

VFN PRAHA

VŠEOBECNÁ FAKULTNÍ
NEMOCNICE

25. COLOURS OF
SEPSIS
Festival intenzivní medicíny

**OPTIMALIZACE PŘED
KARDIOCHIRURGICKÝM
VÝKONEM**

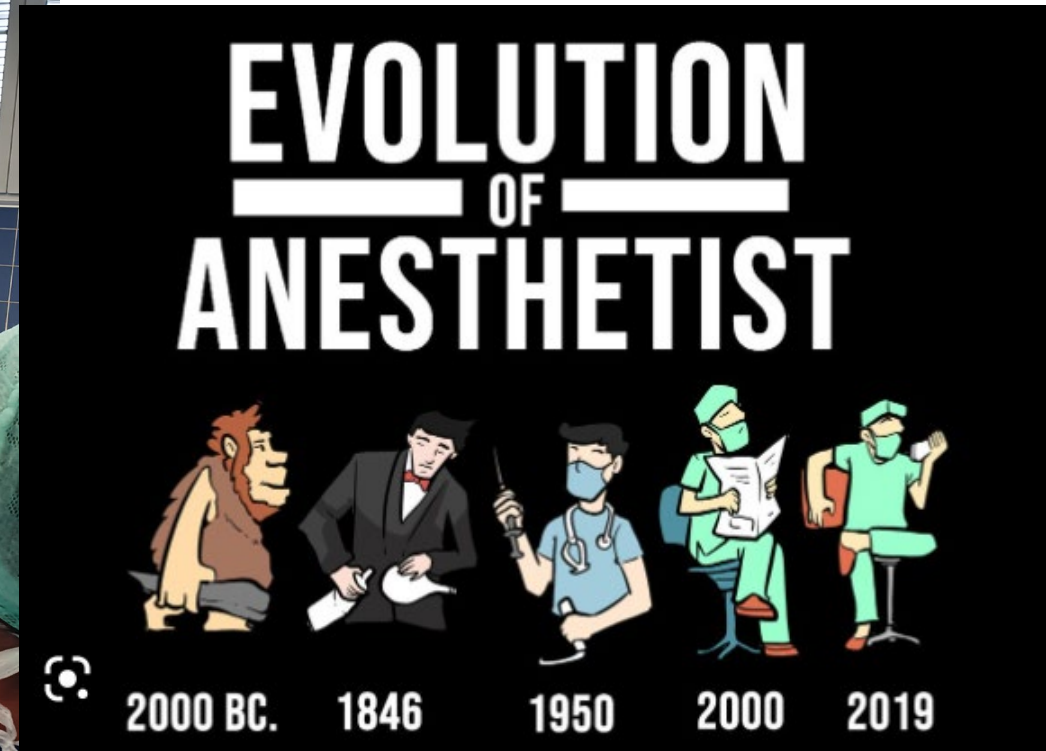
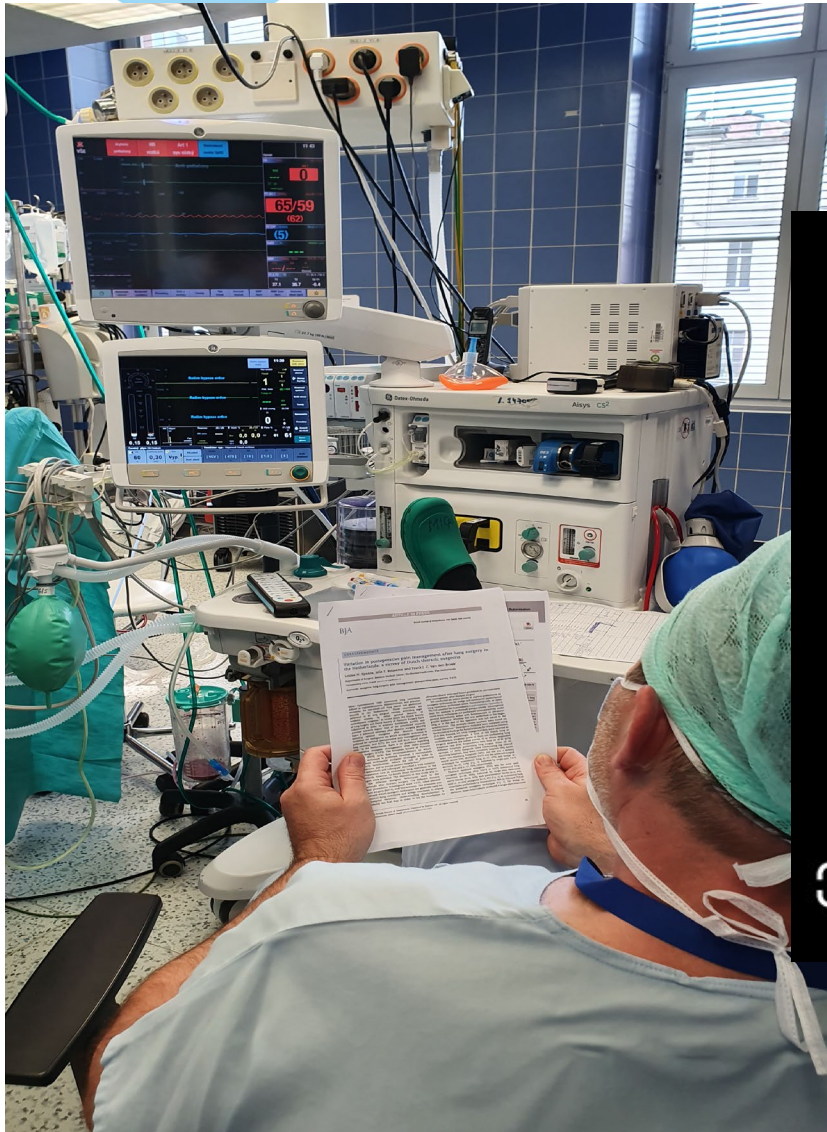
Pavel Michálek

