

## The Value of Pre-operative ECGs in elective surgical patients

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### Abstract

**Introduction:** The value of routine pre-operative ECGs has been debated. This study was done in S.N. Medical College, Agra between January 2004 to June 2005. We included patients aged 17-90 years of age, admitted in various surgical specialties.

**Method:** In our hospital, routine ECG testing is done in all patients above 45 years age & below this age only if indicated. Routine pre-operative ECGs were analysed in terms of frequency of abnormalities and whether or not peri-operative management was changed, when the result was abnormal. The frequency of results being present in the notes at the time of operation, and the costing of the tests was also examined.

**Results:** Total number of ECGs performed were 412, but abnormality was seen in only half the ECGs. Pre-operative intervention was done in 21 patients. Out of these, 5 cases were postponed. Anaesthetic M/N was altered only in 3 patients, with only 2 patients exhibiting complication (hypotension). It is conservatively estimated that a saving of Rs 28,016 (Rs. 68 per test-current rates) per year could be made in our hospital alone by selective ordering of ECGs.

**Conclusions:** It was concluded from this study that ECGs should not be done blindly for screening purposes in healthy surgical patients, as it is inefficient, unnecessary & expensive. The pre-operative ECGs should be done according to patient's age, ASA grade and type of operation, after thorough pre-anaesthetic check up of the patients.

**Keywords:** Pre-operative ECG's, Screening investigation, Elective surgery.

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### Introduction

The pre-operative cardiac evaluation has been extensively studied pre-operative assessment.

The reason being, heart disease is common in western nations, are on an increasing trend in India and the results of perioperative cardiac complications can be devastating. The evaluation of co-existing cardiac disease can be costly and associated with patient morbidity. However, there is a little rationale for testing, other than based on specific indicators. (Velanovich, 1994).

The incidence of abnormal ECGs increase with age, male gender, ASA class, presence of coronary artery disease, other heart diseases, peripheral vascular disease, HTN and Diabetes Mellitus. Testing should be done only on expectation of a finding that might have reasonable relevance for anaesthesia & surgery, based on presence of positive findings of history & physical examination and/or need of the surgeon or other clinician for baseline values in anticipation of significant changes caused by surgery or other medical interventions (e.g. Chemotherapy). The goal of testing should be to optimize known clinical conditions prior to surgery, and to detect subclinical conditions in groups of patients with particular risk factors. (Macpherson & Colleagues, 1990)

### Materials and Methods

Study was done in S.N.M.C., Agra, between Jan. 2004 to June 2005. We included patients aged 17-90 years of age, admitted in various surgical specialties, scheduled for elective surgery.

Routine pre-operative tests and special investigations e.g. ECG, Chest x-ray, etc. were ordered by resident anaesthesiologist after thorough pre-anaesthetic check up of the patient, at the time of admission, to screen for occult diseases. (History of angina, myocardial infarction, hypertension, diabetes mellitus, tuberculosis, kidney disease, liver dysfunction, neurologic disease, haematologic dysfunction, etc. was taken). Data was obtained from anaesthesia chart and daily progress notes from the case sheet. It is a routine practice in our hospital for these investigations to be performed on all patients presenting for elective surgery.

Basic demographic data, drug, and previous medical & surgical history, habits, ASA status etc. were noted. Type of surgery and surgical risk was also considered. Results of pre-operative investigations were classified as normal or abnormal and also the frequency by which each test was done was noted. Any abnormal result was recorded together with any subsequent change in perioperative management i.e. action taken pre, intra or post operatively, as consequence of abnormal result, aimed at minimizing the anaesthetic risk. The frequency with which results could be found in the patients notes were also documented. Complications occurring peri-operatively, were recorded in detail stating whether pre-operative tests were normal or not. A complication was considered relevant to a test result if the test was done to predict an increased risk of that complication.

Costings for the tests were obtained from various departments, the charges being based on a non emergency basis.

**Table 1: Showing ECGs indicated according to age and positive history**

Investigation	Indication		Total
	According to age	According to positive history	
Electrocardiogram	300 (73%)	112 (27%)	412

## Results

In our hospital, routine ECG testing is done in all patients above 45 years of age and below this age only if indicated. Total number of ECGs were 412. ECG was indicated in these patients, due to positive history or examination but abnormality was seen only in 184(46%) patients. Among these 184 patients, whose results were abnormal, 148(80%) patients had their age above 45 years and in 46(25%) patients ECG was indicated due to positive history and physical examination.

The chief findings were- 1) Sinus Tachycardia, 2) Poor progression of R waves, 3) Non significant ST segment changes, 4) Left axis deviation, 5) Findings suggestive of old myocardial infarction, 6) Low voltage complexes 7) Findings suggestive of acute myocardial infarction. Pre-operative intervention was done in 21 patients. These patients had their age above 45 years and symptoms of myocardial insufficiency were present along with associated diseases such as diabetes mellitus and hypertension. Consultation with cardiologist was done. Out of these, 5 cases were postponed, with 1 patient having accidental ECG findings. Anaesthetic management was altered only in 3 patients with only 2 patients exhibiting complication(hypotension).

