

A DISSERTATION
FOR
THE PATTISON PRIZE IN CLINICAL SURGERY
1989

FACTORS AFFECTING LENGTH OF POST-OPERATIVE BED REST
A STUDY OF SURGICAL UNITS IN
BEIJING, CHINA
AND
DUNFERMLINE, FIFE

BY
DANIEL E. PORTER



SUMMARY

An observational study was carried out on patients in surgical wards in Dunfermline, Fife and Beijing, China. Factors thought to affect length of post-operative bed rest were identified and recorded. These included unit policy, patient disability, anaesthetic technique, length of surgery, analgesia given to the patient, and post-operative complications. The relevance of this was discussed in terms of prevention of deep venous thrombosis. Differences in these factors were compared in five types of operation in Beijing and Dunfermline. Some other general observations were made.

An illustrative series of three case reports are also recorded from my surgical attachment at Dunfermline and West Fife Hospital.

INTRODUCTION

In China, a casual remark from a professor of Surgery to this elective student sparked a project into life:

"You know of course that Chinese patients suffer venous thrombosis less than Westerners in the post-operative period". Why, I thought, was this the case? Certainly a study of Hong Kong Chinese found that out of 150 patients who had major elective surgery only 2.6% had evidence of deep venous thrombosis using I^{125} labelled fibrinogen (Nandi et al, 1980). This compared with 17 - 35% in most Caucasian studies (Reasbeck et al, 1988).

Perhaps there might be clotting factor differences between races, or maybe Chinese patients are quickly ambulant after surgery reducing the risk of clot formation. I felt the latter possibility worth investigating and set out to discover any factors which might determine length of post-operative bed rest.

Workers have shown that only a small proportion of post-operative patients have clinically obvious thrombotic complications. An Australian study of 152 patients who underwent major elective surgery showed that although 36 had signs of deep venous thrombosis on I^{125} labelled fibrinogen and venogram investigations, only 6 had calf tenderness on examination and only 1 had pleuritic chest pain with a pulmonary embolus (Reasbeck et al, 1988). As I considered the design of my study it became obvious that the number of patients

I could include would fall far short of that required to show any correlation between symptomatic thrombosis and length of bed rest. However I could collect data from China and data from a future Scottish surgical attachment and compare the two. This in itself would give an interesting insight into surgical and anaesthetic management, attitudes of patients and surgeons and the spectrum of disease and patients seen. The main thrust of the project would be to determine the effect of these factors on length of post-operative bed rest and therefore indirectly on venous clot formation.

Deep venous thrombosis is a major source of concern in United Kingdom surgical units. Attempts to reduce the incidence of this post-operative complication include the use of subcutaneous heparin or low dose aspirin, avoiding pressure on the legs and elevation of the feet or use of external pneumatic calf compression (McCredie and Burns, 1986). Part of Virchow's aetiological triad for thrombus formation is increased stasis of blood, thus it is considered that the incidence of thrombosis is partly related to long periods of immobility during and after surgery. One of the first published series illustrating this was a post-mortem study of 239 patients dying from any cause, of whom 52% had thrombus in the lower limbs. No evidence of thrombus was found in those bed-ridden for less than two days prior to death. The proportion with thrombosis rose to 50% if immobilised for a week and to 90% if immobilised for more than ten days. A similar picture is seen in the 13 patients in the series who died after surgery (Gibbs, 1957). Surgical textbooks also state that post-operative atelectasis

and decubitus ulceration are less common in rapidly mobilised patients. The perceived benefit of mobilising patients quickly however must be balanced against the risk of wound breakdown. It is considered that the direct cause of wound dehiscence is inadequate closure, facilitated by general debility, infection, abdominal distension, cachexia and steroids (McCredie and Burns, 1986). Severe coughing is said to predispose to wound breakdown and thus by the same mechanism of tension on sutures early ambulation might also be thought to contribute, but I could find no evidence for this in the literature. Gibbs (1957) urges for caution in robust mobilisation, believing in a risk of detaching a non-organised thrombus. In addition, studies in Coronary Care Units show little relationship between length of bed rest and sub-clinical deep venous thrombosis (Hayes et al, 1976). The impracticality of mobilising patients under the influence of anaesthetic agents, experiencing severe pain or suffering post-operative complications is obvious and presents a challenge to medical staff.

In China, general anaesthesia is rarely used except in very major surgery. The favoured anaesthetic or analgesic techniques are those of electro-acupuncture for non-abdominal procedures, and spinal or epidural anaesthesia for intra-abdominal surgery. These are complemented with local anaesthesia and benzodiazepine hypnosis as circumstances require. Differences in anaesthetic technique, I considered, might affect venous thrombosis formation per-operatively, and influence length of post-operative bed rest.

Other factors in China which might affect bed rest after surgery were considered to be age and sex of the patient, diagnosis and pathology of the disease, type of operation, length of surgery, time of surgery in the day and post-operative complications. In Fife where fewer language problems were encountered (!) additional data was included. Analgesia given to the patient was recorded. Pre-operatively the patient gave an estimate of his anticipated length of recumbency after surgery. Pre-operative questionnaires to give a disability and psychiatric score were also completed.

METHODS

The Third Teaching Hospital of Beijing Medical University is a large general hospital located in north-west Beijing. It provides acute services in many medical and surgical specialties. A department of Traditional Chinese Medicine coexists. The General Surgical Unit consists of 100 beds for elective and emergency surgery and admits patients from a wide area of Hebei Province and from all over China for its specialist service of hepatic and biliary tract surgery. Eight million People live in Beijing, capital city of China and are free to use any hospital in the city including the Third Teaching Hospital.

Dunfermline and West Fife Hospital is a district hospital close to the centre of Dunfermline with a large general surgical unit containing 60 acute beds for emergency and elective surgery. The Casualty department admits patients from the western sector of Fife with a population of 250,000.