KARIM 1.LF UK a VFN Praha

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HISTORIE vs. SOUČASNOST

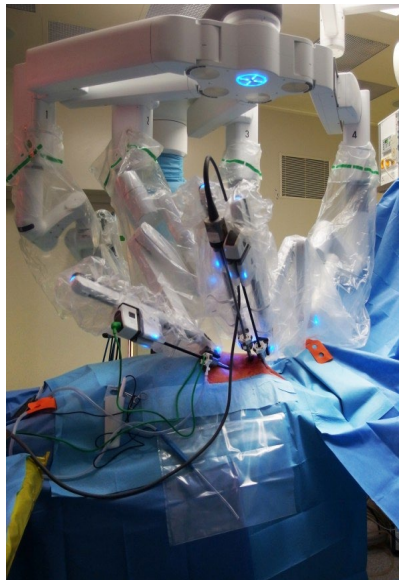
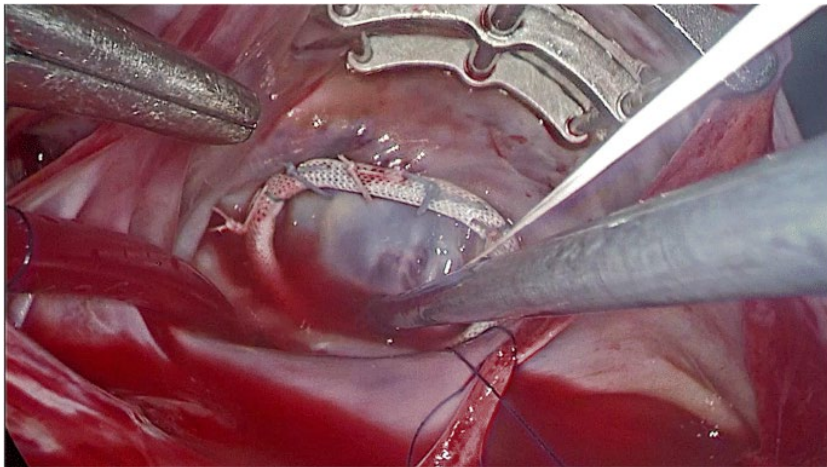




MINIMÁLNĚ INVAZIVNÍ KARDIOCHIRURGIE

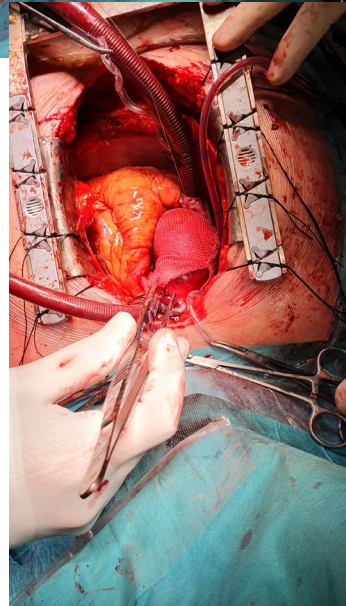
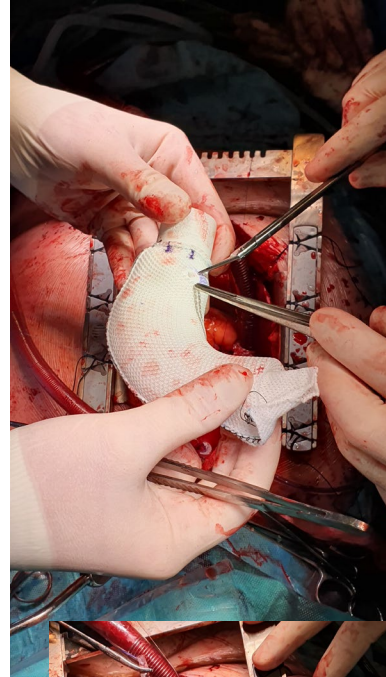
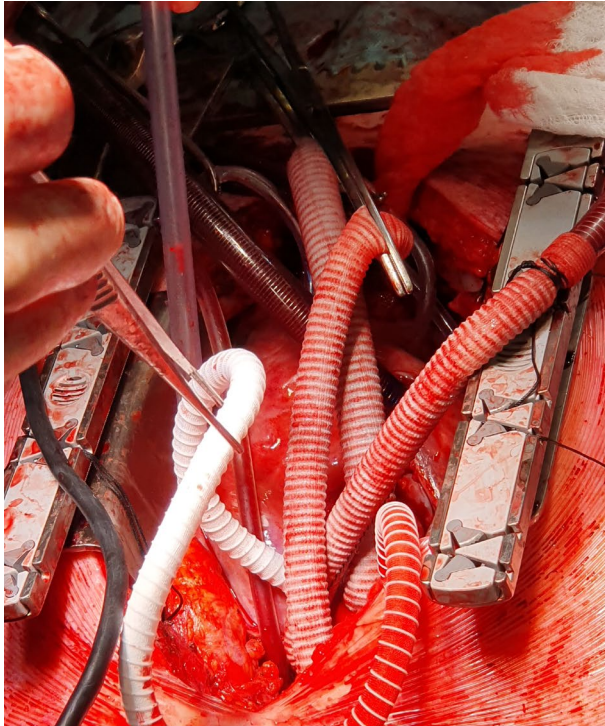


- Prováděna torakoskopicky nebo z minitorakotomie
- Přímé (MIDCAB) nebo robotické revaskularizace myokardu (*Ali, J Thorac Dis 2021; Bonatti, J Thorac Dis 2021*)
- Miniinvazivní výkony na mitrální, trikuspidální chlopni nebo septech (*Goldstone, Ann Cardiothorac Surg 2016*)
- Náhrada aortální chlopně (*Goyal, StatPearls 2021*)



