



PRACTICE AND ASSOCIATED FACTORS OF PREOPERATIVE
INVESTIGATIONS IN PATIENTS UNDERGOING ELECTIVE SURGERY AT
TIKUR ANBESA SPECIALIZED HOSPITAL, ADDIS ABABA, ETHIOPIA,
2021

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Thesis to be submitted to the school of medicine and health sciences, department of
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specialty training in Anesthesiology, Critical Care and Pain Medicine.

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STATEMENT OF DECLARATION

I hereby declare and affirm that this research is my own original work as a partial fulfillment of the requirement for the speciality certificate training in Anesthesiology, Critical Care and Pain Medicine. I have followed all the ethical consideration in the preparation, data collection, data analysis and completion of this research. All the sources of the material used for this research and all people and institution who gave support for this work are fully acknowledged. I have sited and referenced all the sources used in this research document.

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PATIENTS UNDERGOING ELECTIVE SURGERY AT TIKUR ANBESA SPECIALIZED
HOSPITAL, ADDIS ABABA, ETHHIOPIA, 2021**

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This is to certify that the thesis prepared by G/hiwot G. titled practice and associated factors of preoperative investigations in patients undergoing elective surgery at Tikur Anbesa specialized hospital, submitted in partial fulfilment of the requirement for specialization in Anesthesiology,

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Abbreviations

ABG.....	Arterial blood gas analysis
ACCPM.....	Anesthesiology, critical care and pain medicine
aPTT.....	Partial Prothrombin Time
BG.....	Blood Grouping
CBC.....	Complete Blood Count
Cr.....	Creatinine
CXR.....	Chest X-ray
ECG.....	Electrocardiogram
ECHO.....	Echocardiogram
FBS.....	Fasting Blood Sugar
INR.....	International Normalizing RATIO
NICE.....	National Institute of Clinical Excellence
PAC.....	Pre-Anesthetic Check-up
RBS.....	Random Blood Sugar
S/E.....	Serum electrolyte
TDF.....	Theoretical Domains Framework
U/A.....	Urine analysis

Abstract

Background: 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. There are no clear guidelines regarding preoperative investigations in Tikur Anbesa specialized hospital. The present study aimed to assess the practice of the pre-operative investigations and compare it with the NICE guideline.

Methods: Institution based analytic cross-sectional study design was conducted from May to July, 2021. The present study was carried out in TASH after the approval from department of anesthesiology critical care and pain medicine. Data Collected from complete PAC sheets, investigations already done, asked by surgeon/surgery resident, anesthesiologists/ACCPM resident and anesthetist were noted and compared with standard recommendations and guideline (NICE guideline). Data was coded and entered to SPSS version-25 software. Univariate data was expressed in frequency, mean, SD and bivariate data was analyzed using fisher's exact test, binary and multiple logistic regression. P value less than 0.05 was considered statically significant.

Results: Two hundred nineteen (99.5%) questionnaires were collected and analyzed. Two hundred sixty-five (31.3%) tests were not indicated as per the NICE guideline. ACCPM physicians are more rational in ordering preoperative investigations as compared to surgeons/surgical residents and anesthetists.

Conclusion: Unnecessary preoperative investigations are prevalent at Tikur Anbesa specialized hospital. Anesthesiology, critical care and pain medicine physicians are more compliant with the recommendation/NICE guideline as compared to surgeons/surgical residents and anesthetists.

1. Introduction

1.1. Background

Pre-anesthetic evaluation is the initial step in preparing a patient for surgery. Generally, the final goal is to optimize the patient for a better condition prior to surgery, with an ultimate advantage of reducing peri-operative morbidity and mortality(1). Commonly done preoperative investigations include complete blood count (CBC), serum electrolytes(S/E), blood urea nitrogen (BUN), serum creatinine (cr.), blood glucose(FBS, RBS), chest x-ray (CXR), electrocardiograph (ECG) and urinalysis(U/A)(1).

During the 1970s, the practice of routinely ordering pre-operative laboratory investigations by doctors worldwide was not given much attention. But since 1980s, many assessments of medical technology found that routine pre-operative investigations without suspected or known patient disease yield an extremely low rate of true positive test results and were not cost-effective(1). Although the laboratory tests can help in ensuring optimal preoperative condition, routine screening tests have several shortcomings(2).

With increment of health care services, health care management is now advocating cost effective and safe health care delivery. Nowadays the usefulness of selectively ordered pre-operative tests is high compared to the practice of routine testing. The American society of anesthesiologists (ASA) and National Institute of Clinical and Health Excellence (NICE) have developed guideline on the use of pre-operative laboratory tests before elective surgeries(1–3).

