STUDY THE CLINICAL VALUEOF PRE-OPERATIVE TRANSTHORACIC ECHOCARDIOGRAPHYAND ADHERENCETO INDICATIONS BY RECENT EVIDENCE-BASED GUIDELINESFOR EVALUATING PATIENTS UNDERGOING NON-CARDIACSURGERY

Submitted for Partial fulfillment of Masters degree in cardiovascular medicine

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بسم الله الرحمن الرحيم

قَالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

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Abstract

Background: The pre-operative non-invasive testing aims at providing information on three cardiac risk markers: LV dysfunction, myocardial ischemia, and heart valve abnormalities, all major determinants of adverse post-operative outcome. One of these non-invasive testing is resting TTE.

The aim of this study: The aim of this study is to identify whether requested transthoracic echocardiography (TTE) for patients undergoing non -cardiac surgery as a part of pre-operative assessment were indicated according to current published guidelines or not .Another aim is to detect the clinical impact of this pre-operative TTE on the decision-making and management.

Methods: This study was conducted at Kasr Al Aini teaching-hospital, Cairo University, from January 2013 to January 2014, and included 125 randomly selected patients recommended for non-cardiac surgery of both gender (89 males and 36 females), with age between 18-86 years,admitted or presented to our hospital for non-cardiac surgery.TTE was done for each of our subjects after clinical evaluation , electrocardiogram , chest X-ray and routine lab ; these TTEs were analyzed according to 2009ESC guidelines, from view of indications of TTE and TTE findings.

Results: 27 subjects had class I indication for pre-operative TTE with 100%of significant TTE findings(27 subjects with 20 moderate/severe valvular lesion, 13 LV systolic dysfunction, 22LV diastolic dysfunction (grade II and III) and 9 ischemic evidence),13 subjects had class IIa indication for pre-operative TTE with 100%of significant TTE findings(13 subjects with 9 moderate/severe valvular lesion, 3 LV systolic dysfunction, 11 LV diastolic dysfunction and 4 ischemic evidence) and85 subjects with class III indication for pre-operative TTE with91.7% of significant TTE findings (78 subjects with 44 moderate/severe valvular lesion, 20 systolic dysfunction, 72 diastolic dysfunction and 27 ischemic evidence).

Conclusion: In conclusion, the pre-operative TTE examinations for not indicated patients can detect significant findings in the form of LV systolic dysfunction, LV diastolic dysfunction, moderate to severe valvular lesions and regional wall motion abnormality.Regardless of age and type of operation, the pre-operative TTE examination was not associated with improved hospital stay.

Keywords: Pre-operative assessment - TTE – Non-cardiac operation - LV dysfunction - Myocardial ischemia –valvular heart disease.

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Abbreviations

AAA:	Abdominal aortic aneurysm
ACC :	American college of cardiology
ACS:	Acute coronary syndrome
AHA:	American heart association
AST:	Aspartate aminotransferase
AT:	Anaerobic threshold
AVA:	Aortic valve area
BUN:	Blood urea nitrogen
CABG:	Coronary artery bypass graft
CAD:	Coronary artery disease
CARP:	Coronary artery revasculrization
CAS:	Carotid artery stent
CCS :	Canadian cardiovascular society
CEA:	Carotid endarterectomy
CPET:	Cardiopulmonary exercise test
CW:	Continuous wave
DASI:	Duke activity status index
DT:	Deceleration time
ECG:	Electrocardiography
EROA:	Effective regurgitant orifice area
ESA :	European society of anaesthesiology
ESC:	European society of cardiology
EVAR:	Endovascular AAA repair
FS:	Fractional shortening
HF:	Heart failure
HF*r*EF:	Heart failure with reduced ejection fraction
HF*p*EF:	Heart failure with preserved ejection fraction
HR:	Heart rate
ISWT:	Incremental shuttle walk test

JVD:	Jugular venous distention
LVEDD:	Left ventricular-end diastolic dimension
LVEDV:	Left ventricular end-diastolic volume
LVEF:	Left ventricular ejection fraction
LVESD:	Left ventricular end-systolic dimension
LVESV:	Left ventricular end-systolic volume
LVOT:	Left ventricular outflow tract
MET :	Metabolic equivalent task
MV:	Mitral valve
NSTEMI:	Non ST-elevation myocardial infarction
NYHA:	New York heart association
PAC:	Premature atrial contraction
PISA	Proximal isovelocity surface area
PLAX:	Parasternal long axis
PMI:	Perioperative myocardial infarction
POISE:	Perioperative ischemic evaluation
PSAX:	Parasternal short axis
PW:	Pulse wave
PVC:	Premature ventricular contraction
RWMA:	Regional wall motion abnormality
STEMI:	ST-elevation myocardial infarction
TTE :	Transthoracic echocardiography
USA:	Unstable angina
VHD:	Valvular heart disease
VTI:	Velocity time integral

Introduction

Patients undergoing non-cardiac surgeries can be at risk for major perioperative cardiac complications, particularly if they are elderly. Worldwide, it is estimated that approximately 500,000 to 900,000 patients per year undergoing non-cardiac surgery suffer a perioperative cardiac death, non-fatal myocardial infarction (MI), or non-fatal cardiac arrest.(1)

Given the increasingly advanced age of patients undergoing surgeries, this risk is expected to remain substantial. The risk of death from a perioperative MI may be as high as 50%. The elevated risk of perioperative MI is multifactorial and may be primarily due to increased sympathetic tone, a pro-inflammatory state, hypercoagulability and occasional hypoxia during the first few days after surgery.(1)

Within the next 20 years, the ageing of the population will have a major impact on peri-operative patient management. It is estimated that elderly people require surgery four times more often than the rest of the population. Although mortality from cardiac disease is decreasing in the general population, the prevalence of IHD, heart failure, and cardiovascular risk factors (especially diabetes) is increasing.