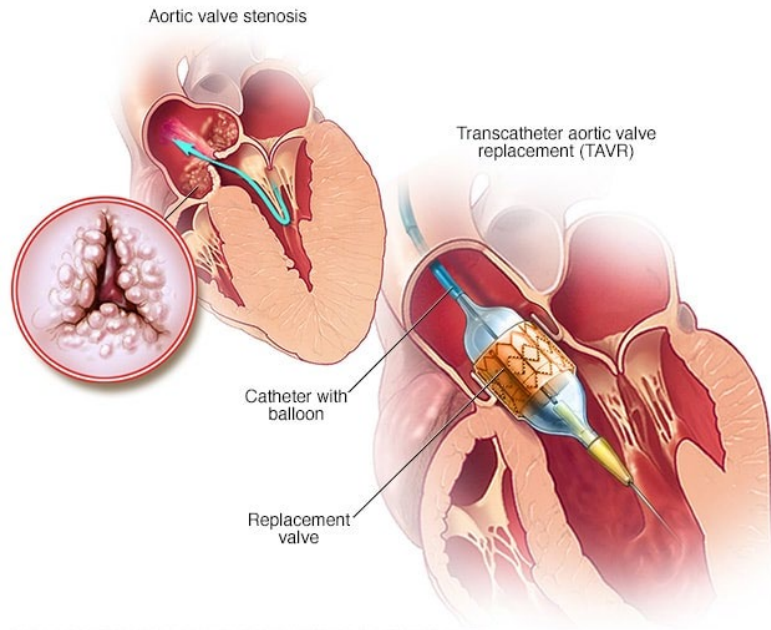


CHIRURGIE AORTY

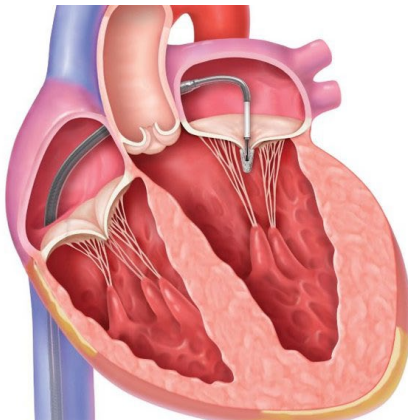


- Posun k náhradám speciálně vyrobeným pro pacienta nebo hybridním náhradám (*Hemli, Heart Surg Forum 2017*)
- Snaha o prevenci/zábranu akutní disekce aorty nebo ruptury (*Grus, 2022*)
- Operace ascendentní aorty exovaskulární protézou (Exovasc - PEARS) (*Pepper, Br J Cardiol 2020*)
- Kombinace cévní protézy a stentgraftu pro výkony na oblouku aorty – Thoraflex (*Fujikawa, Eur J Cardiothorac Surg 2019*)

KATETRIZAČNÍ VÝKONY NA CHLOPNÍCH



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- TAVI – transkatérová implantace aortální chlopně (*Howard, J Cardiac Surg 2019*)
- MitraClip – remodelace insuficientní mitrální chlopně pomocí klipů na její cípy (*Boekstegers, Clin Res Cardiol 2014*)
- Výkony na hybridním sále nebo mimo prostředí kardiochirurgických sálů
- Většinou prováděny kardiology nebo intervenčními radiology



STRATIFIKACE PERIOPERAČNÍHO RIZIKA

- Skórovací systémy (*Pittams, J Cardiothorac Vasc Anesth 2022*)
- Jaký má být dobrý skórovací systém?
- Podobné prediktivní hodnoty pro různé chirurgy a centra
- Respektování „up to date“ postupů
- Aplikovatelný na celou populaci
- Dobrá prediktivní hodnota pro mortalitu i závažnou pooperační morbiditu, ale také pro self-reporting QOL





RIZIKOVÉ FAKTORY

Summary of the Preoperative, Intraoperative, and Postoperative Risk Factors for Patients Undergoing Cardiac Surgery⁶⁻¹⁰

Patient Factors	Surgical Factors	Postoperative Factors
Age and frailty Age >65 y Clinical frailty Poor mobility	Surgical experience Inexperienced operator Low-volume centers	Prosthesis failure Patient-prosthesis mismatch Structural valve degeneration Graft occlusion
Extracardiac disease Hemodialysis COPD Peripheral vascular disease Renal impairment Neurologic disease	Intraoperative complications Visceral injury Gastrointestinal ischemia Prolonged CPB time Prolonged "cold" period Failure to wean from CPB	Need for redo surgery Bleeding Cardiac tamponade Sternal dehiscence Deep sternal wound infection Treatment failure
Cardiovascular risk factors Hypertension Current smoker Diabetes mellitus Hyperlipidemia	Emergency presentation Aortic dissection Acute STEMI Ventricular rupture Acute mitral prolapse	Postoperative complications Stroke/TIA Arrhythmia Acute kidney injury Myocardial infarction Thromboembolism

Body habitus
 Obesity (BMI >30)
 Low body weight

Population factors
 Japanese
 Indian subcontinent

Female sex
 Ejection fraction
 Congestive cardiac failure
 LVEF <50%
 Hematological disturbance
 Hypoalbuminemia
 Anemia

High-risk procedure
 Aortic arch surgery
 Combined or multiple procedures

Mechanical circulatory support
 Extracorporeal membrane oxygenation
 Ventricular assist device
 Intra-aortic balloon pump

Hospital stay
 Prolonged ICU stay
 Prolonged ventilatory support
 Need for dialysis
 Postoperative cardiogenic shock
 Inotrope requirement
 Vasopressors
 Refractory hypotension

- (Hote, Heart Asia 2018; Prins, Cardiovasc J Afr 2012; Sullivan, Am J Cardiol 2016; Parsonnet, Circulation 1989; Krishna, Indian J Thorac Cardiovasc Surg 2015)



