinued or substituted.[96]
- See Beers Criteria (see **Appendix V**) for additional list of medications that may need to be discontinued perioperatively.[97]
- Herbal medications should be stopped at least 7 days before a surgical operation due to uncertainty of contents.[96] See **Appendix VI** for more specific recommendations.

Continue perioperatively:

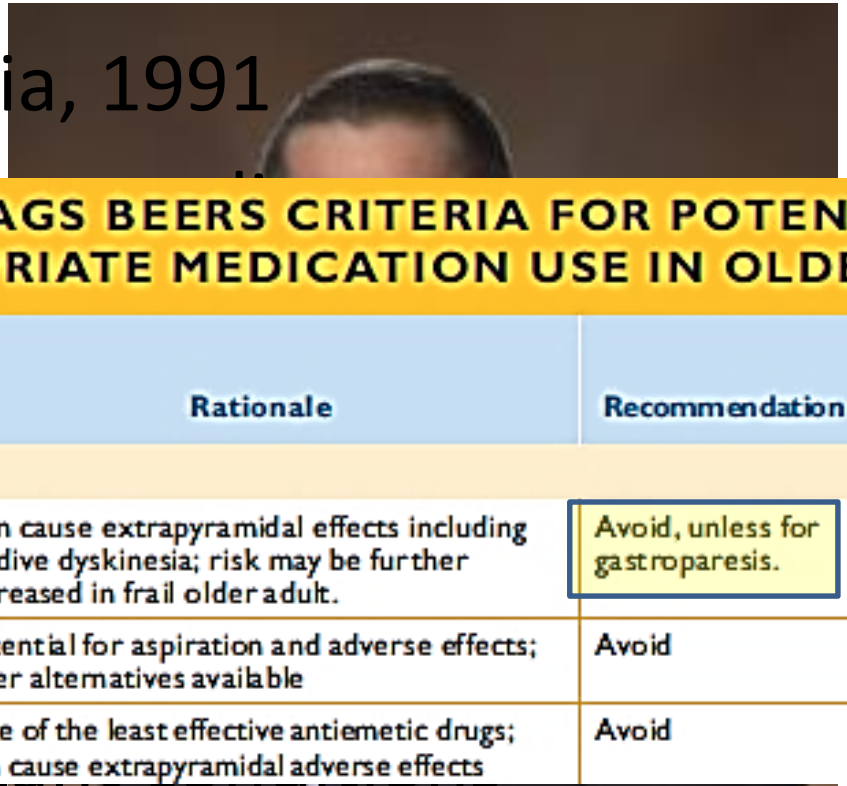
- Medications with withdrawal potential, including selective serotonin reuptake inhibitors (SSRIs), tricyclic antidepressants, benzodiazepines, antipsychotics, monoamine oxidase inhibitors (MAOIs), beta blockers, clonidine, statins, and corticosteroids, should be continued.[96]
- Angiotensin-converting enzyme inhibitors and angiotensin II receptor blockers should be continued *unless* their only indication is for hypertension and the patient's blood pressure is well controlled.[96]

Additional considerations in patients at risk for postoperative delirium:

- Avoid starting new prescriptions for benzodiazepines and consider reducing benzodiazepines when possible.[33,34]
- **Avoid using meperidine** for treatment of pain.[98] Ensure that pain is adequately controlled to reduce risk for developing postoperative delirium.[35-38]
- Use caution when prescribing antihistamine H_1 antagonists (**especially diphenhydramine/ Benadryl®**) and other medications with strong anticholinergic effects.[33,34]
- No increased risk associated with neuroleptics (antipsychotics) and digoxin.[33]
- No conclusive evidence for H_2 antagonists, tricyclic antidepressants, anti-Parkinson medications, steroids, NSAIDs, and antimuscarinics.[33]

Mark H. Beers, MD, Geriatrician

- Beers Criteria, 1991



2012 AGS BEERS CRITERIA FOR POTENTIALLY INAPPROPRIATE MEDICATION USE IN OLDER ADULTS[97]

Organ System/ Therapeutic Category/Drug(s)	Rationale	Recommendation	Quality of Evidence	Strength of Recommendation
Gastrointestinal				
Metoclopramide	Can cause extrapyramidal effects including tardive dyskinesia; risk may be further increased in frail older adult.	Avoid, unless for gastroparesis.	Moderate	Strong
Mineral oil, given orally	Potential for aspiration and adverse effects; safer alternatives available	Avoid	Moderate	Strong
Trimethobenzamide	One of the least effective antiemetic drugs; can cause extrapyramidal adverse effects	Avoid	Moderate	Strong

- Contraindicated
- Relatively contraindicated

ACC/AHA GUIDELINES FOR PERIOPERATIVE

Recommendation on Statins

Preoperative statins should be started as soon as possible prior to a surgical operation for patients who have known vascular disease, elevated low-density lipoprotein cholesterol, or ischemia on thallium testing.

