

ASSESSMENT OF PREOPERATIVE EVALUATION OF
GERIATRIC PATIENTS BY ANAESTHETISTS AT
THE KENYATTA NATIONAL
HOSPITAL.

A DISSERTATION PRESENTED IN PART FULFILMENT OF THE REQUIREMENT FOR THE
AWARD OF THE DEGREE OF MASTER OF MEDICINE IN ANAESTHESIOLOGY
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HOSPITAL.

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DECLARATION:

This dissertation is my original work and has not been submitted for the award of a degree in any other university.

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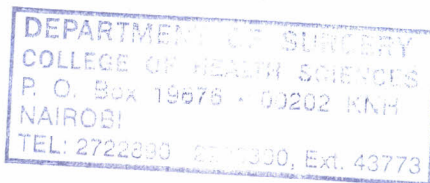


TABLE OF CONTENTS.

DECLARATION.....	3
TABLE OF CONTENTS.....	4
DEDICATION.....	5
ACKNOWLEDGEMENTS.....	6
ABSTRACT.....	7
LIST OF ABBREVIATION.....	9
IMPORTANT DEFINITIONS.....	10
1.0 INTRODUCTION AND LITERATURE REVIEW.....	11
1.1 BACKGROUND.....	11
1.2 PREANAESTHETIC EVALUATION OF THE ELDERLY.....	12
1.2.1 RISK ASSESSMENT.....	14
1.2.2 FUNCTIONAL ASSESSMENT.....	14
1.2.3 PREOPERATIVE TESTING.....	15
1.2.4 PREOPERATIVE OPTIMIZATION.....	16
1.3 GUIDELINES.....	17
2.0 STUDY JUSTIFICATION.....	18
3.0 OBJECTIVES.....	19
4.0 METHODOLOGY.....	20
5.0 ETHICAL CONSIDERATIONS.....	23
6.0 RESULTS.....	24
7.0 DISCUSSIONS.....	34
8.0 CONCLUSIONS.....	37
9.0 RECOMMENDATIONS.....	37
APPENDICES.....	38
REFERENCES.....	48

DEDICATION.

To my parents Moses and Rebecca Nabalindo, you taught me to believe in myself.

To my cherished daughter Sharon; my joy and strength and always terrific.

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ABSTRACT.

Background.

Geriatric is a term used to refer to any patient aged 65 years and above. These patients have special needs when it comes to the practice and conduct of anaesthesia. Physiological changes in various organ systems occurring with age compounded by the high incidence of co-morbidities in the elderly affect the conduct of anaesthesia. Currently about 1000 geriatric patients are admitted annually into orthopedic, gynecological and general surgical wards at the Kenyatta National Hospital (KNH) and most of them require some form of surgery. Part of the preparation before surgery includes preanaesthetic evaluation by the anaesthetist who will administer anaesthesia on the day of surgery. Currently there is no anaesthetist with a sub-specialization in geriatric anaesthesia at KNH.

Objective.

The objective of this study was to assess the practice of preanaesthetic evaluation of geriatric patients by the anaesthetists at KNH and compare it with the international guidelines formulated by the American Society of Anaesthesiologists.

Methodology.

The study was an observational, descriptive, cross-sectional study of preanaesthetic evaluations by anaesthetists at KNH done on 100 geriatric patients scheduled for elective surgery. The study site was the KNH general surgical, orthopedic and gynecological wards. The eligible patients who formed the basis of a preanaesthetic review and the anaesthetists were required to fill a consent form before being recruited. Data was collected using a questionnaire from the patients' medical records. The data collected included demographic information, risk assessment, whether functional/mental status was assessed, presence of co-morbidities and if preoperative optimization and medical consultation was requested for.

Results.

Data from the medical records of 100 geriatric patients scheduled for elective surgery was collected with focus on the preanaesthetic evaluation. The ages ranged from 65 – 92 years with a mean of 72.6 years. 90% of the patients in the study had a preanaesthetic evaluation done by anaesthetists of different cadres. Most of the patients (81%) were evaluated on the day before surgery. 57.8% of the patients were found to have at least one co-morbid condition. ASA physical status was used for risk stratification in all patients although the functional and mental status of the patients was only evaluated in 8.9% of those evaluated. Preoperative tests were mainly used routinely without considering the patients co-morbidities or the type of surgery. Preoperative optimization of geriatric patients at KNH was requested for by anaesthetists but requests for medical consultation were made for only 11.1% of the evaluated patients.

Conclusions.

The preoperative evaluation of geriatric patients at KNH does not meet the international standards as per guidelines formulated by the ASA.

LIST OF ABBREVIATIONS.

ADL – Activities of daily living **UON** – University of Nairobi.

ASA – American Society of Anaesthesiologist.

CO – Clinical officer.

COPD – Chronic obstructive pulmonary disease.

CXR – Chest x-ray.

DM – Diabetes mellitus.

ECG – Electrocardiogram.

HTN – Hypertension.

IADL – Instrumental activities of daily living.

KNH – Kenyatta National Hospital.

RBS – Random blood sugar.

RCO – Registered clinical officer.

SHO – Senior house officer.

SPSS – Statistical Package for the Social Sciences.

WHO – World Health Organization.

IMPORTANT DEFINITIONS.

1. ADL-Activities usually performed in the course of a normal day in a person's life e.g. eating, toileting, dressing, bathing, brushing teeth.
2. IADL-Activities performed by a person living independently during the course of a normal day e.g. managing money, shopping, telephone use, taking medication correctly, housekeeping.
3. Elective surgery-Non emergency surgery which is planned, allowing the doctor and patient to determine the best time and place for it.
4. Emergency surgery-Surgery that cannot be delayed, for which there is no alternative therapy and a delay could result in death or permanent impairment of health.
5. Co-morbidity – The presence and effects of one or more diseases in addition to the primary disease.

LIST OF FIGURES AND TABLES.

Figure 1: Japan's population by age in 1950/2030.....	11
Figure 2 : Age distribution.....	24
Figure 3 : Sex distribution.....	25
Figure 4 : Surgical specialty.....	26
Figure 5 : Cadre of anaesthetist.....	26
Figure 6 : Timing of preoperative evaluation.....	27
Figure 7 : Prevalence of co- morbid conditions.....	28
Figure 8 : Number of co morbid conditions per patient.....	29
Figure 9 : Prevalence of co morbidities per age group.....	30
Figure 10 : Assessment of functional/mental status.....	30
Figure 11 : Preoperative tests.....	31
Figure 12 : Factors associated with postponement/cancellation of surgery.....	34
Table 1 : Risk assessment.....	28
Table 2 : Choice of tests and presence of co-morbid condition.....	33
Table 3 : Cadre of anaesthetist and choice of tests.....	33
Table 4 : optimization.....	34

1.0 INTRODUCTION AND LITERATURE REVIEW.

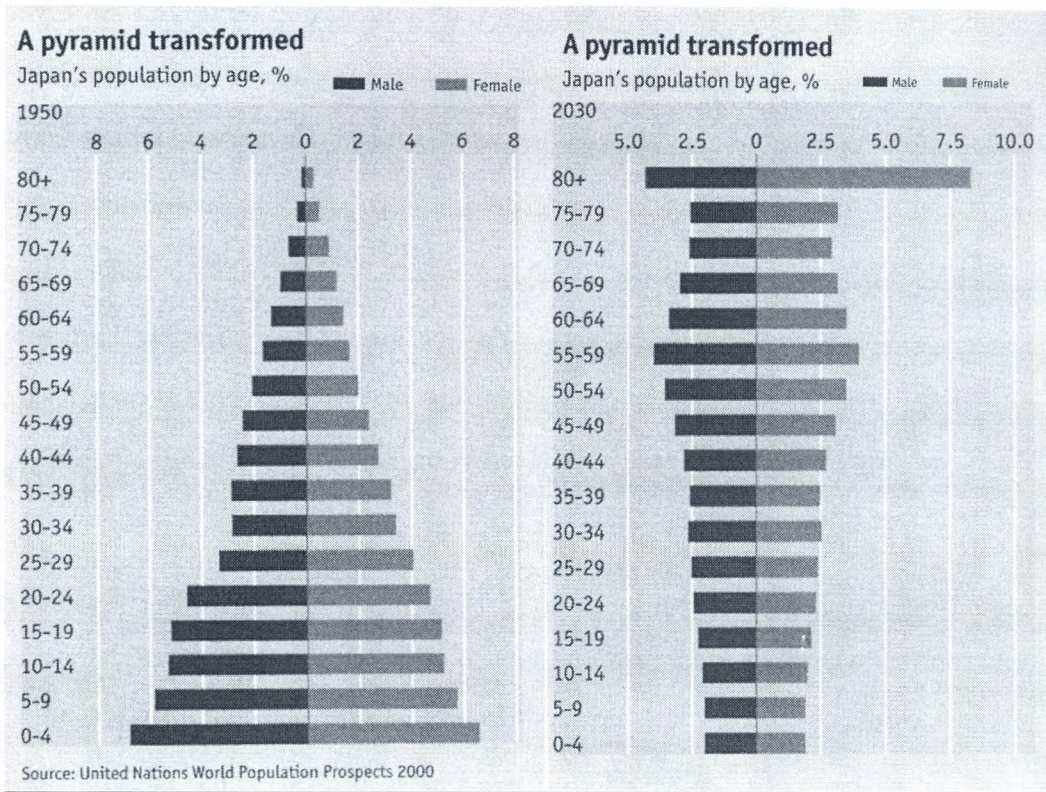
1.1 BACKGROUND.