STRATIFIKACE PERIOPERAČNÍHO RIZIKA

Summary of the Benefits and Limitations of the Risk Scores Included

Risk Score	Number of Variables	Number of Patients	Benefits	Limitations
<u>Parsonnet</u>	16	3,500 (from a single center)	<ul style="list-style-type: none"> • Has been extensively validated 	<ul style="list-style-type: none"> • Does not account for recent surgical advancement <ul style="list-style-type: none"> • Only focuses on mortality
Cleveland Clinic	13	5,051 (from a single center)	<ul style="list-style-type: none"> • Has been validated <ul style="list-style-type: none"> • Compares favorably with other risk scores 	<ul style="list-style-type: none"> • Only applicable to CABG <ul style="list-style-type: none"> • No data surrounding use with combined procedures • Not widely used
Society of Thoracic Surgeons	Isolated CABG: 49 Valve procedures: 50 CABG and valve: 50	Isolated CABG: 774,881 (from 249 centers) Valve procedures: 109,759 CABG and valve: 101,661	<ul style="list-style-type: none"> • Validated extensively <ul style="list-style-type: none"> • Widespread uptake in the United States • Assesses immediate and long-term outcomes 	<ul style="list-style-type: none"> • Restricted range of procedures <ul style="list-style-type: none"> • May tend to underestimate risk compared with EuroSCORE
<u>EuroSCORE</u>	17	13,302 (from 128 centers)	<ul style="list-style-type: none"> • Extensively validated <ul style="list-style-type: none"> • Comprehensive methodology for construction • Versatile 	<ul style="list-style-type: none"> • Logistic score is difficult to use <ul style="list-style-type: none"> • May have variations according to population
EuroSCORE II	17	22,831 (from 154 centers)	<ul style="list-style-type: none"> • Extensively validated <ul style="list-style-type: none"> • No need for logistic and additive models • The best performing risk stratification model so far • Validated in aortic surgery 	<ul style="list-style-type: none"> • Based on elective procedures; may not perform as well with non-elective procedures


Abbreviation: CABG, coronary artery bypass grafting.



EUROSCORE II

- Používáno od roku 2012 (*Nashef, Eur J Cardiothorac Surg 2012*)
- Primární cíl – mortalita během hospitalizace

← ↻ 🏠 <https://www.euroscore.org/index.php?id=17> 🔊 📄 aā 🔍 ⭐ ⚙️ 📄 ⬇️ Přihlásit

EuroSCORE home about **calculator** new EuroSCORE 3 references contact  Royal Papworth Hospital NHS Foundation Trust

EuroSCORE II calculator

EuroSCORE II EuroSCORE I (additive) ⓘ EuroSCORE I (logistic) ⓘ

Important: EuroSCORE II is the current EuroSCORE calculator which should be used to calculate risk for current patients. If you need to calculate the older EuroSCORE I (additive or logistic), please select the appropriate tag above. ✕

Patient-related factors

age

gender

chronic pulmonary disease no

extracardiac arteriopathy no

poor mobility no

previous cardiac surgery no

active endocarditis no

critical preoperative state no

renal impairment

diabetes on insulin no

Cardiac-related factors

CCS angina class 4 no

LV function

recent MI no

pulmonary hypertension

NYHA

Operation-related factors

surgery on thoracic aorta no

urgency

weight of the operation

EuroSCORE II

0.00 %

Based on the information you have provided... if 100 people with a similar condition had a similar operation, 0 may be expected to die, whereas 100 would be expected to survive. Your EuroSCORE is 0.00.



OPTIMALIZACE = PREHABILITACE

- Anémie
- Diabetes mellitus
- Obezita, spánková apnoe
- Optimalizace kardiologického stavu
- Křehkost
- Malnutrice
- Respirační onemocnění
- Abstinance návykových látek
- Deprese