For patients undergoing noncardiac surgery who are currently taking statins, statin therapy should be continued. Statin use may also be considered for patients undergoing vascular and intermediate-risk surgical operations.

- Patients undergoing intermediate risk or vascular surgery with known coronary artery disease or with multiple clinical risk factors for ischemic heart disease.

Preoperative Assessment

- Assess functional capacity and frailty index
- Assess risk factors for post op delirium
- Medication management and assessment for polypharmacy
- Thorough assessment of comorbidities

Diabetes in the Elderly

“Diabetic patients should undergo preoperative assessment of their fasting blood glucose level, and their treatment optimized using IV insulin for type I diabetics, and oral hypoglycemic drugs and/or parenteral insulin for type II diabetics.”

ACTIVE CARDIAC CONDITIONS

Patients require evaluation and treatment before nonurgent, noncardiac surgery (Class I, Level of Evidence B)[52]

Condition	Examples
Severe valvular disease	• Severe aortic stenosis (mean pressure gradient >40 mmHg, aortic valve area <1 cm^2, or symptomatic) • Symptomatic mitral stenosis (progressive dyspnea on exertion, exertion presyncope, or heart failure)

Reprinted from *Journal of the American College of Cardiology*, Vol 54(22), Fleischmann KE, Beckman JA, Buller CE, et al., 2009 ACCF/AHA Focused Update on Perioperative Beta Blockade, p2102-2128, 2009, with permission from Elsevier.

CARDIAC RISK STRATIFICATION FOR NONCARDIAC SURGICAL PROCEDURES (BASED ON REVISED CARDIAC RISK INDEX)[52]

Risk	Examples
Low (< 1%)	Endoscopic procedures, superficial procedures, cataract surgery, breast surgery, ambulatory surgery
Intermediate (1-5%)	Intraperitoneal and intrathoracic surgery, cardiac endarterectomy, head and neck surgery, orthopaedic surgery, prostate surgery
Vascular (> 5%)	Aortic/other major vascular surgery, peripheral vascular surgery

Reprinted from *Journal of the American College of Cardiology*, Vol 54(22), Fleischmann KE, Beckman JA, Buller CE, et al., 2009 ACCF/AHA Focused Update on Perioperative Beta Blockade, p2102-2128, 2009, with permission from Elsevier.

RISK FACTORS FOR POSTOPERATIVE PULMONARY COMPLICATIONS

Patient Related Factors

- Age >60
- COPD
- ASA class II or greater
- Functional dependence
- Congestive heart failure
- Pulmonary HTN
- Obstructive sleep apnea
- Current smoker
- Impaired sensorium
- Pre-operative sepsis

Surgery Related Factors

- Prolonged operation
  - > 3 hours
- Surgical site
- Emergency operation
- Perioperative transfusion
- Residual neuromuscular blockade
- General anesthesia

70

TOF < 0.7

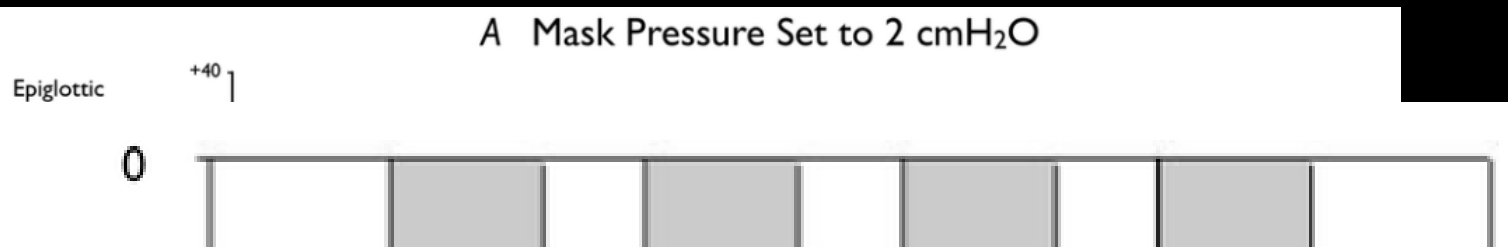
Table 2. Relationship Between Measured Train-of-Four Ratio Threshold (0.7 or 0.9) and Clinical Weakness