It is projected that the population of the elderly will rise in most countries in future¹. This is partly due to advances in medical care. More elderly people are being operated on because of better surgical and anaesthetic techniques^{1,2}. Good and sophisticated peri-operative monitoring facilities make it possible and smooth for the anaesthetist to take care of an elderly surgical patient while minimizing complications.

In the United States it is estimated that more than 50% of Americans above 65 years will undergo some form of surgery². The geriatric patient is more likely to undergo more surgical procedures than a younger patient for causes other than trauma and obstetric³. These patients also have a higher morbidity and mortality following anaesthetic exposure and surgery. Fortunately there is evidence that this morbidity and mortality can be reduced by good peri-operative care starting with a thorough preoperative evaluation⁴. The United Nations World Population Prospects 2000 shows that there will be a rise in the number of the elderly in most countries in the future^{1,2,5}.

Below is a pyramid of comparison of Japan's population (in 1950/2030) by age.

Figure 1 – Japan's population by age in 1950/2030.



This pattern is projected for most countries.

1.2 PREANAESTHETIC EVALUATION OF THE ELDERLY.

Geriatric issues impact on every aspect of anaesthesia and an aging population carries profound implications for the practice of anaesthesiology. It is widely accepted that preanaesthetic evaluation of the geriatric patients is more complex than that of younger patients⁷.

Research done in 2005 by Cook at Mayo Clinic & Foundation evaluated the results of researches on preanaesthetic evaluation of geriatric patients carried out between 1980 and April 2001.

These were reviews, clinical trials, randomized controlled trials and Meta analyses. The aim was

to identify and recommend areas where further research was needed in geriatric anaesthesia and preanaesthetic evaluation was one of the areas identified¹.

First, there is greater heterogeneity of these patients. This necessitates evaluating each patient as an individual with no generalizations². Each of these patients may have co-morbidities which accumulate with age and each co-morbid condition increases the risk of exposure to anaesthesia. It is estimated that on average every patient above 65 years has on average 3 to 5 co-morbid conditions⁵. This is why Preston et al concluded that geriatric surgery is about disease, not age and surgery can actually be an effective way of restoring both length and quality of life of the elderly^{5,6}.

Normal physiological changes which have been well defined occur in every organ system with aging. Most important are changes in the cardiovascular, respiratory, renal and neurological systems. The most important generalization is that basal function of the various organ systems is relatively uncompromised by aging but functional reserve and specifically the ability to compensate for physiologic stress is greatly reduced^{3,5,9}.

The co-morbidities, physiological changes and use of multiple medications in combination make the response of the elderly patient to the surgical stress unpredictable. This unpredictability can be reduced by having a thorough preanesthetic evaluation⁹.

The preoperative assessment of elderly patients is determined by the underlying health status and influenced by the urgency of the surgical procedure. It serves four important functions^{1,5}. First, the surgical team is alerted of physiologic conditions that may alter management and determine if medical intervention is indicated before surgery. An index of risk for anaesthesia and surgical exposure is also determined. Lastly, data collected from pre-anaesthetic evaluation can be used as a baseline on which the success of surgery can be judged⁵.

Another important fact is that extreme age is not a contraindication to surgery because acceptable outcomes have been reported even in the very old patients. However, the challenge is to identify which patients will do well or poorly⁶.

1.2.1 RISK ASSESSMENT.

Risk assessment evaluates the relative contribution of co-morbidities to surgical morbidity and mortality. It is difficult because one patient can have more than one disease and diseases vary among patients. The ASA classification is used overboard and gives a relatively comparable risk assessment. This is also what is commonly used in our setting.

The age of the patient also contributes to risk. One of the classifications including surgical grades takes age into consideration where the older the patient the worse the surgical grade and the more the preoperative tests required before surgery¹⁰.

1.2.2 FUNCTIONAL ASSESSMENT.

It is important to assess the preoperative functional status of the patient. Evaluation of a resting patient may not indicate how the patient would react to surgical stress on the cardiac, pulmonary and metabolic systems⁵. This also provides a basis on which the success of surgery can be judged.

Four parameters are used. The patient's ability to carry out activities of daily living(ADL) and instrumental activities of daily living(IADL) give an idea of how independent the patient is and how this can be improved by surgery^{11,14,17}. The emotional and cognitive status of the patient should be assessed since subtle forms of cognitive impairment are common in the elderly. It is also a predictor of post-operative delirium a common occurrence in the elderly. This is achieved by carrying out a mental status examination¹³. History of alcohol abuse and dependence should be brought out clearly. Lastly; urologic function especially the ability to control micturition should be assessed¹⁵.

The aim should be to return the patient to at least his/her pre-operative activity level or better^{16, 18}. The success of surgery should be questioned if the procedure is technically adequate but renders the patient dependent post-operatively. Unlike the younger patient, the older patient is at far greater risk of long term functional compromise following the stress of surgery^{19, 20}.

In one study by Keen & Anderson, geriatric patients with hip fracture going for total hip replacement were assessed preoperatively and a functional rating scale was used to predict temporary or permanent placement into a nursing home after surgery. A conclusion was made that those patients with worse functional rating preoperatively were likely to end up permanently in nursing homes¹².

1.2.3 PRE-OPERATIVE TESTING.

Tests can be routine or specific. Routine tests are those done without considering the patient's co-morbid conditions or the type of surgery planned while specific tests are done to assess the degree of control of the patient's co-morbidities and at what degree they have affected the function of the different organ systems. It is generally agreed that routine tests may not add value to management²². When routine tests are carried out, the finding of abnormal results and the degree to which these affect the anaesthetic or surgical plan is not significant²³.

Smaller studies of elderly population suggest that there is a higher yield for specific tests^{1,25}. Routine chest x-rays of patients aged above 65 years undergoing surgery may show abnormalities regarded as significant but the degree to which they affect the course of treatment is not significant^{28,31}. However, many patients aged above 65 years are found to have major ECG abnormalities and some patients actually require surgery to be delayed due to these abnormalities. Secondly, a significant number of geriatric patients develop new ECG abnormalities postoperatively²⁴. From these observations a preoperative ECG for all elderly patients especially the very old is recommended to provide a basis for comparison and as a means of detecting patients for whom surgery should be delayed to allow for optimization first^{1,27,29}.

Sewell et al examined the value of a battery of tests in acutely ill elderly patients. The most important finding was the frequency of unknown urinary tract infections. Urrosepsis is also a common finding in elderly patients undergoing elective hip arthroplasty. Therefore, a cost benefit analysis justifies urinalysis and urine microscopy in elderly patients undergoing surgery^{32,33}. The Practice Advisory for Preanaesthetic Evaluation gives guidelines that show what specific tests are required for each co-morbid ,type of surgery and in some cases age before the patient is exposed to anaesthesia and surgery.

1.2.4 PRE-OPERATIVE OPTIMIZATION

This involves correcting any abnormalities detected by the above dimensions of pre-anaesthetic evaluation before surgery⁵. Once the decision for elective surgery is made, a medical consultation should be made for patients with significant co-morbidities. This is especially for medium to high risk patients e.g. ASA 3 and above³⁴. After the evaluation the medical consultant can decide to recommend proceeding with surgery, order additional tests to evaluate the patient or institute management to optimize the patient's condition before surgery^{33,36}.

A study by Roy shows that optimizing cardiac function and controlling sugar before surgery decreased mortality and morbidity postoperatively¹. There is also evidence that when the surgical and medical consultants work together in managing surgical patients with medical co-morbidities, there are improved outcomes and reduced costs³⁷. This is measured by a decrease in the length of stay in hospital and decreased postoperative complications³⁸.

An article published in the Internet Journal of Anesthesiology reviewed a study on preanaesthetic evaluation of an obese geriatric patient with multiple co morbidities (stroke, hypertension and myocardial infarction). A good history, physical examination and pre-operative testing led to the patient being optimized before surgery. This aided in the alterations in the intraoperative and post operative management thus improving the outcome and success of surgery. The patient was discharged on the third day and was able to go back to her preoperative functional status.

1.3 GUIDELINES ON PREANAESTHETIC EVALUATION OF ELDERLY PATIENTS³⁹.

Several international bodies have come up with guidelines on preanaesthetic evaluation of geriatrics. However these are liable to modification as more research goes on.

The American Society of Anaesthesiologists recommends that the preanaesthetic evaluation of the elderly should be accomplished several days before surgery and this is best done in preanaesthetic clinics^{23,39}.

It should include history taking, physical examination and review of medical records.

The functional status of the patient should be assessed by ADL and IADL and the mental status of the patient should also be evaluated.

An inquiry on any co-morbid conditions and the medications the patient is using should be made.

The choice for specific tests is emphasized where tests are indicated by co-morbid conditions and the type of surgery contemplated and not solely because of age.

Lastly, adequate preoperative optimization should be requested for all geriatric patients to help minimize perioperative complications.

2.0 STUDY JUSTIFICATION.

Geriatric anesthesia is a relatively new field of interest because of the increasing number of people living to above 65 years of age .At The Kenyatta National Hospital more than 1000 geriatric patients are admitted annually into the surgical wards the majority of who undergo some form of surgery under anaesthesia and this number is likely to increase in future. Elderly patients are likely to undergo surgery than younger patients yet the fact that these patients accumulate co-morbidities with age makes the conduct of anaesthesia complex. It also affects the outcome and success of surgery.

Fortunately, there is evidence that preparing these patients well pre-operatively improves outcome. Identifying co-morbid conditions and involving medical consultants to help optimize the patient's condition is important. Good outcomes mean improved functional status for the geriatric patient and this has social, economic and health benefits.