M. McCann et al. / Journal of Cardiothoracic and Vascular Anesthesia 33 (2019) 2255–2265

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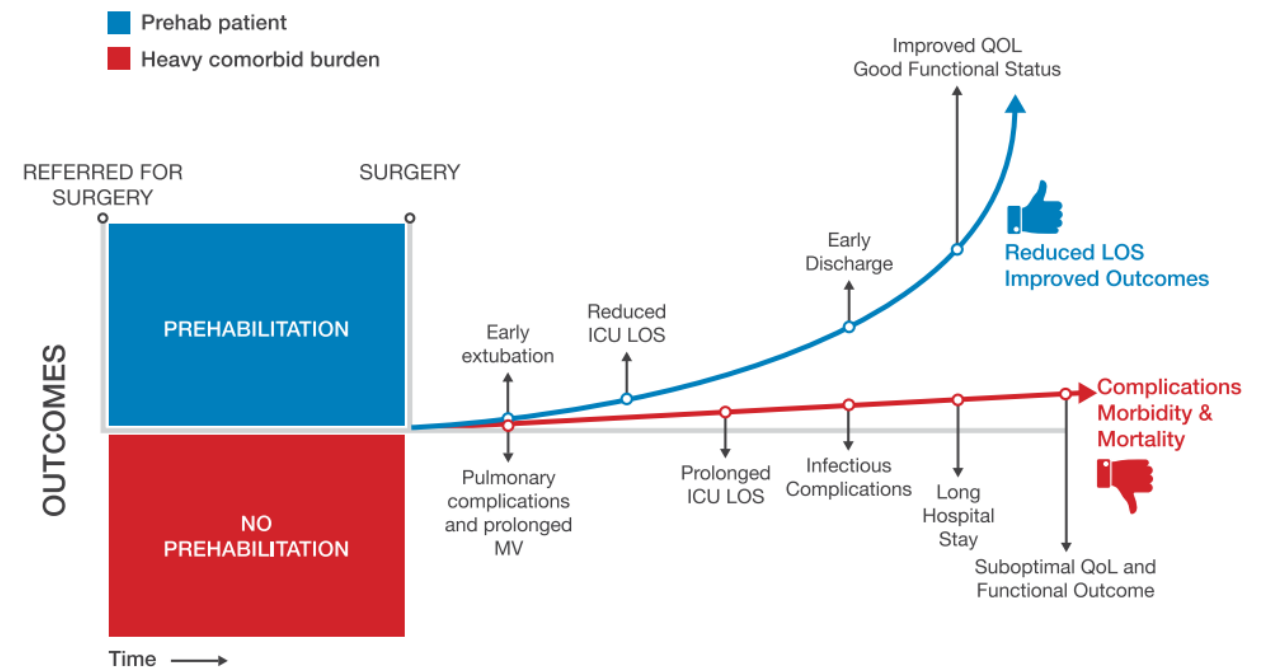
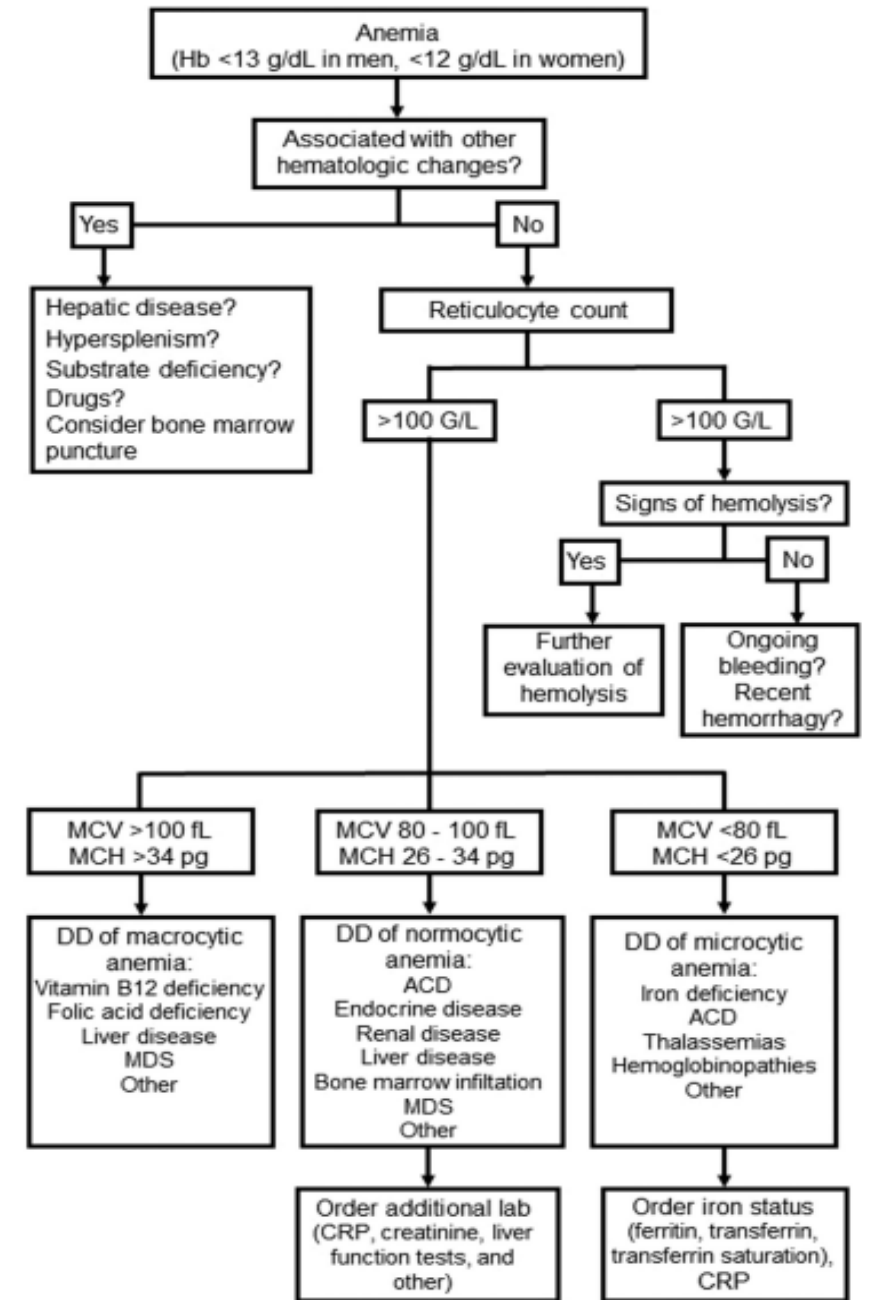


Fig 2. Effect over time of prehab on hospital and longer-term outcomes. ICU, intensive care unit; LOS, length of stay; MV, mechanical ventilation; QoL, quality of life.



KOREKCE ANÉMIE

- Středně závažná i závažná – Hb < 110 g/L spojeny se závažným zvýšením mortality i závažné pooperační morbidity (*Hazen, Br J Anaesth 2022*)
- Diagnostika – multifaktoriální příčina – GIT krvácení, deficit Fe²⁺, B12, kyseliny listové, erythropoetinu, vliv věku (*Kloeser, J Cardioth Vasc Anesth 2023*)
- P.o. (i.v.) suplementace Fe²⁺, B12, folátu
- ESA (erythropoetin) 200-500 U/kg 3 dny, 100-150 U/kg 2xtýdně po 2-4 týdny (*Rosenthal, Anaesthetist 2019*)
- Konzultace hematologa



Effect of ultra-short-term treatment of patients with iron deficiency or anaemia undergoing cardiac surgery: a prospective randomised trial



Lancet 2019; 393: 2201–12

Published Online

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[S0140-6736\(18\)32555-8](http://dx.doi.org/10.1016/S0140-6736(18)32555-8)

Donat R Spahn*, Felix Schoenrath*, Gabriela H Spahn, Burkhardt Seifert, Philipp Stein, Oliver M Theusinger, Alexander Kaserer, Inga Hegemann, Axel Hofmann, Francesco Maisano, Volkmar Falk

Summary

Background Anaemia and iron deficiency are frequent in patients scheduled for cardiac surgery. This study assessed whether immediate preoperative treatment could result in reduced perioperative red blood cell (RBC) transfusions and improved outcome.

Methods In this single-centre, randomised, double-blind, parallel-group controlled study, patients undergoing elective cardiac surgery with anaemia (n=253; haemoglobin concentration (Hb) <120 g/L in women and Hb <130 g/L in men) or isolated iron deficiency (n=252; ferritin <100 mcg/L, no anaemia) were enrolled. Participants were randomly assigned (1:1) with the use of a computer-generated range minimisation (allocation probability 0·8) to receive either placebo or combination treatment consisting of a slow infusion of 20 mg/kg ferric carboxymaltose, 40 000 U subcutaneous erythropoietin alpha, 1 mg subcutaneous vitamin B12, and 5 mg oral folic acid or placebo on the day before surgery. Primary outcome was the number of RBC transfusions during the first 7 days. This trial is registered with ClinicalTrials.gov, number NCT02031289.