In both China and Fife, patients were admitted to the study if they had consented to undergo one of five operations. Thyroidectomy, Cholecystectomy, Appendicectomy, Inguinal herniorrhaphy and Mastectomy. These procedures were considered to provide the study with a reasonable spectrum of surgical experience. Both elective and emergency surgery was included.

In Beijing, 57 patients who fulfilled entry criteria were admitted consecutively to the series between 7th September and 20th October 1987. 29 patients in Dunfermline were entered consecutively between 8th September and 1st November 1988.

All patients who fulfilled entry criteria consented to be admitted to the study.

A standardised form was produced to record data in China (Fig. 1). A similar form with room for additional information was used in Fife (Fig. 2). I interrogated each patient post-operatively and used hospital notes in order to gather the data required. In Fife a pre-operative psychiatric questionnaire was completed by the patient whereupon an estimate of anticipated length of post-operative bed rest was also made by the patient. It was understood that this post-operative recumbency period would be measured from the completion of surgery to the point when the patient took his first steps out of bed. I attempted to stress to the patient that their knowledge of the study should not make them walk any earlier or later than they would otherwise do.

Length of surgery was measured from time of first incision to insertion of last stitch and was usually recorded by the anaesthetist.

The level of disability of each patient was assessed by interrogation using a separate form (Fig. 3). Work by Patrick et al (1973) enabled a classification of disability to be devised involving areas of social activity, mobility and physical activity. This was slightly modified by me in this study to produce a questionnaire giving a disability score for each patient. The score ranged from 0 - 29; thirty functional levels with zero indicating minimal disability.

A questionnaire to determine a "psychiatric score" for each patient was also used. This was taken from work by

Figure 1

Data sheet for use in China

ADMISSION N° 病历号					
BED N° 病床号		AGE 年龄		SEX 性别	
DIAGNOSIS 诊断					
TYPE OF OPERATION 手术类型					
OPERATION DATE 手术日期		TIME OF COMPLETION 手术时间(结束)			
ANAESTHESIA 麻醉	LOCAL 局麻		ACUPUNCTURE 针麻		OTHER 其它
	GENERAL 全麻		EPIDURAL 硬膜外		
POST-OPERATIVE COMPLICATIONS 手术后并发症					
DATE OF FIRST AMBULATION 第一次行走日期			TIME 时间		
TOTAL BED-REST 总卧床时间	DAYS 天数		HOURS 小时数		

Figure 2

Data sheet for use in Fife

NAME	AGE	SEX	UNIT N ^o
DISEASE :			
TYPE OF OPERATION			
DATE OF OPERATION		TIME	
DURATION OF OPERATION			
DATE OF 1 st AMBULATION		TIME	
DURATION OF NON-AMBULATORY PERIOD:-			DAYS
			HRS
PATHOLOGY :		ANALGESIA	
POST-OP. COMPLICATIONS :		ESTIMATED BED REST.	

NAME

UNIT No

SOCIAL ACTIVITY SCALE

- | | | |
|--|----|--|
| | 1. | Performed major and other activities |
| | 2. | Performed major activities but limited in other activities |
| | 3. | Performed major activity with limitation |
| | 4. | Did not perform major activity, but performed self-care activities |
| | 5. | Required assistance with self-care activities |

MOBILITY SCALE

- | | | |
|--|----|---------------------------|
| | 1. | Travelled freely |
| | 2. | Travelled with difficulty |
| | 3. | In house |
| | 4. | In hospital |
| | 5. | In special unit |

PHYSICAL ACTIVITY SCALE

- | | | |
|--|----|-----------------------------------|
| | 1. | Walked freely |
| | 2. | Walked with limitation |
| | 3. | Moved independently in wheelchair |
| | 4. | In bed or chair |

Brightwell (1979) who devised a Health History Questionnaire. 22 questions (Fig. 4) were weighted according to their likelihood of indicating need for psychiatric referral. Thus questions 4, 5, 6, 9, 10, 16, 17, 20, 21, 22 scored two points and the others scored one point if answered in the affirmative. A total score for the questionnaire was recorded.

Drugs intended or able to induce analgesia before and after surgery were recorded. I produced an analgesic index (Table 1) to approximate the total amount of analgesia given to the patient before the end of the bed rest period.

In order to prove or refute the existence of a consistent relationship between data (such as between length of bed rest and length of surgery), correlation coefficients and t-tables were used. Comparisons between means (such as average length of bed rest in China compared with Fife) involved use of a parametrical statistical test on unpaired data. Student's t-test fulfilled these criteria.

DUNFERMLINE AND WEST FIFE HOSPITAL

CONFIDENTIAL

QUESTIONNAIRE ON POST OPERATIVE BED-REST STUDY.

YES or NO

- 1. Are you ever very nervous around strangers ? _____
- 2. Do you find it hard to make decisions ? _____
- 3. Do you find it hard to concentrate or remember ? _____
- 4. Do you usually feel lonely or depressed ? _____
- 5. Do you often cry ? _____
- 6. Would you say you had a hopeless outlook ? _____
- 7. Do you have difficulty relaxing ? _____
- 8. Do you have a tendency to worry a lot ? _____
- 9. Are you troubled by frightening dreams or thoughts ? _____
- 10. Do you have a tendency to be shy or sensitive ? _____
- 11. Do you have a strong dislike for criticism ? _____
- 12. Do you lose your temper often ? _____
- 13. Do little things often annoy you ? _____
- 14. Are you disturbed by any work or family problems ? _____
- 15. Are you having any sexual difficulties ? _____
- 16. Have you ever considered committing suicide ? _____
- 17. Have you ever desired or sought psychiatric help ? _____
- 18. Have you gained or lost much weight recently ? _____
- 19. Have you lost your interest in eating lately ? _____
- 20. Do you take two or more alcoholic drinks a day ? _____
- 21. Have you ever used marijuana ? _____
- 22. Have you ever used heroin, LSD or similar drugs ? _____

UNIT NUMBER : _____

Table 1

Analgesic Index

<u>Type of Drug</u>	<u>Score for each dose</u>
Benzodiazepine	2
Compound analgesic	2
Oral opioid	3
Parenteral opioid	4
Opioid syringe pump/ 12 hours	4

RESULTS

General observations

The 57 patients admitted to the investigation in Beijing provided 20 thyroidectomies, 13 cholecystectomies, 15 appendicectomies, 5 inguinal hernia repairs and 4 mastectomies. 23 men and 34 women in all (Fig. 5). The 29 patients in Dunfermline underwent 1 thyroidectomy, 9 cholecystectomies, 4 appendicectomies, 15 inguinal herniorrhaphies and no mastectomies. There were 22 men and 7 women (Fig. 5).