Among the significant comorbidities in elderly patients presenting for general surgery, cardiovascular disease (CVD) is the most prevalent. Age per se, however, seems to be responsible for only a small increase in the risk of complications; greater risks are associated with urgency and significant cardiac, pulmonary, and renal disease; thus, these conditions should have greater impact on the evaluation of patient risk than age alone.(2)

In 1977, Goldman et al. [3] developed a multifactorial index of risk for cardiac morbidity and mortality. Extensive work has subsequently been done on various aspects of perioperative cardiac evaluation, including clinical factors and non-invasive testing. The variety of strategies and practices used has led to high costs associated with pre-operative risk assessment. Many studies have recently challenged common practices in the area of perioperative care that were found to have no clear benefit. [1]

The purpose of pre-operative evaluation is not to “clear” patients for an operation. The purpose is to assess current medical status and cardiac risks posed by the planned operation and recommend strategies that may influence short and long term outcomes.

Although the pre-operative assessment is a complex process, a few basic questions and observation by a physician with regard to the patient’s general health, functional capacity, cardiac risk factors, comorbid medical illnesses, and type of anticipated operation can assist in evaluating cardiac risk.

It is not prudent to order non-invasive tests for every patient. The physician tries to obtain as much information as possible by means of history and physical examination.

As a general rule, pre-operative intervention is rarely needed unless it is indicated. Patients with clinically stable heart disease may not need extensive pre-operative testing.

Communication is vital among primary physicians, consulting physicians, anesthesiologists, and surgeons for short- and long-term care of patients. . [1]

Aim of the work

The aim of this study is to identify whether requested transthoracic echocardiography (TTE) for patients undergoing non -cardiac surgery as a part of pre-operative assessment were indicated according to current published guidelines or not .

Another aim is to detect the clinical impact of this pre-operative TTE on the decision-making and management.

Introduction

Currently, specialty societies have published two sets of guidelines on perioperative cardiovascular evaluation and management for non-cardiac surgery. The first isan American College of Cardiology/American Heart Association (ACC/AHA) Guidelines on perioperative cardiovascular evaluation and management of patients undergoing non-cardiac surgerypublished guidelines in 2014. [4]

The second is guidelines on non-cardiac surgery: cardiovascular assessment and management by the European Society of Cardiology (ESC) and the European Society of Anaesthesiology (ESA). [2]

These Guidelines are intended for physicians and collaborators involved in the pre-operative, operative, and post-operative care ofpatients undergoing non-cardiac surgery.

The objective is to endorse a standardized and evidence-based approach to peri-operative cardiac management. The Guidelines recommend a practical, stepwise evaluation of the patient that integrates clinical risk factors and test results with the estimated stress of the planned surgical procedure. This results in an individualized cardiac risk assessment, with the opportunity of initiating medical therapy, coronary interventions, and specific surgical and anaesthetic techniques in order to optimize the patient's peri-operative condition.

Compared with the non-surgical setting, data from randomized clinical trials (which provide the ideal evidence-base for the guidelines) are sparse. Consequently, when no trials are available on aspecific cardiac-management regimen in the surgical setting, datafrom the non-surgical setting are extrapolated and similar recommendations made, but with different levels of evidence.

Anaesthesiologists who are experts on the specific demands of the proposed surgical procedure, will usually co-ordinate the pre-operative evaluation.

The majority of patients with stable heart disease can undergo low and intermediate-risk surgery without additional evaluation.[(2)]

Selected patients require evaluation by a team of integrated multidisciplinary specialists including anaesthesiologists, cardiologists, and surgeons and when appropriate an extended team (e.g. internists, intensivists, pulmonologists or geriatricians).[(5)]

The ultimate aims of this evaluation are two-fold. First is the identification of those patients for whom the perioperative period may constitute an increased risk of morbidity and mortality, aside from the risks associated with the underlying disease. Second, this identification should help to design perioperative strategies that aim to reduce additional perioperative risks.[(6)]

Perioperative cardiac complications can occur in patients with documented or asymptomatic ischemic heart disease, ventricular dysfunction and valvular heart disease. It has been estimated that in non-cardiac surgery, major perioperative cardiac events may occur in up to 4% of cardiac patients and 1.4% of an unselected patient population.[(7)]

The 2014 ESC guidelines Stepwise approach to pre-operative cardiac assessment

Figure 1 presents in algorithmic form an evidence-based stepwise approach for determining which patients benefit from cardiactesting, coronary artery revascularization, and cardiovascular therapy before surgery.[(2)]