Findings Between Jan 9, 2014, and July 19, 2017, 1006 patients were enrolled; 505 with anaemia or isolated iron deficiency and 501 in the registry. The combination treatment significantly reduced RBC transfusions from a median of one unit in the placebo group (IQR 0–3) to zero units in the treatment group (0–2, during the first 7 days (odds ratio 0·70 [95% CI 0·50–0·98] for each threshold of number of RBC transfusions, p=0·036) and until postoperative day 90 (p=0·018). Despite fewer RBC units transfused, patients in the treatment group had a higher haemoglobin concentration, higher reticulocyte count, and a higher reticulocyte haemoglobin content during the first 7 days (p≤0·001). Combined allogeneic transfusions were less in the treatment group (0 [IQR 0–2]) versus the placebo group (1 [0–3]) during the first 7 days (p=0·038) and until postoperative day 90 (p=0·019). 73 (30%) serious adverse events were reported in the treatment group versus 79 (33%) in the placebo group.

Interpretation An ultra-short-term combination treatment with intravenous iron, subcutaneous erythropoietin alpha, vitamin B12, and oral folic acid reduced RBC and total allogeneic blood product transfusions in patients with preoperative anaemia or isolated iron deficiency undergoing elective cardiac surgery.

Added value of this study

Our trial found that ultra-short-term (usually the day before surgery but on Friday in patients operated the next Monday) combination treatment with intravenous iron, subcutaneous erythropoietin alpha, vitamin B₁₂, and oral folic acid reduced the need for RBC and total allogeneic blood product transfusions in patients with preoperative anaemia or isolated iron deficiency undergoing elective cardiac surgery.

Implications of all the available evidence

Physicians should routinely measure haemoglobin and iron parameters in patients undergoing cardiac surgery and consider combination treatment of preoperative anaemia or iron deficiency even the day prior to surgery. This is of particular relevance since a growing percentage of elective cardiac surgery is done within a few days after an acute cardiac event.



DIABETES MELLITUS A KONTROLA GLYKÉMIE

- Až 40% pacientů – diabetes mellitus II. typu
- Hemoglobin A1c – silný nezávislý rizikový faktor pro zvýšení četnosti renálního selhání, infekce rány, CMP, mortality (*Navaratnarajah, J Cardiothor Surg 2018*)
- HbA1c < 7% - kvalitní kontrola diabetu (*McCann, J Cardioth Vasc Anesth 2019*)
- Přesto 25% pacientů před KCH výkonu má HbA1c >7% a 10% má nediodagnostikovaný DM (*Engelman, JAMA Surg 2019*)





OPTIMALIZACE KARDIÁLNÍ FUNKCE

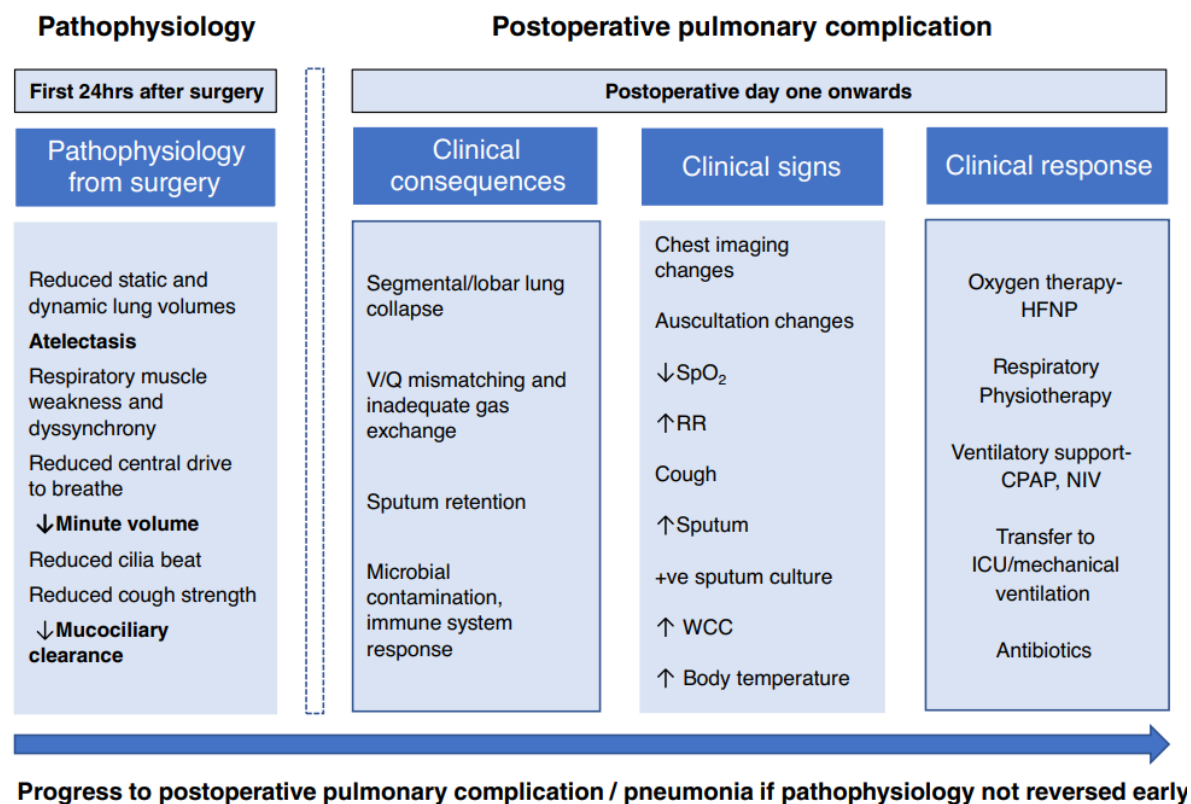
- Detailní zhodnocení srdeční funkce v klidu i při zátěži – TTE/TEE, 3D(4D), angiografie (MRI), DSE
- Optimalizace pacientů se srdečním selháním – funkce ledvin, jater, volume status, snížení dávky ACE inhibitorů, nevysazení beta-blokátorů, hodnocení hladin BNP, NT-proBNP (*Lee, Anaesthesia 2019*)
- Ideální hodnoty - BNP < 300 pg/mL, NT-proBNP < 1000 pg/mL
- Terapie hypertenze, FiS, brady/tachykardie
- Identifikace pacientů pro inotropní podporu (dobutamin, levosimendan, milrinon), IABK nebo implantaci mechanické srdeční podpory (*Pichette, Am J Cardiol 2017*)





