CARDIAC RISK ASSESSMENT AND REDUCTION IN NON CARDIAC SURGERY

Essay

Submitted for Partial Fulfillment of Master Degree of Anesthesia

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بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لَا عِلْمَ لَنَا إِلَّا مَا عَلَّمْتَنَا

إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

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Randa Adel

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List of Abbreviations

Abb.	Mean
AAA	Abdominal aortic aneurysm
ABPI	Ankle-brachial pressure index
ACC	American College of Cardiology
ACEI	Angiotensin converting enzyme inhibitor
ACP	American College of Physicians
ACS-NSQIR	American College of Surgeons' National Surgical Quality Improvement Program Risk
ACSs	Acute coronary syndromes
AF	Atrial fibrillation
AHA	American Heart Association
AKI	Acute kidney injury
AKIN	Acute Kidney Injury Network
ARB	Angiotensin receptor blocker
ASA	American Society of Anesthesiologists
AT	Anerobic threshold
BP	Blood pressure
CABG	Coronary artery bypass grafting
CAD	Coronary artery disease
CARP	Coronary artery revascularization prophylaxis
CAS	Carotid artery stenting
CCS	Canadian Cardiovascular Society
CEA	Carotid endarterectomy
CHD	Congenital heart disease
CI-AKI	Contrast induced-acute kidney injury

Abb.	Mean
CKD	Chronic kidney disease
CMR	Cardiovascular magnetic resonance
COPD	Chronic obstructive pulmonary disease
CPET	Cardiopulmonary exercise test
CT	Computed tomography
CVD	Cardiovascular disease
DBP	Diastolic blood pressure
ECG	Electocardiography
EqCO_2	Ventilator equivalent of CO_2
ESA	European Society of Anaesthsoiology
ESC	European Society of Cardiology
ESRD	End-stage renal disease
EVAR	Endovascular AAA repair
GFR	Glomerular filtration rate
HF	Heart failure
HR	Heart rate
HT	Hypertention
IE	Infective endocarditis
IHD	Ischemic heart disease
ISWT	Incremental shuttle walk test
KDIGO	Kidney disease improving global outcomes
LV	Left ventricle
LVEF	Left ventricular ejection fraction
MET	Metabolic equivalent
MI	Myocardial infarction
MRI	Magnetic resonance imaging

Abb.	Mean
NSQIP	National Surgical Quality Improvement Program
NSTE-ASCs	Non–ST-elevation acute coronary syndromes
NYHA	New York Heart Association
O_2	Oxygen
OD	Organ disease
OHS	Obesity hypoventilation syndrome
PAD	Peripheral artery disease
PAH	Pulmonary artery hypertension
PCI	Percutaneous coronary intervention
RCRI	Revised cardiac risk index
RF	Risk factor
RIFLE	Risk injury, Failure, Loss, End-stage renal disease
RRT	Renal replacement therapy
SBP	Systolic blood pressure
6MWT	6-minute walk test
SPECT	Single photon emission computed tomography
SVT	Supraventricular tachycardia
SYNTA	Synergy between Percutaneous Coronary intervention with TAXUS and Cardiac Surgery
TEE	Transesophageal echocardiography
TTE	Transthoracic echocardiography
VPBs	Ventricular premature beats

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Introduction

Risk assessment by the anesthesiologist is a complex task incorporating numerous physical and laboratory findings. Cardiac complications after surgery depend on patient- related risk factors, type of surgery and on the circumstances that influence cardiac risk such as urgency, invasiveness, and type and duration of the procedure ***(Mangano, 2014).***

Many cardiac patients undergoing non cardiac surgery are at risk for perioperative cardiovascular events. Identification of risk provides the surgeon with information that helps him better understand the benefit to risk ratio of a procedure and may lead to intervention that decreases the risk and helps anesthesiologists in the choice of the anesthetic technique that reduces morbidity and mortality ***(Fleisher et al., 2014)***.

The physical examination should focus on the cardiovascular system, and include blood pressure measurements, auscultation of the heart and lungs, abdominal palpation, and examination of the extremities for edema and vascular integrity. Important findings include evidence of heart failure or a murmur suspicious for

hemodynamically significant valvular heart disease ***(Kristensen et al., 2014).***

When assessing preoperative cardiac risk, many risk scores can used, e.g. the revised cardiac risk index (RCRI), the Lee index or the American College of Surgeons' National Surgical Quality Improvement Program Risk (ACS-NSQIR) model ***(Bilimoria et al., 2013)***.

Several specific diseases need special consideration regarding preoperative cardiac assessment, e.g. patients with valvular heart disease are at increased risk of perioperative cardiac complications during non cardiac surgery. The risk is highly variable according to the type, severity of valvular heart disease, and the type of non cardiac surgery. Concomittant diseases may influence the prognosis of cardiac patient and need special attention, e.g. diabetes mellitus and pulmonary diseases ***(Vahanian et al., 2012).***

Cardiac risk reduction is applied by risk stratification, preoperative coronary revascularization to prevent myocardial ischemia and preoperative pharmacological therapies. Postoperative pain management is crucial as severe pain increases sympathetic drive and delays recovery ***(Perk et al., 2012)***.

Risk Assessment in Anesthesia

The pre-anesthetic assessment is an integral part of safe anesthetic practice. It serves to identify associated medical illness and anesthetic risks, with the ultimate aim of reducing morbidity and mortality associated with anesthesia and surgery ***(Rushfoth et al., 2006).***

The objectives of the preanesthetic assessment are manifold. At times, to achieve these objectives, the anesthesiologist has to resort to resources such as medical consultation and treatment as well as laboratory and other investigations ***(Mangano, 2014).***

Risk stratification

Risk stratification involves the grading of patients into incremental levels of risk and can be defined as: a process of medical decision-making within which a collection of activities (e.g. laboratory and clinical testing), is used to determine a person's risk for suffering a particular condition, and need or lack thereof, for preventive intervention ***(Atkinson, 2008).***

Quantifying risk

Patients with cardiorespiratory disease are at increased risk of perioperative morbidity and mortality. Overall risk is also dependent on the type of surgery, with thoracic and intra-abdominal procedures associated with the highest complication rates. Direct complications of surgery or anesthesia account for only 1% of overall mortality and the majority of adverse events are linked to the severity of pre-existing cardiorespiratory disease and the functional inability of patients to meet the extra metabolic demands associated with undergoing surgery ***(Poldermans, 2009).***

Preoperative risk assessment

Risk is best assessed by a combination of factors, including clinical predictors, specific organ functions, surgical risk, and functional capacity. These considerations will provide recommendations on pre-anesthetic assessment to enhance patient safety ***(Poldermans, 2009).***

Clinical predictors

Clinical predictors include factors obtained from the patient's medical history, examination and laboratory findings. A thorough history and examination is crucial to