		Measured TOF Ratio		Measured TOF Ratio	
		<0.7 (n = 85)	>0.7 (n = 441)	<0.9 (n = 237)	>0.9 (n = 289)
TOF fade detected (n = 526)	Yes	23 (27)	6 (1)	27 (12)	2 (<1)
	No	62 (73)	435 (99)	210 (88)	287 (99)
DBS fade detected (n = 526)	Yes	30 (35)	6 (1)	35 (15)	1 (<1)
	No	55 (65)	435 (99)	202 (85)	288 (99)
		Measured TOF Ratio		Measured TOF Ratio	
		<0.7 (n = 51)	>0.7 (n = 280)	<0.9 (n = 146)	>0.9 (n = 185)
Head lift test (n = 331)	Failure	10 (20)	41 (15)	27 (18)	24 (13)
	Success	41 (80)	239 (85)	119 (82)	161 (87)
		Measured TOF Ratio		Measured TOF Ratio	
		<0.7 (n = 46)	>0.7 (n = 262)	<0.9 (n = 139)	>0.9 (n = 169)
Tongue depressor test (n = 308)	Failure	10 (22)	25 (10)	19 (14)	16 (10)
	Success	36 (78)	237 (90)	120 (86)	153 (90)

Clinical weakness was detected by visual and tactile assessment of TOF and DBS fade, head lift and tongue depressor tests. Clinical assessment of TOF and DBS fade was performed in all patients (n = 526). Head lift and tongue depressor tests were correctly evaluated in only 331 and 308 patients respectively. Data are presented as actual number and percentage (in parentheses). By example, among the 85 patients having a TOF ratio less than 0.7, a tactile TOF fade was detected in 23 (27%) of them and was absent in 62 (73%).

DBS = double-burst stimulation; TOF = train-of-four.

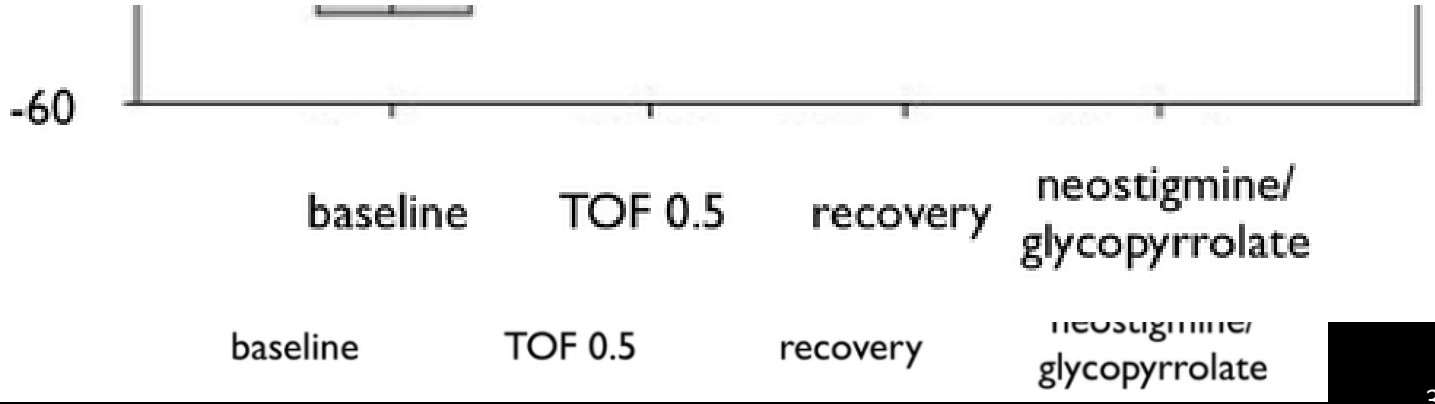
relaxant and the arrival in the postanesthesia care unit (PACU). Partial paralysis was defined as a train-of-four (TOF) ratio less than 0.7 or less than 0.9. n = number of patients. *Significantly different from TOF < 0.9.



Anesthesiology 2010; 113:1280–8

Neostigmine/Glycopyrrolate Administered after Recovery from Neuromuscular Block Increases Upper Airway Collapsibility by Decreasing Genioglossus Muscle Activity in Response to Negative Pharyngeal Pressure

Frank Herbstreit, Dr.med.,* Daniela Zigrahn, Cand.med.,† Christof Ochterbeck, Dipl.-Ing.,‡ Jürgen Peters, Dr.med.,§ Matthias Eikermann, M.D., Ph.D.‖



Survey of Anesthesiology:
August 2014 - Volume 58 - Issue 4 - p 174
doi: 10.1097/01.SA.0000450930.01685.5b
Geriatric Anesthesia

Pharyngeal Function and Breathing Pattern During Partial Neuromuscular Block in the Elderly: Effects on Airway Protection

Hårdemark Cedborg, Anna I.[*†]; Sundman, Eva[*†]; Bodén, Katarina[‡]; Hedström, Hanne Witt[§]; Kuylenstierna, Richard[‖]; Ekberg, Olle[¶‡]; Eriksson, Lars I.[*†]

Geriatric Anesthesia

Perioperative Cognitive Trajectory in Adults

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(*Br J Anaesth*, 112:440–451, 2014)

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DOI: 10.1097/SA.0000000000000061

A consistent perception in the past 60 years has been that many elderly patients have persistent cognitive decline after surgery and anesthesia. Particularly, cardiac surgery and major orthopedic surgery are seemingly associated with persistent postoperative cognitive decline (POCD) in up to 50% of patients. If this is true over time, older patients and their families would need to consider the risk of persistent POCD when they are making decisions regarding elective surgery. However, studies of postoperative cognition have had methodologic weaknesses that limit their value. This review was performed to address whether a vulnerable subgroup of patients might have long-lasting cognitive decline or, in contrast, cognitive improvement after surgery.

