

# LA CHIRURGIA DI SPALLA-OMERO TRAUMATOLOGIA

**Monitoraggio - Chi? Come? Cosa?**

# MONITORARE

- Rilevazione periodica e sistematica DEI PARAMETRI allo scopo di controllare la situazione o l'andamento di sistemi anche complessi

# MONITORAGGIO STANDARD

- ECG continuo
- NIBP almeno ogni 5'
- SpO2 continuo
- .....

SUFFICIENTE?

Dott. Tiziano CRESPI  
Anestesia&Rianimazione. Ospedale  
Galeazzi - Sant'Ambrogio

# FATTORI DI RISCHIO

- CORRELATI AL PZ
- CORRELATI ALLA PROCEDURA CHIRURGICA
- **CORRELATI ALLA POSIZIONE CHIRURGICA**

- Anestesista
- Chirurgo
- Nurse
- Strumentista
- OSS

- Esperienza
- Capacità
- Tecniche

- Devices dedicati
- Sistemi di Monitoraggio
- Strumentazione
- Impiantabili

- Patologie croniche:

- Lievi
- Moderate
- Severe

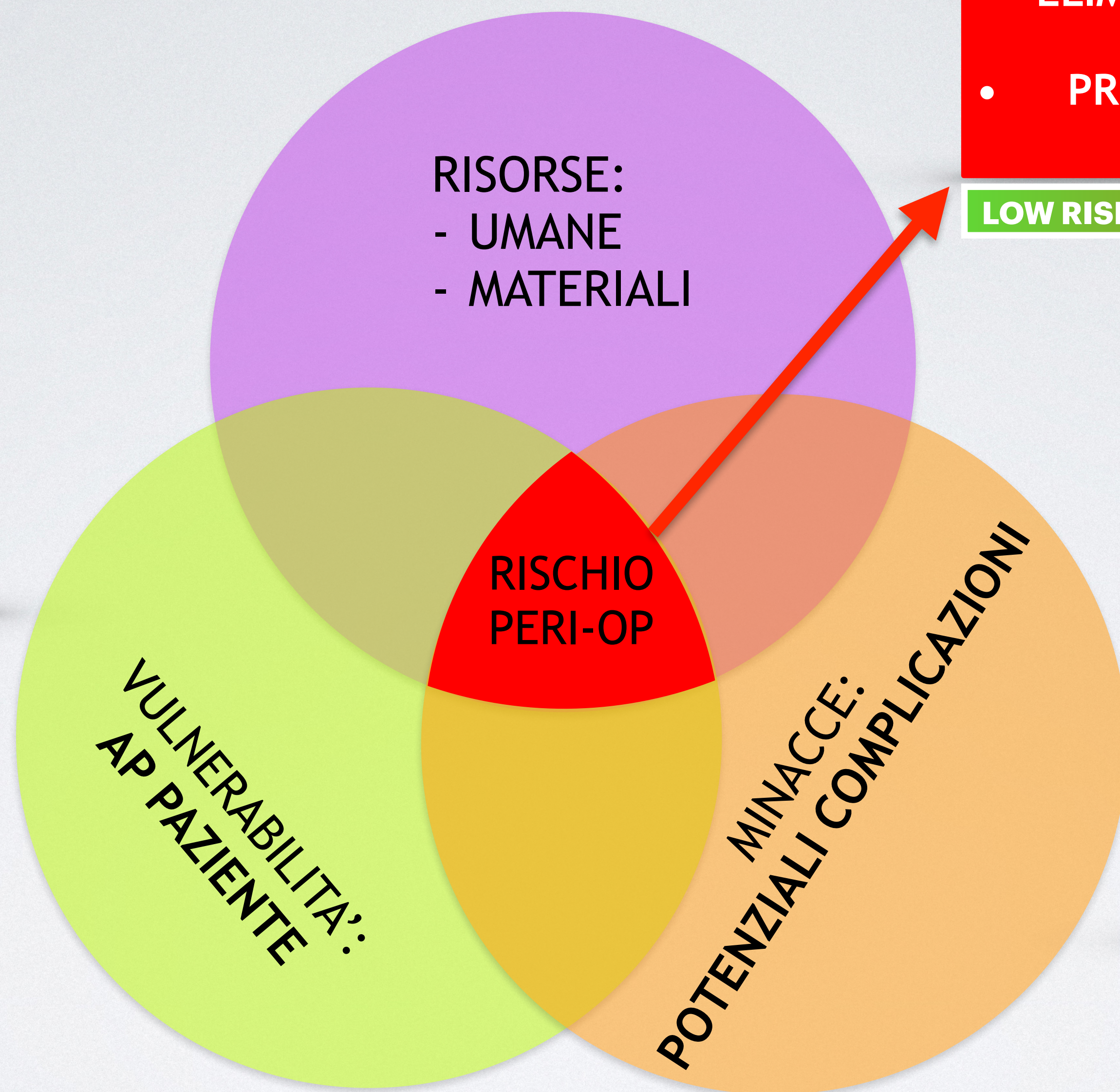
- Patologie croniche:

- Stabili
- Instabili

- Stati morbosi acquisiti dalla patologia acuta o dalle terapie

- Riserva Funzionale

## ANALISI DEL RISCHIO



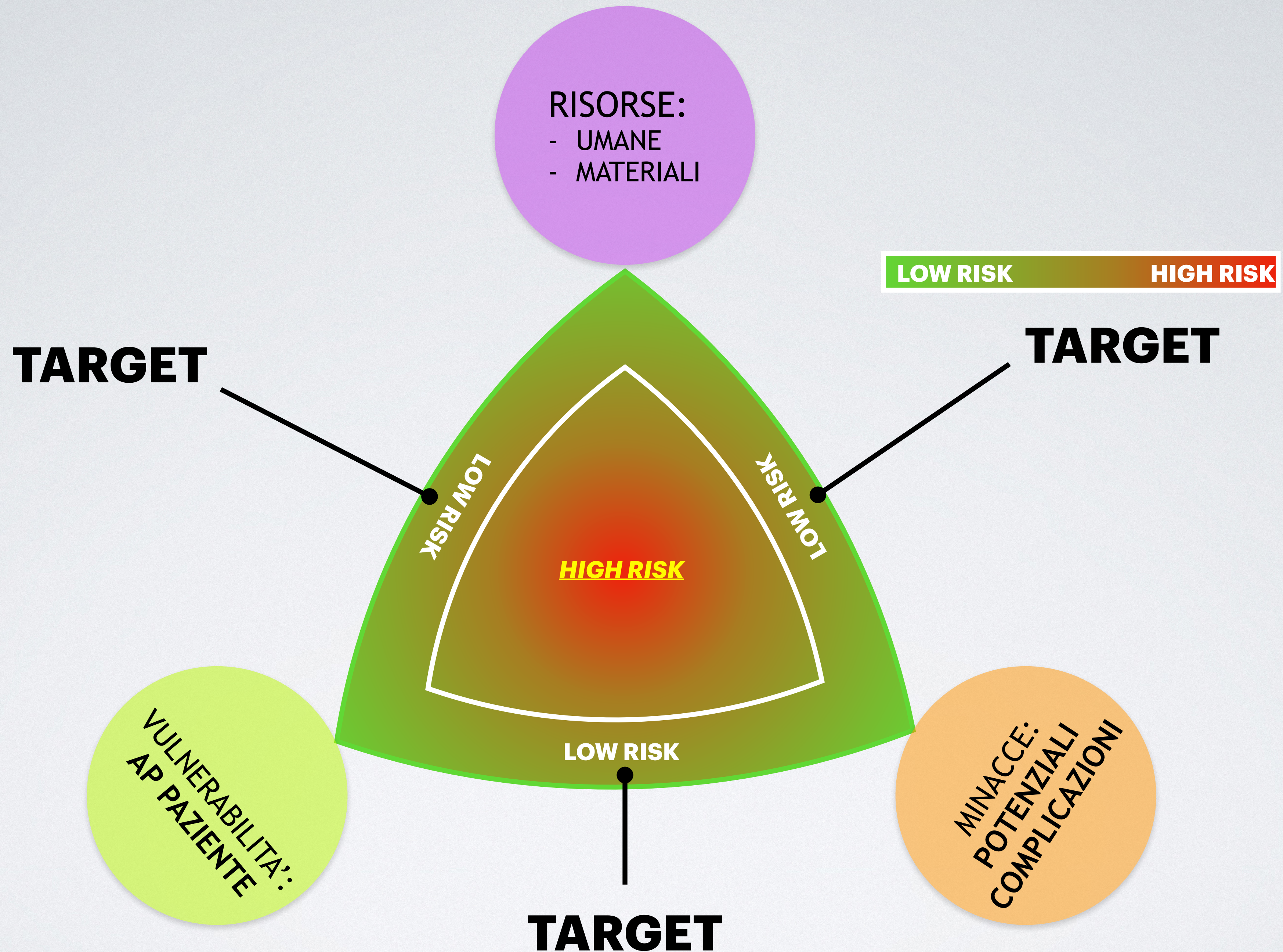
- APPROCCIO PROATTIVO PER ELIMINAZIONE/MODULAZIONE DELLE CRITICITÀ
- PROGRAMMI/PROCEDURE DI SICUREZZA

