

Preoperative laboratory testing - Comparison of National Institute of Clinical Excellence guidelines with current practice - An observational study

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Abstract

Background and Aims: Preoperative laboratory testing is done to detect abnormalities in the body not detected by clinical examination. Often a battery of tests is advocated as a routine for patients scheduled for low or intermediate risk surgery. This prospective observational study was aimed to assess agreement of the current practice of preoperative laboratory investigations with the National Institute of Clinical Excellence (NICE) guidelines, and the impact of investigations on patient care and costs.

Material and Methods: The study was conducted at a tertiary referral center on 385 patients aged 18-70 years of either gender, posted for elective general surgical, gynaecological or otolaryngological surgery. Sixteen investigations were examined: hemogram, blood urea, serum creatinine, serum electrolytes, coagulation profile, urinalysis, thyroid function tests, electrocardiogram, echocardiogram, chest x-ray, pulmonary function tests, blood sugar, glycosylated hemoglobin, liver function tests, treadmill test and coronary angiogram. The history and physical examination were reviewed to examine for indication for these laboratory investigations. These were compared with NICE guidelines. Impact of these investigations on anesthetic decision-making was noted.

Results: There was almost no agreement of the current practice with the NICE guidelines. The total cost of all tests obtained was Rs 5,48,755. Total additional cost of unindicated tests was Rs 5,10,730 (93%). Average amount spent on additional investigations per patient was Rs 1326.57.

Conclusion: Most investigations are overprescribed and have minimal agreement with NICE guidelines. None of the tests had any impact on clinical care. Nearly a million rupees is incurred per year in one referral hospital alone, when NICE guidelines are not followed.

Keywords: Clinical laboratory testing, cost-comparison, guidelines, preoperative

Introduction

Evaluation of a patient to detect comorbidities is an integral part of preanesthetic check-up. Preoperative laboratory testing is done to detect abnormalities in the body which have not been detected by clinical examination. It may also be done to evaluate the extent of derangement in physiology due to

the underlying clinical condition. Some investigations are obtained as a part of surgical workup. Often a battery of tests is advocated as a routine, even in healthy patients scheduled for low or intermediate risk surgery.

Many international guidelines are available to assist decision making.^[1,2] The prevalence of abnormalities is very low in healthy patients. The consensus of these guidelines is that unnecessary tests may lead to extra cost burden, delay in surgery and occasional

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harm to the patient.^[3,4] It is possible that these guidelines may not entirely be applicable to the Indian population. The present study was aimed to compare the preoperative laboratory investigations ordered in a referral medical college hospital of South India with the National Institute of Clinical Excellence (NICE) guidelines.^[1] The primary objective of the study was to evaluate the agreement of the current practice with NICE guidelines. The secondary objectives included evaluation of impact of the investigations on patient care and additional costs.

Material and Methods

This prospective observational study was conducted at a teaching and tertiary care hospital of South India between May 2016 and July 2017 after approval of the Institutional Ethical Committee. Patients between 18 and 70 years, of either gender, belonging to American College of Anesthesiologists (ASA) Physical Status 1 or 2 and posted for elective general surgical, gynaecological or otolaryngological surgery were included. Patients posted for repeat surgery and pregnant women were excluded. Examples of surgeries selected for the study were hemorrhoidectomy, laparoscopic cholecystectomy, appendectomy, total abdominal hysterectomy, mastectomy, mastoidectomy, varicose veins ligation and thyroidectomy.

The patients were evaluated the day prior to surgery. All laboratory investigations and number of times they were ordered, either by the surgeon or the anesthesiologist were noted. The following sixteen investigations were examined: hemogram (CBP), blood urea and serum creatinine, serum electrolytes, coagulation profile [prothrombin time (PT), activated thromboplastin time (APTT), international normalised ratio (INR)], urinalysis, thyroid function tests (TFT), electrocardiogram (ECG), echocardiogram (ECHO), chest x-ray (CXR), pulmonary function tests (PFT), blood sugar (BS), glycosylated hemoglobin (GlyHb), liver function tests (LFT), treadmill test (TMT) and coronary angiogram. The history and physical examination were reviewed specifically to see whether there was any indication of any of these laboratory investigations. Those obtained by the surgeon for the diagnosis of the surgical condition were excluded.