One limitation of a previous POCD research is allowing for outcomes. Persistent POCD, that is, lasting longer than 6 months, is thought to be common and affects quality of life and function. Many studies of POCD are limited by the absence of matched nonsurgical controls, limitations of statistical analyses, and length of follow-up. New evidence suggests that some patients show cognitive improvement after surgery. If surgery improves a patient's health, enhances quality of life, decreases inflammation, or alleviates pain, POCI could occur. The POCI could also be considered as net cognitive improvement or as a slowing of preoperative decline.

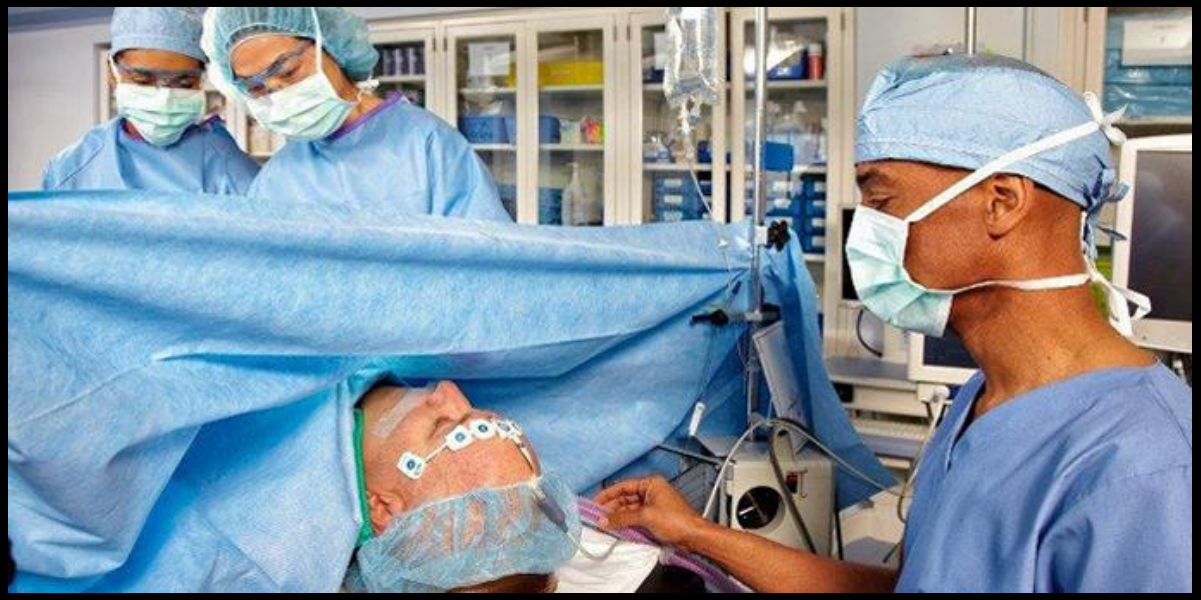
Cognitive trajectory can be affected by nonmodifiable or modifiable factors. Factors considered nonmodifiable include age, genes, and dementia. However, studies on the effects of age on postoperative cognition have yielded conflicting and contrasting results, with some noting POCD and subsequent incident dementia, especially in cardiac surgery patients, but others not. It is still unknown whether cognitively normal patients with brain pathology consistent with later onset of clinical dementia are at increased risk for POCD or accelerated dementia after surgery. No associations between genetic factors (eg, apolipoprotein E gene) and POCD have been observed. The "cognitive reserve" hypothesis and the preoperative cognitive trajectory are likely important determinants of the postoperative trajectory. However, when a postoperative change is noted, whether the trajectory is transiently altered or irreversibly altered is still ambiguous.

