Original Article

An observational cohort study on pre-operative investigations and referrals: How far are we following recommendations?

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ABSTRACT

Background and Aims: Pre-operative investigations are often required to supplement information for risk stratification and assessing reserve for undergoing surgery. Although there are evidence-based recommendations for which investigations should be done, clinical practice varies. The present study aimed to assess the pre-operative investigations and referral practices and compare it with the standard guidelines. **Methods:** The present observational study was carried out during 2014–2015 in a teaching institute after the approval from Institute Ethical Committee. A designated anaesthesiologist collected data from the completed pre-anaesthetic check-up (PAC) sheets. Investigations already done, asked by anaesthesiologists as well as referral services sought were noted and compared with an adapted master table prepared from standard recommendations and guidelines. Data were expressed in frequencies, percentage and statistically analysed using INSTAT software (GraphPad Prism software Inc., La Zolla, USA). **Results:** Seventy-five out of 352 patients (42.67% male, 57.33% female; American Society of Anesthesiologists physical status I to III) were included in this study. Nearly, all patients attended PAC with at least 5 investigations done. Of them, 89.33% were subjected to at least one unnecessary investigation and 91.67% of the referral services were not required which lead to 3.5 (SD ±1.64) days loss. Anaesthesiologist-ordered testing was more focused than surgeons. **Conclusion:** More than two-third of pre-operative investigations and referral services are unnecessary. Anaesthesiologists are relatively more rational in ordering pre-operative tests yet; a lot can be done to rationalise the practice as well as reducing healthcare cost.

Key words: Elective surgery, pre-anaesthetic check-up, pre-operative investigation, pre-operative referrals, routine investigation

INTRODUCTION

Pre-anaesthetic check-up (PAC) is a basic element in anaesthetic care. It is defined as the process of clinical assessment that precedes the delivery of anaesthesia care for surgical and non-surgical procedures.[1] The PAC needs the consideration of information from multiple sources including pre-operative investigations. 'Routine investigations' are quite routine practice though there are negative recommendations and clear note in the guidelines that routine investigations are not needed in all patients.[1,2] There is a relative dearth of data on practice patterns and its comparisons with standard guidelines and recommendations from developing countries. The present study aimed to assess the pre-operative investigations and referral practices and compare it with such guidelines and recommendations. This will help in making decision, protocols, policy, provide cost-effective healthcare and contribute to the economy.

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METHODS

After the approval of Institutes' Ethical Committee, the present prospective observational study was conducted during March 2014 to June 2015. Patients of any American Society of Anesthesiologists (ASA) physical status of both sexes planned for elective surgery or interventional procedures requiring anaesthetic services were included in this study. All patients attending PAC outpatient department (OPD) for evaluation and risk stratification were included except the patients undergoing cardiac surgeries. The evaluating anaesthesiologist completed PAC and noted and/or advised the investigations which he/she thought as required. The data were collected by a fixed designated anaesthesiologist for the entire duration of the study by screening the investigation files as well as the completed PAC record sheets. However, designated anaesthesiologist did not filter out any investigations. The designated anaesthesiologist (data collector) also did not intervene to modify the PAC process conducted by other colleague of the same rank. However, if the evaluating person was a postgraduate trainee and requested an opinion from the designated anaesthesiologist, advice was given as part of teaching, training and patient care. The patients were thus evaluated, and the patients who were directly evaluated by the designated anaesthesiologist were not included in the study. However, if any anaesthesiologist senior to the designated anaesthesiologist intervened/supervised/advised some investigation/s or referral in the patients who were being evaluated by the designated anaesthesiologist; those patients were also included in the study.

