

FORUM

Assessment of postsurgical recovery after discharge using a pen computer diary*

A. Begg,¹ G. Drummond² and B. Tiplady³

1 Research Assistant, 2 Senior Lecturer and Consultant Anaesthetist, 3 Honorary Research Fellow, Department of Anaesthesia, Intensive Care, and Pain Medicine, Royal Infirmary, Edinburgh, EH16 4SA, UK

Abstract

We assessed patients after their return home following gynaecological surgery, using a daily electronic diary. Thirty-two females aged 27–77 years took part. After a hospital stay of 1–6 days (mean 2.3), they were given a pen-based electronic diary and asked to record symptoms and other data over one month. They also completed a questionnaire at the end of the study. Substantial effects on quality and duration of sleep, pain during both the night and day, interference with daily activities, energy, and ability to concentrate were recorded, mostly during the first week of treatment. Symptoms reported in the final questionnaire correlated significantly with diary data. Most patients found the electronic diary easy to use, and none found it difficult. Daily electronic diaries are an acceptable method of obtaining better information on the extent and duration of symptoms and other difficulties after discharge following surgery.

Keywords *Measurement techniques:* computers. *Medical records:* health diaries. *Outcome assessment:* patient. *Surgery:* gynaecological.

Correspondence to: Dr B Tiplady, Department of Psychology, University of Edinburgh, 7 George Square, Edinburgh EH8 9JZ, UK.

E-mail: brian@penscreen.com

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The costs of healthcare provision increase the pressure for efficient use of resources. Reducing the length of hospital stay after surgery is one approach to cost reduction. To properly assess cost effectiveness, information is needed on the degree to which patients are affected by post-surgical problems on their return home, and their speed of recovery.

Most of the work in this area has investigated day case surgery, which now accounts for a large proportion of surgical procedures. In Scotland, for example, about 60% of elective surgery is carried out on a day basis [1]. Some studies have investigated the immediate postoperative recovery period using functional measures (ability to

drink, void urine, or walk), symptom measures (pain, nausea) or cognitive testing [2–5]. Others have used questionnaires to assess symptoms and their impact, as well as overall satisfaction, after return home. Studies considering several time-points after discharge show that a substantial proportion of patients have at least moderate pain sufficient to interfere with daily activities, after their return home [4,6,7]. As well as pain, the after effects of surgery may include cognitive impairments. Thus Tzabar *et al.* [8] used the Cognitive Failures Scale over a 3-day period after day case surgery, and found more failures in patients who had received a general anaesthetic compared to those given only a local anaesthetic.

Work on patients undergoing surgery as in-patients has mostly focused on the recovery period before discharge [9–11]. Myles *et al.* [4] administered a Quality of Recovery Scale to patients daily for 6 days then weekly for up to 6 weeks after minor or major surgery. The scale assessed wellbeing, specific functions, symptoms, and need for support. Questionnaires were administered by telephone after discharge, but it is not clear from the report how long these patients stayed in hospital. Substantially greater effects were recorded after major surgery, as expected, with scores returning to baseline after about one week. Other studies have used questionnaires to assess patient satisfaction, symptoms or problems after discharge. Thus Mort *et al.* [12] sent a questionnaire to patients 3 months after cholecystectomy. They found that older patients had more postoperative complications but less abdominal pain than younger patients. Johnson [13] used a telephone survey of patients one month after cardiac surgery. Their study emphasised a need to improve patient education, in particular pain control. Rödiger *et al.* [14] used the Cognitive Failures Questionnaire 2 months after surgery, to compare cardiac and non-cardiac patients. They found a similar, substantial, incidence of such failures in two groups.

Significant residual effects of surgical and anaesthetic procedures may occur after discharge home, but the extent, duration, and impact on patients' everyday lives is more difficult to assess. Diaries, filled in by the patients after they return home, can provide this information. However, it is possible that the very problems we wish to assess might impair the patients' ability to complete a diary satisfactorily. Thus, cognitive failures (difficulty concentrating or remembering) or the effects of loss of sleep or the side-effects of analgesics might reduce the willingness and ability of patients to complete a diary satisfactorily. The present study was therefore set up partly to assess the use of daily diaries in this patient group, and partly to obtain information about the scale and time course of postoperative problems. Patients recovering after in-patient surgery were studied because of the lack of postdischarge information in this group.

To obtain a reliable record of the use of diaries by patients, electronic devices were used. Electronic diaries can give improved data quality compared to paper diaries, simplify data handling, and are acceptable to patients [15–17].