LOW RISK

HIGH RISK

- Complicanze anestesologiche
- Complicanze mediche
- Complicanze chirurgiche
- Malfunzionamenti devices

# ANALISI



# F. R. PAZIENTE PER E.A. CEREBRALI

- Età
- Patologia C-V (IPA, recente IMA, FA, HF, valvulopatia), (—> APT, TAO, DOAC);
- Pregresso STROKE / TIA (—> APT, TAO, DOAC);
- TSA
- IRA, IRC, Dialisi;
- DM;
- BPCO;
- Tabagismo;

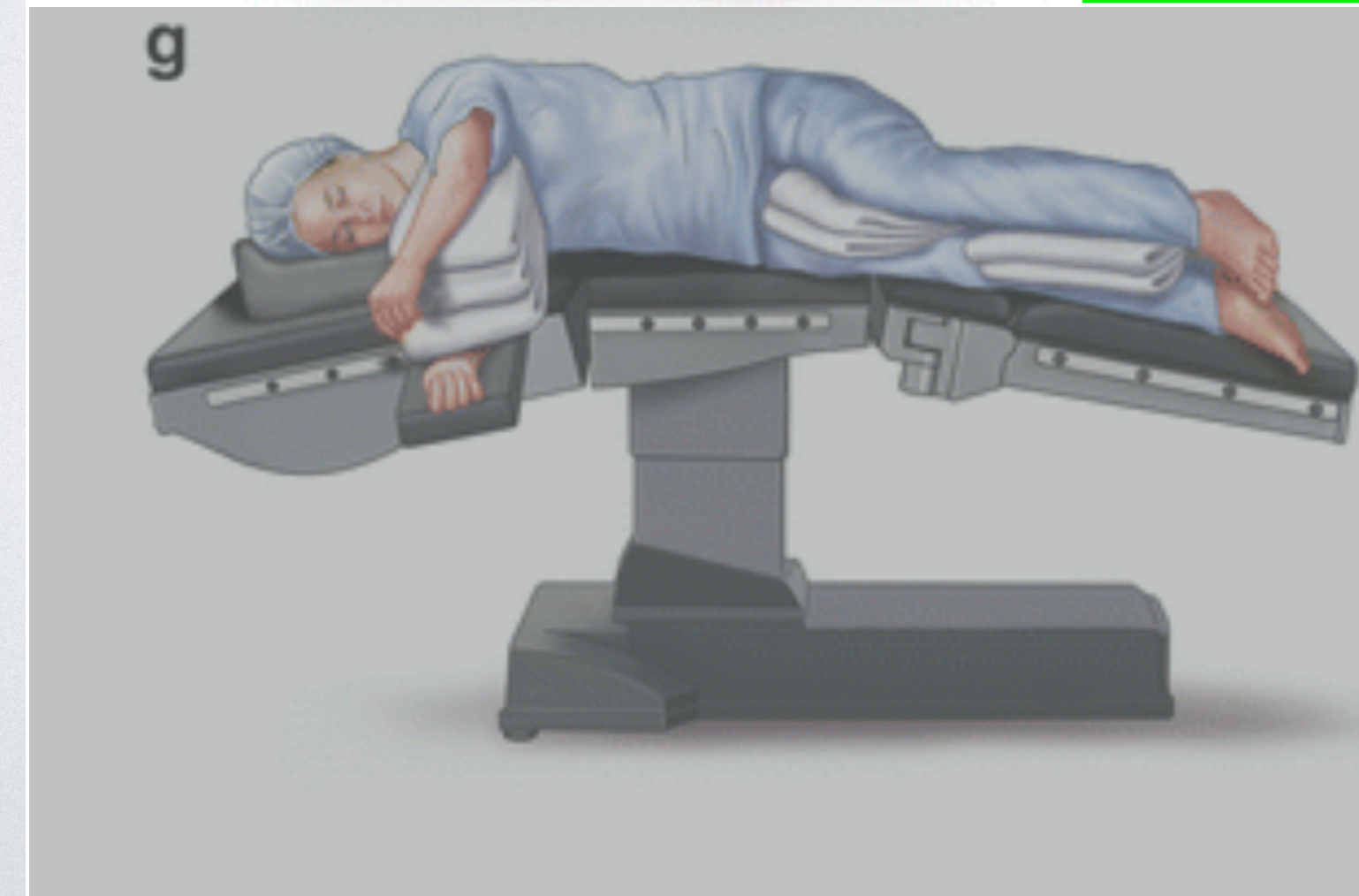
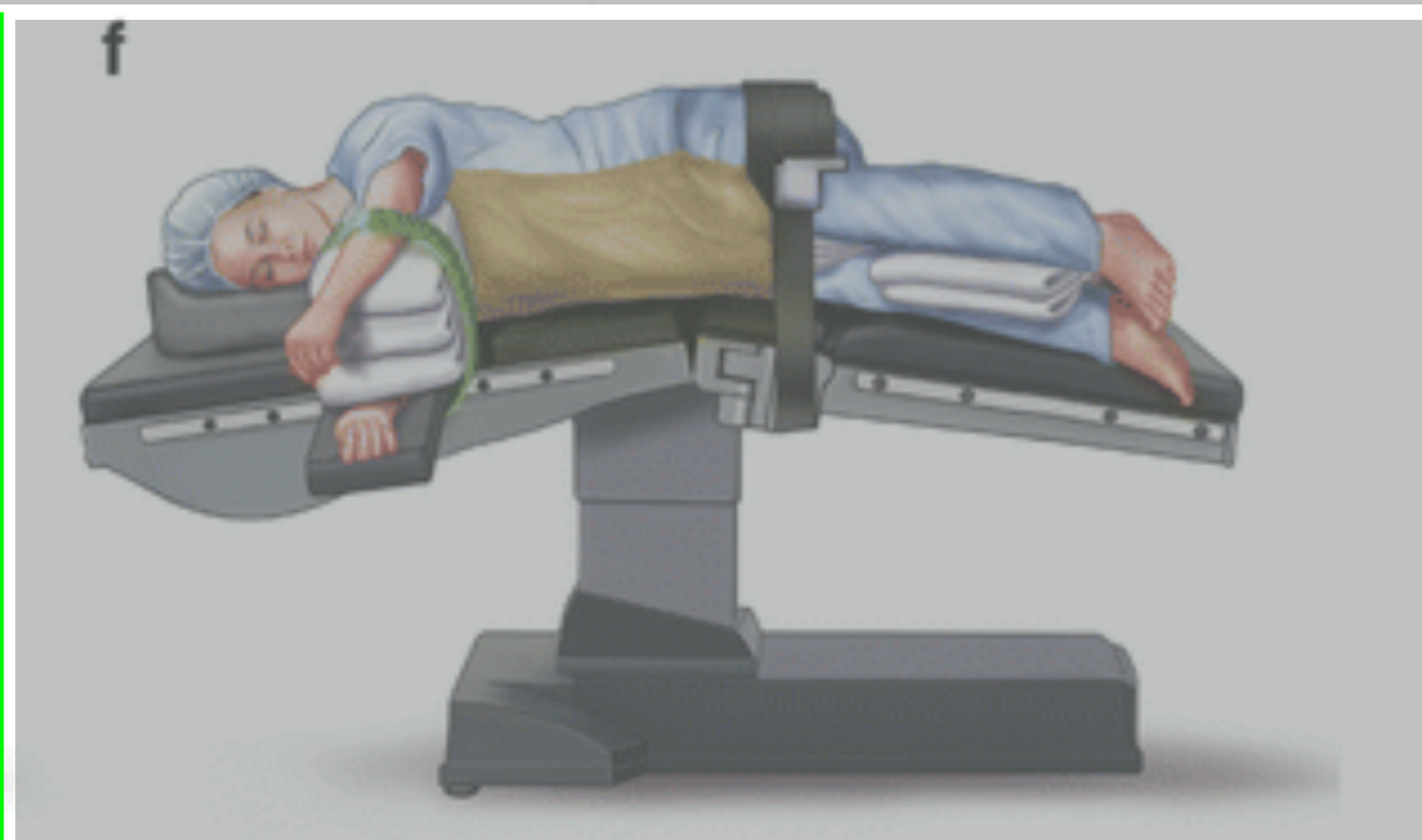
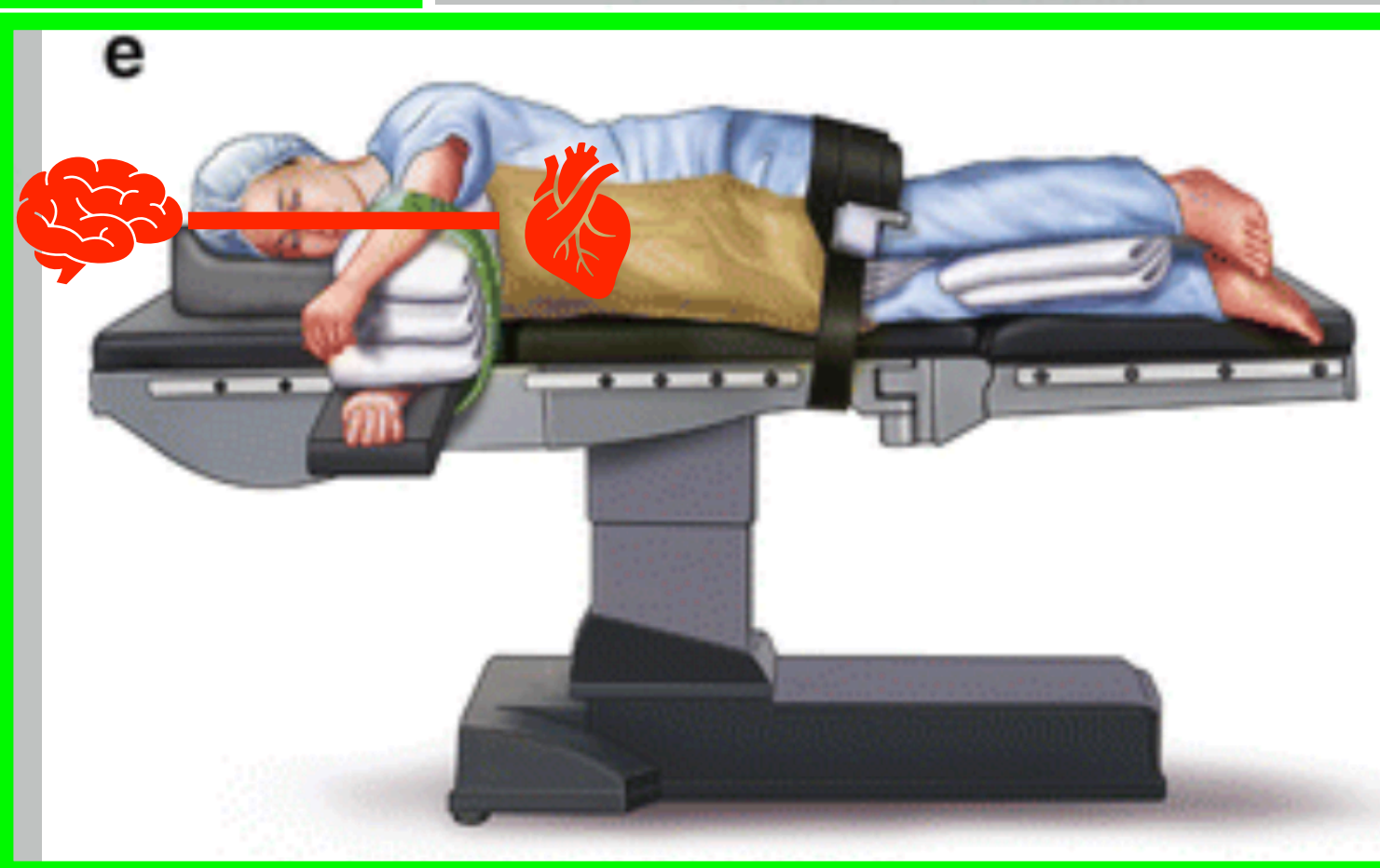
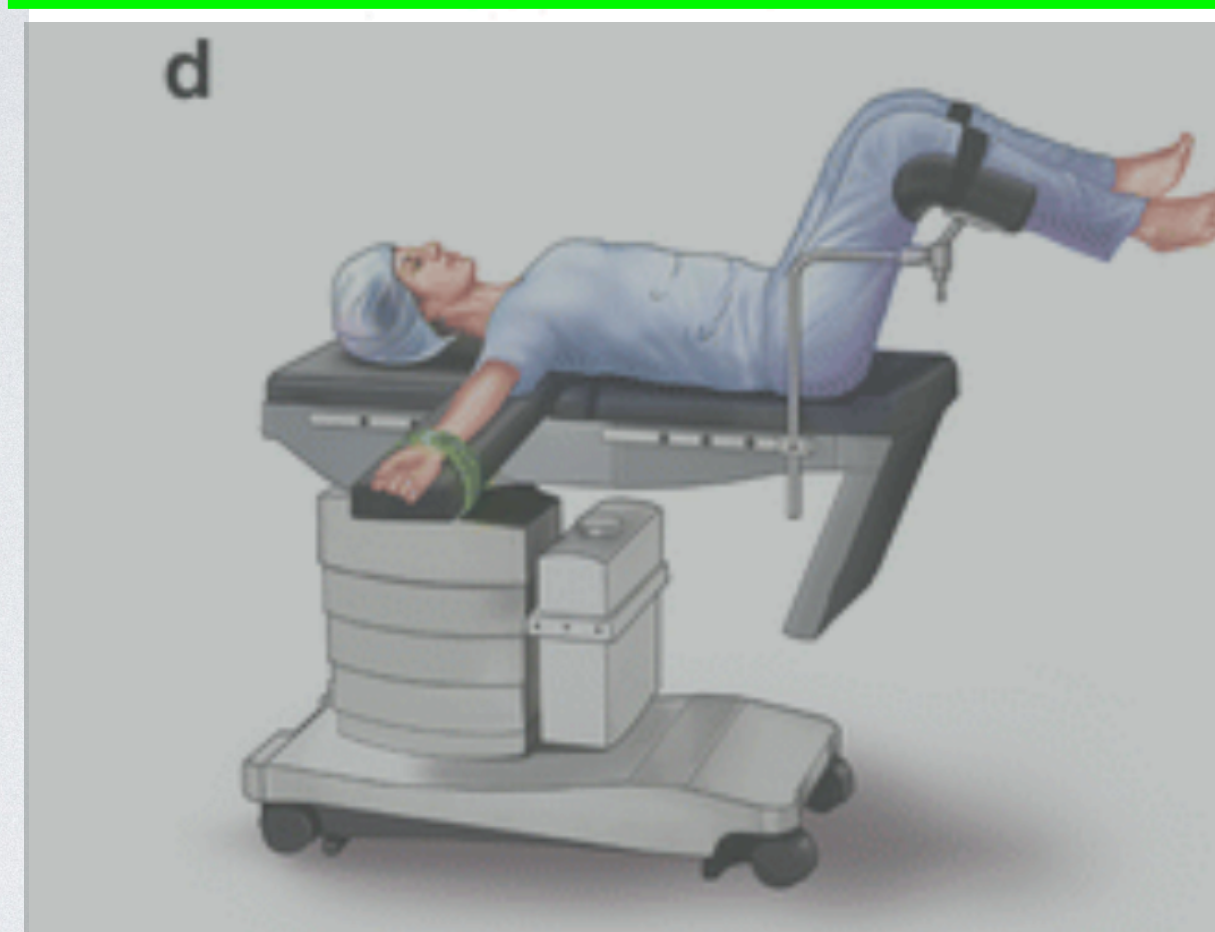
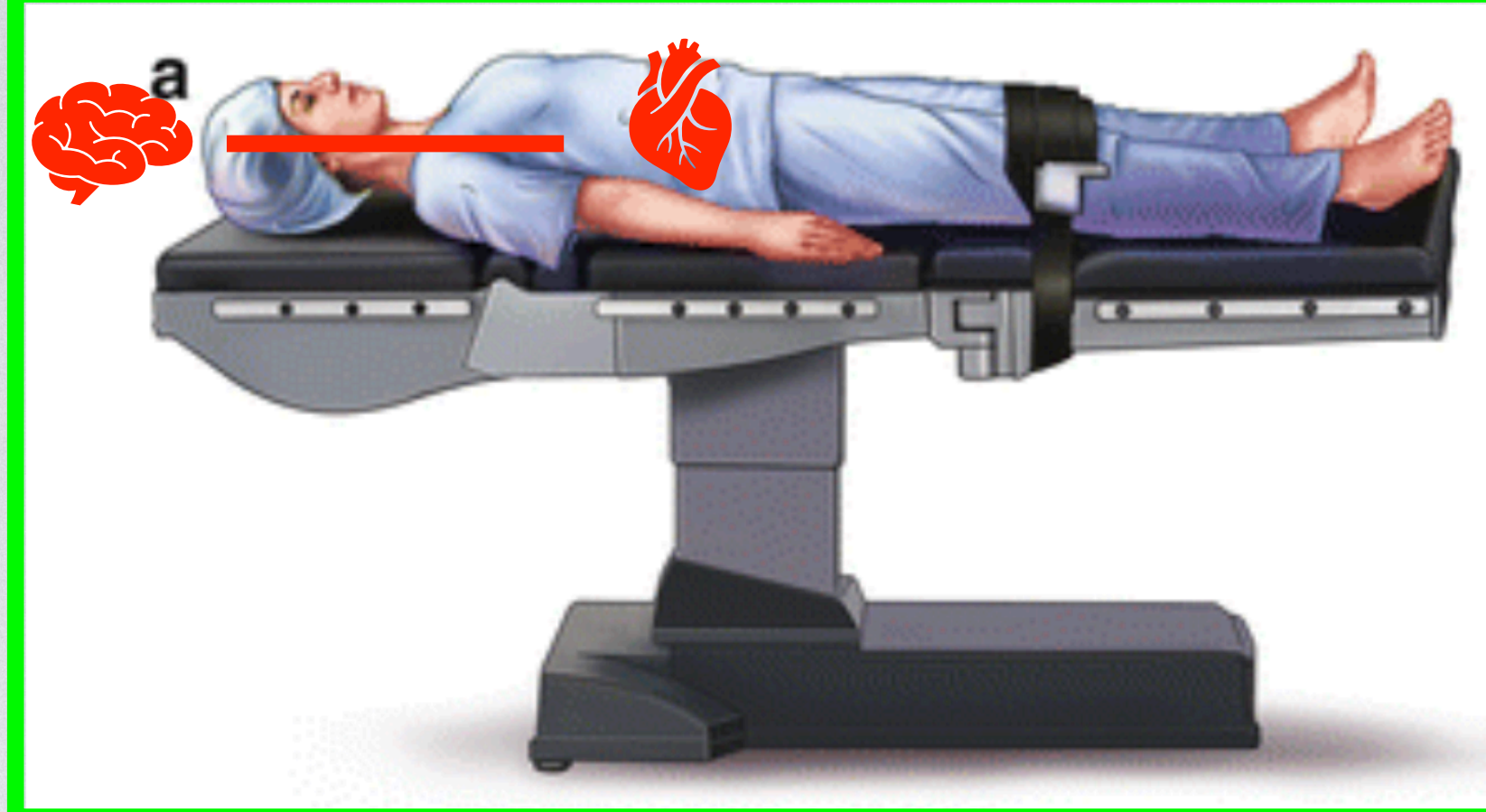