1.2. Statement of the problem

The old practice of routine preoperative investigations in patients undergoing elective surgery is still prevalent among surgeons and anesthesiologists. This leads to unnecessary patient cost and burden. More than 60% of anesthesiologist and more than 70% of surgeons believe that pre-operative tests will detect a hidden abnormality, But it doesn't mean that these routine preoperative investigations change patients' management and outcome(3). A multicenter study found 27% of the patients had some abnormal results in the pre-operative tests and 54.5% of these abnormal test results were newly detected(3). Schein et al. (2002) a multicenter trial involving more than 10,000 patients of cataract surgery reported that incidence of postoperative adverse events and death was same whether preoperative routine tests were done or omitted(2).

During the past years, routine perioperative investigations have been challenged by several guidelines and academic challenges. Because this results in significant cost without much benefit(2). The early studies against routine preoperative screening tests were published in mid and late 1980s. In a retrospective review of charts of over 2000 elective surgical patients who underwent battery of tests including complete blood cell count, differential blood count, prothrombin time, glucose level, serum electrolytes, creatinine, platelet count, etc., Kaplan *et al.* (1985) demonstrated that only 22% tests were revealed abnormalities(2,4). Unnecessary laboratory testing during preoperative preparation of patients is still common. However, achieving a compliance of 100% would be a practical impossibility(5).

1.3. Significance of the study

Even if pre-operative tests are ordered to aid in the management of surgical patients, many pre-operative tests are routinely ordered for apparently healthy patients without any clinical indication, and the subsequent test results are rarely used. In addition, unnecessary testing may lead physicians to pursue and treat borderline and false- positive laboratory abnormalities(6,7). This routine preoperative investigation is associated with increased hospital stay and extra cost. In a study done at Gondar university hospital, it showed that estimation of 13.83% cost reduction by applying the NICE guidelines(6).

This study is designed to determine the practice of pre-operative investigations in patients undergoing elective surgery in Tikur Anbesa specialized hospital.

2. Literature review

Pre-anesthetic check-up is the process of clinical assessment that precedes the delivery of anesthesia care for surgical and non-surgical procedures. Evaluation of a patient to detect comorbidities is an integral part of preanesthetic check-up. It involves through history, physical examination and investigations. It is a main element in preoperative care(6,8,9). During the early 1940s-1960s, physicians use detailed history and physical examination for preoperative evaluation while mandatory laboratory investigations were sent to confirm the diagnosis, but after the introduction of a biochemical auto-analyzer laboratory machines made it easier for clinicians to obtain a large number of tests with a small addition of cost(1). The ease of ordering and low cost of obtaining many laboratory tests made this new method of evaluation attractive. This practice evolved from the assumption that early and frequent testing could detect disease in their pre-clinical stage to allow early and less costly treatment(7,10).

In the absence of any clinical indication, the probability of finding a significant abnormality that change perioperative management on laboratory tests and imaging modality is very small. Even among elderly patients “routine” preoperative testing was of little benefit unless done based on patients clinical basis(11). though there are negative recommendations and clear note in the guidelines that routine investigations are not needed in all patients(6,7,10). The indiscriminate order for additional tests on pre-anesthetic evaluation is common in clinical practice, which entails additional costs and the possibility of false-positive results with a delays and further workup for the management of these false positive results(12).

In a study done in Sri Lanka, it showed less than 40% adherence to the NICE guideline(5). Another study done in India showed that 89.33% were subjected to at least one unnecessary investigation and 91.67% of the referral services were not required. According to this study, it also indicate that more than two-third of pre-operative investigations and referral services investigations were unnecessary(13). In other study done in Brazil in 2014, it was found that 41.9% of the tests performed on patients classified as ASA-I were not indicated. In ASA II group, 17.72% were made unnecessarily(12). Another study shows, 65% of patients were identified as having been requested unnecessary tests, with a minimum of one and up to 8 unnecessary tests. This unnecessary investigation had an increase in cost and hospital stay(14).

In a study done at Gondar University, majority of the test were ordered by surgical teams (87.9%) and 12.1% by Anesthetists. The study indicate that, a total additional cost incurred towards unindicted tests was 13.89% of the total cost for the tests(6).

Different countries and teaching medical institutions like National Institute of Health and Clinical Excellence (NICE-UK) and Canadian Anesthesiologists' Society(CAS) have developed guidelines in preoperative testing practice to decrease hospital stay and reduce costs(15,16). In our country, so far there is no guideline published on the national or institutional level.

3. Objective of the study

3.1. General objective

To assess the practice and associated factors of preoperative investigations in patients undergoing elective surgery at TASH, Addis Ababa- Ethiopia, 2021

3.2. Specific objective

To assess the practice of preoperative investigations in patients undergoing elective surgery at TASH, Addis Ababa- Ethiopia, 2021.

To assess factors that affect practice of preoperative investigations in patients undergoing elective surgery at TASH, Addis Ababa, Ethiopia, 2021

4. Methods and materials

4.1. Study area

The study was conducted at Tikur Anbesa Specialized Hospital (TASH) wards and operating tables. It is located in Central part of Addis Ababa city Administration, the capital of Ethiopia. It is found at 9⁰1'48" N, 38⁰ 44'24" E and 2355m above sea level. It has estimated population of 4.7 million by 2020.