So far, no such study has been carried out at KNH and this study will serve to evaluate our practice and provide a basis for more studies in geriatric anaesthesia. As time passes, as an anaesthetist one cannot avoid to anaesthetize a geriatric patient and as human beings we cannot avoid growing old. The recommendations emanating from the study will help in equipping anaesthetists with the necessary knowledge required when evaluating a geriatric patient.

3.0 OBJECTIVES.

3.1 Broad Objective.

To assess the practice of pre-anaesthetic evaluation of geriatric patients by anaesthetists at KNH.

3.2 Specific objectives.

- i) To determine the timing of pre-operative evaluation of geriatric patients at KNH.
- ii) To assess how risk stratification and functional status of the patients are determined.
- iii) To assess the choice of routine v/s specific pre-operative tests for geriatric patients.
- iv) To find out if pre-operative optimization of geriatric patients is requested for by anaesthetists
at KNH.
- v) To formulate recommendations on how to improve preoperative evaluation of geriatric patients.

3.3 RESEARCH QUESTION.

Does the quality of pre-anaesthetic evaluation of geriatric patients at KNH measure up to established international standards?

$Z^2_{(1-\alpha/2)}$ is the standard error of the mean corresponding to a 95% confidence interval and the corresponding value from a t-table is 1.96

P is a proportion in this case the rate of cancellation of surgery on the day of surgery due to patient being unprepared and this can be avoided by a good preoperative evaluation. This was found to be about 7% in most studies⁴⁰.

d is the target margin of error which was put at 5 per cent.

$$n = \frac{1.96^2 \times 0.07 (1 - 0.07)}{0.05^2}$$

Thus $n = 100$

The distribution was as follows;

General surgery – 60, Orthopaedics – 32, Gynaecology – 8

Note; this were 100 patients translating into 100 pre-anaesthetic reviews.

4.5 Sampling procedure.

The eligible patients were recruited into the study from the theatre list prepared by the surgical team thus requiring a preanaesthetic evaluation. Consecutive sampling was used to select the patients.

4.5.1 Inclusion criteria

1. Patients aged 65 years and above planned for elective surgery in the general surgery, orthopedic and gynecological wards.
2. All anesthetists who review these patients before surgery including consultants, SHO, qualified and trainee clinical officers.

3. Eligible patients who consent to participate in the study.
4. All anaesthetists who consent to participate in the study.

4.5.2 Exclusion criteria.

1. Non consenting patients.
2. Non consenting anesthetists.
3. Patients requiring emergency surgery as decided by the surgical team.

4.6 Data collection procedure

Data was collected during a period of three months from March 2010 to May 2010. The eligible patients who formed the basis of a preanaesthetic review or their next of kin for those unable to give consent completed and signed a consent form before being involved in the study. The anaesthetist reviewing the patients also gave an informed written consent. The consenting process involved explaining to the patients and anaesthetists the aim of the study, the procedure, confidentiality and use of the results. The data was collected using a questionnaire which was filled by the investigator. The information was from the medical records including the preanaesthetic evaluation notes. The investigator looked for the history, physical examination, tests done and any other management instituted before surgery as requested for by the anesthetist. In some cases the investigator interviewed the patients and anesthetists to clarify but not to add to the information from medical records. This was for the purpose of data quality control. Once data was collected from the patient's file, an orange sticker was put on the cover of every file to avoid double recruitment. There was a short follow up on the morning of surgery to capture the patients who may have been reviewed late at night or on the day of surgery.

The data collected was coded, entered and managed in Microsoft Access database. It was analyzed using SPSS version 17.0 and is presented in tables, graphs and in prose.

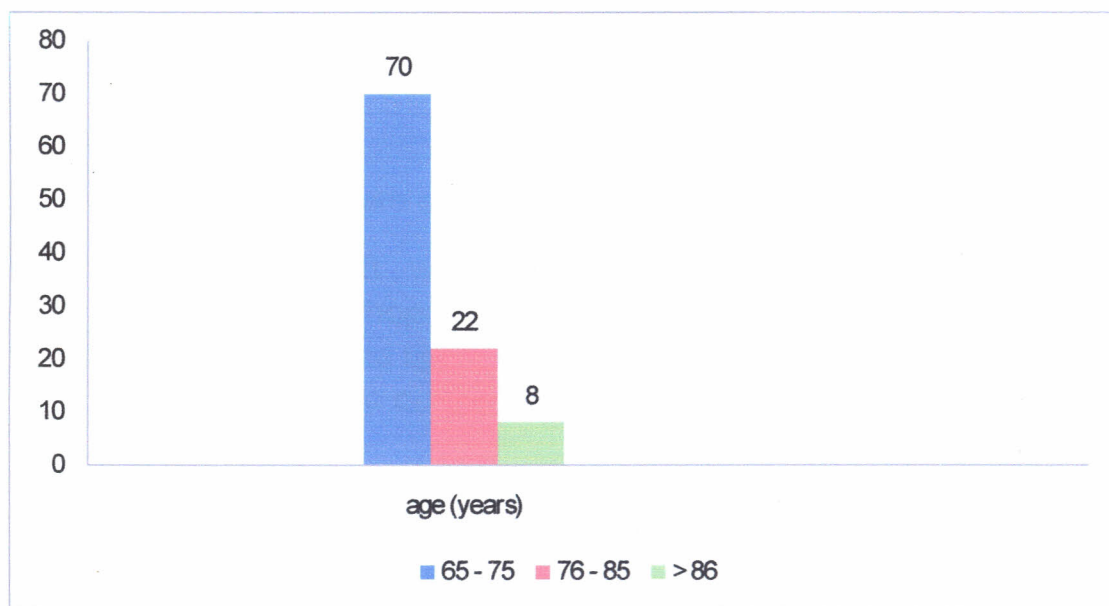
5.0 ETHICAL CONSIDERATIONS.

1. The study involved feeling a questionnaire from medical records and interviews, no invasive procedure was carried out.
2. Participants in the study were required to give a written informed consent after the nature of the study was explained to them.
3. The participants' confidentiality was maintained throughout the study and no names were used in the questionnaire.
4. Any information which was deemed important in the management of the patient was communicated to the surgical team by the investigator.
6. Approval was obtained from the KNH/UON Ethical and Research Committee before the study was undertaken and the results will be availed to the same committee.

6.0 RESULTS.

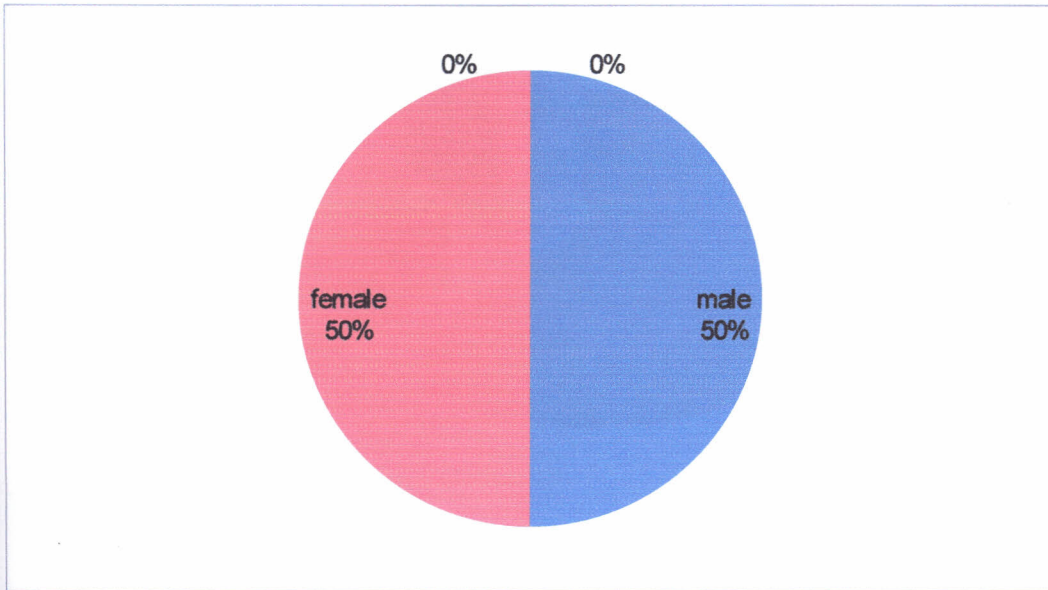
The study involved 100 geriatric patients who formed the basis of a preanaesthetic evaluation by the anaethetists at Kenyatta National Hospital (KNH). Patients were consecutively sampled once they were put on the theatre list and thus eligible for a preanaesthetic review. Patients reviewed by the investigator were not included in this study. Figure 1 below shows the age distribution.

Figure 2- Age distribution.



The mean age was 72.6 yrs with a standard deviation of 7.8 yrs. The patients' ages ranged from 65yrs to 92 yrs. The exact age was found in the medical records and confirmed from the patient incases where medical records were unclear.

Figure 3- sex distribution.



50% of the patients were male while 50% represented females.

Majority of the patients were general surgical patients representing 60% of the patients. 32% were orthopedic patients and the rest were gynecological patients as shown in the figure 4 below. This was in keeping with the 2008 statistics of KNH used to calculate sample size for this study.

Figure 4- surgical specialty.