The age, sex, weight, operation planned, ASA physical statuses, comorbid conditions, metabolic equivalent of tasks (METs) were also noted. Surgical procedures/interventional procedures were divided into three categories adapted from the National Institute for Clinical Excellence classification[2] (i.e., minor, intermediate and major) for this study. The investigations already done by surgical team before sending the patient to PAC OPD for evaluation and risk stratification as well as the investigations enquired/noted by anaesthesiologists in the PAC record sheet and referrals sought were noted. However, the investigations done for diagnostic purposes were excluded from this study. The times required for fitness declaration after evaluation by the referee doctors were also noted. A master table [Appendix 1] of investigations recommended based on the type of surgery, age, METs, ASA physical status, comorbidity, etc., were prepared from few standard guidelines and recommendations in this field.[1-8] The data collected for the present study were evaluated against this master table. Data were expressed in absolute number and percentage scale. Further statistical tests to analysis the data were done by appropriate statistical tests using INSTAT software (GraphPad Software, Inc., La Zolla, CA, USA) and $P < 0.05$ was considered as statistically significant.

RESULTS

A total of 352 patients were screened on the OPD days on which the designated anaesthesiologist got random posting in PAC OPD. Out of them, 75 patients were eligible for the study based on the inclusion and exclusion criteria.

Majority (57.33%) of the patients were female and of ASA physical status I (65.33%). Body mass indices of the patients were between 15.12 and 28.69 kg/m^2 with a mean value of 21.236. The demographic parameters and physical status of the studied sample are included in Table 1. Fifty-two (69.33%) patients underwent major surgery. Twenty-four (32%) patients had at least one comorbidity with pallor (anaemia) and hypertension being the most common comprising 8 (10.67%) each. Other common comorbid conditions were diabetes mellitus and smoking, 5 (6.67%) each, renal failure and other renal diseases, 5 (6.67%).

Table 1: Frequency table of demographic parameters and comorbidities of the patients

Parameters	*n* (%)*/mean (SD) (95% CI)# (*n*=75)
Sex	
Male	32 (42.67)
Female	43 (57.33)
ASA physical status#	1.38 (0.56) (1.25-1.51)
I	49 (65.33)
II	23 (30.67)
III	3 (4.00)
IV	0 (0.0)
V	0 (0.0)
Age group (years)	
5-40	48 (64.00)
41-60	22 (29.34)
61-80	4 (05.33)
81 and above	01 (01.33)
Age (years)#	35.84 (16.63) (32.01-39.67)
Weight (kg)#	48.61 (12.31) (45.77-51.45)
Height (cm)#	149.92 (15.98) (146.24-153.60)
BMI (kg/m^2)#	21.23 (3.09) (20.52-21.95)
METs#	7.48 (1.15) (7.21-7.74)

SD – Standard deviation; CI – Confidence interval analysed by unpaired *t*-test. ASA – American Society of Anesthesiologists; BMI – Body mass index

There were 1 (1.33%) each of cardiovascular, respiratory and thyroid disorder also and none of the patient was having METs <4. Almost 99% of the patients attended the PAC OPD with blood routine examinations (haemoglobin [Hb], total and differential leucocytes counts, platelet counts), serum electrolytes (sodium, potassium, calcium, chloride), blood sugar, blood urea and serum creatinine levels already done. Out of these, 89.33% patients were subjected to at least one investigation which was not required/recommended [Table 2]. Twelve (16%) patients were referred to other departments, out of which 11 (91.67%) of the referral services were deemed as not required [Table 3].

Most of the investigations were already done by surgical colleagues before sending the patient for PAC and risk stratifications. The evaluating anaesthesiologist recognised that many of the investigations done were not necessary, and so, not all investigations were noted in the PAC record sheet. Comparison of these recorded (anaesthesiologist thought as required) investigations revealed that anaesthesiologists were nearly rational (3–9% unnecessary, $P > 0.05$) in deciding the requirement of pre-operative tests in context to blood cell counts, Hb, coagulation profile, blood urea, serum electrolytes, creatinine and echocardiography (ECHO) [Table 4]. However, among the chest X-rays (CXRs), blood sugar measurements and electrocardiograms (ECGs) that anaesthesiologists thought as necessary and recorded in the PAC sheet, 21–44% of these were still done unnecessarily when compared with recommendations and the difference was highly significant ($P = 0.001$) [Table 4].