TASH hospital is a tertiary hospital which also gives services for referral cases from other specialized referral hospitals throughout the country. It has 11 OR tables for elective (separated orthopedic and obstetric operating tables) cases and 5 emergency OR tables. The surgical team accompanies senior consultant surgeons (different specialty), fellow surgeons, general surgeons and surgical residents. The department of anesthesiology, critical care and pain medicine has 15 consultant anesthesiologists and 59 residents (year 1-3).

Patients who are planned for admission for elective surgery undergo preanesthetic evaluation by ACCPM senior/ resident at separate preanesthetic clinic before admission, but this service has significantly decreased since the COVID-19 epidemics and most patients were directly admitted to ward from surgical OPDs. The patient also undergoes second preoperative evaluation immediately after scheduled for OR. Surgical patients who undergo elective surgery during the study period were included.

4.2. Study period

Three months (May – July, 2021)

4.3. Study design

Institution based, analytic cross-sectional study design was conducted from May to July, 2021 G.C.

4.4. Source population

All surgical patients who undergo elective surgery at Tikur Anbesa specialized hospital

4.5. Study population

All surgical patients who undergoes elective surgery at Tikur Anbesa specialized hospital during the study period.

4.6. Sample size and sampling technique

The actual sample size for the study is determined by using single population proportion

$$n = (Z_{\alpha/2})^2 pq. /d^2$$

Where:

n= Initial estimated sample size

Z = Confidence level (alpha, α), 1.96

P = prevalence from previous study (0.8)

d= marginal error (0.05)

$n = (1.96)^2 * 0.2 * 0.8 / (0.05)^2 = 245$ since total population is 4000 case a year and since study time was 3 months, the total case is less than 10,000, (1106). Using the reduction formula $n = n_0 / (1 + (n_0 - 1) / N)$ and adding 10% non-respondents, $n = 220$. The number of cases done in three months in each table was orthopedics (150), general surgery (145), neurosurgery (95), obstetrics (90), pediatrics (231), cardiothoracic (60), urosurgery (231), ENT (30) and gynecology (80). Using stratified random sampling for each table, the sample required from each table was, (orthopedic, 30, general surgery 29, neurosurgery 19, obstetrics, 18, pediatrics 46, cardiothoracic 12, ENT 6, urology 46 and gynecologic OR 14 cases. Further systematic random sampling was applied from each stratum by determining “K” value ($k=5$) and sample was collected from each.

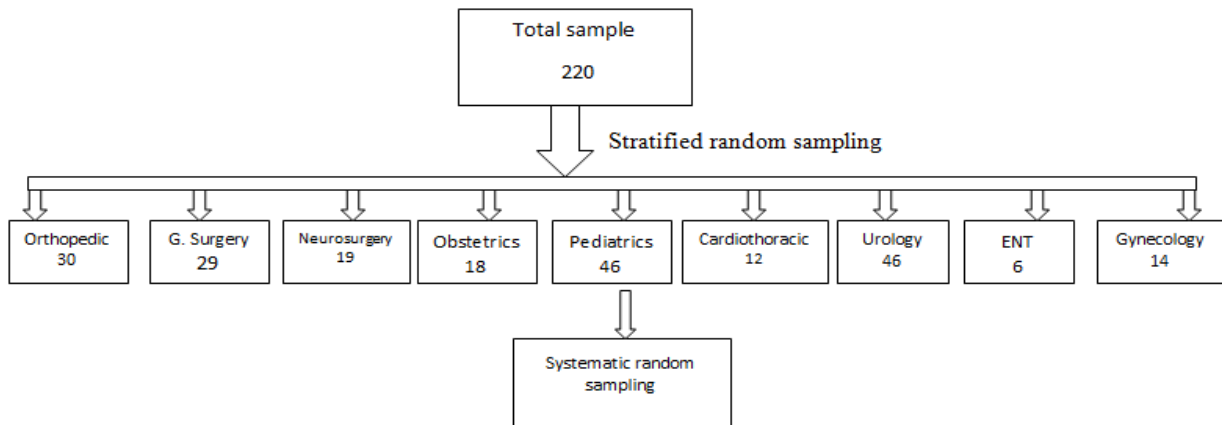


Figure 1: sampling procedure and technique on practice and associated factors of preoperative investigations in patients undergoing elective surgery in TASH, Addis Ababa, Ethiopia, 2021

4.7. Inclusion criteria

All surgical cases scheduled for elective surgery at TASH from May to July 2021

4.8. Exclusion criteria

Cardiac surgery, neonates scheduled for elective surgery.

4.9. Study variables

4.9.1. Dependent variable

Practice of preoperative investigations (compliant with the NICE guideline and non-compliant with the NICE guideline).