Eight modifiable factors include inflammation and its resolution, pain and decrease in pain, intraoperative techniques, cardiopulmonary bypass, vascular risk factors, postoperative delirium, critical illness, and quality of life and mood. Systemic inflamma-

Intraoperative Management

Intraoperative Management

- Minimally invasive anesthetic technique
- Thermoregulation
- Induction and maintenance



Anesthetic Technique

Table 3. Effects of Central Neuraxial Block Versus General Anesthesia on Ambulatory Surgical Patients

Outcome	n	Number of trials	Central neuraxial block* (mean)	General anesthesia* (mean)	OR or WMD** (95% confidence interval)	*P* value
Anesthesia induction time (min)	384	7	17.8	7.8	8.1 (4.1 to 12.1)	0.0001
PACU time (min)	476	10	56.1	51.9	0.42 (−7.1 to 7.9)	0.91
VAS in PACU (mm)	563	7	12.7	24.4	−9 (−15.5 to −2.6)	0.006
Nausea	637	12	5%	14.7%	0.40 (0.15 to 1.06)	0.06
Phase 1 bypass	218	4	30.8%	13.5%	5.4 (0.6 to 53.6)	0.15
Need for postoperative analgesics	716	11	31%	56%	0.32 (0.18 to 0.57)	0.0001
Time until discharge from ASU (min)	839	14	190	153	34.6 (13 to 56.1)	0.002
Excellent patient satisfaction	709	11	81%	78%	1.5 (0.8–23.1)	0.45

Table 4. Effects of Peripheral Nerve Block Versus General Anesthesia on Ambulatory Surgical Patients

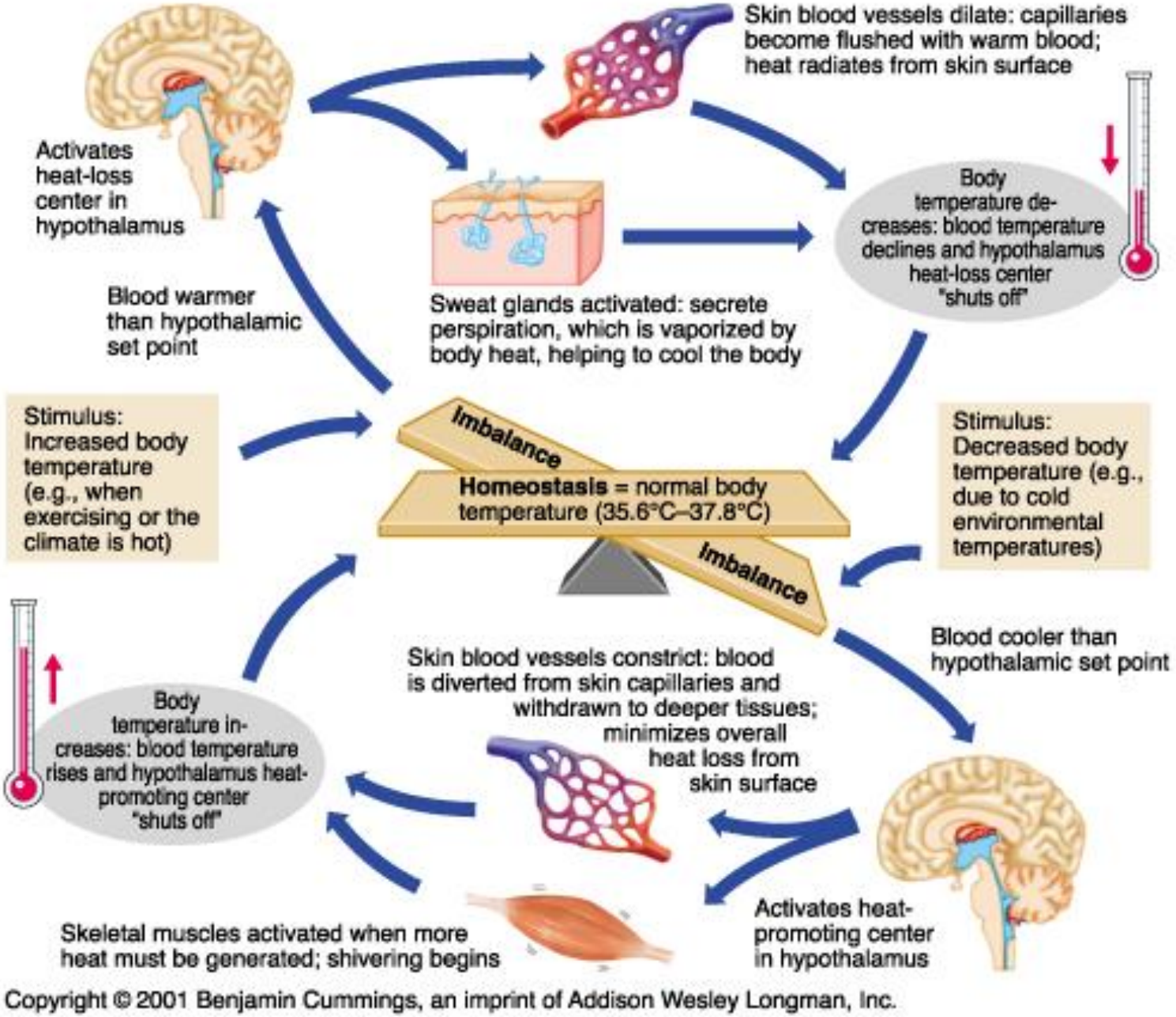
Outcome	n	Number of trials	Peripheral nerve block* (mean)	General anesthesia* (mean)	OR or WMD** (95% confidence interval)	*P* value
Anesthesia induction time (min)	329	6	19.6	8.8	8.1 (2.6 to 13.7)	0.0001
PACU time (min)	308	6	45.2	72	−24.3 (−36.3 to −12)	0.0001
VAS in PACU (mm)	359	7	9.6	35.8	−24.5 (−35.7 to −13.3)	0.0001
Nausea	319	6	6.8%	30%	0.17 (0.08 to 0.33)	0.0001
Phase 1 bypass	329	6	81%	315	14.3 (7.5 to 27.4)	0.0001
Need for postoperative analgesics	259	6	6.2%	42.3%	0.11 (0.03 to 0.43)	0.001
Time until discharge from ASU (min)	328	6	133.3	159.1	−29.7 (−75.3 to 15.8)	0.2
Excellent patient satisfaction	158	4	88%	72%	4.7 (1.8 to 12)	0.001