Methods

This was an open study, involving no change to the patients' normal treatment. Patients completed a daily diary for a period of approximately one month following their discharge from hospital after surgery.

Female patients aged 16 or over undergoing gynaecological surgery expected to involve an in-patient stay of 1–7 days were invited to take part in the study. Patients were excluded if they were suffering from dementia, confusion, or any other condition making it unlikely that a daily diary could be completed, or if they were taking part in any concurrent investigation involving changes of any aspect of normal treatment. All patients gave written informed consent to take part in the study, which was approved by the Lothian Region Ethics Committee.

The diary was scheduled to be completed on the morning and evening of each day. Input was by means of a visual analogue scale (VAS), a 5-item Likert scale (LS) or as numeric input (N). The items assessed were as follows:

Morning: Difficulty falling asleep (VAS), disturbed sleep (VAS), dreaming more than usual (VAS), waking up early (VAS), waking refreshed (VAS), hours slept (N), bodily pain during night (LS), bodily pain interfering with sleep (LS).

Evening: downhearted and sad (VAS), full of energy (VAS), everyday activities (LS), social activities (LS), concentration (LS), remembering (LS), bodily pain during day (LS), bodily pain interfering with activities (LS).

The diary was set up on either an Apple Newton MessagePad 120/130 or a Psion Series V (Clinitrac® diary application). These devices are small computers with touch-sensitive screens on which the user can tap with a stylus to make responses. Entries (morning or evening) were initiated by the patient. Questions were laid out one per screen. The patient tapped to enter a response, then tapped a 'Next' button to proceed to the next question. The patient could change an incorrect response before tapping 'Next', but not subsequently. Each question had to be completed before proceeding to the next one. All entries were time-stamped on completion to enable checking of patient compliance.

The diary included a demonstration mode which was used to train the patient in the use of the diary at the initial recruitment visit.

A paper questionnaire filled in at the end of the study assessed how comfortable the patient was with technology, how easy or difficult the electronic diary was to use, and assessed the overall level of symptoms during the study period. The Cognitive Failures Questionnaire [8] was also used.

Patients were approached in the ward before surgery, the nature and purpose of the study explained to them, the electronic diary demonstrated, and consent obtained. Before discharge, they were issued with the diary, and instructed to complete it in the morning and evening of each day until the first follow-up visit in the clinic (usually

about 4 weeks after discharge). The final questionnaire was filled in at the time of the follow-up visit.

Most data are reported descriptively. All data are referred to the number of days since the operation (not since discharge). The change in symptoms scores over the study period was analysed by taking the mean score for each of the periods: up to 7 days after surgery, 8–14 days after surgery and 15–21 days after surgery, and subjecting these to a repeated measures Analysis of variance (ANOVA). Correlations were calculated using the Spearman coefficient.

Results

Thirty-two patients were enrolled in the study and issued with diaries. Of these, two returned their diaries unused. One patient was excluded because she was re-admitted to hospital during the evaluation period, and two because their in-patient stay had been longer than the specified 7 days. Therefore, data from 27 patients were evaluated. They were aged 27–77 years (mean 48.9), and the length of hospital stay was 1–6 days (mean 2.3). Twelve patients were undergoing vaginal procedures, 13 abdominal procedures, and two laparoscopies.

The overall completeness of data from the daily diaries over the 4 week assessment period was 74.7%. Symptom scores recorded by the patients are shown in Table 1 and in Figs 1 (morning data) and 2 (evening data). Most of the items showed impairment in the first few days after the operation, with scores gradually declining thereafter. These trends were significant when the weekly means

Table 1 Mean item scores for each week post operation.

Measure	Week no.			Statistical significance
	1	2	3	
Difficulty falling asleep	43	27.5	28.3	**
Disturbed sleep	46	31.7	30.2	*
Dreaming more than usual	30	28.6	23.9	n.s.
Waking early	58	42.7	41.8	**
Waking refreshed	37	43.2	45.8	n.s.
Hours of sleep	6.1	6.9	6.9	*
Pain during night	2.2	2.1	1.8	**
Pain interfering with sleep	2.1	1.9	1.6	**
Downhearted and sad	31	30.1	31	n.s.
Full of energy	29	36.1	40.7	**
Limitation to everyday activities	3.5	2.7	2.3	***
Limitation to social activities	3.3	2.6	2.1	***
Difficulty concentrating	2.3	2	1.8	***
Difficulty remembering	1.9	1.8	1.8	n.s.
Pain during day	2.2	2	1.9	*
Pain interfering with activities	2.8	2.3	2	**

n.s., not significant; **p* < 0.05; ***p* < 0.01; ****p* < 0.001.