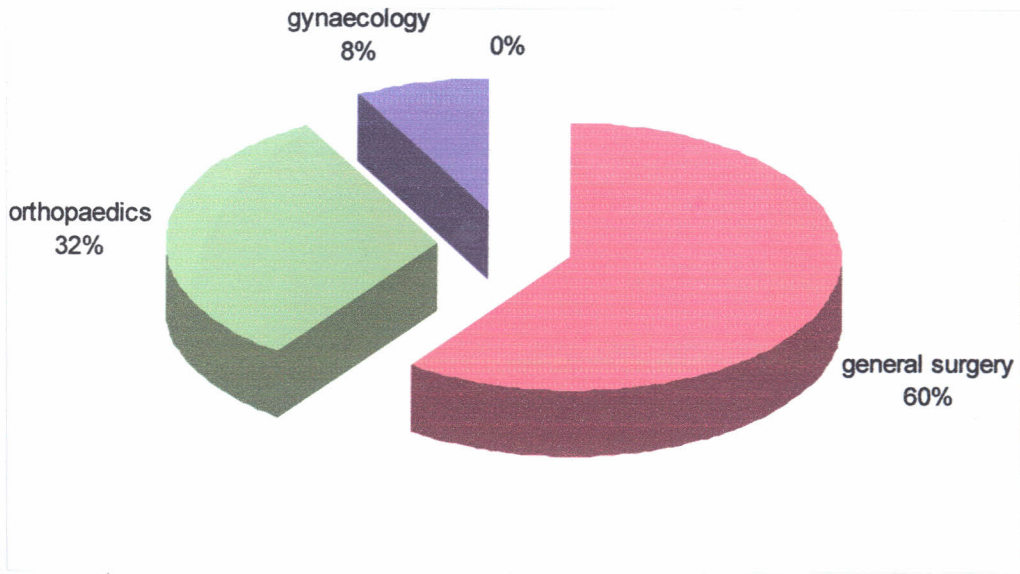
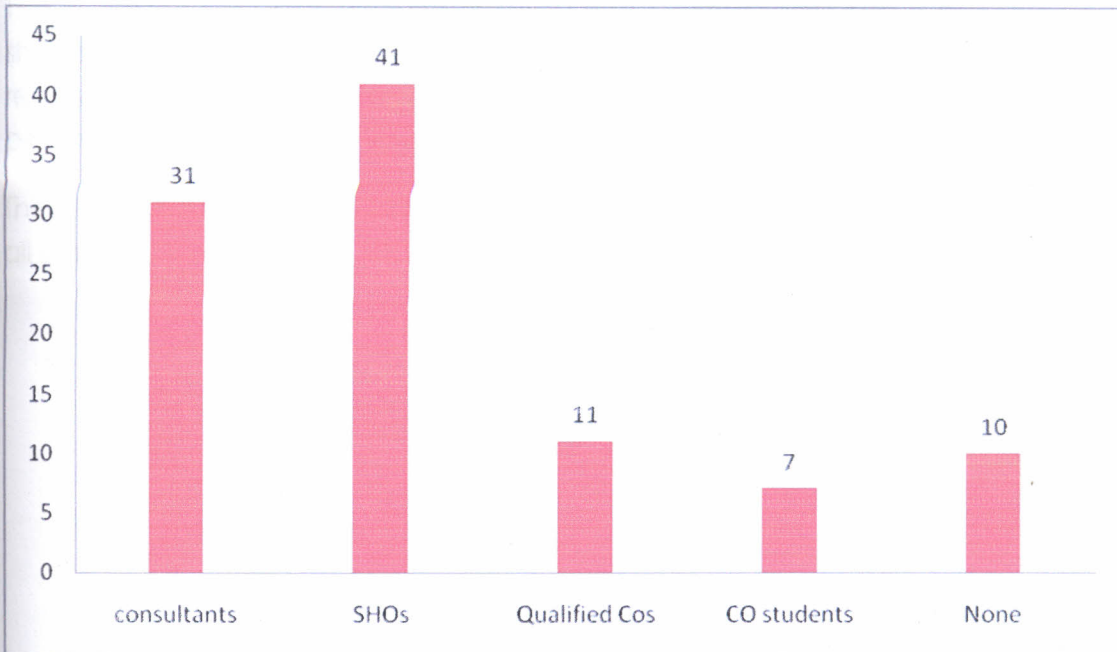
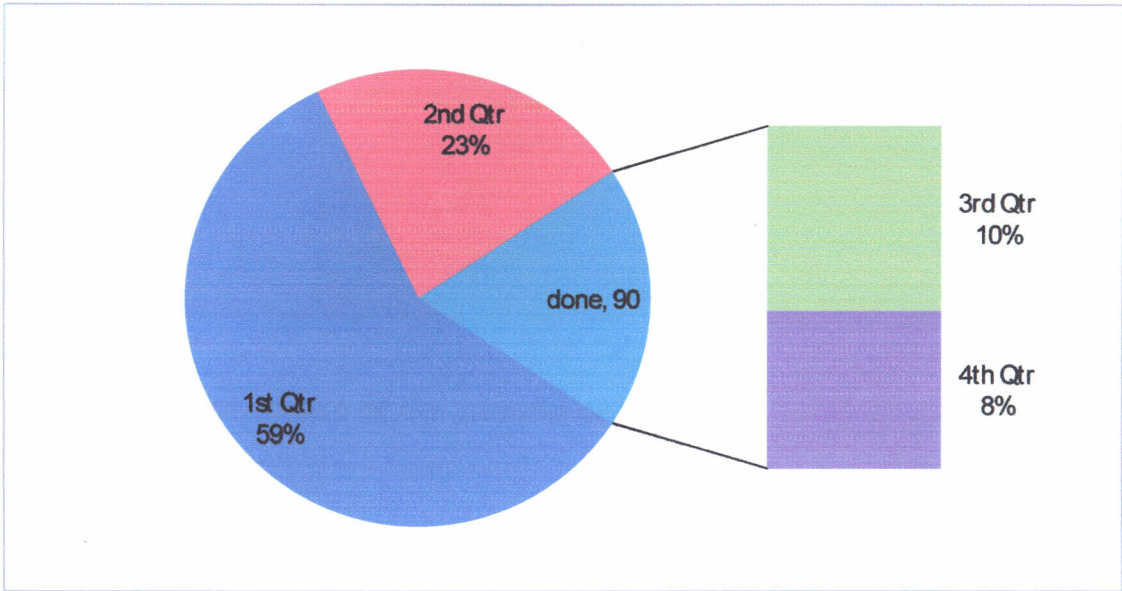


Figure 5 – cadre of anaesthetist.



The bar graph in figure 5 represents the cadre of anaesthetists who reviewed the patients. Most patients that is 47% were reviewed by anaesthetists in training, 41% by SHOs and 7% by CO students. These trainees are supervised by consultants. 31% were reviewed by consultants and the rest by RCOs. However 10% of the patients were not evaluated preoperatively.

Figure 6- Timing of preoperative evaluation.



The timing of preoperative evaluation was categorized into three groups as shown above in figure 6. Most patients making 81% of the study population were reviewed on the day before surgery. Several days before surgery included all patients reviewed > 24 hours before surgery.

The risk assessment was determined by the ASA Physical Status Classification in all patients reviewed as shown in table 1 below.

Table 1 – Risk assessment

	ASA Classification	Surgical grade	Other
Number of patients	90	0	0

Figure 7 - Prevalence of co- morbid conditions.

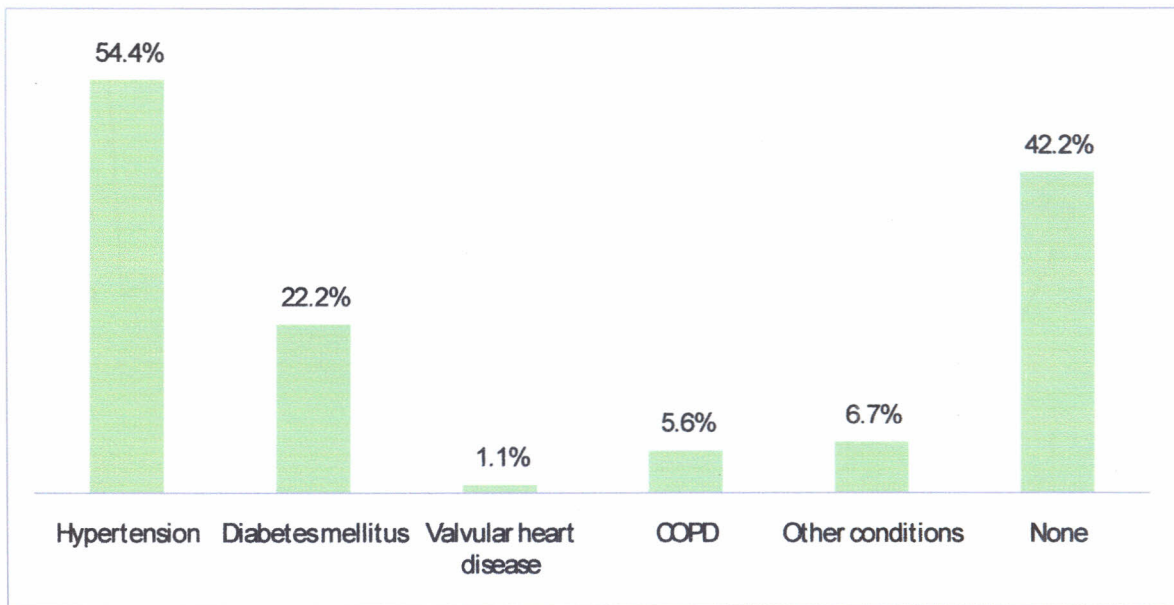


Figure 7 above shows the prevalence of co-morbid conditions in the study population as documented in the medical records. HTN and DM were the most prevalent co morbid conditions. 1 patient had valvular heart disease while 5 had COPD. Other co- morbid conditions included dyslipidaemia, goiter and peptic ulcer disease.