The age of patients ranged from 16 to 76 years in China (mean 42.2 years) and from 14 to 82 years in Fife (mean 53.4 years). This difference was significant ($p < 0.01$) (Fig. 6). Thus the two populations studied were not well matched for age or sex. The diagnosis and pathology did, however, seem to be well matched where adequate numbers of patients were available for comparison. For example 78% of cholecystectomies in Fife and 85% in China were classified as "Chronic cholecystitis". Of appendicectomies, 50% had perforated in Fife compared with 47% in China. 87% of inguinal herniae in Fife were unilateral compared with 80% in China. For every patient in each operative category a short summary was made of the surgery performed. This revealed that highly comparable surgical procedures were used in both centres.

On Post-operative bed rest

It was discovered that various factors were related to the length of post-operative bed rest (Table 2). In China

Figure 5 Number of patients in each operation group in China and Fife according to sex.

SURGERY	THYROID-ECTOMY		CHOLECYST-ECTOMY		APPENDIC-ECTOMY		INGUINAL HERNIA REPAIR		MASTECTOMY		TOTAL	
	M	F	M	F	M	F	M	F	M	F	M	F
CHINA	9	11	2	11	7	8	5	0	0	4	23	34
FIFE	0	1	4	5	3	1	15	0	0	0	22	7

Figure 6 Age of patients in each operation group in China and Fife.

SURGERY	THYROID.	CHOLE.	APPEND.	ING. HERNIA	MAST.	TOTAL
CHINA	44.6	49.6	30.5	42.0	49.8	42.2
FIFE	49.0	54.7	32.3	58.6	—	53.4
't' and 'p' values comparing centres	—	t=0.84 p=N.S.	t=0.12 p=N.S.	t=1.33 p=N.S.	—	t=2.74 p<0.01

Table 2

Figures indicating the presence or absence of a correlation between length of post-operative bed rest and other factors.

PARAMETER TO BE CORRELATED WITH LENGTH OF BED REST		CORRELATION COEFFICIENT ('r')	LEVEL OF SIGNIFICANCE
AGE	CHINA	0.135	N.S.
	FIFE	0.307	N.S.
LENGTH OF SURGERY	CHINA	0.326	$p < 0.02$
	FIFE	0.282	N.S.
ANALGESIA		0.819	$p < 0.001$
PSYCHIATRIC SCORE		0.019	N.S.
DISABILITY SCORE		0.506	$p < 0.01$
ESTIMATED LENGTH OF BED REST		0.510	$p < 0.01$
TIME OF SURGERY IN DAY	CHINA	-0.137	N.S.
	FIFE	-0.242	N.S.

this correlated with length of surgery, but not in Fife. Amount of analgesia, disability score and estimated length of bed rest also correlated with actual length of bed rest. Parameters which varied independently with bed rest included age and psychiatric score of the patient and the time and length of surgery.

I compared sex with post-operative recumbency in two operation types in China and one in Fife (Fig. 7). In China women seemed to walk earlier than men and in Fife this was reversed, but differences were not statistically significant.

Post-operative complications were few, and were not related statistically to length of bed rest. However individual examples showed that severe complications such as myocardial infarction, stress ulcer, continuing peritonitis and prolonged incision pain could increase length of bed rest substantially above average.

The class of anaesthetic administered was largely determined by the type of operation and the centre in which surgery was performed. Thus only 1 out of 57 patients in Beijing received a general anaesthetic in contrast to Dunfermline where all but two anaesthetics were general. A comparison of general with spinal/epidural anaesthesia for inguinal hernia repairs in Fife showed a small but significantly shorter period of bed rest with general anaesthesia (18 hours compared with 21 hours, $p < 0.002$).

When breaking down data into groups based on operation-type, the only groups with adequate numbers to compare were cholecystectomy, appendicectomy and inguinal herniorrhaphy.

Figure 7

The effect of sex on post-operative bed rest in three operation groups; thyroidectomy and appendicectomy in China, cholecystectomy in Fife.

SURGERY	THYROIDECTOMY IN CHINA		APPENDICECTOMY IN CHINA		CHOLECYSTECTOMY IN FIFE	
	M	F	M	F	M	F
LENGTH OF BED REST /HOURS	17.2	6.4	30.2	8.5	23.0	31.5
't' and 'p' values comparing sex	t=1.59 p=N.S.		t=1.67 p=N.S.		t=0.97 p=N.S.	

Figure 8a

Length of post-operative bed rest in each operation group in China and Fife.

SURGERY	THYROID.	CHOLE.	APPEND.	ING.HERNIA.	MAST.	TOTAL
CHINA	11.2 Hours	76.3	18.7	56.4	34.9	33.7
FIFE	27.3	27.7	14.9	18.4	—	21.1
't' and 'p' values comparing centres	—	t=4.23 p<0.001	t=0.53 p=N.S.	t=3.64 p<0.002	—	t=2.43 p<0.02

Using these data it was found that the type of operation performed made a large difference to length of bed rest (Fig. 8a). In China, cholecystectomy and inguinal hernia repair resulted in much longer bed rest than appendicectomy and thyroidectomy. In Fife a less marked difference was seen.