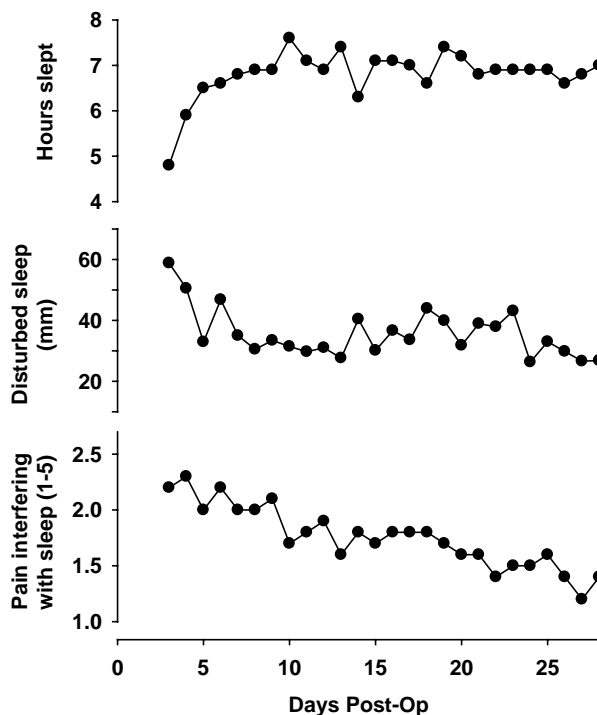


Figure 1 Sleep and night-time pain from the morning entries of the daily diary. Visual Analogue Scales are shown in mm (scale length, 100 mm). Interference due to pain was rated – 1: Not at all; 2: A little bit; 3: Moderately; 4: Quite a bit; 5: Extremely.

were compared for all but four of the items, as shown in Table 1.

Scores from the cognitive failures questionnaire are shown in Fig. 3. The modal score was between 20 and 40, suggesting some cognitive impairment during the study period. Results from the symptom questions show that less than half of the patients reported nausea or headache (42% in each case). In contrast, over 74% of patients reported pain of at least moderate severity during the study period.

Data from the question ‘How easy or difficult did you find the diary to use’ indicated that all but one patient found the diary either ‘very easy’ or ‘quite easy’ to use, with one patient responding ‘neither easy nor difficult’. No patient found the diary difficult to use.

Correlations between the questionnaire ratings of pain and cognitive failure scores and the mean diary scores for the corresponding items over the individual weeks postoperatively and for the study period are shown in Table 2. The pain item on the questionnaire showed substantial and highly significant correlations with diary ratings of both pain and interference due to pain. By contrast the correlations for cognitive failures showed

Questionnaire item	Diary item	Diary period			Overall mean
		Week 1	Week 2	Week 3	
Cognitive Failure Scale	Difficulty concentrating	0.408 n.s.	0.393 n.s.	0.390 n.s.	0.487 n.s.
	Difficulty remembering	0.513 n.s.	0.557*	0.255 n.s.	0.514 n.s.
Pain	Night-time body pain	0.635**	0.846***	0.458 n.s.	0.663**
	Pain interfering with sleep	0.621*	0.635**	0.397 n.s.	0.554*
	Day-time body pain	0.792***	0.773***	0.592*	0.766***
	Pain interfering with activities	0.870***	0.761**	0.719**	0.879***

Table 2 Correlations between diary scores and ratings made using the questionnaire at the end of study.