More than 50% of the patients had 1-2 co-morbidities. The commonest combination was DM/HTN. Only 2 patients were noted to have 3 co-morbid conditions (figure 8). Figure 9 below shows that the older the patient the more likely they were to have a co-morbid condition. 75% of patients > 86 years had co-morbid conditions as compared to 63.2% and 65% of the other age groups.

Figure 8- Number of co morbid conditions per patient.

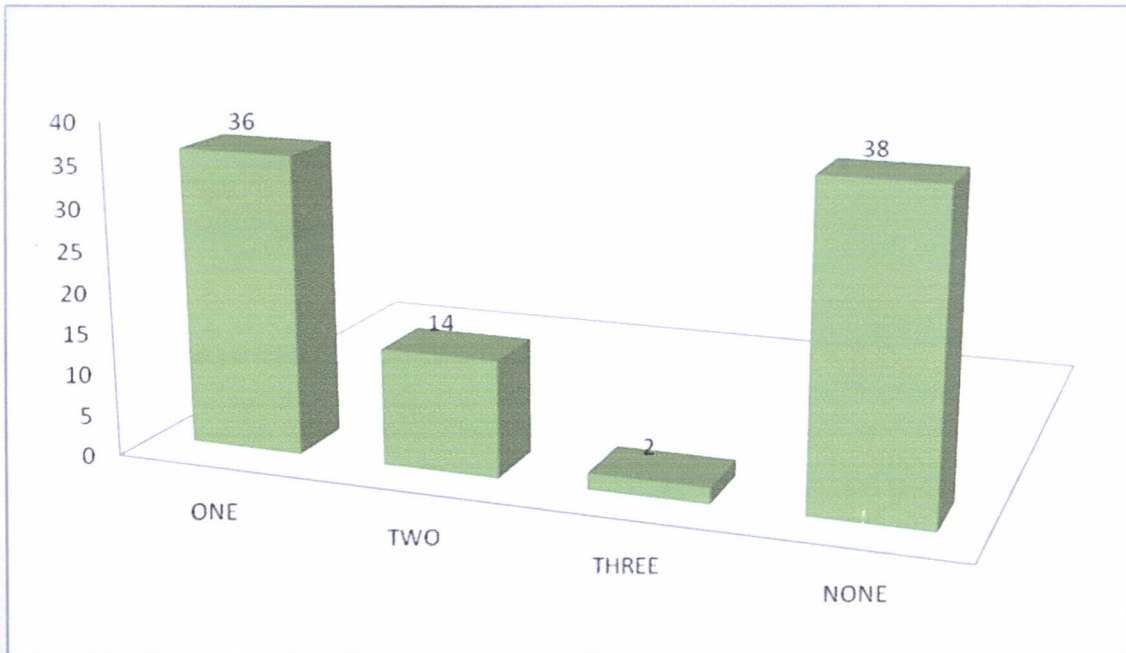


Figure 9- Prevalence of co morbidities per age group

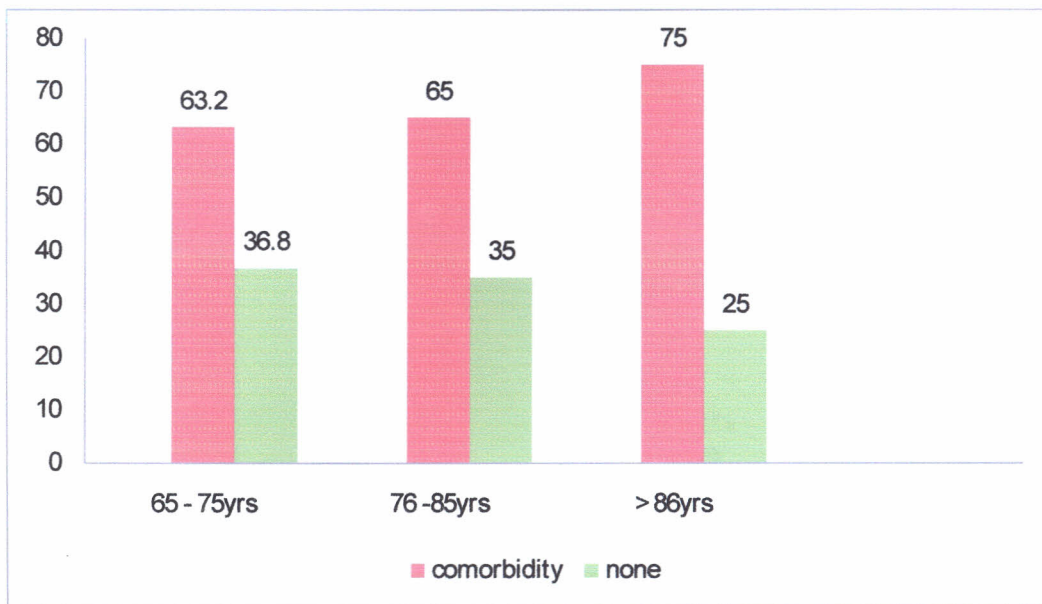
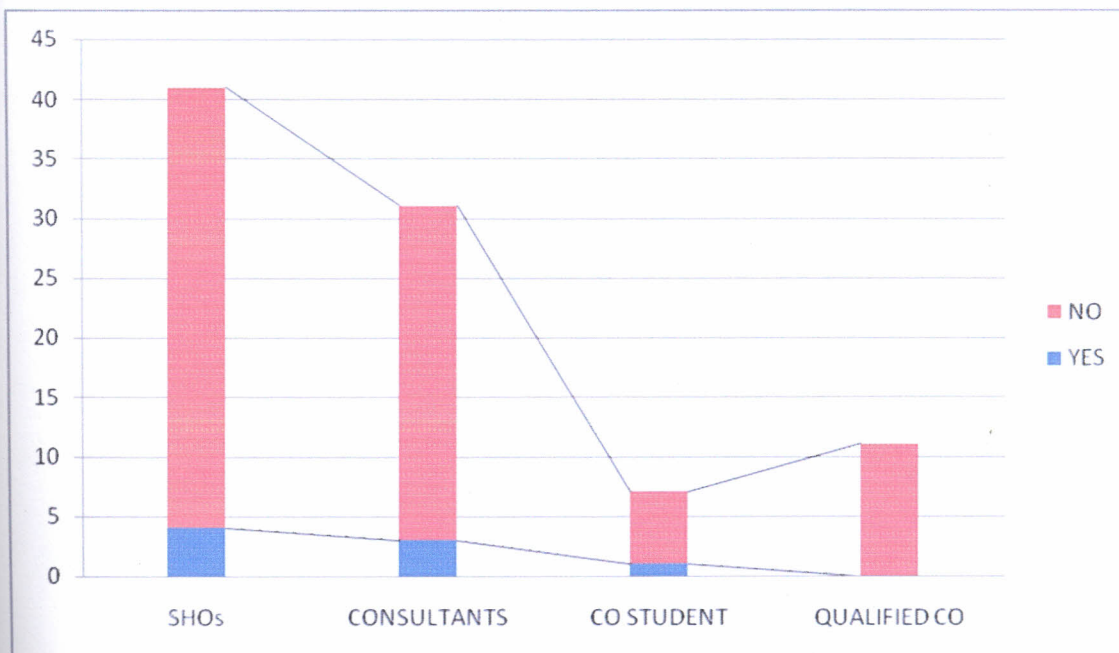
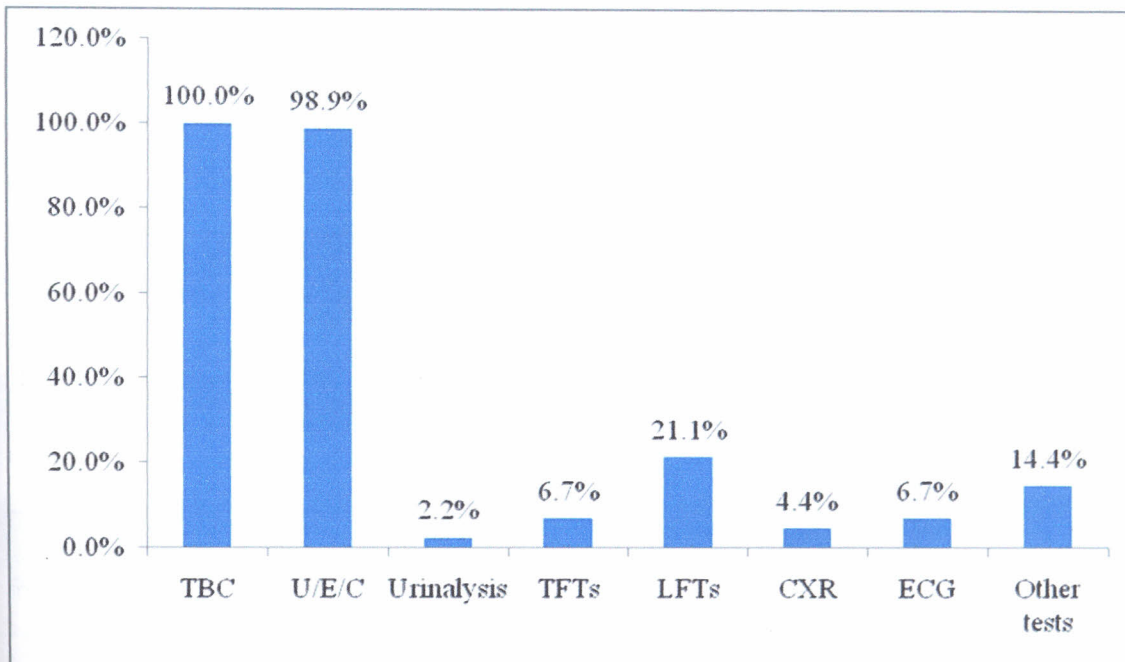


Figure 10 - Assessment of functional/mental status.