DISCUSSION

Cost-effective healthcare delivery has great relevance to developing countries. One of the major drivers of healthcare costs is the inappropriate utilisation of advanced medical technology and services.[9] Routine pre-operative investigational services appear to be one such area.

The goal of PAC is to gather information about the patient and formulating an anaesthetic plan for conducting smooth anaesthesia without or minimal perioperative morbidity and mortality.[10] Identification of unsuspected conditions requiring treatment before surgery or a change in anaesthetic management may be a possible benefit of routine pre-operative investigations, but a false positive finding may lead to unnecessary, costly and possibly harmful treatments or further investigations leading to delay in surgery.[11] The ASA has stated that 'no routine laboratory or diagnostic screening test is necessary for the pre-anaesthetic evaluation of patients'.[12] The pre-operative investigations should be based on the history, physical examination, perioperative risk assessment and clinical judgment.[13] In this context, the present finding of at least five investigations already being done in nearly all the patients before attending for PAC is a big concern.

The 'routine' screening of full blood count contributes little in patient's management.[14] In this study, routine blood examinations were done in 98.67% patients, and 61.33% of Hb measurements were actually not required. Evidence does not support routine CXR for patients aged below 70 years without risk factors as

Table 2: Table of investigations done by surgeons and anaesthetists and their comparison with standards

Name of the tests	Number of patients				Total tests required among all (%) (*n*=75)	Fisher's exact test	
	Already done	Anaesthetist asked	Total done (*n*) (%) (*n*=75)	Not required among done (%) (*n*=75)		RR (95% CI)	*P*
Blood R/E	74	0	74 (98.67)	29 (39.18)	45 (60.00)	0.60 (0.50-0.63)	<0.0001
PT, aPTT, INR	74	0	74 (98.67)	67 (90.54)	7 (9.33)	0.09 (0.04-0.19)	<0.0001
Blood sugar	74	0	74 (98.67)	66 (89.18)	8 (10.67)	0.10 (0.05-0.20)	<0.0001
Chest X-ray	65	0	65 (86.67)	56 (86.15)	9 (12.00)	0.13 (0.07-0.25)	<0.0001
Electrocardiogram	59	0	59 (78.67)	51 (86.44)	8 (10.67)	0.13 (0.06-0.26)	<0.0001
Echocardiography	14	1	15 (20.00)	13 (92.85)	2 (2.67)	0.13 (0.03-0.56)	0.001
Liver function test	63	0	63 (84.00)	43 (68.25)	20 (26.67)	0.31 (0.21-0.46)	<0.0001
Serum electrolytes	74	0	74 (98.67)	23 (31.08)	51 (68.00)	0.68 (0.58-0.80)	<0.0001
Serum creatinine, blood urea	75	0	75 (100.0)	20 (26.67)	55 (73.33)	0.73 (0.63-0.84)	<0.0001
AEC	0	2	2 (2.67)	2 (100.0)	0 (0.00)	0.00 (infinity)	0.496
Thyroid function	3	1	4 (5.33)	1 (25.00)	3 (4.00)	0.75 (0.17-3.23)	1.00
HbA_1C	2	4	6 (8.00)	5 (83.33)	1 (1.33)	0.16 (0.02-1.35)	0.116

Blood R/E – Haemoglobin, total and differential leucocytes counts, platelet counts; PT – Prothrombin time; aPTT – Activated partial thromboplastin time; INR – International normalisation ratio; AEC – Absolute eosinophil count; HbA1C – Glycosylated haemoglobin; RR – Relative risk; CI – Confidence interval

it does not decrease morbidity or mortality.[15] In the present study, 86.67% of the patients had undergone CXR and out of these more than 85% were unnecessary. The present study also reveals similar findings for ECG, two-dimensional (2D) ECHO and blood sugar measurements. Only one (1.52%) blood sugar level came in impaired range; however, it did not change the anaesthetic management.