The length of post-operative recumbency was less in Fife (mean 21.1 hours) than in China (mean 33.7 hours), a significant difference. This phenomenon was seen across the range of operation types (Fig. 8a).

On other findings

In Fife, a good correlation was found to exist between age and disability score. The amount of analgesia administered to the patient correlated well with both disability score and estimated length of bed rest. These correlations are recorded in Table 3. No other significant associations between factors were found in the data, notably there was no correlation of either psychiatric score or time of surgery in the day with any parameters measured.

In all types of operation, average length of surgery is significantly longer in China (mean 2.4 hours) than in Fife (mean 0.8 hours).

Looking at differences between types of operation, we find that appendicectomy was performed on younger patients than were found in other operations. Length of surgery in cholecystectomy is significantly greater than in appendicectomy and inguinal herniorrhaphy (Fig. 9). Analgesia administration is low in inguinal hernia repair (Fig. 10). Psychiatric score is

statistically high in appendicectomy (Fig. 11), but with only four patients the repeatability of this finding is in doubt. Disability score and estimated length of bed rest did not differ significantly between types of surgery (Fig. 12, 13).

Table 3

Various other significant correlations in the data.

PARAMETERS TO BE CORRELATED	r^2	LEVEL OF SIGNIFICANCE
AGE x DISABILITY	0.475	$p < 0.02$
ANALGESIA x ESTIMATED BED REST	0.486	$p < 0.02$
ANALGESIA x DISABILITY	0.478	$p < 0.02$

Figure 9 Length of surgery in each operation group in China and Fife.

SURGERY	THYROID.	CHOLE.	APPEND.	ING.HERNIA.	MAST.	TOTAL.
CHINA	2.85 HOURS	3.31	1.27	1.35	2.50	2.40
FIFE	1.42	1.14	0.69	0.72	—	0.87
't' and 'p' values comparing centres	—	t=3.70 p<0.002	t=2.58 p<0.05	t=8.12 p<0.001	—	t=4.89 p<0.001

Figure 10 Amount of analgesia given in each operation group in Fife

SURGERY	THYROID.	CHOLE.	APPEND.	ING.HERNIA.	MAST.	TOTAL
ANALGESIA SCORE	6.0	11.9	9.0	4.8	—	7.2

Figure 11 Psychiatric score in each operation group in Fife.

SURGERY	THYROID.	CHOLE.	APPEND.	ING.HERNIA	MAST.	TOTAL
PSYCHIATRIC SCORE	9.0	5.0	9.5	4.9	—	5.8

Figure 12

Disability score in each operation group in Fife.

SURGERY	THYROID.	CHOLE.	APPEND.	ING.HERNIA.	MAST.	TOTAL
DISABILITY SCORE	1	4.3	1.5	3.4	—	3.27

Figure 13

Estimated length of bed rest in each operation group in Fife.

SURGERY	THYROID.	CHOLE.	APPEND.	ING.HERNIA	MAST.	TOTAL
ESTIMATED LENGTH OF BED REST	4.0 HOURS	46.7	39.5	21.0	—	30.1

DISCUSSION

General Observations

Almost double the number of patients were admitted to the study in China compared with Fife, and over a shorter period of time. This probably reflects differences in the size of respective units.

Of interest is the relative plethora of thyroid surgery in Beijing compared with Dunfermline; the diagnosis divided between euthyroid multinodular goitre (45%) and single thyroid adenoma (40%). These are two distinct disease entities, the former relating to thyroid hormone dysfunction and the latter a benign tumour. Why thyroid pathology should be more prevalent in Beijing surgical wards is unknown.

Inguinal hernia repairs appear to be commoner in Fife than Beijing, possibly due to a higher level of primary health care in the United Kingdom. In Chinese cites a frantically busy Casualty department is the only state provision wherein the Public can inquire about painless swellings.

It is interesting that Chinese patients were on average younger than their Fife counterparts irrespective of operation type. One explanation of this might be in demographic differences; the population explosion in China has led to far more young people than elderly, whereas in Scotland the trend is reversed. In China, therefore, diseases largely affecting old people will be seen relatively more frequently in younger patients compared with Scotland.