OR = odds ratio; WMD = weighted mean difference; * weighted by subject number; ** weighted by inverse variance; PACU = Postanesthesia care unit; ASU = ambulatory surgical unit; POD = postoperative day; VAS = visual analogue scale.

Thermoregulation

- **Impaired ability to protect against hypothermia**
- **Increased risk of wound infection and myocardial ischemia**

http://solutions.3m.com/wps/portal/3M/en_US/IPD-NA/3M-Infection-Prevention/products/catalog/~/3M-Bair-Hugger-Full-Body-Surgical-Blanket-Model-610?N=7570550+3294259569&rt=d



https://exercisephysiologist.files.wordpress.com/2012/02/thermoregulation-feedback.jpg

Induction and Maintenance

- Prolonged circulation times
- Decreased MAC requirement
- Increased risk of fluid overload
- Decreased drug metabolism
- Impaired respiratory response to hypoxia

Versed, or not to Versed?

someecards
user card

SQU Med J, August 2010, Vol. 10, Iss. 2, pp. 255-261, Epub. 19th Jun 10
Submitted: 26th Aug 09
Revision Req. 23rd Nov 09, Revision Recd. 2nd Jan 10
Accepted: 3rd Feb 10

CASE REPORT

Fentanyl and Midazolam induced Respiratory

Though fentanyl is known to competitively inhibit metabolism of midazolam by cytochrome P450 3A4 (CYP3A4) activity[2] leading to prolonged apnea.[1]

midazolam or propofol.

after 90 minutes. No cause and effect relationship could be established between the administered drugs and this unusual response.

Keywords: Day case surgery; Midazolam, Fentanyl; Apnea; Muscle paralysis; Case report; Oman

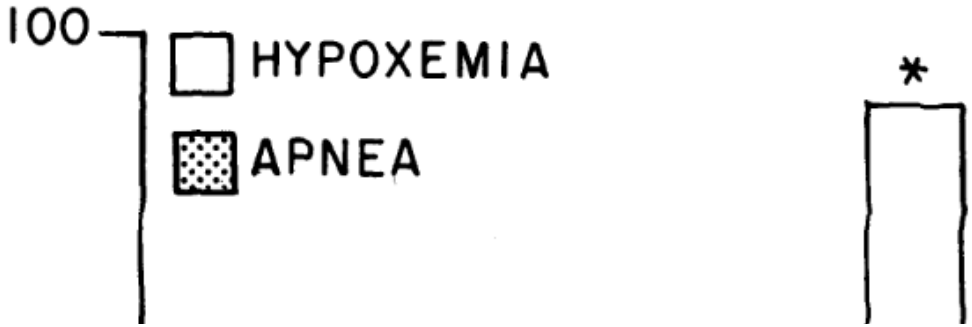


Table 11

Anesthesiology
73:826–830, 1990

Frequent Hypoxemia and Apnea after Sedation with Midazolam and Fentanyl

Peter L. Bailey, M.D., Nathan L. Pace, M.D.,† Michael A. Ashburn, M.D.,* Johan W. B. Moll, drs.,‡ Katherine A. East, M.S.,§ Theodore H. Stanley, M.D.†*

More than 80 deaths have occurred after the use of midazolam (Versed®), often in combination with opioids, to sedate patients undergoing various medical and surgical procedures. We investigated the respiratory effects of midazolam (0.05 mg·kg^{-1}) and fentanyl (2.0 μg·kg^{-1}) in volunteers. The incidence of hypoxemia (oxyhemoglobin saturation <90%) and apnea (no spontaneous respiratory effort for 15 s) and the ventilatory response to carbon dioxide were evaluated. Midazolam alone produced no significant respiratory ef-

ports, was most likely quite variable. Outside the specialty of anesthesiology, no minimal monitoring standard is established or applied in patients who receive drugs with the potential to cause significant respiratory depression. Thus, there may be one or more possible explanations for these apparently drug-related deaths.