The grade of the surgical procedures (NICE guidelines), surgical procedure conducted, any untoward intraoperative complications and requirement of blood transfusion were noted. Any impact of the investigations on the anesthetic decision-making was also noted.

The test results were categorised as normal or abnormal. Tests not recommended by the guidelines were termed as unindicated tests. Cost analysis was done for each test based on

the cost of each investigation as charged to a patient admitted to the general ward (the least charges). The amount spent on obtaining unindicated tests was termed as additional cost.

Kappa statistic was used to compare agreement of each test with that recommended by the NICE guidelines. For a confidence level of 95%, and confidence interval of 0.05, where the proportion complying with the guidelines is not known (in such cases, would be assumed to be 0.5) and the population size is large, a sample size of 385 was required. All collected data was entered into Microsoft database and analysed using SPSS for Windows, Version 16.0. Chicago, SPSS Inc. Percentages and frequencies were used to express discrete variables and mean and standard deviation were used to express continuous variables.

Results

A total of 385 patients were enrolled, evaluated and reviewed. The demographic data including the grade of surgical procedure are given in Table 1. Out of a total of 2997 tests obtained, 274 tests were done as indicated and 2723 tests were not indicated as per the NICE guidelines [Table 2]. Urinalysis was found to be unindicated 100% of the time as were chest x ray and liver function tests. Coagulation profile and echocardiogram were deemed unnecessary 99.4% of the time each. Coronary angiogram was obtained in one patient only and may have been avoided, according to the guidelines. Glycated hemoglobin and thyroid profile were indicated in some patients but not indicated in 75.2% and 76.54% of patients respectively. None of the results in the unindicated tests were abnormal except complete blood picture (0.6%) and glycated haemoglobin (1.56%) [Table 2]. There was no impact of the results of additional investigations on the type of anaesthetic or blood transfusion. There were no untoward

Table 1: Demographic data

Parameters	Values
Age (years)	42.1±11.8
Gender (male/female)	167/218
ASA PS	
I	240
II	145
Grade of surgery	
Major	62
Intermediate	242
Minor	81
Surgical specialty	
General surgery	225
Gynecology	82
ENT	78

The data is expressed as mean±SD or n. SD=Standard deviation, ASA PS=American Society of Anesthesiologists physical status, ENT=Ear-nose-throat

Table 2: Details of preoperative tests, agreement with National Institute of Clinical Excellence guidelines and cost analysis

Tests	Number (%) of patients in whom tests were done	Number (%) of unindicated tests	Number (%) of unindicated tests with abnormal results	κ	Cost per test (Rs)	Cost of unindicated tests (Rs)
Complete blood count	385 (100)	333 (86.4)	2 (0.6)	0	130	43,290
Coagulation tests	171 (41.4)	170 (99.4)	0 (0)	0	185	31,450
Serum creatinine	381 (98.9)	335 (87.9)	0 (0)	0	125	41,875
Serum electrolytes	382 (99.2)	370 (96.9)	0 (0)	0	125	46,250
Urinalysis	211 (54.8)	211 (100)	0 (0)	0	55	11,605
Random blood sugar	289 (75)	253 (87.5)	0 (0)	0.06	70	17,710
Postprandial blood sugar	284 (73.7)	248 (87.3)	0 (0)	0.07	70	17,360
Glycated hemoglobin	85 (22)	64 (75.2)	1 (1.6)	0.33	300	19,200
Electrocardiogram	304 (78.9)	255 (83.9)	0 (0)	0.08	110	28,050
Echocardiogram	192 (49.8)	190 (98.9)	0 (0)	<0	700	133,000
Treadmill test	0 (0)	0 (0)	0 (0)	0	800	0
Coronary angiogram	1 (0.25)	1 (100)	0 (0)	0	8800	8800
Chest X-ray	231 (60)	231 (100)	0 (0)	0	140	32,340
Liver function tests	153 (39.7)	153 (100)	0 (0)	0	400	61,200
Thyroid profile	81 (21)	62 (76.5)	0 (0)	0.32	300	18,600
Pulmonary function tests	0 (0)	0 (0)	0 (0)	0	1000	0

complications in any of the patients. The statistical agreement of the local hospital practice with NICE guidelines using Kappa statistics was evaluated and is given in Table 2. It was seen that there was almost no agreement between clinical practice and NICE guidelines.