One of the reasons provided by perioperative team for doing routine investigations is getting rid of being sued for not detecting subclinical medical problems which may manifest during perioperative period. This reason probably can be discarded as the court of law depends on evidence; and current evidences indicate that the incidental findings or abnormal test results of routine pre-operative tests hardly change anaesthetic management.[16,17] Moreover, a medico-legal problem can even arise when the tests come out to be normal and patient alleges that the tests were done for the monetary benefit. An empathetic approach, effective communication, up to date knowledge, informed consent, good record keeping and sympathy without accepting blame from patients is probably an answer to it and also can reduce the chance of being sued.[18]

Four (5.33%) patients had minor and incidental findings (i.e., increase in eosinophil counts, right bundle branch block, etc.) in the routine testing. This led to unnecessary referrals as well as delay in declaring fitness. Asking for the absolute eosinophil count was a total waste of time as it could have been calculated directly from the already done counts. One thyroid function test was carried out unnecessarily in a patient whose 3 months prior report was found to be normal despite no changes in thyroid-related symptoms and therapy.[19]

The present study shows similar, if not worse, findings as compared to the study done in Srilanka.[20] The mentioned study found very poor compliance to the local recommendations for CXRs, coagulation profiles, liver enzymes and 2D ECHO. Another retrospective review found that 100% of the patients had many routine investigations done, but there was no change in the plan of anaesthesia in any of these cases despite having 32.5% abnormal test results for some of the tests.[21]

Eleven (91.67%) referrals to other physicians in the present study were also not required. Four patients required change in the management of comorbid conditions, but none of them changed anaesthetic management. Although two cases were cleared on the same day with advice to produce the reports day before surgery, there were a mean 3.5 ± 1.64 days of delay

Table 3: Frequency table showing the patterns of referral services sought by anaesthesiologists

Referral (department) with postponement (*N*=12), reason	Not required, *n* (%)
Cardiology (4)	
Blood pressure control - 2	1 (50)
Dyspnoea on exertion (METs 5) for echo - 1	1 (100)
Incidental RBBB - 1	1 (100)
Medicine (6)	
Sugar control - 2	2 (100)
Eosinophil count high - 2	2 (100)
Dry cough without fever and sputum - 1	1 (100)
Incidental hypercholesterolemia - 1	1 (100)
Paediatrics (2)	
Dry cough, no fever, sputum, running nose - 1	1 (100)
Controlled asthma - 1	1 (100)

N – Total number; *n* – Number; RBBB – Right bundle branch block; METs – Metabolic equivalents of tasks

Table 4: Investigations thought to be required by anaesthesiologist and their comparison with standards

Name of the tests	Number of patients (*n*=75)		Fisher's exact test	
	Anaesthetist enquired (%)	Tests required (%)	RR (95% CI)	Two-tailed *P* value
Blood R/E	52 (69.33)	45 (60.00)	0.86 (0.68-1.09)	0.305
PT, aPTT, INR	12 (16.00)	7 (9.33)	0.58 (0.24-1.40)	0.326
Blood sugar	52 (69.33)	8 (10.67)	0.15 (0.07-0.30)	<0.0001
Chest X-ray	52 (69.33)	9 (12.00)	0.17 (0.09-0.32)	<0.0001
Electrocardiogram	29 (38.67)	8 (10.67)	0.27 (0.13-0.56)	0.0001
Echocardiography	4 (5.33)	2 (2.67)	0.50 (0.09-2.64)	0.681
Liver function test	32 (42.67)	20 (26.67)	0.62 (0.39-0.98)	0.058
Serum electrolytes	59 (78.67)	51 (68.00)	0.86 (0.71-1.05)	0.195
Serum creatinine, blood urea	58 (77.33)	55 (73.33)	0.94 (0.78-1.13)	0.705
AEC	2 (2.67)	0 (0.00)	0.00 (infinity)	0.496
Thyroid function	4 (5.33)	3 (4.00)	0.75 (0.17-3.23)	1.00
HbA1C	6 (8.00)	1 (1.33)	0.16 (0.02-1.35)	0.116