Although hypnotic doses of midazolam and other ben-

DRUG CONDITION

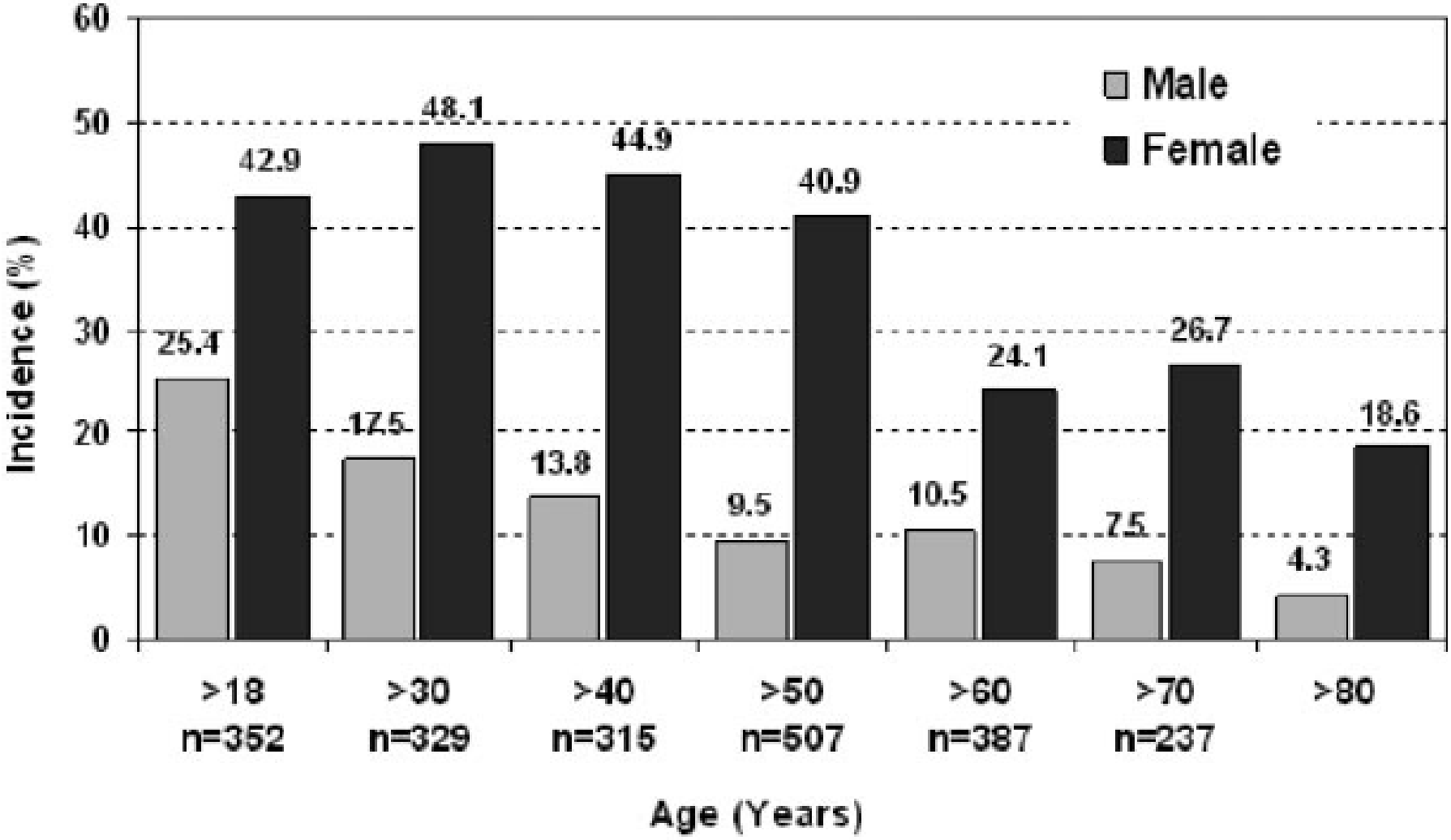
Nagelhout, J. J., & Plaus, K. L. (2014). *Nurse anesthesia* (5th ed.). St.Louis, MO: Elsevier.

Fig. 4-6 Incidence of hypoxemia and apnea after midazolam (0.05 mg/kg IV), fentanyl (2 μg/kg IV), or both drugs, in young adult volunteers. (From Bailey et al.,[134] with permission.)