OPTIMALIZACE STAVU DÝCHACÍHO SYSTÉMU

- Dostatečné vyšetření – rtg, spirometrie, KR interakce
- Předoperační respirační edukace a trénink nácviku dýchání (*Boden, Curr Anesthesiol Rep 2022*)
- Nácvik správného kašle
- Trénink inspiračních svalů (*Shei, J Strength Cond Res 2018*)
- Cílená bronchodilatační léčba, cílená mukolytická léčba, mobilizace sputa







KŘEHKOST

- Vulnerabilita ke stresujícím faktorům následkem ztráty fyziologických rezerv
- Pre-Křehkost („pre-frailty“) – polovina populace nad 65 let
- Vyšší pooperační mortalita, závažná morbidita, delší ICU i iH-LOS, častější nesamostatnost (*Lee, Circulation 2010*)
- Zhodnocení – „frailty“ skóre, Friedova kritéria (*Graham, Anesth Analg 2017*)
- Prehabilitace – svalový trénink, inspirační trénink, mentální trénink, karbohydráty/výživa

Lee et al. *Journal of Cardiothoracic Surgery* (2021) 16:184
<https://doi.org/10.1186/s13019-021-01541-8>

Journal of
Cardiothoracic Surgery

REVIEW

Open Access

Frailty and pre-frailty in cardiac surgery: a systematic review and meta-analysis of 66,448 patients



Jessica Avery Lee^{1†}, Bobby Yanagawa^{1†*}, Kevin R. An¹, Rakesh C. Arora², Subodh Verma¹, Jan O. Friedrich³ and on behalf of the Canadian Cardiovascular Surgery Meta-Analysis Working Group

Abstract

Background: The burden of frailty on cardiac surgical outcomes is incompletely understood. Here we perform a systematic review and meta-analysis of studies comparing frail versus pre-frail versus non-frail patients following cardiac surgery.

Methods: We searched MEDLINE and EMBASE databases until July 2018 for studies comparing cardiac surgery outcomes in “frail”, “pre-frail” and “non-frail” patients. Data was extracted in duplicate. Primary outcome was operative mortality.

Results: There were 19 observational studies with 66,448 patients. Frail patients were more likely female (risk ratio [RR] 1.7; 95%CI:1.5–1.9), older (mean difference: 2.4; 95%CI:1.3–3.5 years older) with greater comorbidities and higher STS-PROM. Frailty (RR2.35; 95%CI:1.57–3.51; $p < 0.0001$) and pre-frailty (RR2.03; 95%CI:1.52–2.70; $p < 0.00001$) were associated with increased operative mortality compared with non-frail patients. Frailty was also associated with greater risk of prolonged hospital stay (RR1.83; 95%CI:1.61–2.08; $p < 0.0001$) and intermediate care facility discharge (RR2.71; 95%CI:1.45–5.05; $p = 0.002$). Frail (Hazard Ratio [HR]3.27; 95%CI:1.93–5.55; $p < 0.0001$) and pre-frail patients (HR2.30; 95%CI:1.29–4.09; $p = 0.005$) had worse mid-term mortality (median follow-up 1 years [range 0.5–4 years]). After adjustment for baseline imbalances, frailty was still associated with greater operative mortality (odds ratio [OR]1.97; 95%CI:1.51–2.57; $p < 0.00001$), intermediate care facility discharge (OR4.61; 95%CI:2.78–7.66; $p < 0.00001$) and midterm mortality (HR1.37; 95%CI:1.03–1.83; $p = 0.03$).

Conclusion: In patients undergoing cardiac surgery, frailty and pre-frailty were associated with 2-fold and 1.5-fold greater adjusted operative mortality, respectively, greater adjusted perioperative complications and frailty was associated with almost 5-fold risk of non-home discharge.

Keywords: Frailty, Coronary artery bypass graft, Valve surgery



OBÉZNÍ PACIENT

- Obezita je nezávislým prediktorem perioperačních a pooperačních komplikací po KCH výkonech (*McCann, J Cardiothorac Vasc Anesth 2019*)
- BMI ≥ 35 kg/m² zvyšuje riziko pooperačního AKI, infekce rány, pooperační AF i mortality (*Mariscalco, Circulation 2017*)
- Diagnóza obstruktivní spánkové apnoe – STOP BANG – léčba – domácí CPAP (*Krishnasamy, J Thorac Dis 2019*)





KOREKCE NUTRIČNÍHO STAVU

- Malnutrice, kachexie vyskytující se u 20% pacientů, spojeny se zvýšenou pooperační morbiditou i mortalitou (*McCann, J Cardiothorac Vasc Anesth 2019*)
- Hypalbuminémie (< 30 g/L) zvyšuje riziko prodloužené UPV, vzniku AKI, infekce, prodlužuje LOS, zvyšuje mortalitu (*Lee, Anesthesiology 2016*)
- Screening na malnutrici, chuť k jídlu – Malnutrition Universal Screening Tool, Short Nutritional Assessment Questionnaire (*Chermesh, Eur J Prevent Cardiol 2012*)
- Příprava nutričními preparáty, karbohydráty, tekutinami
- Některé látky mohou mít imunoprotektivní efekt-arginin, selen





ABSTINENCE

- Kuřáci – vyšší riziko pooperační pneumonie (OR 1.99, $p < 0.001$), prodloužené UPV a ICU LOS (*Grabas, BMC Cardiovasc Disord 2016*)
- Nad 70 let – vyšší riziko pooperačního renálního selhání (17.3% vs. 3.1%), zvýšená časná mortalita (14.8% vs. 2.1%) (*Jones, ICTS 2011*)
- Ideálně 8 týdnů, ale i 4 týdny zlepšují výsledek (*Benedetto, J Thorac Cardiovasc Surg 2014*)
- Psycholog, vareniclin, ostatní (akupunktura)
- Redukce, přerušování konzumace alkoholu 4 týdny před výkonem (*Engelman, JAMA Surg 2019*)