Blood R/E – Haemoglobin, total and differential leucocytes counts, platelet counts; PT – Prothrombin time; aPTT – Activated partial thromboplastin time; INR – International normalisation ratio; AEC – Absolute eosinophil count; HbA1C – Glycosylated haemoglobin; RR – Relative risk; CI – Confidence interval

in rest. Other interesting finding is the difference in the pre-operative routine tests order pattern between surgeons and anaesthesiologists. Anaesthesiologists were more rational in deciding the requirement of most of the routine tests (41–97% vs. 10–60%) [Figure 1]. This reconfirms that the anaesthesiologist-ordered testing is more focused and less costly as compared to surgeon.[22]

The advantage of the present study is the prospective data collection on random OPD days, but this led to a smaller sample. The comparison is done with an adapted table prepared from multiple guidelines mostly based on level II evidence. Therefore, the present study can be taken as pilot study and guide for further studies. Pre-anaesthetic investigative practices differ a lot; so, future similar studies are expected to give different results. However, considering the very high percentage of investigations done unnecessarily with extreme statistical significance, the conclusions drawn from future studies are unlikely to be different.

CONCLUSION

The uses of unnecessary pre-operative tests are very much prevalent despite the growing body of evidence that such investigations do not help. Anaesthesiologists are relatively more rational in ordering pre-operative tests yet; a lot can be done to rationalise the practice as well as to reduce healthcare cost without compromising on the quality of the patient care.

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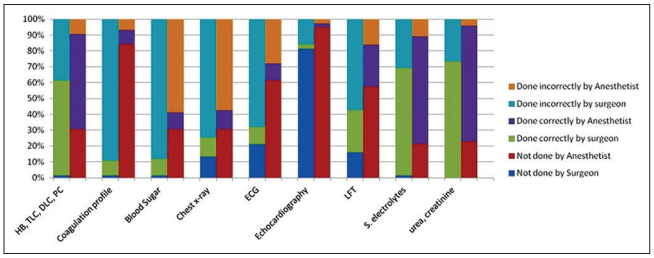

Figure 1: 100% stacked cluster column graph of the investigations done, not done, required by surgeon and anaesthetist. (Hb: Haemoglobin, TLC: Total leucocytes counts, DLC: Differential leucocytes counts, PC: Platelet counts, (coagulation profile-prothrombin time, activated partial thromboplastin time and international normalisation ratio), ECG: Electrocardiogram, LFT: Liver function test)

Conflicts of interest

There are no conflicts of interest.

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Appendix 1: Master table of recommended pre-operative investigations for elective surgeries for age ≥5 years (adapted[1-8])

Category of patients	Blood R/E	Electrolytes	Urea creatinine	ECG	Chest X-ray	Echo	Blood sugar
Minor surgery, 5-40 years, METs any, ASA 1 or 2	No	No	No	No	No	No	No
Minor surgery, 4 -59 years, METs ≥4, ASA 1 or 2	No	No	No	No	No	No	No
Minor surgery, 40-59 years, METs <4, ASA 2	No	No	No	No	No	No	No
Minor surgery, 60-79 years, METs ≥4, ASA 1 and 2	No	No	No	No	No	No	No
Minor surgery, 60-79 years, METs <4, ASA 2	No	No	Yes*	Yes*	No	No	No
Minor surgery, ≥80 years, METs any, ASA 2	Yes*	No	Yes*	Yes	No	No	No
Inter surgery, 5-40 years, METs any, ASA 1 or 2	No	No	No	No	No	No	No
Inter surgery, 40-59 years, METs >4, ASA 1 or 2	No	No	No	No	No	No	No
Inter surgery, 40-59 years, METs <4, ASA 2	Yes*	Yes*	Yes*	Yes*	No	No	Yes
Inter surgery, 60-79 years, METs >4, ASA 1	Yes	Yes	Yes	Yes	No	No	Yes
Inter surgery, 60-79 years, METs <4, ASA 2	Yes	Yes	Yes	Yes	No	No	Yes
Inter surgery, ≥80 years, METs any, ASA 2	Yes	Yes	Yes	Yes	No	No	Yes
Major surgery, 5-40 years, METs any, ASA 1 or 2	Yes	Yes*	Yes*	Yes*	No	No	No
Major surgery, 40-59 years, METs ≥4, ASA 1 or 2	Yes*	Yes	Yes	Yes*	No	No	Yes
Major surgery, 40-59 years, METs <4, ASA 2	Yes	Yes	Yes	Yes*	Yes	No	Yes
Major surgery, 60-79 years, METs ≥4, ASA 1	Yes	Yes	Yes	No	No	No	…
Major surgery, 60-79 years, METs >4, ASA 2	Yes	Yes	Yes	Yes	Yes*	No	Yes
Major surgery, 60-79 years, METs <4, ASA 2	Yes	Yes	Yes	Yes	Yes	No	Yes
Major surgery, >80 years, METs any, ASA 2	Yes	Yes	Yes	Yes	Yes	No	Yes