Most patient's functional /mental status were not evaluated preoperatively at least as documented from the medical records.

Figure 11 – Preoperative tests



A general analysis of the tests done for the patients is represented by the bar graph above. Almost all patients had a TBC and U/E/C representing 100% and 98.9% respectively. LFTs were done in 21.1% of the patients. Only 6 patients had an ECG done and 2 were evaluated with an echocardiogram. The category 'other tests' included RBS, coagulation profile, lipid profile and echocardiogram.

Table 2 below shows the choice of the tests for patients with different co-morbidities.

Table 2- Choice of tests and presence of co-morbid condition.

	HTN	DM	Valvular heart disease	COPD
LFTS	10	8	0	1
TFTS	2	1	0	0
RBS	5	8	0	1
CXR	2	2	1	3
ECG	4	1	1	0
ECHO	1	0	1	0

Lipid profile 1- dyslipidaemia.

Coagulation profile 3 - obstructive jaundice, CBD obstruction, diabetic foot.

Table 3-Cadre of anaesthetist and choice of tests.

Tests	Cadre of anaesthetist				P value
	Consultant	SHO	Qualified CO	CO student	
TBC	31 (34.4%)	41 (45.6%)	11 (12.2%)	7 (7.8%)	-
U/E/C	31 (34.8%)	40 (44.9%)	11 (12.4%)	7 (7.9%)	0.751
Urinalysis	2 (100.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0.273
TFTs	4 (66.7%)	2 (33.3%)	0 (0.0%)	0 (0.0%)	0.329
LFTs	8 (42.1%)	7 (36.8%)	3 (15.8%)	1 (5.3%)	0.739
CXR	3 (75.0%)	1 (25.0%)	0 (0.0%)	0 (0.0%)	0.338
ECG	5 (83.3%)	1 (16.7%)	0 (0.0%)	0 (0.0%)	0.074

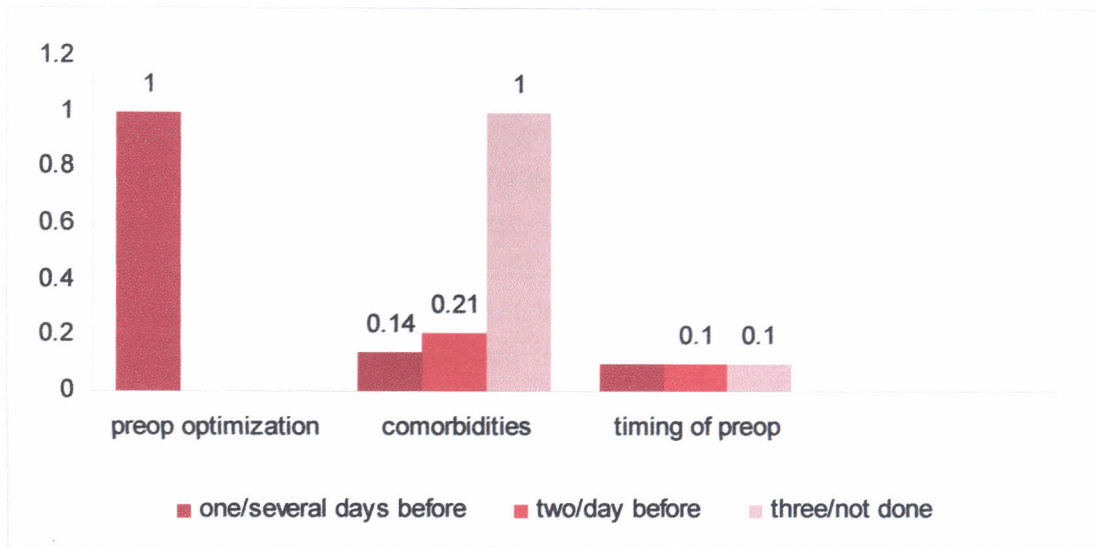
Table 3 above shows that there was no statistical significance (that is P value < 0.05) in the association between cadre of anaesthetist and request for tests. This could be due to cross consultation and supervision of the anaesthetists in training by the consultants.

Table 4 - optimization

Variable	Frequency (%)
Preoperative optimization	
Yes	33 (36.7)
No	57 (63.3)
Medical consultation	
Yes	9 (10.0)
No	81 (90.0)
Surgery postponed/cancelled	
Yes	10 (11.1)
No	80 (88.9)

36.7% of reviewed patients had preoperative optimization requested for. This was in form of a request to control blood sugar or blood pressure and an order to convert some diabetic patients to a glucose potassium infusion. Despite a high prevalence of co- morbid conditions medical consultations were only requested for in 10% of the patients. Of the patients reviewed, 10 had surgery postponed or cancelled (reasons for postponement/cancellation were not determined in this study). All patients who had their surgery cancelled/postponed had preoperative optimization requested for while 4 of them had a medical consultation requested for.

Figure 12 -Factors associated with postponement/cancellation of surgery.



Request for preoperative optimization, presence of co-morbidities and timing of preoperative evaluation were associated with postponement/cancellation of surgery using proportions as shown in figure 11 above. Surgery was likely to be postponed/cancelled when preoperative optimization was asked for. The more co-morbidities a patient had the higher the chance of rescheduling surgery. There was a 10% chance of rescheduling surgery despite the timing of preoperative evaluation.

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7.0 DISCUSSION.

Geriatric anaesthesia is a new but rapidly growing field of anaesthesia involving patients aged 65yrs and above due to the growing number of this group of patients^{1,2}. The study was an observational, descriptive cross-sectional study involving 100 geriatric patients. These patients were consecutively sampled from the general surgical, orthopedic and gynaecological wards once they were put on the theatre list thus requiring a preanaesthetic review. The patients were divided into three age groups that is 65 -75 yrs (the elderly), 76-85 yrs (the old) and 86yrs and above (the very old). This is important because the physiological changes in the different organ systems and the accumulation of co-morbidities increases with age and thus the older the patient the higher the risks of exposure to surgery and anaesthesia^{4,5}. 8% of the patients in this study were very old and studies have shown good outcomes following surgery even in this age group⁶.

The American Society of Anaesthesiologists recommends that the preanaesthetic evaluation of the elderly scheduled for elective surgery be accomplished several days before surgery. This is best done in the preanaesthetic clinics with the anaesthesia team involved from the start^{23,39}. Majority of geriatric patients in the study were reviewed on the day before surgery this being the first contact between the anaesthetist and the patient. Some patients did not have any form of preoperative evaluation. ASA recommends that all patients should be reviewed before surgery²³. The timing of preoperative evaluation is important to allow for time to carry out tests and optimize the patient to avoid postponement/cancellation of surgery due to uncontrolled co-morbidities on the day of surgery. In this study, all patients who had their surgery rescheduled had preoperative optimization requested for. Although reasons for cancellation of surgery were not considered in this study, uncontrolled co-morbidities could be a contributing factor since the higher the number of co-morbidities the higher was the chance of having surgery rescheduled.

Risk assessment in geriatric patients is difficult because of great heterogeneity of the patients⁷. The ASA Physical Status classification gives a relatively comparable risk assessment. All the anaesthetists used the ASA classification to assess the patients in the study.

Co-morbid conditions are common in the elderly and each co-morbid condition increases the risk of exposure to anaesthesia^{5,6}. Most patients in this study had 1-2 co-morbidities as compared with 3-5 conditions quoted in other studies⁵. The commonest co morbidity was hypertension while HTN and DM was the commonest combination of co-morbidities. This parallels observations made on geriatric patients in other studies in the United States of America although the prevalence observed in this study was lower. In one study upto 67% and 44% of the geriatric patients studied had HTN and DM respectively³⁴. This could be due to the

fact that the study only considered the documented conditions in the patient's medical records, objective screening methods may have yielded higher prevalences. There was a statistically significant correlation between age and number of co morbid conditions in this study. An inquiry of the co morbidities is recommended by the ASA guidelines³⁹. This guides the anaesthetist in knowing which tests to request for and to anticipate the effects of the disease on the various organ systems which may affect the contact of anaesthesia. A tailored anaesthetic approach can then be planned for intra/postoperatively.

After surgery the patient should be able to go back to his or her preoperative activity level or better¹⁶. This is why it is important to evaluate and document the patient's functional status preoperatively^{14,17}. If surgery /anaesthesia make the patient worse functionally the success of surgery should be questioned even if the procedure was technically adequate¹⁸. High incidence of subtle cognitive impairment preoperatively and postoperatively requires that the mental status of geriatric patients be assessed during the preanaesthetic evaluation¹³. There was a general lack of assessment of functional/mental status of the patients in this study.