4.9.2. Independent variable

Age, sex, ASA class, surgery grade, type of surgery, number of comorbidities, investigation types, number of investigations

4.10. Data collection, analysis and interpretation procedure

Data was collected at Tikur Anbesa Specializes hospital with structured questionnaire which includes, sociodemographic characteristics, surgical speciality type, ASA class, number of comorbidities, procedure to be done and investigations which are done with the respective physician/health care worker who order it. Data collectors are members of anesthesiology, critical care and pain medicine residents. Training was given for the data collector before data collection. Data was coded and entered to SPSS version-25 software. After data was cleared, data analysis was done. Univariate data was expressed in frequency, mean, SD and bivariate data was analyzed using fisher's exact test, binary and multiple logistic regression. P value less than 0.05 was considered statically significant.

4.11. Ethical consideration

Ethical consent was obtained from department of anesthesiology, critical care and pain medicine, TASH. After explaining the aim and benefit of study, verbal informed consent was obtained from each study participant and their Confidentiality was guaranteed throughout the study.

4.12. Dissemination plan

The study result was submitted to Addis Ababa University School of medicine and was presented to the health science community and disseminated to the concerned body. Result will be published on peer reviewed scientific journal.

4.13. Operational definition

Compliant with the NICE guideline: Investigations done according to the NICE guideline recommendations.

Non-compliant with the NICE guideline: Investigations done which are not recommended by the NICE guideline.

NICE: A guideline which makes recommendations to help guide the appropriate use of routine preoperative tests for patients before elective surgery (National Institute of Clinical Excellence)

ASA physical status: Classification system of a patient fitness for surgery based on systemic diseases severity irrespective of age and surgery type.

Minor surgery: Minimally invasive procedures or procedures that does not involve serious risk (examples include but not limited to, excision of skin lesion, drainage of breast abscess, circumcision, laparoscopy and cataract surgery)

Intermediate surgery: Surgery with a moderate risk (include primary repair of inguinal hernia, excision of varicose vein, tonsillectomy, etc.)

Major surgery: Examples include, total abdominal hysterectomy, radical neck dissection, thyroidectomy, colonic resection, vascular surgery.

5. Results

5.1. Socio-demographic characteristics

A total of 220 subjects who undergo elective surgery were evaluated for number of investigations done preoperatively. Two hundred nineteen questionnaires were analyzed making the valid data 99.5%. One chart was excluded from analysis for incomplete data. One hundred fifteen (52.5%) cases were male and 104(47.5%) were females. Regarding age distribution, majority of them were under the age group of 15-45 which accounted for 99(45%), 27(12.3%) were above 65 years old (mean=35.5years).

Table 1: Socio-demographic characteristics of the patients in Tikur Anbesa specialized hospital, scheduled for elective surgery (n=219), 2021

Variable		frequency	percentage
Gender	Male	115	52.5
	Female	104	47.5
Age	≤14	51	23.3
	14-45	98	44.7
	45-65	44	20.1
	>65	26	11.9

5.2. Characteristics of cases based on surgical filed speciality, surgery grade, ASA class, comorbidity type and number of comorbidities

Among the total sample collected, 45(20.5%) were urosurgery patients, 46(21%) pediatric surgery, 30(13.6%) orthopedic surgery, 29(13.2%) from general surgery, 19(8.6%) neurosurgery, 18(8.2) obstetrics 14(6.4%), gynecologic surgery, 12(5.5%) cardiothoracic surgery and 6(2.7%) were from ENT.

Table 2: Case distribution by surgical speciality of patients undergoing elective surgery at TASH type (n=219), 2021

Surgical specialty type	Frequency	Percentage
urosurgery	45	20.5
Pediatric surgery	46	21
orthopedics	30	13.6
General surgery	29	13.2
Neurosurgery	19	8.6
obstetrics	18	8.2
Gynecologic surgery	14	6.4
cardiothoracic	12	5.5
ENT	6	2.7

ENT: ear, nose and throat

Majority of the patients were ASA class I and II accounting for 98(44.5%) and 86(39.1%) respectively. Thirty-two (14.5%) of the cases were ASA class III and the rest 1.8% were ASA class IV. One hundred sixty-nine (76.8%) patients undergo major surgery, while 44(20%) and 7(3.2%) undergo intermediate and minor surgery respectively.

Table 3: ASA grade and surgery grade of patients undergoing elective surgery at Tikur Anbesa specialized hospital (N=219), 2021

ASA class	Frequency	Percentage
I	97	44.2
II	86	39.1
III	32	14.5
IV	4	1.8
Surgery grade		
Minor	6	2.0
intermediate	43	19.6
Major	170	77.6

ASA-American society of anesthesiology

Out of the total patients, 94(42.9%) had comorbidities, of which CVS 33(35%) and endocrine 17(18%) are the commonest. The rest of the patients have renal, malignancy and respiratory comorbid diseases.