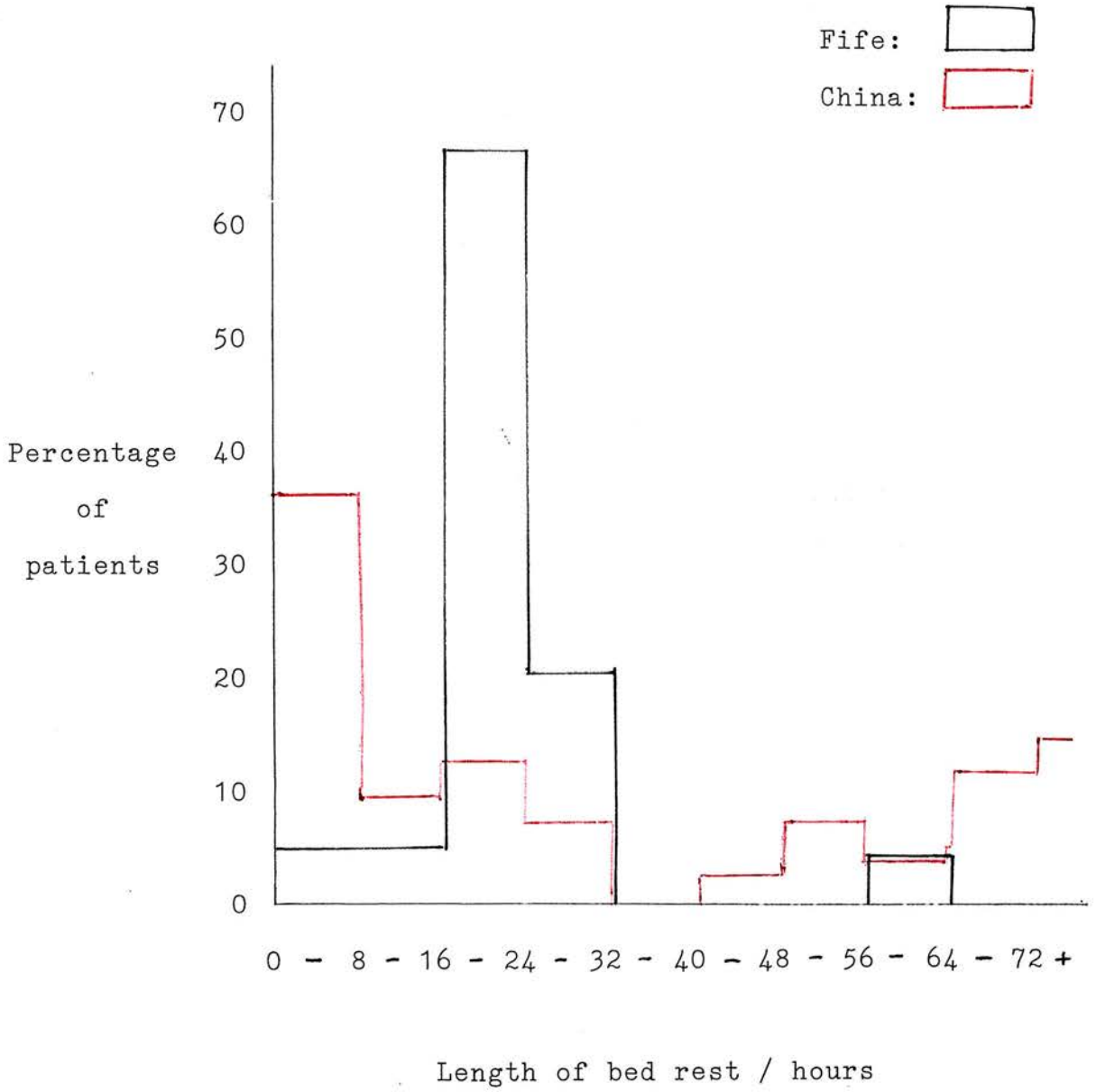
On length of post-operative bed rest

Figure 8b indicates that although average post-operative bed rest is longer in China than in Fife, a considerable number of patients are up from bed within eight hours of surgery in Beijing. This includes 65% of thyroidectomies and 53% of appendicectomies. In Fife only one patient became ambulant within 8 hours of the operation; a 14 year old girl who underwent an uncomplicated appendicectomy. This difference between centres may be explained by the nature of anaesthetic technique given. In China, spinal and epidural anaesthesia for major abdominal surgery is much more conducive to early ambulation than thiopentone-based intravenous agents. Greene (1983) reviews the literature, showing that motor block using tetracaine spinal anaesthesia terminates around 5 hours after infusion. Ambulation is quite possible thereafter. This may have implications for the United Kingdom, where spinal and epidural anaesthesia tends to be reserved for border-line "anaesthetic risk" patients in whom general anaesthesia is contraindicated. This may be the reason why the two patients with spinal/epidural block in Fife had a longer period of post-operative immobility than those receiving general anaesthesia.

In Beijing, acupuncture analgesia was used in place of other forms of anaesthesia in 95% of thyroidectomies, no doubt contributing to earlier ambulation after this type of surgery than after others. Foster et al (1987) reviews the literature to cite scientific evidence for the analgesic effect of electro-acupuncture. Both endogenous opioids and

Figure 8b

A chart illustrating percentage of patients in 8 hourly bands of post-operative bed rest.



serotonin have been implicated as mediators, as have neural pathways. The latter is shown in the work of Chiang et al (1973) in which injection of local anaesthetic into the acupuncture needling site abolished the analgesic effect of acupuncture. In Beijing local anaesthetic was used only at the incision site, if at all. This was always a few inches medial to the acu-points used in thyroidectomy. Lewith (1986) recounted from his own experience the success of acupuncture analgesia in appendicectomy with no other form of analgesia necessary. The consensus in Beijing however was that acupuncture is insufficiently effective for surgery in the abdominal cavity, and epidural anaesthesia should be used instead.

The spectrum of anaesthetic techniques used in Beijing reflects the fact that Chinese prefer to be conscious during surgery. They have traditionally feared the so-called "wai ke" - foreign medicine or surgery, which was not practiced in China before the arrival of Western influence in the nineteenth century. Thus there is a desire to remain awake during the entire procedure. Surgeons in Beijing intimated to me that although this gives the patient peace of mind, surgery is more difficult due to involuntary movements.

One reason why Fife was so successful ambulating patients might be found in Unit policy. A clear nursing directive, for example to help patients into a chair the morning after surgery and to get them walking the following day is good policy if a high patient turnover is to be achieved. Such a policy exists in Dunfermline, but not in Beijing where it is

largely the patient who is responsible for his own mobilisation. Many classes of Chinese society have to pay the hospital for health care and it is possible that the unit's financial best interests lie in having pay-beds full as long as possible while patients recover. If deep venous thrombosis really occurs as infrequently as is claimed in China then this removes an additional motivator for early ambulation.

Our study shows that length of surgery in Beijing is on average longer in all types of surgery than in Fife. This may also help to explain differences in length of post-operative recumbency in the two centres.

That cholecystectomy and inguinal hernia repair cause longer immobility than appendicectomy and thyroidectomy is not surprising. Chinese acupuncture for thyroidectomy encourages early ambulation, and appendicectomy involves a quick operation performed largely on young patients compared with others in the study.

Although the two centres did not provide patients well matched for age or sex, the results suggest these factors were not too important in determining length of bed rest. Perhaps age becomes important when associated with gross infirmity. Few of the patients studied were in this category.