Postoperative Concerns

- PONV
- Respiratory complications
- Pain
- Delirium

PONV


60
50
40
30
20
10
0
Incidence (%)
Male
Female
25.4
42.9
17.5
48.1
13.8
44.9
9.5
40.9
10.5
24.1
7.5
26.7
4.3
18.6
>18
n=352
>30
n=329
>40
n=315
>50
n=507
>60
n=387
>70
n=237
>80
Age (Years)

Delirium and POCD

Does anaesthesia cause postoperative cognitive dysfunction? A randomised study of regional versus general anaesthesia in 438 elderly patients

L. S. Rasmussen[1], T. Johnson[2], H. M. Kuipers[3], D. Kristensen[4], V. D. Siersma[5], P. Vila[6], J. Jolles[7], A. Papaioannou[8], H. Abildstrom[1], J. H. Silverstein[9], J. A. Bonal[10], J. Raeder[11], I. K. Nielsen[12], K. Korttila[13], L. Munoz[14], C. Dodds[15], C. D. Hanning[16] and J. T. Moller[1] for the ISPOCD2 investigators*

Conclusion: No significant difference was found in the incidence of cognitive dysfunction 3 months after either general or regional anaesthesia in elderly patients. Thus, there seems to be no causative relationship between general anaesthesia and long-term POCD. Regional anaesthesia may decrease mortality and the incidence of POCD early after surgery.

Table 3. Clinical Characteristics of Postoperative Delirium and Postoperative Cognitive Dysfunction (POCD)[a]

	Delirium	POCD
Clinical presentation	Disoriented, fluctuating mood, inability to focus attention	Oriented, alert, vague complaints of attention/memory problems
Affect	Labile, variable	Depression may develop
Onset	Acute—within hours to days after surgery	Subtle—usually noticed days to weeks after surgery
Duration	Days to weeks	Usually improves within weeks to months, but occasionally persists for years
Subtypes	Hyperactive, hypoactive, or mixed type	Memory dysfunction, executive dysfunction or mixed type
Sleep–wake cycle	Worse at night, in darkness and upon awakening	No differences
Assessment	Confusion Assessment Method (CAM) is best for clinicians	Neuropsychological testing, but no defined criteria for diagnosis; not recognized in the *DSM–IV*

Summary

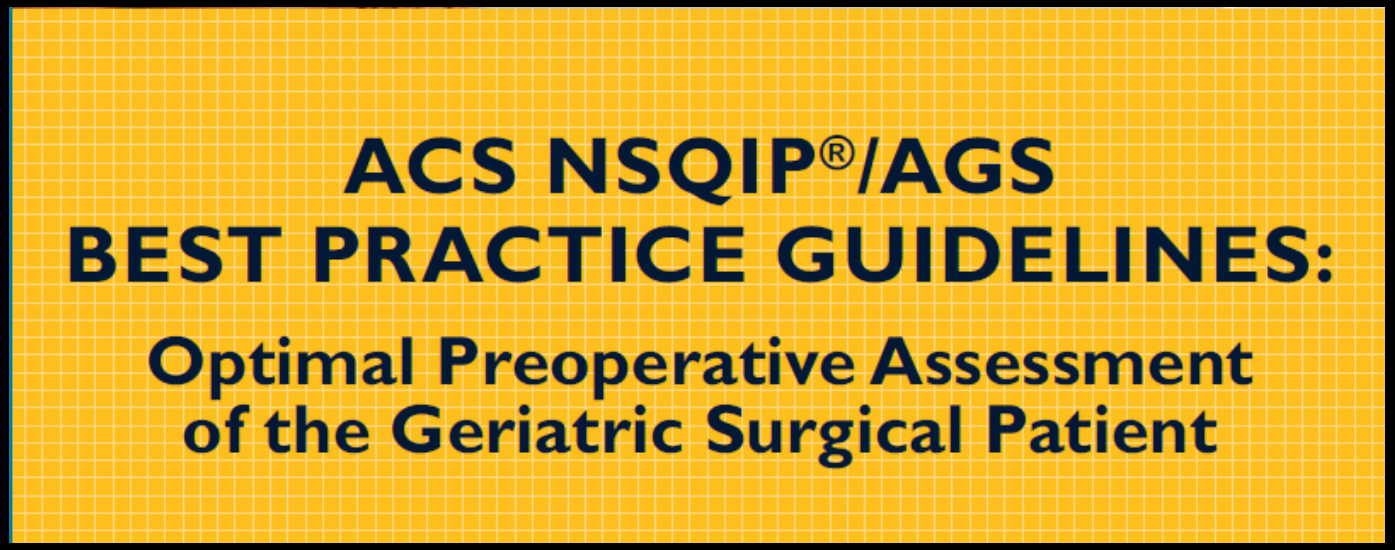
- Physiologic vs. chronologic aging
- Thorough preoperative assessment
- Anesthetic technique
- Start low, go slow
- Reduce unnecessary complications

Anesthesia Resources

http://www.sagahq.org/professionalresources.html

http://ageing-map.org/

Anesthesia Resources



http://site.acsnsqip.org//wp-content/uploads/2011/12/ACS-NSQIP-AGS-Geriatric-2012-Guidelines.pdf

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