**Table 2: Abnormal results, action taken and relevant complications**

Investigation	Total tests performed	No. of Abnormal Results	Abnormal Test Results		No. of patients with complications	
			Action	No Action	Normal Result	Abnormal Result
ECG	412	184(46%)	21	163	1 (4%)	8 (2%)

## Discussion

Heart disease is common, and the results of perioperative cardiac complications can be devastating. Pre-anaesthesia cardiac evaluation may include, consultation with specialists and ordering, requiring or performing tests that range from non-invasive passive or provocative screening tests (e.g. stress testing) to non-invasive and invasive assessment of cardiac structure, function & vascularity (e.g. Echocardiogram). The evaluation of co-existing cardiac can be costly and associated with patient morbidity.

The value of routine pre-operative ECGs has been debated. Our study found that in 412 patients, only three had their anaesthetic management affected by abnormalities detected. Goldberger and O' Kanski presented data that yield of abnormal ECGs, did not justify routine pre-operative screening in asymptomatic patients younger than 45 years of age. On the other hand, others have found pre-operative ECG abnormalities in up to 66 percent of patients (Johnson and colleagues, 1988, Jakobsson & White, 1984)

The incidence of abnormal ECGs increases with age, male gender, ASA class, presence of coronary artery disease, other heart diseases, peripheral vascular disease, hypertension and diabetes mellitus (Velanovich 1994). Patients with abnormal ECGs have a three fold risk of having post-operative cardiac complications (Velanovich 1991). Age, p wave abnormalities and pre-

operative dysrhythmias were independent predictors of post-operative dysrhythmic events (Velanovich 1994). In a cohort of patients having vascular surgery, 24 to 48 hrs per-operative ECG monitoring identified patients at risk of post operative ischemic events (Raby, Goldman, Cregar 1989). Using discriminate analysis, Brenner and associates found that abnormal ECG adds to the predictive value of their point system in the assessment of operative risk.

In certain subgroups of patients, more sophisticated pre-operative screening may be indicated. Patients having vascular surgery are known to be at high risk for concomitant coronary artery disease and post-operative cardiac complications. Hertzner and Colleagues(1984) performed coronary angiography on 1,000 patients, under consideration for peripheral vascular surgery. They found that 34 percent of the patients suspected to have coronary artery disease and 14 percent of patients not suspected to have coronary artery disease did in fact have surgically correctable coronary artery disease. Nevertheless, it would not be feasible to perform coronary angiograms on everyone even in this high risk group. Another approach is to use pre-operative dipyridamole thallium scanning in this group of patients. (Boucher, Brewster, Darling 1985, Eagle, Singer, Brewster, 1987, Eagle, Coley, Newell, 1989, Cambria, Brewster, Abbott, 1992). This technique can identify patients at high risk of post operative ischemic

event. Yet this scanning does not add to predictive value of post operative cardiac risk in patients determined to be either at very low or at very high risk based on clinical grounds. (Eagle, Coley Newell 1989, Cambria, Brewster, Abbott, 1992). Therefore, only in the intermediate risk group would dipyridamole-thallium scanning add useful information.

Few data on the value of trans-oesophageal electrocardiography detect transient wall motion abnormalities in predicting cardiac morbidity in non cardiac surgical patients suggest that the incremental value of this technique for risk prediction is small (Eisenberg, London, Leeing-1992). Anesthesiologists should balance the risks and costs of these evaluations against their benefits. Clinical characterizes to consider include cardiovascular risk factors and type of surgery.

Pre-operative diagnosis based guidelines have been developed, after analysis of studies, best evidence available, and consensus of expert professionals, which provide basic recommendations for laboratory and other tests (Kumar and Srivastava, 2011).

**Table 3: Showing ECGs indicated, based on diagnosis, before elective surgery**

ECG
Cardiac disease
Hypertension
Chronic lung disease
Diabetes
Thyroid disease
Morbid obesity
Digoxin therapy
Males > 45 years
Females > 55 years

These recommendations can be accepted as such, or can be modified based on local needs and individual practice, to ensure highest quality of surgical care.

## Conclusion

Performing ECG testing as a routine pre-operative screening investigation is not justified in asymptomatic patients younger than 45 years. The value of pre-operative screening lies in clinician's assessment; the selective tests are then ordered considering specific information obtained from patient's interview, examination, review of medical records and the type, and invasiveness of proposed surgery and anaesthesia.

The tests should be done only if the results are likely to affect patient management and post-operative outcome and adoption of guidelines for testing can maximize the yield and prevent waste of resources and time.

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