Chinese women walk earlier than men. One reason suggested for this in Beijing was that womenfolk there were so uneasy about using a bed pan that they would rather make a painful way to the traditional squatting latrine than subject themselves to a worse indignity!

The correlation of length of surgery with length of

subsequent bed rest in China but not in Fife is probably due in part to the larger pool of subjects in the Beijing study from which statistics were drawn. It is assumed that the correlation results from a greater catabolic effect and more extensive procedures associated with prolonged surgery. Fig. 14 illustrates this correlation and emphasises the separate grouping of operation-types.

When patients pre-operatively estimated their length of bed rest, values given correlated with the actual period of immobility. This suggested patients knew something of their own fitness and pain-threshold and maybe a little about the kind of operation they were to have, since cholecystectomy patients tended to give a longer estimate than those having inguinal hernia repairs. Interestingly, the average estimate for bed rest (30.1 hours) was significantly longer than the average actual figure (21.1 hours); why should patients be over-pessimistic about the effects of surgery on their mobility?

Administration of analgesia correlated well with length of bed rest. Hardly surprising when pain is a major disincentive to ambulation. Perhaps the hypnotic effect of these drugs had an additional effect.

Disability score also correlates significantly with length of bed rest, presumably because of physical problems with ambulation and the greater age of disabled patients. Disabled patients tended to need more analgesia than others, the reason for which may also lie in the longer period of recumbency required by such patients.

In designing the study I considered psychiatric status (admittedly an imprecise term) to be a possible influence on length of immobilisation. It is possible that a psychiatric questionnaire designed in the United States is not the most applicable for a Scottish study. Perhaps in patients with more gross psychiatric problems than those investigated we would find an effect. In any case, knowledge of psychiatric state is certainly important to the surgeon in determining which patients might have unrealistic expectations of surgical prognosis. Such unfulfilled expectations could cause post-operative psychological problems.

I had expected the time of surgery in the day to correlate inversely with length of bed rest if a unit policy to ambulate patients the following day was enforced, as in Fife. In fact the correlation was only weakly negative.

Post-operative complications, it seemed, were not sufficiently common to relate statistically to length of bed rest. However among cases with serious complications bed rest was particularly long, thwarting unit policy on early ambulation. It is considered that active steps should be taken to reduce venous stasis in these patients.

ILLUSTRATIVE CASE REPORTS

I have chosen three case reports with which to illustrate factors affecting length of post-operative recumbency in Dunfermline and West Fife Hospital. As one of two medical students in the surgical unit I was closely involved in observing the management of these patients and helping the House Surgeon where appropriate.

The clinical course of these patients recorded in the case reports reveals some of the problems encountered in achieving early ambulation. I considered that restriction of case reports to patients undergoing cholecystectomy would present a more uniform picture of these problems and how they were resolved.

The first case, relatively uncomplicated, results in a period of recumbency almost identical to the second case, in which quite obvious past and present medical problems might have resulted in prolonged bed rest had there been insufficient care. The third case presents different but very real difficulties both before and after surgery. However this thwarts unit policy by delaying ambulation for only a short while.

Permission

Permission was gained to report each case from the consultants concerned.

REPORT 1

Mrs E.C. Age 35.

This lady, a married housewife from Rosyth has two healthy children aged 13 and 6. Her father died of renal cancer and her mother of ovarian cancer. Her two elder siblings suffer from peptic ulcer disease. She drinks alcohol only occasionally and smokes 10 - 15 cigarettes daily.

She made an appointment to see her G.P. in April 1988 and gave a history of increasingly frequent attacks of right hypochondrial pain. This was sharp in character, constant in severity with a sudden onset and offset, unrelieved by Dihydrocodeine. The pain radiated to the back and over both shoulders. She recognised that fatty foods exacerbated the episodes. There was no history of dyspepsia or bowel dysfunction, no nausea, no history of jaundice, no dark urine or pale stools.

Her G.P. ordered an oral cholecystogram which was reported as showing a non-functioning gall bladder. An abdominal ultrasound scan was then performed which indicated a contracted, thick walled gall bladder which contained stones. The biliary tree was not dilated.

In September 1988 Mrs E.C. saw the surgeons at Dunfermline and West Fife Hospital, who on the above evidence diagnosed chronic cholecystitis with gall stones, and arranged elective admission for cholecystectomy. At this point a chest X-Ray was found to be normal. U + E's, LFT's and FBC were normal except for a raised MCV of 100.5fl.

On admission on 12th October 1988, Mrs E.C. gave the

above history and explained she had lost $\frac{1}{2}$ stone in weight over 6 months despite a good appetite. She had been taking a low-fat diet during this time. Mrs E.C. had no past medical history of note and no allergies. Her only medication was Dihydrocodeine 60mg p.r.n. (< 200mg/24 hours).

On examination, Mrs E.C. was found to be thin, weight 48kg. Examination of the breasts revealed an inverted nipple of long-standing duration. Her abdomen was found to be thin and soft with no abnormal masses. Murphy's sign was present. There were no other abnormalities on examination. MCV was again mildly raised at 99.7fl. Mrs E.C. was fasted for theatre and 2 units of blood cross-matched.

On 13th October she received pre-operative medication of Diazepam 10mg orally and was anaesthetised using general anaesthesia. Through a right subcostal incision a cholecystectomy and per-operative cholangiogram were performed. This showed no stones obstructing the common bile duct. The surgeon's impression was of a contracted gall bladder containing at least one small stone with no acute inflammation. Other viscera were normal. No drain was required after wound closure. Pathology confirmed a contracted, thick walled gall bladder indicating chronic cholecystitis. Culture of cystic duct fluid failed to grow organisms.

Her medication included intravenous Cephuroxime 750mg before surgery and 12 hourly after surgery. In the recovery period 35% Oxygen for 12 hours, intravenous morphine 10mg prn. and intravenous fluids were prescribed. On return from theatre pulse was 70/minute, temperature 36.2^oc. The patient passed

urine in the afternoon. Nil by mouth.

