Hospital Practice

Rational preoperative evaluation

Alan D. Muskett and James M. McGreevy

Department of Surgery, University of Utah, Salt Lake City, UT 84132, USA.

Summary: Clinical data from two hundred consecutive patients undergoing surgical procedures at the Salt Lake City VA Hospital form the basis of this study. Results of nine commonly ordered preoperative tests (blood count, differential, electrolytes, chemistry panel, urinalysis, prothrombin time, partial thromboplastin time, electrocardiogram, and chest X-ray) were matched with the preoperative history and physical examination and the outcome of surgery in each patient. Each test was examined by (1) the frequency with which it was ordered, (2) the frequency with which it was abnormal, and (3) the frequency with which the abnormal result affected preoperative care. A prevalence of medical illness was found in this population, with 47.5% having a major cardiovascular diagnosis, 35.5% a metabolic or endocrine disease, and 28% a major pulmonary diagnosis.

A total of 1271 tests were performed, with 477 (35.5%) showing some abnormality. However, only 76 (5.9%) changed the patient's management before surgery. All but five of these abnormalities were predictable from the clinical evaluation and these five were minor. The overall postoperative complication rate was 9%. No complication was attributed to the omission of a preoperative test. No surgical cases were cancelled during the study period based solely on a preoperative test. We conclude that many preoperative tests can be safely eliminated by ordering only those based on a specific abnormality in the history or physical examination, resulting in more cost-effective surgical care.

Introduction

The contemporary surgeon must find a balance between minimizing the risks to his or her patients and containing the cost of surgical care. Since an operative complication results in an unacceptable monetary and corporal cost, some preoperative tests will be inexpensive. The identification of these tests is the principal aim of this investigation.

Materials and methods

Clinical data from 200 consecutive patients undergoing surgical procedures at the Salt Lake City Veterans Administration Hospital form the basis of this study. This patient population is a useful one for studying preoperative evaluation, as the patients have a high prevalence of significant medical illnesses. Results of nine commonly ordered preoperative tests (blood count, differential, electrolytes, chemistry panel, urinalysis, prothrombin time, partial thromboplastin time, electrocardiogram, and chest X-ray) were matched with the preoperative history and physical examination and the outcome of surgery in each patient. Each test was examined by (1) the frequency with which it

was ordered, (2) the frequency with which it was abnormal, and (3) the frequency with which the abnormal result affected preoperative care.

Results

A high prevalence of medical illness was found in this population, particularly involving the cardiovascular, pulmonary, and metabolic systems of the patients. Results are summarized in Table I. The mean age of the group was 56 years, with a mean cigarette consumption of 32 pack years.

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One hundred and eleven patients had general anaesthetics, 52 regional, and 37 local. The general surgery service performed 58 of the 200 procedures, ortho-

Correspondence: A.D. Muskett, M.D.
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Table I Medical profile by systems (*n* = 200)

System	Number involved	%
Cardiovascular	95	47.5
Hypertension	55	
Peripheral vascular disease	28	
History of MI	25	
Angina	19	
Chronic CHF	14	
Endocrine/metabolic	71	35.5
Alcoholism	28	
Diabetes	26	
Pulmonary	56	28.0
COPD	26	
Central nervous system	40	20.0
History CVA	10	
History TIA	7	
Psychiatric illness	7	
Dementia	6	
Infectious disease	21	10.5
Renal	16	8.0
ESRD/Dialysis	8	
Acute renal failure	2	
Transplants	2	
Genitourinary	29	10.5
Gastrointestinal	21	14.5
Haematological	14	7.0

MI = myocardial infarction; CHF = congestive heart failure; COPD = chronic obstructive pulmonary disease; CVA = cerebral vascular accident; TIA = transient ischaemic attack; ESRD = end-stage renal disease.

opaedic surgery 35, ophthalmology 23, plastic surgery 20, urology 19, neurosurgery 18, otolaryngology 14, and cardiothoracic surgery 14 procedures. The average postoperative stay was 7 days; the median stay 4 days.

Table II Summary of laboratory, X-ray and electrocardiogram results

Test	Number ordered	%	Number abnormal	%	Abnormal results changing therapy	%
Complete blood count	199	(99.5)	121	(60.8)	18	(9.0)
White cell differential count	155	(57.5)	54	(34.8)	8	(5.1)
SMA7†	117	(58.5)	77	(65.8)	24	(20.5)
SMA20†	108	(54.0)	88	(81.4)	9	(8.3)
Urinalysis	174	(87.0)	39	(22.4)	9	(2.6)
Prothrombin time	128	(64.0)	5	(3.9)	0	(0.0)
Partial thromboplastin time	126	(63.0)	5	(3.9)	0	(0.0)
Electrocardiogram	145	(72.5)	53	(36.5)	2	(1.3)
Chest X-ray	119	(59.5)	35	(29.4)	6	(5.0)

† See Table III; SMA = sequential multiple analysis.