The choice of specific tests is emphasized where tests are indicated by co- morbid conditions and the type of surgery contemplated. It's generally agreed that routine tests may not add value or change management²². Almost all patients reviewed in this study had a TBC and U/E/C requested for. These 2 tests were routinely used since they did not take into consideration the type of surgery or the co- morbid conditions of the patient. The other tests were chosen depending on the patient's co-morbidities and the type of surgery although this was erratically used. Currently the Kenyatta National Hospital has no guidelines /protocol to guide choice of preoperative tests. The nearest we have for guidelines are the requirements before a patient is received into theatre where all patients are required to have a TBC and U/E/C. This has no scientific basis and may increase costs without influencing management. The "Practice Advisory for Preanaesthetic Evaluation " from the ASA gives a guideline on the recommended laboratory tests depending on the patient's age, co- morbid conditions and type of surgery³⁹. In these guidelines some tests like ECG is required in all geriatric patients especially those aged 75 yrs and above. This is because of the high incidence of major ECG abnormalities found preoperatively and high incidence of new ECG abnormalities postoperatively in this age group^{24,27,29}. A major limitation during the study was that most tests were requested for by the surgeons who therefore tended to request for tests important for surgical management and not anaesthesia. However the anaesthetist can request for further tests where needed.

Preoperative optimization involves correction of any abnormality detected by history, examination and tests before surgery⁶. In this study it was observed that the anaesthetists requested for preoperative optimization. This was mainly in diabetics where control of blood glucose and conversion to glucose potassium infusion before surgery were requested for. Some hypertensive patients also had control of blood pressure asked for. Preoperative optimization had a significant association with cancellation of surgery. Roy et al showed that optimizing cardiac function and blood sugar decreased postoperative morbidity and mortality in geriatric patients¹. Despite the high prevalence of co-morbid conditions, the involvement of medical consultants was low. It is recommended that a medical consultation be made for all patients with co-morbidities³⁴. There is also evidence that involvement of medical consultants in the management of patients with medical co-morbidities improves outcomes and reduces costs.

8.0 CONCLUSIONS.

- Preoperative evaluation of geriatric patients at the KNH is mainly done on the day before surgery. It is done in the wards once the patient is put on the theatre list.
- Anaesthetists at the KNH use the ASA physical status classification to determine anaesthetic/surgical risk in geriatric patients.
- Functional/mental status assessment was done in only 8.9% of the patients in the study.
- There are no guidelines or protocol to guide the choice of specific preoperative tests in geriatric patients at the KNH.
- Anaesthetists at the KNH request for preoperative optimization while medical consultation was requested for in only 11.1% of the patients reviewed.

9.0 RECOMMENDATIONS.

1. Geriatric patients should be reviewed several days before surgery. To facilitate this without increasing costs, preanaesthetic clinics run by anaesthetists should be established alongside already operating surgical outpatient clinics. This will facilitate review, testing and optimization of patients before they are admitted.
2. Guidelines / protocol should be formulated to guide all aspects of preoperative evaluation of geriatric patients. Better still a comprehensive preanaesthetic evaluation form which will capture all the important information should be considered. This will facilitate proper documentation for purposes of communication, follow up and medicolegal purposes.
3. Emphasis should be put on the importance of involvement of medical consultants in geriatric patients with medical co- morbidities. This co- management can well be done at the preanaesthetic clinics where these patients are referred to medical outpatient clinics or a consultant is requested to review them at the preanesthetic clinics.
4. Further studies need to be done in other aspects of perioperative management of geriatric patients to come up with conclusions on outcomes following changes in perioperative management.

APPENDIX 1

QUESTIONNAIRE

PATIENT INFORMATION

SERIAL NUMBER.....

GENDER..... AGE..... DATE.....

DIAGNOSIS.....

WARD.....

CADRE OF ANAESTHETIST

CONSULTANT SHO QUALIFIED CO CO STUDENT

TIMING OF PREOPERATIVE EVALUATION.

SEVERAL DAYS DAY BEFORE SURGERY NOT DONE
BEFORE SURGERY

RISK STRATIFICATION.

ASA SURGICAL GRADE OTHERS

COMORBID CONDITIONS (tick as appropriate)

- i)Hypertension.
- ii)Diabetes mellitus.
- iii)Cardiac disease.
- iv)Pulmonary disease.
- v)Other

v)None

TESTS DONE FOR THE PATIENT ACCORDING TO PRESENCE OF COMORBID CONDITIONS. (Tick as appropriate)

	TBC	UEC	Urinalysis/ microscopy	TFTs	LFTs	CXR	ECG	Others (specify)
Hypertension								
Diabetes mellitus								
Valvular heart disease								
COPD								
Others								
None								

FUNCTIONAL AND MENTAL STATUS ASSESSMENT

How was functional and mental status assessed? (Tick as appropriate).

- i) Activities of daily living YES NO
- ii) Instrumental activities of daily living YES NO
- iii) Urological function YES NO
- iv) Mini mental status examination YES NO
- v) Alcohol dependence YES NO

PREOPERATIVE OPTIMIZATION.

- i) Was preoperative optimization requested for? YES NO
- ii) Was a medical consultation requested for? YES NO
- iii) Was surgery postponed or cancelled? YES NO

APPENDIX 2

CONSENT EXPLANATION.

ASSESSMENT OF PREOPERATIVE EVALUATION OF GERIATRIC PATIENTS BY ANAESTHETISTS AT THE KENYATTA NATIONAL HOSPITAL.

Introduction: My name is Dr Nabulindo M .Susane, a post graduate student in anesthesia at the University of Nairobi. Am conducting a survey on the preoperative assessment of geriatric patients at the Kenyatta National Hospital. The research will take place between March and May 2010.

Purpose of the study: The aim of this research is to assess our local practice and compare it to the international guidelines with the intention of identifying weaknesses and strengths and come up with recommendations on how to improve our practice and help improve patient outcomes. The data generated will be used strictly for research purposes.

Interventions: The procedure will involve the use of a questionnaire and there will be no interventions.

Voluntary participation: Your participation in this study is entirely voluntary. You reserve the right to withdraw from the study at any stage.

Risks and benefits: You are not exposed to any risks by participating in this study. The data collected will be used to come up with recommendations to improve the care of elderly patients going for elective surgery.

Confidentiality: Confidentiality and research ethics will be guaranteed throughout the research. Serial numbers instead of names will be used to identify participants.

Contacts: For any questions or clarifications you can contact the following people;

Dr. Nabulindo M. Susane-0721418587 or susanenabulindo@yahoo.com

Dr. Patrick Olang'- 0722523116 or patrick.olang @uonbi.ac.ke

This proposal has been reviewed and approved by the KNH/UON Ethics and Research Committee. Upon acceptance to participate in the survey, please sign the provided informed consent form.

Thank you.

INFORMED CONSENT FORM

ANAESTHETIST'S SECTION

I....., ofdo hereby consent to participate in the above study whose relevance and risks have been explained to me by the researcher. I have not been coerced or enticed with any benefits and agreed to take part in this study voluntarily. I have also been assured of my right of confidentiality and have been assured that i can withdraw from the study at any stage without any risk of victimization.

Signature.....

PATIENT'S/NEXT OF KIN'S SECTION

I..... of do hereby give consent for myself/my relative to participate in the above study whose nature, benefits and risks have been fully explained to me by the researcher. I have not been coerced or enticed to participate and voluntarily gave permission. I have been assured of my/my relative's confidentiality and that am free to withdraw from the study at any stage.

Signature

RESEARCHER'S SECTION

I have explained the nature of the study to the participants detailing the benefits and risks of the study and have not withheld any information. I have assured the participants of their confidentiality and the right to withdraw from the study at any stage.

Signature.....

FOMU YA IDHINI KUSHIRIKI

SEHEMU YA DAKTARI.

Mimi..... kutoka mji wa nimekubali kushiriki katika utafiti huu. Umuhimu, manufaa na madhara yanayoweza kutokea nimeelezwa vilivyo na nimekubali kushiriki kwa hiari yangu mwenyewe. Pia nimehakikishiwa kuwa habari nitakazotoa zitabakia siri na nina uhuru wa kujiondoa wakati wowote.

Sahihi.....

SEHEMU YA MGONJWA/JAMAA WA MGONJWA.

Mimi.....kutoka mji wanimetoa kibali changu/jamaa wangu kushiriki katika utafiti huu. Nimeelezwa juu ya manufaa ya utafiti huu vilevile kuhusu madhara yanayoweza kutokea na nimekubali kushiriki kwa hiari yangu.

Nimeahidiwa kuwa habari zozote nitakazotoa zitabakia siri na nina uhuru wa kujiondoa kwenye utafiti huu wakati wowote

Sahihi

SEHEMU YA MTAFITI

Mimi mtafiti nimemweleza mshiriki kwa kina kuhusu utafiti huu, manufaa na madhara yote bila kuficha habari zozote. Pia nimemweleza kuwa habari zozote atakazotoa zitabakia siri na kwamba ana uhuru wa kujiondoa kwenye utafiti huu wakati wowote bila dhuluma.

Sahihi ya mtafiti.....