# F. R. CHIRURGIA

- COMPLESSITA'
- INVASIVITA'
- DURATA
- P. E.

# R. F. POSIZIONAMENTO

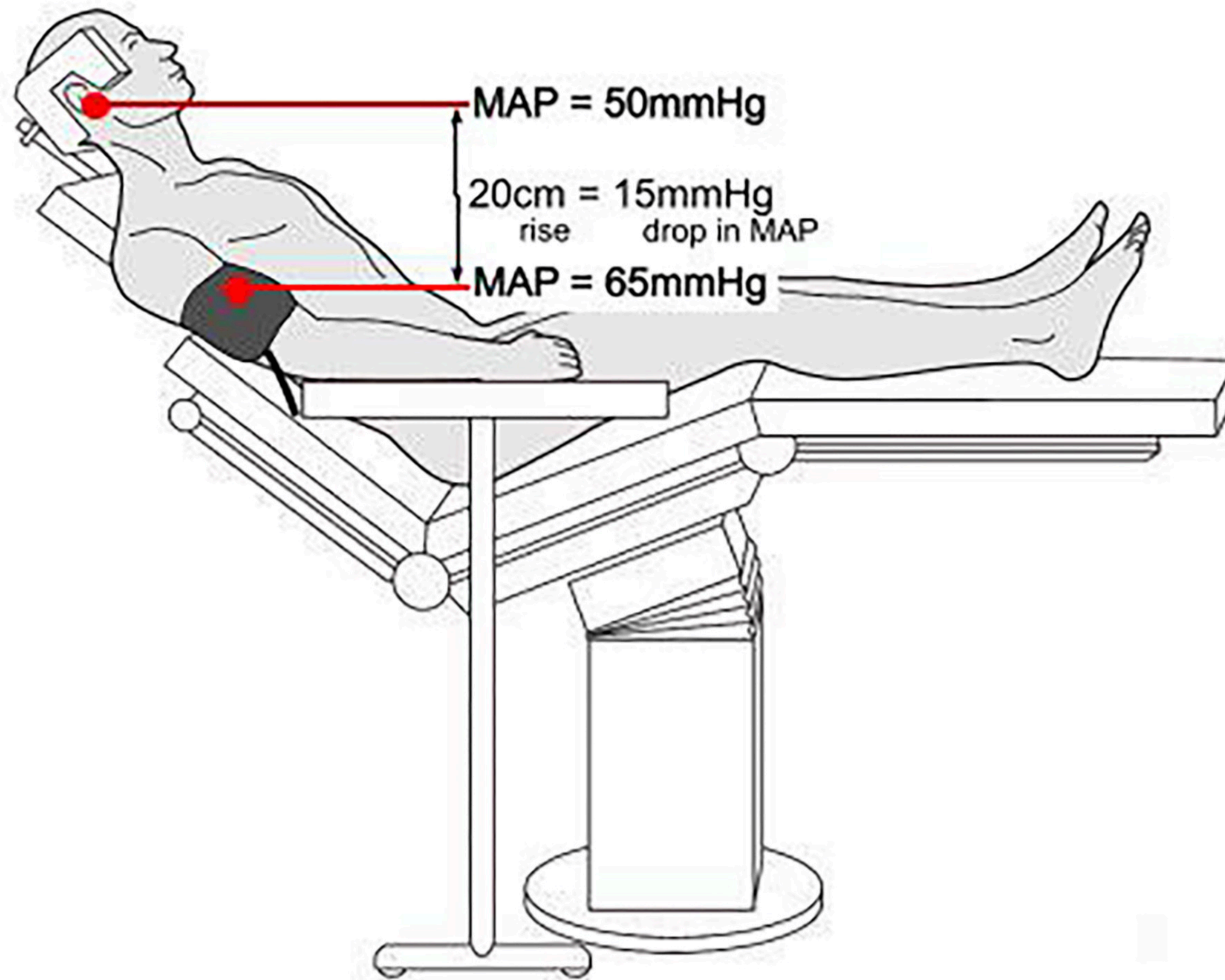
- SUPINO
- PRONO
- D. L.
- **B.C.P.**



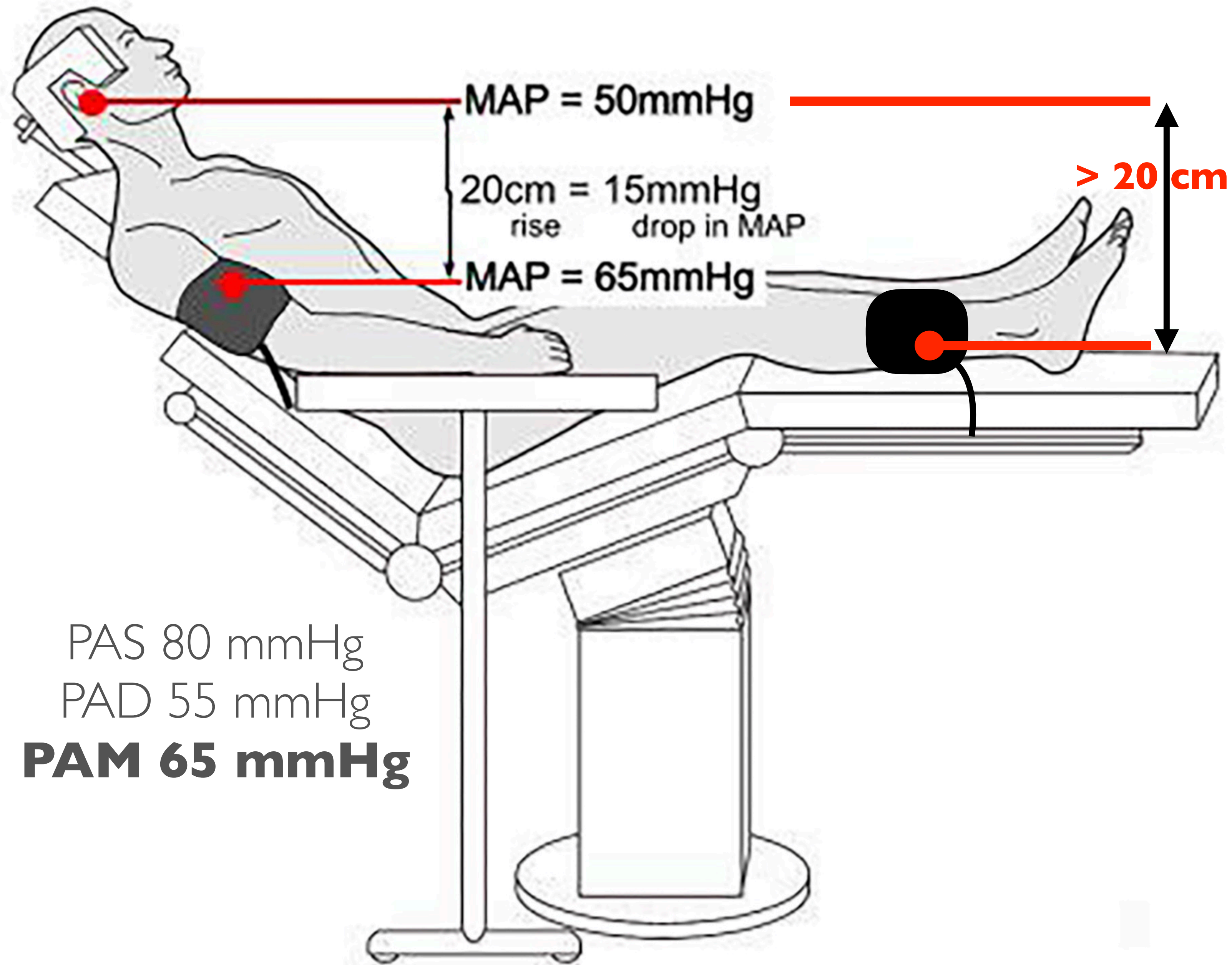
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# DOVE MISURARE?