On 14th October Codydramol 2 tabs prn was prescribed. She tolerated 15ml water, so free fluids and a light diet were allowed. She first ambulated at 10.00 a.m. Intravenous antibiotics and fluids were stopped.

On 15th October flatus was passed, mobilising well.

On 17th October bowels opened. Mrs E.C. was discharged home for review at the out-patient clinic in one month.

REPORT 2

Mrs M.B. Age 65

This lady, a widow for 7 years lives in Dunfermline. She has 2 healthy children and 3 deceased brothers who died from stomach cancer, lung cancer and tuberculosis. She drinks no alcohol and smokes 10 cigarettes daily. Her daughter visits her each day and a home-help comes twice weekly.

In December 1987 Mrs M.B. was admitted to Dunfermline and West Fife Hospital with a bleeding benign gastric ulcer. It was noted then that an oral cholecystogram in 1965 had revealed a gall bladder calculus. An abdominal ultrasound scan on admission revealed a gall stone with no inflammation of the gall bladder, and also multiple cysts in both kidneys.

After discharge, Mrs M.B. was advised to start a low-fat diet. When seen 3 months later there was no ulcer recurrence and she was advised to have an elective cholecystectomy. She refused at the time, expressing her fear of hospitals, but

several months later decided to accept the offer of surgery.

On 17th October 1988 Mrs M.B. was admitted to Dunfermline and West Fife Hospital for elective cholecystectomy. She denied abdominal symptoms over the previous 10 months. She gave no history of dark urine or pale stools, no flatulence, no vomiting. She admitted to losing 3 stones in weight over two years.

Mrs M.B. gave a long past medical history. She had tuberculosis when aged 25, and was followed up in 1988 by physicians in Milesmark Hospital, Dunfermline; there was no reactivation. She was noted to have asymptomatic right sided hydronephrosis aged 40, secondary to an anomalous renal vessel. At the age of 45 she was admitted to Jordanburn hospital with depression. Aged 55 she had septicaemia of unknown aetiology, although subacute bacterial endocarditis was queried. She was diagnosed as having an asymptomatic hiatus hernia with reflux at the age of 63, and last year a bleeding gastric ulcer was diagnosed. In recent years she had suffered from mild ankle oedema and shortness of breath on exertion, but without symptoms of angina. She had also experienced urinary stress incontinence of late, and claimed to be allergic to penicillin. Her normal medication was Frusemide 40mg bid and Slow K both alternate days, and Triazolam 0.25mg nocte.

On examination Mrs M.B. was found to be thin and had finger clubbing. There was no abnormality of her cardiovascular system, notably no signs of valve disease. Examination of her respiratory system revealed increased dullness to percussion and harsh breath sounds over the left

lung apex. Her abdomen was soft and not tender. Intestinal loops but no abnormal masses could be palpated. A rectal examination was negative for occult blood. Investigations included Chest X-Ray showing left upper zone fibrosis and pleural thickening consistent with a diagnosis of old tuberculosis. An ECG was normal. Haematological investigations gave values within the normal range; Haemoglobin 13.0g/dl. Pre-operatively Mrs M.B. was cross-matched for 2 units of blood and was fasted for theatre.

On 18th October she was given Phenergan 75 mg before surgery. A general anaesthesia was administered and a right subcostal incision made, revealing a non-inflamed gall bladder containing a large stone. This organ was removed without a per-operative cholangiogram performed. Examination of other viscera showed no sign of peptic ulceration or diverticular disease. A small hiatus hernia admitted one finger.

Intravenous Cephuroxime 750mg was given once pre-operatively and twice post-operatively. Other medication prescribed on return from theatre were Cyclimorph 10mg 4 hourly prn, Minihep 5,000u bid and 35% Oxygen for 12 hours. The pulse was then 68/minute and blood pressure 110/70mmHg. She was catheterised on the ward and passed 750ml urine. She maintained a good urine output thereafter. Intravenous fluids consisted of Hartmann's solution, Haemacell, Dextran 70, 5% glucose, normal saline. Nil by mouth.

On 19th October free fluids were allowed and tolerated well. Haemoglobin was 11.2g/dl. Mrs M.B. first ambulated at 10.45 a.m.

On 21st October a light diet was commenced. Discharge was planned but postponed due to lack of home support.

On 22nd October Mrs M.B. was discharged home. Her daughter agreed to lend a hand at home until a new home help could be arranged. Review was arranged for six weeks.

REPORT 3

Mr R.H. Age 59

This gentleman, a retired riveter living in Rosyth is happily married with no children. He smokes 50 cigarettes daily and drinks alcohol at weekends; 5 - 6 pints of beer.

On 2nd May 1988 Mr R.H. attended the Casualty Department at Dunfermline and West Fife Hospital complaining of severe right sided hypochondrial pain which had woken him at 5.00 a.m. He described it as varying in severity and radiating to his back. He gave no history of fatty food intolerance. There was no vomiting, no urinary symptoms, no dark urine or pale stools, no jaundice and no change in bowel habit. Intramuscular Pethidine 50mg relieved the pain and he was admitted to the surgical ward where he was found to be pyrexial, temperature 37.4°C, pulse 80/minute, blood pressure 160/90mmHg. No abnormal abdominal signs could be elicited.

The pain settled on conservative therapy. An abdominal ultrasound scan revealed a non-distended gall bladder with a thickened wall in places with neither stones nor biliary tree dilation. He was discharged home on 5th May and advised to

start a low fat diet.

On 16th May 1988 Mr R.H. was again admitted with similar pain. On this occasion he looked jaundiced and gave a 3 day history of anorexia, pale stools and dark urine. On examination Murphy's sign was elicited. A Chest X-Ray revealed fluid at the right lung base. Haemoglobin was raised at 19g/dl. Bilirubin was normal at 12 umol/l. An ultrasound scan showed free fluid around the gall bladder. He was given Cephuroxime and Metronidazole and discharged when the pain had settled.