Complications occurred in 18 patients giving an incidence of 9%. There was no mortality. Cardiovascular complications were most common, with 7 patients involved. All had preoperative electrocardiograms which were unchanged from previous tracings. Five patients suffered wound infections, three of whom had a perforated viscus. All three patients with pulmonary complications had chest X-rays which were interpreted as normal in two cases, with the third patient having a carcinoma of the lung. There were three vascular graft thromboses related to technical errors. No complications were predictable from preoperative testing. No operative cases were cancelled during the period of this study due to unsuspected laboratory abnormalities.

Discussion

Despite the fact that 35.5% of the 1271 tests performed displayed some abnormality, only 76, or 5.9%, of the tests actually affected the care of the patient before operation. Of the 76 tests affecting care, only 5 were unsuspected on the basis of clinical history and physical examination.

The remaining 71 tests which resulted in clinical decisions were predictable from the presenting history and physical examination.

Clinicians may argue that laboratory tests detect potentially dangerous but clinically silent abnormalities. Sandler (1979) found routine blood counts and urinalysis helpful in less than 1% of medical outpatients presenting for diagnosis. Kaplan *et al.* (1982) found no haemoglobin abnormalities, one platelet, and one white blood cell abnormality in 610 blood counts in healthy subjects. Robbins & Rose (1979) found no unpredicted partial thromboplastin times in 1025 studies. Eisenberg *et al.* (1982) found one patient in 480 who may have benefited from routine prothrombin and partial thromboplastin screening. Delahunt & Turnbull (1980) found 63 unpredicted

Table III Factors predicting abnormal preoperative tests requiring intervention ($n = 200$)**Complete blood count**

Acute inflammatory conditions (WBC)
 Active bleeding (Haematocrit)
 Renal failure (Haematocrit and WBC)
 Known anaemia (Haematocrit)
 Malignancy
 Symptoms of haematological disease

Differential

Acute inflammatory conditions
 Haematological malignancy

Electrolytes, glucose, creatinine (SMA7)

Diabetes
 Renal failure
 Diuretic use
 Gastrointestinal losses

Chemistry profile (SMA20, includes SMA7)

Liver, biliary disease
 Parathyroid disease
 Diabetes mellitus
 Renal failure
 Diuretic use
 Gastrointestinal losses

Urinalysis

Urinary symptoms
 Diabetes mellitus

Prothrombin time

Anticoagulant therapy
 Liver disease

Partial thromboplastin time

Bleeding history

Electrocardiogram

History of cardiac disease
 Symptoms of cardiac disease

Chest X-ray

Abnormal history or physical examination
 (i.e. congestive heart failure, pneumonia)

abnormalities in 1792 blood and X-ray tests in routine surgical cases, none of which affected the care of the patient.

Seymour *et al.* (1982) and Loder (1978) support the use of routine chest radiography in elderly patients, citing their value in detecting unsuspected disease and their value as a baseline. However, the National Study by the Royal College of Radiologists (1979), involving 10,619 preoperative chest films, found that preoperative chest radiography had no effect on preoperative decision making regardless of the abnormality detected. No 'baseline' value was detectable. Several reviews (Eddy, 1980; Frause & Carlson, 1975; Task Force on the Periodic Health Examination, 1979; Breslow & Somers, 1977) have found chest X-rays unnecessary as screening devices.

Recommendations on the preoperative electrocardiogram vary widely. Ferrer (1978) advocates one routinely in patients of all ages. Paterson *et al.* (1983), Elston & Taylor (1984) and Seymour *et al.* (1983) prefer a selective approach to preoperative electrocardiography. Rabkin & Horne (1983) found that even in patients with documented new abnormalities compared to previous tracings, there appeared to be no impact on the scheduling or conduct of the procedure.

Conclusion

While previous studies have reviewed healthy patient groups, our study examines a highly diseased patient population to test the hypothesis that significant clinical abnormalities are best detected by the history and physician examination. Our results indicate that extensive routine preoperative testing has no screening or baseline value. Certainly some preoperative investigations are appropriate, if they are based on the finding of a specific clinical abnormality, and if the result of the test might affect the care of the patient before or during the operation. This approach requires a most careful evaluation by the physician, but the resultant cost savings and decreased stress to the patient are the reward.

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