Conversion Factor: 1cm rise = 0.75mmHg drop in MAP

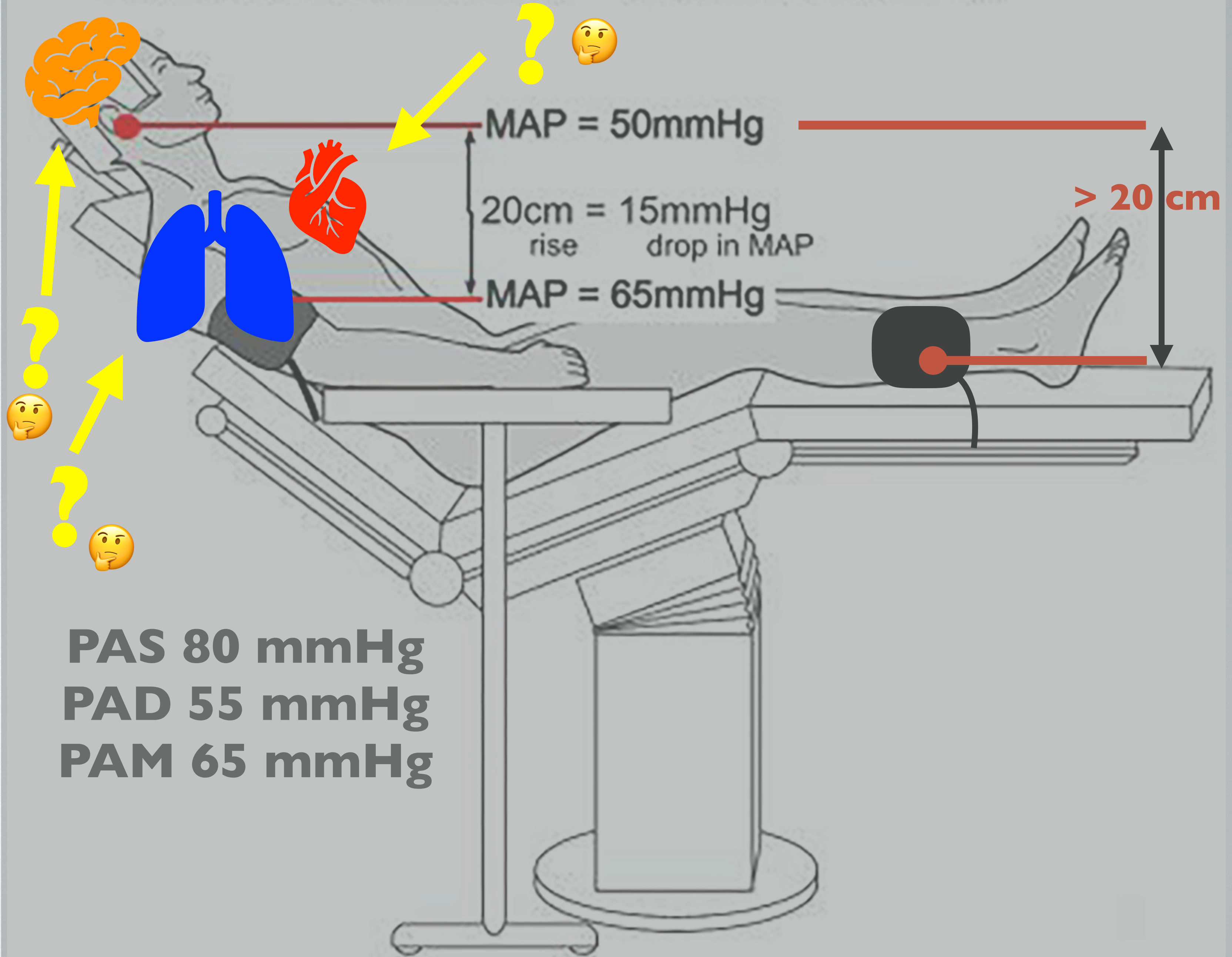


Conversion Factor: 1cm rise = 0.75mmHg drop in MAP



PAS 80 mmHg  
PAD 55 mmHg  
**PAM 65 mmHg**

Conversion Factor: 1cm rise = 0.75mmHg drop in MAP



**PAS 80 mmHg**  
**PAD 55 mmHg**  
**PAM 65 mmHg**

# B. C. P.

- **EFFETTI CV.** Blood Shift, ↓ SVR, ↓ MAP, ↓ Preload, ↓ SVI, ↓ CPP
- **PERFUSIONE CEREBRALE.** “A number of cases of **stroke, ischemic brain injury, spinal cord injury, and death** have been reported in patients who had shoulder surgery in the beach chair position. The **INCIDENCE** of catastrophic neurologic injury in this setting is **unknown** and **appears** to be very **low**. The **INCIDENCE of more minor neurologic injury** is also unknown.”
  - Autoregolazione Cerebrale. FISIOL. Supino → Seduto: ↓ CPP 15% → ↑ 50-80% SVR. Ma Autoregolazione in AG? Empiricamente MAP ≥ 70 mmHg.
  - Ossigenazione Cerebrale. NIRS: *Cerebral Desat. Events (CDE)* = ↓ ≥ 20% risp basale o valore assoluto ≤ 55% fino a 80% BCP. → TARGET EtCO<sub>2</sub> 30-45 mmHg e ↑ FiO<sub>2</sub> 30-100%
  - Goal pressorio. in AG MAP (assoluta) al MEATO ACUSTICO ≥ 70 mmHg = bracciale ≥ 90-95 mmHg o MEATO ACUSTICO ≥ 20-25 mmHg risp basale al bracciale.
  - Effetto Tecnica Anestesiologica. ALR minor/nessun impatto.
- **EFFETTI VENTILATORI.** ↑ FRC: Desaturazioni dipendenti da Cl.

# ECD-TSA

- SOSTENIBILITA' COSTI E TEMPO
- Esame Dinamico MA Pre-Op
- Identifica pz a rischio per stenosi carotidee ma:
  - non fornisce indicazioni specifiche su condotta Anestesiologica (“Normotensione e profilassi EBPM peri-Op.”???)
  - Non fornisce dati funzionali su SNC durante Anestesia.



## Visual Loss and Ophthalmoplegia After Shoulder Surgery

M. Tariq Bhatti, MD\*, and F. Kayser Enneking, MD†

Departments of \*Ophthalmology, Neurology, and Neurological Surgery and †Anesthesiology, Orthopedics, and Rehabilitative Medicine, University of Florida College of Medicine, Gainesville



Case report

## Cerebral ischemia during shoulder surgery in the upright position: a case series **4 pz**

Andrea Pohl MD (Clinical Associate)<sup>a, b</sup>, David J. Cullen MD, MS (Professor, Chairman)<sup>a, b</sup>  

<sup>a</sup> Department of Anesthesiology and Pain Medicine, Elizabeth's Medical Center, Boston, MA 02135, USA

<sup>b</sup> Tufts University School of Medicine, Boston, MA 02111, USA

### Abstract

We report 4 cases of ischemic brain and spinal cord injury after shoulder surgery in the beach chair position, using data from medical legal case reviews. We argue that the correlation between cardiovascular risk factors and cerebral ischemic complications for this type of surgery is poor in these middle-aged patients. Rather, our analysis suggests that the sitting position and the head position create specific physiological conditions that may be conducive to cerebral and spinal cord ischemia during this type of surgery. Thromboembolic events may be an additional cause of adverse neurologic outcomes.

# Neurocognitive Deficits and Cerebral Desaturation During Shoulder Arthroscopy With Patient in Beach-Chair Position: A Review of the Current Literature

Dane Salazar, MD, Antony Hazel, MD, Alexander J. Tauchen MD, Benjamin W. Sears MD and Guido Marra, MD

## SOLO ICTUS?

### Abstract

Arthroscopic shoulder surgery with the patient in the beach-chair position (BCP) has been associated with neurocognitive complications caused by cerebral ischemia.

We reviewed the current literature for the incidence of postoperative neurocognitive deficits, number of reported neurocognitive complications, and incidence of intraoperative cerebral desaturation events in patients who underwent arthroscopic shoulder surgery in the BCP.

Among 10 studies with a composite enrollment of 24,701 patients, there was only 1 case of a postoperative neurocogni-

tive deficit (overall incidence, 0.004%). Four case reports (not included in the 10 studies) described 6 patients with a catastrophic neurocognitive complication after shoulder surgery in the BCP. Incidence of reported intraoperative cerebral desaturation events varied significantly (0%-100%; mean, 41.1%).