APPENDIX 3

STUDY BUDGET ESTIMATES

Item	Quantity	Cost in shs
Biostatistician	-	20000
Research assistant	-	6000
Ethics and research committee	-	1000
Paper	3 rims	6000
Flash drives/compact discs	2 each	1500
Printing	-	3000
Photocopying	-	2000
Other consumables(airtime/pens etc)	-	2000
GRAND TOTAL	-	41,500

APPENDIX 4

STUDY TIMETABLE

	JUL 2009	AUG 2009	SEP 2009	OCT 2009	NOV 2009	DEC 2009	JAN 2010	FEB 2010	MAR- MAY 2010	JUNE 2010	JULY 2010
Proposal development	√	√	√	√	√						
Proposal presentation						√					
Submission to ERC							√	√			
Data collection									√	√	
Data analysis										√	
Dissertation writing											√
Dissertation presentation											√

APPENDIX 6

ASA Physical Status (PS) Classification System*:

ASA PS Category	Preoperative Health Status	Comments, Examples
ASA PS 1	Normal healthy patient	No organic, physiologic, or psychiatric disturbance; excludes the very young and very old; healthy with good exercise tolerance
ASA PS 2	Patients with mild systemic disease	No functional limitations; has a well-controlled disease of one body system; controlled hypertension or diabetes without systemic effects, cigarette smoking without chronic obstructive pulmonary disease (COPD); mild obesity, pregnancy
ASA PS 3	Patients with severe systemic disease	Some functional limitation; has a controlled disease of more than one body system or one major system; no immediate danger of death; controlled congestive heart failure (CHF), stable angina, old heart attack, poorly controlled hypertension, morbid obesity, chronic renal failure; bronchospastic disease with intermittent symptoms
ASA PS 4	Patients with severe systemic disease that is a constant threat to life	Has at least one severe disease that is poorly controlled or at end stage; possible risk of death; unstable angina, symptomatic COPD, symptomatic CHF, hepatorenal failure
ASA PS 5	Moribund patients who are not expected to survive without the operation	Not expected to survive > 24 hours without surgery; imminent risk of death; multiorgan failure, sepsis syndrome with hemodynamic instability, hypothermia, poorly controlled coagulopathy
ASA PS 6	A declared brain-dead patient who organs are being removed for donor purposes	

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11th June 2010

Ref: KNH-ERC/ A/500

Dr. Nabulindo M. Susane
Dept. of Surgery/Anaesthesia
School of Medicine
University of Nairobi

Dear Dr. Nabulindo

**RESEARCH PROPOSAL: "ASSESSMENT OF PREOPERATIVE EVALUATION OF GERIATRIC PATIENTS
BY ANAESTHETISTS AT THE KENYATTA N. HOSPITAL" (P16/1/2010)**

This is to inform you that the KNH/UON-Ethics & Research Committee has reviewed and **approved** your above revised research proposal for the period 11th June 2010 to 10th June 2011.

You will be required to request for a renewal of the approval if you intend to continue with the study beyond the deadline given. Clearance for export of biological specimens must also be obtained from KNH/UON-Ethics & Research Committee for each batch.

On behalf of the Committee, I wish you a fruitful research and look forward to receiving a summary of the research findings upon completion of the study.

This information will form part of the data base that will be consulted in future when processing related research study so as to minimize chances of study duplication.

Yours sincerely

PROF A N GUANTAI
SECRETARY, KNH/UON-ERC

c.c. Prof. K. M. Bhatt, Chairperson, KNH/UON-ERC
The Deputy Director CS, KNH
The Dean, School of Medicine, UON
The Chairman, Dept. of Surgery, UON
The HOD, Records, KNH
Supervisor: Dr. P.O.R. Olang, Dept. of Surgery/Anaesthesia, UON

REFERENCES

1. David J. Cook MD, Geriatric Anaesthesia, J Am Geriatr Soc ,2nd Edition.2004.
2. Jeffrey H. Silverstein, Charles H. McLeskey, G. Alec Rooke et al .Geriatric Anesthesiology. 2nd edition.2004.
3. Muravchick S. Geroanesthesia: principles for management of the elderly patient: The biology of aging and preoperative evaluation .United States of America, 1996:1-34.
4. Jin F, Chung F. Minimizing perioperative adverse events in the elderly. Br J Anaesth .87. 2001. 608-624.
5. V Joshi, S Shivkumaran, V Bhargava et al. Journal of The Indian Academy of Geriatrics, Vol. 2; No. 1.March, 2006.
6. Hugo Quinny Cheng, MD. Perioperative Medical Care of the Elderly Hip Fracture Patient. UCSF Academic Geriatric Resource Center.2008.
7. Thomas DR, Ritchie CS. Preoperative assessment of older adults. J Am Geriatr Soc 1995; 43:811-821.
8. Finucane P, Phillips GD Flinders. Preoperative assessment and postoperative management of the elderly surgical patient. Med J Aust 1995 Sep 18; 163:328-30.
9. Muravchick S. Preoperative assessment of the elderly patient. Anesthesiol Clin North America 2000 18:71-89.
10. Mohr DN. Estimation of surgical risk in the elderly: a correlative review. J Am Geriatr Soc 1983; 99- 102.
11. Lawton MP, Brody EM. Assessment of older people: self-maintaining and instrumental activities of daily living. Gerontologist 1969; 9:179-186.

12. Keene JS, Anderson CA. Hip fractures in the elderly: Discharge predictions with a functional rating scale. *JAMA* 1982; 248:564-567.
13. McCartney JR, Palmateer LM. Assessment of cognitive deficit in geriatric patients. A study of physician behavior. *J Am Geriatr Soc* 1985; 33:467-471.
14. Raja SN, Haythornthwaite JA. Anesthetic management of the elderly: measuring function beyond the immediate perioperative horizon. *Anesthesiology* 1999; 91:909-911.
15. Millar K, Asbury AJ, Murray GD. Pre-existing cognitive impairment as a factor influencing outcome after cardiac surgery. *Br J Anaesth* 2001; 86:63-67.
16. McDowell I, Kristjansson B, Hill GB, Hebert R. Community screening for dementia: the Mini Mental State Exam (MMSE) and Modified Mini-Mental State Exam (3MS) compared. *J Clin Epidemiol* 1997; 50:377-383.
17. Katz S. Assessing self-maintenance: activities of daily living, mobility, and instrumental activities of daily living. *J Am Geriatr Soc* 1983; 31:721-727.
18. Roizen MF, Kaplan EB, Schreider BD, et al: The relative roles of the history and physical examination, and laboratory testing preoperative evaluation for outpatient surgery: The "Starling" curve of preoperative laboratory testing. *Anesthesiol Clin North Am* 5(1):15-34, 1987.
19. Roizen MF: Preoperative evaluation. In Miller RD (ed): *Anesthesia*, 4th ed, Vol 1. New York, Churchill Livingstone, 1994, pp 827-882.
20. Chung OY, Beattie C, Friesinger GC. Assessment of cardiovascular risks and overall risks for noncardiac surgery. *Cardio* 1999; 17:197-211.
21. Stima PS, Chung MD. Postoperative delirium in the elderly. *Anesth Analg*; 1995.80: 1223-1232.
22. Perez A, Planell J, Bacardaz C et al. Value of routine preoperative tests: a multicentre study in four general hospitals. *Br J Anaesth* 1995; 74:250-6.

23. Power LM, Thackray NM. Reduction of preoperative investigations with the introduction of an anesthetist-led preoperative assessment clinic. *Anaesth Intensive Care* 1999; 27:481-8.
24. Rabkin SW, Horne JM: Preoperative electrocardiography: Effect of new abnormalities on clinical decisions. *Can Med Assoc J* 128: 146-147, 1983.
25. Macpherson DS. Preoperative laboratory testing: should any tests be "routine" before surgery? *Med Clin North Am* 1993 Mar; 77:289-308.
26. Kaplan EB, Scheiner LB, Boeckmann AJ, et al: The usefulness of preoperative laboratory screening. *JAMA* .1985. 253:3576-358.
27. Gold BS, Young ML, Kinman JL, et al: The utility of preoperative electrocardiograms in the ambulatory surgical patient. *Arch Intern Med.*1992. 152:301-305.
28. Charpak Y, Blery C, Chastang C et al. Prospective assessment of a protocol for selective ordering of preoperative chest x-rays. *Can J Anaesth* 1988 May; 35(3 (Pt 1)):259-64.
29. Callaghan LC, Edwards ND, Reilly CS.Utilisation of the pre-operative ECG. *Anaesthesia*. 1995.50(6):488-90.
30. Schein OD, Katz J, Bass EB et al. The value of routine preoperative medical testing before cataract surgery. Study. *N Engl J Med* 2000 Jan 20; 342:168-75
31. Silvestri L, Maffessanti M, Gregori D et al. Usefulness of routine pre-operative chest radiography for anaesthetic management: a prospective multicentre pilot study. *Eur J Anaesthesiol* 1999; 16:749-60
- 32.Narr BJ, Warner ME, Schroeder DR et al. Outcomes of patients with no laboratory assessment before anesthesia and a surgical procedure. *Mayo Clin Proc* 1997; 72:505-509.
33. Dzankic S, Pastor D, Gonzalez C et al. The prevalence and predictive value of abnormal preoperative laboratory tests in elderly surgical patients. *Anesth Analg* 2001; 93:301-308.

34. Roizen MF. More preoperative assessment by physicians and less by laboratory tests. *N Engl J Med*. 2000 Jan 20; 342:204-205.
35. Gluck R, Muñoz E, Wise L. Preoperative and postoperative medical evaluation of surgical patients. *Am J Surg*. 1988 Jun; 155:730- 734.
36. Huddleston JM, Long KH, Naessens JM, et al. Medical and surgical co management after elective hip and knee arthroplasty: A randomized control trial. *Ann Intern Med*. 2004; 141:2838,
37. Loran DB, Hyde BR, Zwischenberger JB. Perioperative management of special populations: the geriatric patient. *Surg Clin North Am*. 2005; 85:1259-66, xi.
38. American Medical Association. Ethical Opinion 8.043: Ethical Implications of Surgical Comanagement. Chicago: American Medical Association: 2000. Accessed November 26, 2007.
39. Sheila R. Barnett M.D .syllabus on geriatric anaes:Preanesthetic Evaluation for the Elderly Patient.2006.
40. Craig S E. Does nurse-led pre-operative assessment reduce the cancellation rate of elective surgical in-patient procedures: *British Journal of Anaesthetic and Recovery Nursing* 2005; 6: 41-47.