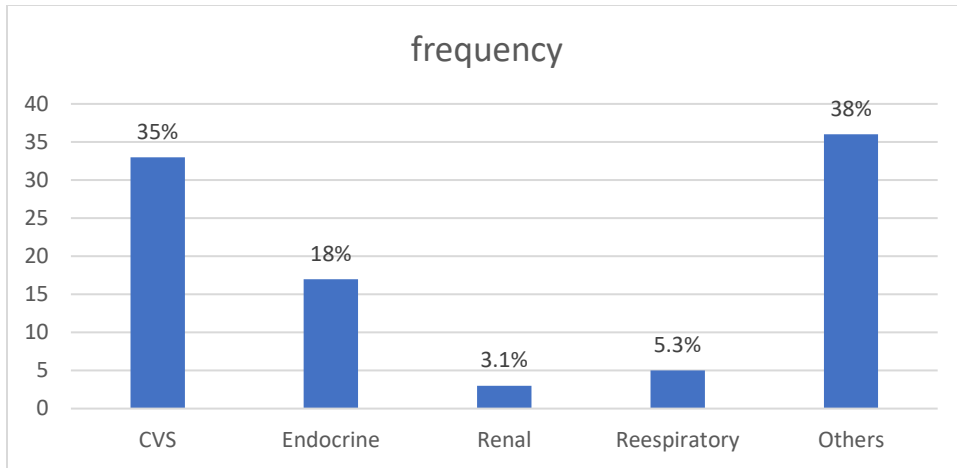


Figure 2: Type of comorbidities in patients undergoing elective surgery at Tikur Anbesa specialized hospital, Addis Ababa, Ethiopia (n=219), 2021

Out of these, majority of the patients had one comorbidity (72.3%), the rest 23.4% had two comorbidities, three percent had three comorbidities and only one (1.1%) had four comorbidities.

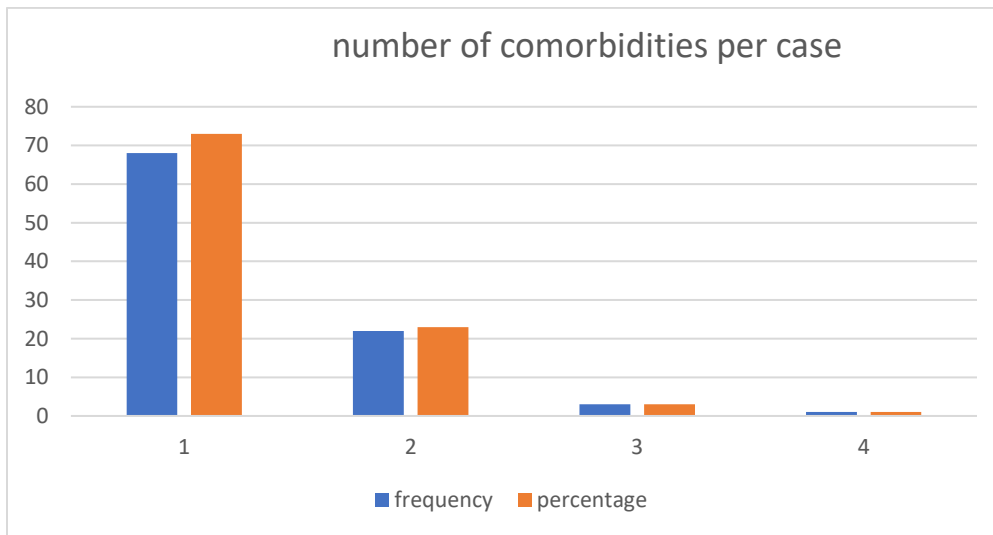


Figure 3: Number of comorbidities per patient, in patients undergoing elective surgery at Tikur Anbesa specialized hospital, Addis Ababa, Ethiopia (n=219), 2021

5.3. Practice and associated factors of preoperative investigations

Out of the 219 cases, 218 of them were subjected to at least one investigation, with the maximum number of investigations per patient being 10 investigations (mean 4 ± 2.3). Majority of the patients were investigated with CBC (98.6%), RFT 154(70%), serum electrolytes 130(59%) and

liver enzymes 106(48%). The rest of the patients were investigated with HA1c, PT/PTT/INR, albumin, CXR, CT/MRI, urine analysis, ECG, ECHO, and FBS.

Table 4 : *preoperative tests done for patients undergoing elective surgery at Tikur Anbesa specialized hospital by surgical team, ACCPM and anesthetists (n=219), 2021*