*If comorbid conditions, history and clinical examination indicate; #Patients with heart failure with worsening dyspnoea or other change in clinical status, dyspnoea of unknown origin, stable patients with documented left ventricular dysfunction but not reassessed within a year. ASA 2 category patients are likely to have a controlled comorbid condition/s. Follow the comorbidity and drug based tables also for these patients . Patients posted for bowel resection; hepatic resection will require coagulation profile. Vascular and cardiac surgery patients are excluded. Blood R/E i.e., haemoglobin, total and differential leucocytes counts; platelet counts; ECG– Electrocardiogram; Echo – 2D echocardiography; 2D – Two-dimensional; ASA – American Society of Anesthesiologists; METs – Metabolic equivalents of tasks

Surgical category with comorbidity/history of	Blood R/E	Electrolyte	Urea creatinine	ECG	Chest X-ray	Echo	Blood sugar	Coagulation profile
Renal disease								
Minor surgery, 16-60 years, (ASA 2)	Yes*	Yes*	Yes	No	No	No	No	No
Minor surgery, 60-80 years, (ASA 2)	Yes	Yes*	Yes	Yes*	No	No	No	No
Minor surgery, >80 years, (ASA 2 or 3)	Yes	Yes	Yes	Yes	No	No	No	No
Intermediate surgery, <60 years, ASA 2 or 3	Yes	Yes	Yes	No	No	No	No	No
Intermediate surgery, >60 years, ASA 2 or 3	Yes	Yes	Yes	Yes	No	No	No	No
Major surgery, 16-40 years, ASA 2	Yes	Yes	Yes	No	No	No	No	No
Major surgery, 40-80 years, ASA 2 or 3	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Major surgery, any age, ASA>3	Yes	Yes	Yes	Yes	Yes	No	No	Yes
Cardiac disease								
Minor surgery, 16-60 years, (ASA 2)	Yes*	Yes*	Yes	No	No	Yes#	No	No
Minor surgery, >60 years, (ASA 2)	Yes*	Yes*	Yes	No	No	Yes#	No	No
Minor surgery, 16-60 years, (ASA 3)	Yes	Yes	Yes	Yes	Yes	Yes#	No	No
Minor surgery, >80 years, (ASA 2 or 3)	Yes	Yes	Yes	Yes	Yes	Yes#	No	No
Intermediate surgery, 16-40 years, (ASA 2)	No	Yes	Yes	Yes*	No	Yes#	No	No
Intermediate surgery, >40-80 years, (ASA 2)	Yes	Yes	Yes	Yes	No	Yes#	No	No
Intermediate surgery, >40-80 years, (ASA 3)	Yes	Yes	Yes	Yes	Yes	Yes#	No	No
Intermediate surgery, >80 years, (ASA 2 or 3)	Yes	Yes	Yes	Yes	Yes	Yes#	No	No
Major surgery in any age, (ASA 2 or 3)	Yes	Yes	Yes	Yes	Yes	Yes#	No	No
Respiratory disease								
Minor surgery, 16-60 years, (ASA 2)	No	No	No	No	No	No	No	No
Minor surgery, 16-60 years, (ASA >3)	Yes*	No	No	Yes*	Yes	No	No	No
Minor surgery, >60 years, ASA >2	Yes	Yes*	No	Yes	Yes	No	No	No
Intermediate surgery, 16-60 years, ASA 2	No	No	No	No	No	No	No	No
Intermediate surgery, 16-60 years, ASA 3	Yes	Yes*	Yes	Yes	Yes	No	No	No
Intermediate to major surgery, >60 years, ASA >2	Yes	Yes*	Yes	Yes	Yes	No	No	No
Major surgery, 16-40 years, ASA 2	Yes	Yes	Yes*	No	No	No	No	No
Major surgery, 40-60 years, ASA 2	Yes	Yes	Yes	Yes*	No	No	No	No
Major surgery, any age, ASA >3	Yes	Yes	Yes	Yes	Yes	Yes#	No	No
Diabetes mellitus	No	Yes	Yes	No	No	No	Yes	No
Thyroid disease	No	Yes	No	Yes*	No	No	No	No
Malnutrition, liver disease	Yes	Yes	Yes	No	No	No	No	Yes
Anaemia	Yes	No	No	Yes	No	No	No	Yes*
Malignancy	Yes	Yes	Yes	No	Yes	No	No	Yes
DOE (NYHA≥II) or new onset DOE, PND	Yes	Yes	Yes	Yes	Yes	Yes	No	No
New onset chest pain, murmur	No	No	No	Yes	Yes	Yes	No	No
History suggestive of bleeding diathesis	Yes	No	No	No	No	No	No	Yes