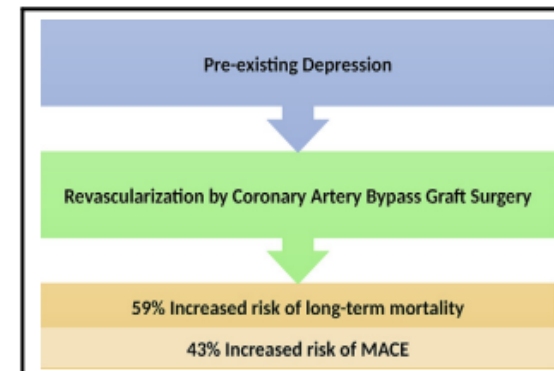


ZHODNOCENÍ A LÉČBA DEPRESE

- Neléčená deprese, s výskytem až 20%, zhoršuje významně krátko- i dlouhodobou pooperační mortalitu (*Beresnevaite, Scand Cardiovasc J 2010*)
- Sociální izolace
- Edukace a psychologická podpora, příprava před výkonem snižuje LOS, intenzitu pooperační bolesti a zlepšuje mentální zotavení po výkonu (*Berger, Anesthesiology 2018*)
- Úprava kvality spánku před výkonem (*Alcantara, Int J Cardiol 2014*)
- Melatonin, SSRI, psychologické metody

Pre-existing psychological depression confers increased risk of adverse cardiovascular outcomes following cardiac surgery: A systematic review and meta-analysis

Lauren B. Flaherty, MA,^a Taylor Wood, BS,^b Allen Cheng, MD,^c and Abdur R. Khan, MD^b



Pre-existing depression confers increased risk for both long-term mortality and major adverse cardiovascular events after coronary artery bypass grafting.

Central Message

In patients undergoing coronary artery bypass grafting, pre-existing depression was significantly associated with increased risk for both long-term mortality and major adverse cardiovascular events.

Perspective

Depressed patients undergoing coronary artery bypass grafting experience worse clinical outcomes. However, data are limited in this patient population. Existing evidence suggests that pre-existing depression is associated with morbidity and mortality in patients who undergo coronary artery bypass grafting. Whether pre-existing depression truly influences clinical outcomes postoperatively remains unresolved.



TAKE HOME MESSAGE

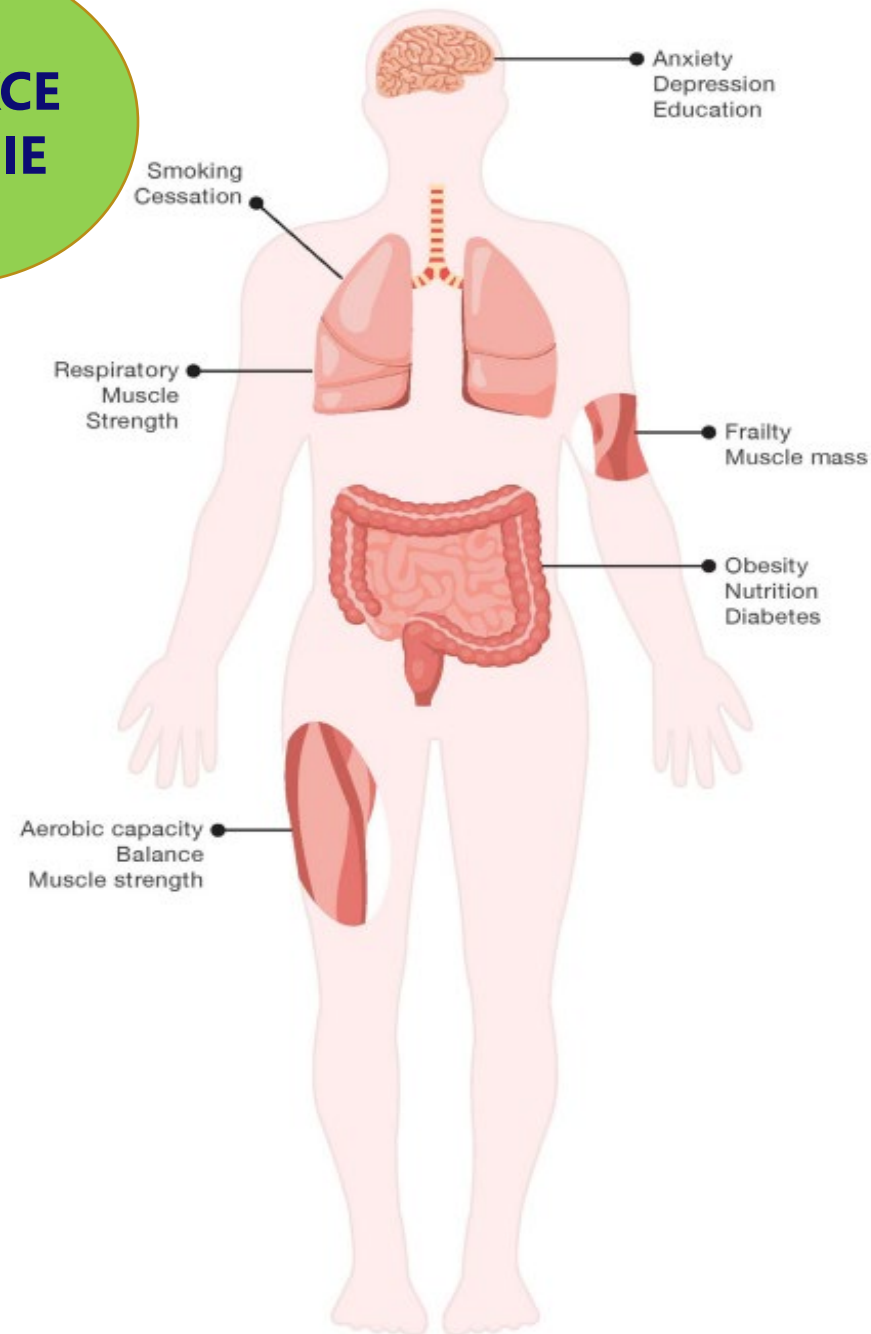
**STANOVENÍ A
STRATIFIKACE
RIZIKA**

**DIABETES,
NUTRICE,
OBEZITA**

**KARDIÁLNÍ
A
RESPIRAČNÍ
PŘÍPRAVA**

**ABUSUS,
LÉČBA
DEPRESE**

**KOREKCE
ANÉMIE**





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