Investigations	Total number/% of investigations	Surgical team		ACCPM		Anesthetist	
		Number/% of investigations done in compliance with NICE guideline	Number/% of investigations done not in compliance with NICE guideline	Number/% of investigations done in compliance with NICE guideline	Number/% of investigations done not in compliance with NICE guideline	Number/% of investigations done in compliance with NICE guideline	Number/% of investigations done not in compliance with NICE guideline
CBC	218(99)	167(76)	9(4.7)	35(16)	3(1.3)	3(1.3)	2(0.9)
RFT	154(70)	93(60.3)	43(27.9)	10(6.4)	3(1.9)	3(1.9)	2(1.2)
Serum electrolyte	130(59)	71(54.6)	40(30)	9(6.9)	5(3.8)		6(4.6)
Liver enzymes	106(48)	35(33)	57(53.7)	2(1)	8(7.5)	1(0.5)	3(2.8)
ECG	64(29)	35(54.6)	20(41.5)	5(7.8)	2(3.1)	1(1)	1(1.5)
ECHO	36(16.4)	20(55)	13(36.1)	1(2.7)	1(3.6)		1(3.6)
PT/PTT/INR	43(19.6)	24(55.8)	18(41)	1(2.3)	-		-
U/A	22(10)	17(77.2)	2(9.0)		2(9.0)		1(3.5)
CXR	30(13.6)	24(80)	1(3.3)	4(13.3)	-		1(3.3)
FBS	18(8.2)	8(44)	5(27)	2(11)	1(5.5)		2(11)
Albumin	18(8.2)	8(44)	10(55)		-		-
Ha1C	9(4)	3(33)	2(22)	3(33)	1(11)		

CBC-complete blood count, RFT-renal function test, ECG-electrocardiography, ECHO-echocardiography/PTT/INR-prothrombin time, international normalizing ratio-chest x-ray, FBS-fasting blood sugar-arterial blood gas analysis.

Most of the investigations were requested by surgical residents/surgical team, followed by ACCPM resident and anesthetists. Surgical residents were involved in ordering of perioperative investigations in 720(84.9%), ACCPM residents 101(11.9%) and anesthetists 27(3.1%) cases. Out of the total of 848 tests obtained, 583(68.7%) investigations were done in accordance with the NICE guideline protocol and 265(31.3%) tests were not compliant with the NICE guideline. Among specific investigation CBC is done in 218(99%) of cases and 14(6.4%) of them were done not in compliance with the NICE guideline. Renal function test was done in 154(70%) and 48(31%) of the cases was done not in compliance with the NICE guideline. Serum electrolyte

done in 130(59%) of the cases, 51(39%) done not in compliance with the NICE guideline. Liver enzymes done in 106(48%) of the cases and 68(64%) were done not in compliance with the NICE guideline. Albumin done in 19(8.2%) of the cases and 10(58%) done not in compliance with the NICE guideline (table 4)

Table 5: Details of preoperative tests done at Tikur Anbesa specialized hospital, compliance with National Institute of Clinical Excellence guidelines (n=219), 2021

Tests Done	Investigation done by surgical team not in compliance with the guideline (%)	Investigation done by ACCPM not in compliance with the guideline (%)	Investigation done by anesthetist not in compliance with the guideline (%)	Total Investigation done not in compliance with the guideline (%)	(P value)/ Fishers exact test
CBC	9(4.1)	3(1.3)	2(0.9)	14(6.4)	0.020
RFT	43(27.9)	3(1.9)	2(1.2)	48(31.1)	0.691
Serum electrolyte	40(30)	5(3.8)	6(4.6)	51(39.2)	0.0074
Liver enzymes	57(53.7)	8(7.5)	3(2.8)	68(64)	0.575
ECG	20(41.5)	2(3.1)	1(1.5)	23(35.9)	0.900
ECHO	13(36.1)	1(3.6)	1(3.6)	15(41.6)	1.00
PT/PTT/INR	18(41)	-	-	18(41.8)	1.00
Urine analysis	2(9.0)	2(9.0)	1(3.5)	5(22.7)	-
CXR	1(3.3)	-	1(3.3)	2(6.6)	-
FBS	5(27)	1(5.5)	2(11)	8(44)	0.353
Albumin	10(55)	-	-	10(55)	0.444
Ha1C	2(22)	1(11)	-	3(33.3)	1.000
ABG analysis	-	-	-	-	-
Total	220(25.9)	26(3.0)	19(2.2)	265(31.3)	-

CBC-complete blood count, RFT-renal function test, ECG-electrocardiography, ECHO-echocardiography/PTT/INR-prothrombin time, international normalizing ratio-chest x-ray, FBS-fasting blood sugar-arterial blood gas analysis.

Out of the investigations that did not comply with the NICE guideline, 220(83%) are done by surgical residents/surgeons and ACCPM residents and anesthetists are involved in 26(9.8%) and 19(7.1%) respectively. All albumin testes done not in accordance with the nice guideline were done only by surgical team. ACCPM physicians are more compliant in ordering preoperative investigations (76%) in ordering preoperative investigations in accordance to the NICE guideline, as compared to surgical team (68.5%) and anesthetists (31%). (Table 5).