n.s., not significant; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

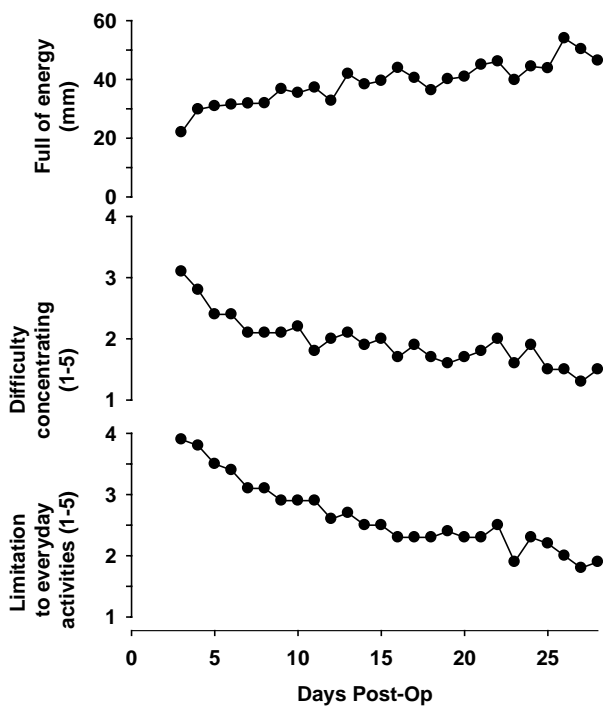


Figure 2 Mood, daily activities, and cognition from the evening entries of the daily diary. Activities were rated on a five-point Likert scale, viz: 1 = Normal; 2 = Somewhat limited; 3 = Quite a bit limited; 4 = Very limited; 5 = Totally limited. Concentration was rated – 1 = No difficulty; 2 = Slight difficulty; 3 = Moderate difficulty; 4 = Quite a bit of difficulty; 5 = Extreme difficulty. Visual Analogue Scales are shown in mm (scale length, 100 mm).

lower, though positive, correlations, which were mostly not statistically significant.

Discussion

We found that patients feel substantial after-effects of surgical procedures following discharge home. These

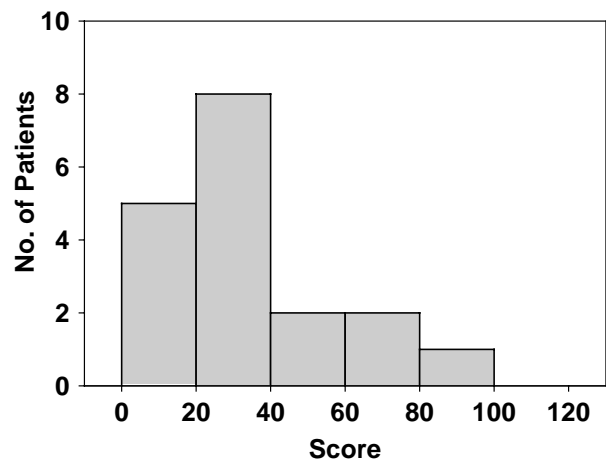


Figure 3 Distribution of total scores on the Cognitive Failures Scale [8]. The scale has a maximum score of 120. The scale was completed at the end of the study period.

effects were particularly marked in the first week, as might be expected. Most of the items in the study showed statistically significant reductions in the second and third week compared to the first, and such effects were found for all the domains assessed: sleep, pain, cognition, and interference with activities. These effects were often very marked. Thus, for the two activity items, the mean scores during the period up to 7 days postoperation were 3.5 for everyday activities and 3.3 for social activities, where 3 corresponded to ‘Quite a bit limited’ and 4 to ‘Very limited’.

The data show that limitation of activities is the most marked effect. Pain during the day, for example, is less prominent than the items indicating limited everyday and social activities (Table 1). Patients may experience pain when they are mobile, and reduce pain by limiting their activity. This may be no bad thing in the early days after discharge, but obtaining such data directly from patients may be extremely useful in advising patients as

to what extent they may expect to be limited, and for how long.

The effect on concentration (Fig. 2) confirms that short-term cognitive impairments may be found after surgery. Such effects could result from the after-effects of anaesthesia, from lack of sleep, from the side-effects of analgesic drugs, or from the inflammatory response to surgery. Such impairment could affect how patients function at home, and warrants further investigation.

The electronic diary used in the study was very effective, and patients found it easy to use. The data completeness recorded here was slightly lower than found previously, for example in asthma studies [18], which may be because patients were using their diaries for the first time while affected by the surgery. Nonetheless, the completeness was sufficient to obtain a reliable picture of the symptoms and functional state of the patients. Thus, electronic diaries are an appropriate method for collecting data in this patient group.

The significant correlations obtained between the diary and questionnaire data give confidence that the results obtained are a valid indication of the patients' condition. Clearly, a poststudy questionnaire is simpler to administer than a daily diary, and may be appropriate in some studies. However, patients may have difficulty recalling the details of their problems a month later, and only a diary will give an accurate time course of problems and their resolution. Such knowledge would help advise patients what to expect when they go home, and is probably not appreciated by many hospital doctors.

Accurate recall of details is a common problem with a paper diary, since many entries are made late, even just before the clinic visit [19]. Electronic diaries ensure that all data are collected at the intended times, and prevent the reduction of data quality due to poorly remembered retrospective entries.

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