The additional cost of unindicated tests performed in all these patients is also listed in Table 2. Echocardiography contributed the highest amount of Rs 1,33,000 and urinalysis the least with a total amount of Rs 11,605. The total cost of all the tests done was Rs 5,48,755. The total cost of unindicated tests done was Rs 5,10,730 (93% of the costs for laboratory investigations). Although the individual laboratory evaluation requirement of individual patients would differ, considering 385 patients were studied, it could be said that an average additional cost per patient was Rs 1326.57.

If we consider that 10 patients of ASA PS 1 and 2, belonging to general surgery, otolaryngology, gynaecology are scheduled for surgery every day and assuming 250 working days a year, the total additional cost would be Rs 33,15,000. This number could increase to 30 patients per day in larger hospitals when other specialties are included and the additional cost per year would be about Rs 99,45,000 at one hospital alone if guidelines are not adhered to.

Discussion

Cost is an important factor in the delivery of effective health care services especially in the developing nations. The practice of

'routine' investigation has been questioned by several studies.^[3-5] Prevalence of abnormal results in routine preoperative tests is around 5-60% although it may vary with the American Society of Anesthesiologists Physical status of patients.^[5-9] Studies that have focused on ASA 1 and 2 patients, report very low prevalence (0.8%) of abnormalities.^[10]

Guidelines were first established in 2003 (NICE guideline CG3), and later updated in 2016, for patients scheduled for elective surgery and aged over 16 years to aid healthcare professionals, patients, their families and carers.^[11] Since its induction, there has been a significant reduction in the ordering of tests in relatively fit individuals posted for elective surgeries in United Kingdom where it was first established.^[11] A systematic review of the literature by Czoski-Murray *et al.* concluded that the strategy has led to substantial resource savings.^[12]

Various studies have shown that more than 50% of the investigations done in the preoperative period are without any clinical correlation.^[5-7] Our study results are in accord with most of the previous studies with the overall prevalence of unindicated tests being more than 90%. In the study done by Keshavan and Swamy, a total of 984 tests were done in 163 patients of which 52% were not indicated.^[3] Abnormal tests were a meager 1.3%. The most common unindicated tests done were echocardiography and chest X-ray.

In an observational cohort study on preoperative investigations and referrals done by Karim *et al.*, a total of 352 patients with at least 5 investigations done in each were included.

At least one unnecessary investigation was done in 89.3%. They concluded that more than two third of the preoperative investigations and referral services were unnecessary.^[4]

Flamm *et al.*, and Imasogie *et al.*, have studied the economic impact of unnecessary investigations and found that a lot of money could be saved if guidelines are adhered to.^[13,14] The point to note here is that the existing guidelines have been in use only in developed nations where people are under regular follow up with their physicians. The notion in our country perhaps, is that the preanesthetic and presurgical evaluation would be an opportunity to discover hitherto unknown comorbidity in that patient. In fact, the Canadian guidelines, although similar to NICE guidelines, advise routine testing for underprivileged populations who would seek medical help only when they are severely unwell.^[15] Considering this, we analysed the data to see the incidence of abnormal result of all investigations done when they were deemed unindicated according to NICE guidelines. The results of most investigations were normal reaffirming that there is nothing to be gained from routine evaluation even in our population. None of these investigations had any impact on the anesthetic course.

It is noteworthy that surgeons see the patients and schedule them for surgery. Many tests are ordered by them anticipating that they may be requested by the anesthesiologists. This can be avoided if the patients are evaluated in a pre-anesthetic clinic, once the surgery is planned and the investigations are ordered by the anesthetist. Adherence to standard guidelines can help. Another reason of ordering many of these investigations is the fear of litigation and adoption of defensive practice. One could possibly quote international guidelines in this situation. If the insurance companies take note of this and enforce the guidelines, then there is a likelihood that compliance would be better and people would be more cost-conscious. It would be useful to have National Guidelines for our country.

Conclusion

A comparison of local practice with NICE guidelines for preoperative laboratory testing shows that most investigations are over-prescribed and with minimal agreement to clinical need and guidelines. Nearly a million rupees may be saved per year, in one referral hospital alone, if NICE guidelines are adhered to. A much larger study would be required to look at the true incidence of abnormal result of these 'routinely obtained' investigations to affirm our findings more strongly.

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Conflicts of interest

There are no conflicts of interest.

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