Table 6: Bivariate/multivariate analysis of preoperative investigation for patients undergoing elective surgery at TASH (n=219), 2021

Variable	Category	Investigation done in compliance with NICE guideline (%)	Investigation done not in compliance with NICE guideline (%)	P-value	COR (95% CI)	P-value	AOR (95% CI)
Age	<=14	45(60.8)	29(39.2)	0.000	1	0.351	1
	14-45	97(63.8)	55(36.1)	0.931	0.97(0.49-1.92)	0.750	0.88(0.421-1.86)
	45-65	44(58.6)	31(41.3)	0.173	1.80(0.77-4.24)	0.352	1.56(0.609-4.03)
	>65	26(59)	18(41)	0.295	1.70(0.62-4.64)	0.308	1.75(0.596-5.16)
ASA class	ASA I	55(57.2)	41(42.7)	0.603	1	0.879	1
	ASA II	55(63.9)	31(36.1)	0.318	1.35(0.74-2.45)	0.972	1.012(0.51-1.99)
	ASA III and IV	22(61)	14(39)	0.647	1.20(0.54-2.62)	0.660	0.82(0.35-1.94)
Surgery grade	Minor and intermediate	49(70)	21(30)	0.319	1	0.788	1
	Major	170(72)	66(28)	0.611	1.18(0.6-2.25)	0.460	1.292(0.65-2.54)
Comorbidity	No	68(53.5)	59(46.5)	0.425	1	0.384	1
	Yes	64(69.5)	28(30.5)	0.017	1.98(1.12-3.48)	0.037	1.914(1.03-3.24)

The number of investigations done showed a significant ($P<0.005$) positive correlation with patient's age ($r=0.489$) and ASA grade ($r=0.547$) but there was no correlation between surgical grade ($p=0.21$) and number of comorbidities ($p=0.57$) with the number of investigations done. The study shows that investigations done in compliance with the NICE guideline are two times more likely ordered in patents with comorbidity ($p=0.017$, OR 1.98 95%, CI 1.03-3.24).

Regarding serum electrolytes, number of unindicated investigations decreases as the age of patients increase ($p=0.007$ $r=-0.2$) and ASA class increases ($p=0.001$, $r=-0.3$). There was no any association between number of comorbidities and surgery grade with serum electrolytes. For the rest of investigations with a poor compliance with NICE guideline, there is no correlation with ASA class, surgery grade, age, number of comorbidity and number of investigations.

6. Discussion

This institution based, analytic cross-sectional study is conducted to describe the practice and associated factors of preoperative investigations in patients undergoing elective surgery at Tikur Anbesa specialized hospital.

Nearly, all patients who undergo preanesthetic workup has undergone with at least 4 investigations (mean=4 SD=2.3) done which is comparable with a study done in India and Sri Lanka(11,17). Most of the patients were investigated with CBC (98.6%), RFT 154(70%), serum electrolytes 130(59%) and liver enzymes 106(48%). The rest of the patients were investigated with HA1c, PT/PTT/INR, albumin, CXR, CT/MRI, urine analysis, ECG, ECHO, and FBS. This result is comparable with a study done in India(100% for CBC) and Gondar(98.6%)(6,7,11). Surgical residents were involved in ordering of perioperative investigations in 720(85.9%) patients followed by anesthesia residents 101(11.9%) and anesthesiologists 27(3.1%) cases which is similar with a study done in India and Gondar(6,17). Out of the total of 848 tests obtained, 583(68.7%) investigations were done in compliance with the NICE guideline protocol and 265(31.3%) tests were not indicated as per the NICE guideline. This value is comparable to a study done in Sri Lanka (38.2%) were not compliant with the guideline(11). In the other hand, this finding is significantly lower as compared to a study done in India(>80%).The discrepancy could be attributed to, because the previous study includes referral investigations which are high likely to be done by health care providers which are least experienced in preanesthetic work up(8).

The number of investigations done showed a significant ($P<0.005$) positive correlation with patient's age ($r=0.489$) and ASA grade ($r=0.547$) but there was no correlation between surgical grade and number of investigations. This finding is similar to a study done Sir Lanka which shows positive correlation with age, ASA grade and Surgery grade. The study shows that investigations done in compliance with the NICE guideline are two times more likely ordered in patents with comorbidity ($p=0.017$, OR 1.98 95%, CI 1.03-3.24). This could be due to the need of more investigations in patients with comorbidity as compared to patients without comorbid illness. ACCPM physicians are more compliant in ordering preoperative investigations (76%) in ordering preoperative investigations in accordance to the NICE guideline, as compared to surgical team (68.5%) and anesthesiologists (31%). (*Table 5*). This is similar with a study done in India

which shows anesthesiologists were more rational in ordering preanesthetic investigations as compared to surgeons (41–97% vs. 10–60%) for the other health care workers(17).

7. Strengths and Limitation of the study

7.1. Strength

Study includes different fields of surgical specialty unit.

First study in the institution can be used as source of data for farther work and development of institutional guidelines.