Neurocognitive complications have been reported in patients who had arthroscopic shoulder surgery in the BCP. Intraoperative monitoring of cerebral perfusion, alternatives to general anesthesia, and prudent use of intraoperative blood pressure control may improve patient safety.

## Outcomes of shoulder surgery in the sitting position with interscalene nerve block: a single-center series

Max Rohrbaugh<sup>1</sup>, Michael L Kentor, Steven L Orebaugh, Brian Williams

Affiliations + expand

PMID: 23222361 DOI: 10.1097/AAP.0b013e318277a2eb

### **RETROSPETTIVO SU 15014 pz**

- 0.37% ADVERSE EVENTS
- ALTERAZIONI NEUROLOGICHE NON IN IMMEDIATO MA ANCHE OLTRE 24H DOPO CH
- RARI SE ALR + SEDAZIONE E RESP. SPONT.

**Results:** The total rate of adverse events was 0.37%. Neurologic abnormalities suggestive of acute cerebral ischemia or hemorrhage did not occur in the immediate perioperative period. One new neurologic deficit was reported, secondary to ischemic stroke, which occurred 24 hours after the surgery. The most frequent complications detected were unplanned return to care (0.067%), local anesthetic systemic toxicity (0.053%), and airway compromise requiring unplanned intubation (0.033%). Complications were infrequent and did not vary in incidence over the course of the study.

**Conclusions:** This retrospective study suggests that intraoperative or immediate postoperative stroke is rare when surgery is conducted in beach-chair position in conjunction with regional anesthesia, propofol sedation, and spontaneous respiration via natural airway.

## Prevalence of cerebrovascular events during shoulder surgery and association with patient position

Darren J Friedman<sup>1</sup>, Nata Z Parnes, Zachary Zimmer, Laurence D Higgins, Jon J P Warner

Affiliations

PMID

### **BCP VS LDP**

- 170-210 K vs 64-100 K
- 0.00281% EVENTI CEREBROVASC. SU TOTALE
- MA EVENTI CEREBROVASC. SOLO IN BCP

The majority of these surgeons average >500 shoulder cases annually. Most of these cases are arthroscopic, and patient position is primarily beach chair. The total number of beach chair-position surgeries was estimated between 173,370 and 209,628, and lateral decubitus-position surgeries were estimated between 64,597 and 100,855. The overall rate of intraoperative cerebrovascular event was 0.00291% (8/274,225). All cerebrovascular events were associated with surgeries in the beach chair position. The rate in the beach chair position ranged from 0.00382% (8/209,628) to 0.00461% (8/173,370). If reported primary patient position was used > or = 75% of the time, no significant difference in observed cerebrovascular event rates was found between positions (P=.051-.0233). In relation to orthopedic procedures performed in the supine position, beach chair positioning does not appear to increase the risk of intraoperative cerebrovascular event.



ELSEVIER



ELSEVIER



Original article

Cerebral oxygenation in patients undergoing shoulder surgery in beach chair position: Comparing general to regional anesthesia and the impact on neurobehavioral outcome

Oxigenación cerebral en pacientes operados del hombro en posición sentada: comparación de anestesia general y regional e impacto en la respuesta neuroconductual

90 pz

J. Aguirre<sup>a</sup>, A. Borgeat<sup>a</sup>, T. Trachsel<sup>a</sup>, I. Cobo del Prado<sup>b</sup>, J. De Andrés<sup>b,c</sup>, P. Bühler<sup>a</sup>

Results

Patients in the R-group showed significantly less cerebral desaturation events (p < 0.001), drops in regional cerebral oxygen saturation values (p < 0.001), significantly better neurobehavioral test results the day after surgery (p < 0.001) and showed a greater hemodynamic stability in the beach chair position compared to patients in the G-group.

Conclusions

The incidence of regional cerebral oxygen desaturations seems to influence the neurobehavioral outcome. Regional anesthesia offers more stable cardiovascular conditions for shoulder surgery in beach chair position influencing neurobehavioral test results at 24 h.

Original Contribution

Cerebral oxygenation in the beach chair position for shoulder surgery in regional anesthesia: impact on cerebral blood flow and neurobehavioral outcome ☆

José A. Aguirre MD, MSc<sup>a</sup>, Olivia Märzendorfer MMed<sup>a</sup>, Muriel Brada MMed<sup>a</sup>, Andrea Saporito MD, MHA<sup>b</sup>, Alain Borgeat MD (Professor for Anesthesiology)<sup>a</sup>, Philipp Bühler MD<sup>a</sup>

MAIN RESULTS

The incidence of cerebral desaturation events was 5%. All patients had a significant blood pressure drop 5 minutes after beach chair positioning, measured at the heart as well as the acoustic meatus levels, when compared with baseline values (P<.05). There was no decrease in either the regional cerebral saturation (P=.136) or the maximal blood flow of the middle cerebral artery (P=.212) at the same time points. Some neurocognitive tests showed an impairment 24 hours after surgery (P<.001 for 2 of 3 tests).

CONCLUSIONS

Beach chair position in patients undergoing regional anesthesia for shoulder surgery had no major impact on cerebral blood flow and cerebral oxygenation. However, some impact on neurobehavioral outcome 24 hours after surgery was observed.

Original Contribution

The beach chair position for shoulder surgery in intravenous general anesthesia and controlled hypotension: Impact on cerebral oxygenation, cerebral blood flow and neurobehavioral outcome

José A. Aguirre MD, MSc<sup>a</sup>, Fabian Etzensperger MD<sup>a</sup>, Muriel Brada MMed<sup>a</sup>, Sandra Guzzella MMed<sup>a</sup>, Andrea Saporito MD, MHA<sup>b</sup>, Stephan Blumenthal MD<sup>a</sup>, Philipp Bühler MD<sup>a</sup>, Alain Borgeat MD<sup>a</sup>

**AG E IPOTENSIONE IN BCP:**

- 25% DESAT SNC
- ↓ PA a 5' > in chi ha DESAT.
- No Deficit SNC **MA** >> impatto NEG ai test neurocomportamentali dopo 24h

**Conclusions:** In ASA I-II patients intravenous general anesthesia and controlled hypotension in the beach chair position affects cerebral blood flow and cerebral oxygenation with impact on the neurobehavioral outcome.

**AG IN BCP:**

- 5% DESAT SNC
- 2 / 3 TEST NEUROCOGNITIVI: IMPAIRMENT DOPO 24H

**AG IN BCP:**

- EMODINAMICA MENO STABILE
- > DESAT REG CEREBRALI
- PEGGIOR OUTCOME NEUROCOMPORTAMENTALI

Clinical Research

# What Is the Risk of Intraoperative Cerebral Oxygen Desaturation in Patients Undergoing Shoulder Surgery in the Beach Chair Position?

42 pz

Chanon Thanaboriboon MD<sup>1</sup>, Panramon Vanichvithya MD<sup>1</sup>, Pongkwan Jinaworn MD<sup>1</sup>

## Results

### *Intraoperative Cerebral Desaturation Risk in the Beach Chair Position*

The risk of intraoperative cerebral desaturation in this study was 43% (18 of 42). The median (interquartile range) duration of intraoperative cerebral desaturation was 19 minutes (5 to 58). The median (range) number of intraoperative cerebral desaturation events was 1 (1 to 3) episode per procedure, and the desaturation event usually occurred approximately 20 minutes after the maximum head elevation was reached

# Safety of Beach Chair Position Shoulder Surgery: A Review of the Current Literature

Glenn S. Murphy, MD, Steven B. Greenberg, MD, and Joseph W. Szokol, MD

Although uncommon, severe neurological events have been reported in patients undergoing shoulder surgery in the beach chair position. The presumed etiology of central nervous system injury is hypotension and subsequent cerebral hypoperfusion that occurs after alterations in positioning under general anesthesia. Most clinical trials have demonstrated that beach chair positioning results in reductions in regional brain oxygenation, cerebral blood flow, and jugular bulb oxygenation, as well as impairment in cerebral autoregulation and electroencephalographic/processed electroencephalographic variables. Further studies are needed to define the incidence of adverse neurological adverse events in the beach chair position, identify the best intraoperative neurological monitors that are predictive of neurocognitive outcomes, the lowest “safe” acceptable blood pressure during surgery for individual patients, and the optimal interventions to treat intraoperative hypotension. (Anesth Analg 2019;129:101–18)

(Fig. 2). Female sex was a risk factor associated with intraoperative cerebral desaturation (Table 2).