On 1st August 1988 an oral cholecystogram was performed as an out-patient procedure and revealed virtually no gall bladder opacification. As a result Mr R.H. was admitted on 14th September 1988 for an elective cholecystectomy.

On admission Mr R.H. gave a past medical history of rheumatic fever as a boy with no clinical sequelae. There was nothing else of note until the two episodes of presumed biliary colic in May 1988. He was on no medication and had no drug allergy. On examination he appeared plethoric and his abdomen was soft and not tender, with a smooth enlarged liver extending 1cm below the costal margin. Faecal occult blood was negative. All other systems were normal. Haemoglobin at 18.3g/dl and haematocrit at 0.55 were slightly above normal. The blood film suggested polycythaemia which was of unknown aetiology. The haematologists were called, who advised that Mr R.H. was unsuitable for surgery and suggested venesection of 500ml blood weekly for three weeks. Mr R.H. was discharged home to return at intervals for this.

On 5th October 1988 Mr R.H. was again admitted for

elective cholecystectomy. His haemoglobin of 15.1g/dl and haematocrit of 0.44 were within normal limits and he consented to surgery. Other blood tests were normal, as were Chest X-Ray and ECG. He was fasted for theatre and cross-matched for two units of blood.

On 6th October Mr R.H. was prescribed 20mg Temazepam for sedation. A general anaesthetic was administered and a right paramedian incision made. The liver was found to be slightly enlarged with no obvious pathology and needle biopsy specimens were taken. Other viscera were normal except the gall bladder which was inflamed and densely adherent to the liver bed. A Cholecystectomy was performed and many small stones extracted. Per-operative cholangiography revealed no obstruction in the common bile duct. A drain was inserted. Culture of bile grew E. Coli and Clostridia. Pathology reports indicated a process of acute on chronic cholecystitis, and the liver showed moderate fatty change with no evidence of hepatitis or Mallory hyaline bodies.

Both intravenous Cephuroxime 750mg and Minihep 5000u were prescribed once pre-operatively and tid thereafter. Other medication included Oxygen 60% for 12 hours and Morphine 1 - 2mg hourly by constant infusion, together with Stemetil.

On return from theatre Mr R.H. was distressed and unable to pass urine. On 7th October intravenous fluids were stopped. On examination his bladder was found to be at umbilical level so he was catheterised. Post-operative blood tests revealed a low haemoglobin (11.5g/dl) and platelet count ($149 \times 10^9/l$). protein and albumin were also low at 52 and 34 g/l respectively.

WCC was normal at $3.8 \times 10^9/l$. Mr R.H. first ambulated at 3.00 p.m. on 7th October.

On 8th October, Cephuroxime, Minihep and Morphine was stopped. Codydramol 2 tabs prn was substituted. Mobilising slowly.

On 9th October Mr R.H. commenced a light diet and his drain was removed. He began to complain of low back pain and right loin pain. A MSU sample was negative.

On 10th October the development of large wound haematoma was apparent, spreading to his scrotum and right flank. The anticoagulant medication was suspected to be responsible, but a coagulation screen revealed no abnormality in these parameters. Haemoglobin was 11.8g/dl and platelets $251 \times 10^9/l$. Albumin was 42g/l and protein 65g/l.

On 14th October, Mr R.H. was discharged from hospital with a Haemoglobin of 13.0g/dl.

At the review clinic on 31st October 1988, Mr R.H. was comfortable and wound healing was satisfactory. An appointment with haematologists was arranged to investigate the cause of his polycythaemia.

The table below records some of the parameters measured in my study from the patients reported here.

	Mrs E.C.	Mrs M.B.	Mr R.H.	Mean for all cholecystectomies in Fife
Disability score	1	3	1	4.3
Psychiatric score	5	13	4	5
Analgesia score	14	12	6	11.9
Length of surgery	35 min	25 min	2 hours + 15 min	1 hour + 10 min
Anticipated length of bed rest	12 hours	48 hours	84 hours	46 hours + 43 min
Actual length of bed rest	24 hours + 45 min	22 hours + 45 min	28 hours + 45 min	27 hours + 40 min

In the above table it can be seen that despite large differences in length of surgery, psychiatric score and anticipated length of bed rest, actual length of bed rest was remarkably constant. It was only in the third reported case that ambulation was delayed (and then only by a few hours) from the morning to the afternoon of the day after surgery.

In all three reports, however, differences in length of post-operative bed rest are tiny compared with the situation in Beijing. This brings obvious benefit given the evidence of

previously mentioned studies in limiting the incidence of deep venous thrombosis; an achievement one presumes well worth the nursing and medical effort required in terms of reduced mortality and morbidity.

CONCLUSIONS

1. Unit policy can be a major determinant of length of post-operative bed rest. Other Caucasian studies show indirectly that this policy can be effective in reducing venous thrombotic complications.
2. In Dunfermline, few medical problems or complications prevent early ambulation.
3. In Beijing, a unit policy on early ambulation is less important than in Dunfermline
4. Prediction of which patients might require a major effort to achieve early ambulation can be made: Patients with disability, those who have prolonged surgery or receive large amounts of analgesia, and those who expect to be immobilised for a long period. The type of operation and the anaesthetic technique used also have a definite influence on the length of recumbency.

QUESTIONS FOR THE FUTURE

1. It would be of interest to see if the rank of the surgeon had any effect on length of bed rest.

2. How important is early ambulation anyway? What proportion of deep venous thromboses have already formed during surgery itself?

3. A prospective study could be carried out to determine the overall mortality and morbidity of different anaesthetic techniques. Observations could extend beyond the anaesthetic period to embrace recovery and ambulative periods.

4. A prospective trial investigating the prevalence of clinical and sub-clinical deep venous thrombosis in patients divided into (a) vigorously mobilised and (b) gently mobilised groups would be useful.

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