7.2. Limitation

Study limited in single tertiary hospital which may not be representative for primary hospitals and private hospitals

Study does not include cost, treatment for false positives of unwanted investigations and its burden

8. Conclusion and recommendation

8.1. Conclusion

Unnecessary preoperative investigations are prevalent at Tikur Anbesa specialized hospital. Anesthesiology, critical care and pain medicine physicians are more compliant with the recommendation/NICE guideline as compared to surgeons/surgical residents and anesthesiologists.

8.2. Recommendation

For health care workers: routine preoperative investigations should be sent based on guideline and as per the standards.

For department of anesthesiology, critical care and pain medicine: To strengthen the preanesthetic clinic service

Need for development of hospital based and national guideline for routine preoperative investigations.

For future researchers: the farther study the reason of inappropriate preoperative investigations, the cost and burden in patients.

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Annex

Questionnaires

Subject information sheet

Addis Ababa University

School of medicine

Subject information sheet

Hi, my name is -----, I am here in behalf of Dr. G/hiwot G., a student in Addis Ababa University School of medicine, department of anesthesiology, critical care and pain medicine. He is conducting a research thesis on “Assessment practice of preoperative investigations in surgical patients undergoing elective surgery at Tikur Anbesa Specialized Hospital, Addis Ababa, Ethiopia, 2021”. He had got formal permission from Addis Ababa University School of medicine and Tikur Anbesa Specialized Hospital officials to conduct the study.

You are selected to participate in this study. There will be no direct benefit by participating in this study, but in future information gathered by this study will help policy makers, programmers and researchers to give appropriate attention on issues of interest and design specific treatment options.

The information will be kept confidential by using only code numbers and locking the data. Only the members of the study team will have the access to the non-coded data and the data will not be used for purposes other than the study. Your willingness and active participation is very important for the success of this study.

If you need any further information or explanation regarding to the study, you can have this address to contact.

Name: Dr. G/hiwot G.

Tel- +251-942028793 Email- zeaxumtsion@gmail.com

Questionnaire: Clinical assessment on the preoperative investigations done for patients undergoing elective surgery at TASH

MRN Number

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SURGICAL WARD NO-.....

Name.....

Age: years

Gender:

Male

Female

Diagnosis.....

Surgical procedure.....

Surgery Grade

Grade 1 minor

Grade 3 major

Grade 2 intermediate

Grade 4 major+

Comorbidities

Cardiovascular diseases

.....

Respiratory diseases

.....

Renal diseases

.....

Other

.....

ASA GRADE

Grade 1: normal healthy patient

Grade 4: 3+ a constant threat to life

Grade 2: mild systemic disease

Grade 5: Moribund (expected to die in 24 hrs.)

Grade 3: severe systemic disease

Preoperative investigations

Requested by

	Done	recommended	surgeon	anesthesiologist	anesthetist	referral		
Chest X-ray	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ECG	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ECHO	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
US	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
CT/MRI	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hba1C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
FBS/RBS	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PT/PTT/INR	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Urine analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Blood gases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Renal Function	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Renal function test	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Albumin	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Liver Function	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Master table of recommended pre-operative investigations for elective surgeries, Adapted from NICE guideline, UK, 2016

Investigation	Surgery grade	ASA I	ASA II	ASA III	ASA IV
ECG	Minor	do not recommend routinely	do not recommend routinely	consider	consider
	Intermediate	do not recommend routinely	consider	offer	offer
	Major	consider	offer	offer	
RFT	Minor	do not recommend routinely	do not recommend routinely	consider	offer
	Intermediate	do not recommend routinely	consider	offer	offer
	Major	consider	offer	offer	offer
CBC	Minor	do not recommend routinely	do not recommend routinely	do not recommend routinely	do not recommend routinely
	Intermediate	do not recommend routinely	do not recommend routinely	consider	consider
	Major	offer	offer	offer	offer

Hemostasis tests:

Do not routinely offer hemostasis tests before surgery.

Consider hemostasis tests in people with chronic liver disease having intermediate or major or complex surgery.

If people taking anticoagulants need modification of their treatment regimen.

Glycated hemoglobin (HbA1c) test

In people with diagnosed diabetes

People with diabetes who are being referred for surgical consultation from primary care should have their most recent HbA1c test results included in their referral information.

Offer HbA1c testing to people with diabetes having surgery if they have not been tested in the last 3 months.

Glycated hemoglobin (HbA1c) test in people without diagnosed diabetes

Do not routinely offer HbA1c testing before surgery to people without diagnosed diabetes.

Urinalysis

Do not routinely offer urine dipstick tests before surgery.

Consider microscopy and culture of midstream urine sample before surgery if the presence of a urinary tract infection would influence the decision to operate

Chest X-ray *Should not be routinely performed prior to surgery.*

ECHO: Do not routinely offer resting echocardiography before surgery.

Consider resting echocardiography if the person has:

Signs or symptoms of heart failure. Before ordering the resting echocardiogram, carry out a resting electrocardiogram (ECG)

Liver function test:

Patients posted for cholecystectomy, Known or suspected liver disease, Inflammatory bowel disease, excess alcohol intake and advanced malignancy.