### *Intraoperative Cerebral Desaturation Episodes and Cognitive Decline*

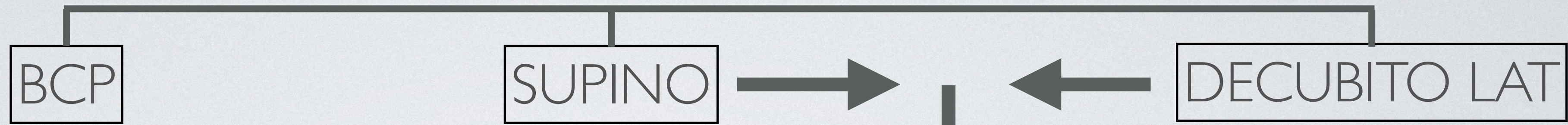
There was no association between intraoperative cerebral desaturation and cognitive decline at 24 hours postoperatively (OR 0.6 [95% CI 0.1 to 2.4]; p = 0.44). Fourteen percent (6 of 42) of patients had postoperative cognitive decline (Table 3). All six patients who had 24-hour postoperative cognitive decline had at least one episode of hypotension intraoperatively. The only risk factor for postoperative cognitive decline was education of less than 6 years (OR 10.5 [95% CI 1.3 to 83.5]; p = 0.02) (Table 4). No patients had focal neurologic deficits postoperatively.

**Further studies are needed to define the incidence of adverse neurological adverse events in the beach chair position, identify the best intraoperative neurological monitors that are predictive of neurocognitive outcomes, the lowest “safe” acceptable blood pressure during surgery for individual patients, and the optimal interventions to treat intraoperative hypotension.**

## DESAT & BCP

- 43% RISCHIO DESAT
- DA 1 A 3 EPISODI DI DESAT
- 19' DESAT MEDIA TOT
- TIMING: ENTRO 20' DA POSIZIONAMENTO
- F > M

# POSIZIONE CHIRURGICA



Fattori Rischio PZ?

SI'

NO

Posizione Modificabile?

NO

SI'

STANDARD

**OLTRE ALLO STANDARD E PRECAUZIONI**  
1) **CONSIDERA AWAKE**  
2) **VALUTA FUNZ SNC**  
3) **Se AG aggiungi NIRS e PROFONDITA' ANESTESIA**  
4) **CHECK PA E NORMOTENSIONE**

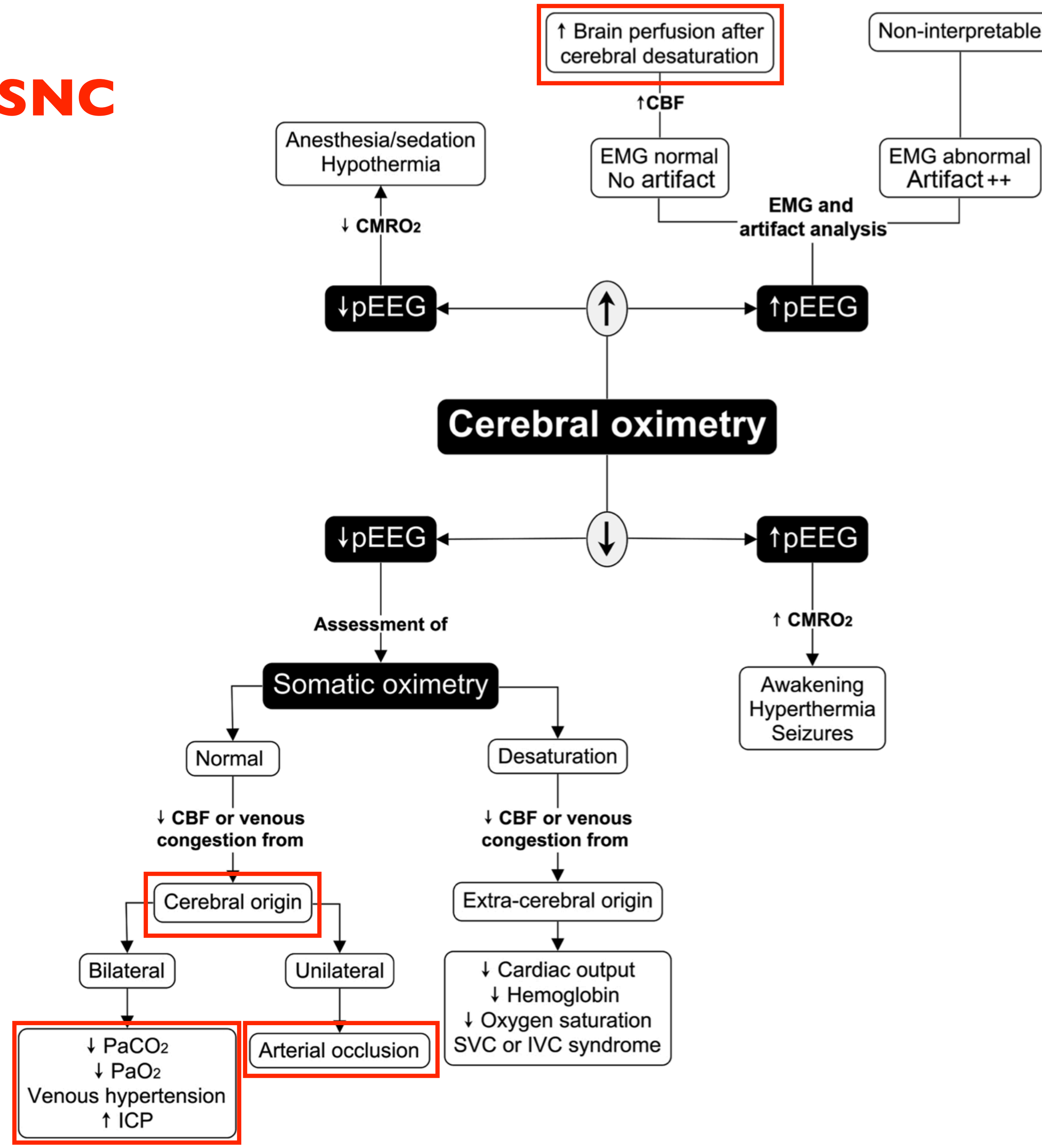


**PRECAUZIONI**

- **POSIZIONAMENTO GRADUALE**
- **TARGET EtCO2 30-45 mmHg;**
- **CONSIDERA ↑ FiO2 30-100%;**
- **MAP al MEATO ACUSTICO ≥ 70 mmHg = bracciale ≥ 90-95 mmHg o MEATO ACUSTICO ≥ 20-25 mmHg risp basale al bracciale.**

# BCP in pz con Fattori di Rischio SNC

- PAM
- EtCO<sub>2</sub>
- Hb
  
- NIRS
- Profondità Anestesia



FINE