*Drug used for treatment of comorbid condition and clinical findings may indicate. Comorbid condition-based recommendations of pre-operative investigations. DM – Diabetes mellitus; DOE – Dyspnoea on exertion; PND – Paroxysmal nocturnal dypnoea; NYHA – New York Heart Association; Blood R/E i.e., haemoglobin, total and differential leucocytes counts, platelet counts, Coagulation profile, i.e., PT – Prothrombin time; aPTT – Activated partial thromboplastin time; INR– International normalisation ratio, ECG– Electrocardiogram; Echo – 2D echocardiography; 2D – Two-dimensional; ASA – American Society of Anesthesiologists

Drugs	Blood R/E	Electrolyte	Creatinine	ECG	Chest X-ray	Echo	Blood sugar	Coagulation profile
Diuretics	No	Yes	Yes	No	No	No	Yes	No
Insulin	No	Yes	Yes$	No	No	No	Yes	No
ACE/ARB blockers	No	Yes	No	No	No	No	No	No
Digoxin	No	Yes	No	Yes	No	No	No	No
Anticoagulants	No	No	No	No	No	No	No	Yes
Systemic steroids	No	Yes	Yes$	No	No	No	Yes	No
IV contrast to be used	No	No	Yes	No	No	No	No	No
Beta agonist	No	Yes	No	No	No	No	No	No
Lithium	Yes	Yes	Yes	Yes	No	No	No	No

$If the underlying diseases (comorbidity) indicate. Blood R/E, i.e., haemoglobin, total and differential leucocytes counts, platelet counts, Coagulation profile, i.e., PT – Prothrombin time; aPTT – Activated partial thromboplastin time; INR– International normalisation ratio, ECG– Electrocardiogram; Echo – 2D echocardiography; 2D – Two-dimensional; ACE – Angiotensin converting enzymes; ARB – Angiotensin receptor blocker; IV – Intravenous

Special Tests

Thyroid function test: History of hypo or hyperthyroidism but status not accessed in last 6 months, change in symptoms, history of thyroidectomy, parathyroidectomy.

Liver function test: All patients posted for cholecystectomy, Known or suspected liver disease, Inflammatory bowel disease, excess alcohol intake and advanced malignancy.

Glycosylated haemoglobin: History of diabetes or suggestive of diabetes and if sugar has not been checked recently, if random blood glucose >11mmoL/L (approximately 200 mg/dL) in patients with a history of steroid intake or body mass index >35.

Other tests such as Pregnancy test, Lung function test, Blood gases, Electroencephalography are not included here.