View Through a Window May Influence Recovery from Surgery

Abstract. *Records on recovery after cholecystectomy of patients in a suburban Pennsylvania hospital between 1972 and 1981 were examined to determine whether assignment to a room with a window view of a natural setting might have restorative influences. Twenty-three surgical patients assigned to rooms with windows looking out on a natural scene had shorter postoperative hospital stays, received fewer negative evaluative comments in nurses' notes, and took fewer potent analgesics than 23 matched patients in similar rooms with windows facing a brick building wall.*

Investigations of aesthetic and affective responses to outdoor visual environments have shown a strong tendency for American and European groups to prefer natural scenes more than urban views that lack natural elements (*1, 2*). Views of vegetation, and especially water, appear to sustain interest and attention more effectively than urban views of equivalent information rate (*2*). Because most natural views apparently elicit positive feelings, reduce fear in stressed subjects, hold interest, and may block or reduce stressful thoughts, they might also foster restoration from anxiety or stress (*3*).

The restorative effect of natural views on surgical patients was examined in a suburban Pennsylvania hospital (200 beds). Such patients often experience considerable anxiety (*4, 5*), and hospital confinement limits their access to outdoor environments almost entirely to views through windows. Views to the outside may be especially important to individuals who have unvarying schedules and spend a great deal of time in the same room (*6*), such as surgical patients. It is possible that a hospital window view could influence a patient's emotional state and might accordingly affect recovery.

Records of patients assigned to rooms on the second and third floors of a three-story wing of the hospital between 1972 and 1981 were obtained. Windows on one side of the wing look out on either a small stand of deciduous trees or a brown brick wall (Fig. 1). The same nurses are assigned to the rooms on a given floor; the nurses' stations are located somewhat closer to the wall-view rooms on both floors. The rooms are all for double occupancy and are nearly identical in terms of dimensions, window size, arrangement of beds, furniture, and other major physical characteristics. Each room has a single window 1.83 m high and 1.22 m wide with the lower edge 74 cm above the floor. The size and placement of the window allow an unobstructed view out for a patient lying in bed on either side of the room. The rooms differ, therefore, essentially only in what is seen through the window. Patients are assigned to rooms as they become vacant.

The sample consisted exclusively of patients who had undergone cholecystectomy, a common type of gall bladder surgery. This is a comparatively standardized procedure with similiar postoperative management in the uncomplicated cases. Only cholecystectomies performed between 1 May and 20 October (1972 through 1981) were identified because the trees have foliage during those months. Patients younger than 20 years or older than 69, patients who developed serious complications, and those with a history of psychological disturbances were excluded. Patients were then matched so that one member of each pair had a view of the trees and the other, the brick wall. The criteria for matching were sex, age (within 5 years), being a smoker or nonsmoker, being obese or within normal weight limits, general nature of previous hospitalization, year of surgery (within 6 years), and floor level. Patients on the second floor, a surgical floor, were also matched by the color of their room (rooms on that floor alternate between blue and green). The 6-year interval for year of surgery was established on the basis of inquiries concerning possible changes in procedures. There was no statistically significant difference in the sampling distributions by year of surgery between the wall-view and tree-view groups. The final data base consisted of records of 46 patients grouped into 23 pairs (15 female and 8 male). An attempt was made to match patients by physician, but this was possible for only seven pairs because the number of doctors was large. However, for the remaining pairs the distribution of different physicians was similar in the two groups. There was no instance, for example, when patients of the same doctor all had rooms with same view.

Recovery data were extracted from the records by a nurse with extensive surgical floor experience. The nurse did not know which scene was visible from a patient's window. Five types of information were taken from each record: number of days of hospitalization; number and strength of analgesics each day (*7*); number and strength of doses for anxiety, including tranquilizers and barbiturates, each day (*8*); minor complications, such as persistent headache and nausea requiring medication—symptoms which are considered to result frequently from conversion reactions (*9*); and all nurses' notes relating to a patient's condition or course of recovery.

Length of hospitalization was defined as day of surgery to day of discharge. These data were assumed to be only ordinal because surgery was performed at different times of day and discharge times were somewhat different. The records showed that patients with window views of the trees spent less time in the hospital than those with views of the brick wall: 7.96 days compared with 8.70 days per patient [Wilcoxon matched-pairs signed-ranks analysis, $T(17) = 35$, $z = 1.965$, $P = 0.025$].

Nurses' notes consisted of comments about the patient's condition written during the postsurgical period ending at midnight of the seventh recovery day after the day of surgery. Notes were classified as negative or positive—for example, negative notes included "upset and crying" or "needs much encouragement," and positive notes included "in good spirits" and "moving well." More negative notes were made on patients with the brick wall view: 3.96 per patient compared to 1.13 per patient with the tree view [Wilcoxon matched-pairs signed-ranks analysis, $T(21) = 15$, $z = 3.49$, $P < 0.001$]. Although more

Table 1. Comparison of analgesic doses per patient for wall-view and tree-view groups.

Analgesic strength	Number of doses					
	Days 0–1		Days 2–5		Days 6–7	
	Wall group	Tree group	Wall group	Tree group	Wall group	Tree group
Strong	2.56	2.40	2.48	0.96	0.22	0.17
Moderate	4.00	5.00	3.65	1.74	0.35	0.17
Weak	0.23	0.30	2.57	5.39	0.96	1.09

positive comments were recorded for the tree-view patients, the difference was not statistically significant.

The multivariate two-sample Hotelling test was used to compare the groups for analgesic intake (*10*). The average number of doses per patient, within each strength level, was computed for (i) the day of surgery and first recovery day, (ii) days 2 through 5 after surgery, and (iii) days 6 and 7 after surgery. It was expected that for the first period no differences in analgesic intake would be found between the two groups, because patients would have been too drugged or too absorbed by intense pain to attend to the windows (*5*). It was also expected that there would be no significant variation across groups in the final two days. In fact, only 45 percent of the patients took any analgesics after the fifth day. The data are summarized in Table 1.

For the period of primary interest, days 2 through 5, there were statistically significant variation between the tree-view and wall-view patients in the mean number of analgesic doses ($T^2 = 13.52$, $F = 4.30$, $P < 0.01$). In the other two periods there were no significant differences. In days 2 through 5 patients with the tree view took fewer moderate and strong pain doses than did the wall-view group and more doses in the weak category. The wall group, therefore, was given many more doses of potent narcotics, whereas the tree group more frequently received such drugs as aspirin and acetaminophen.

With respect to doses of antianxiety drugs, there was no significant variation between the groups. Wall-view patients were given more doses of narcotic analgesics, which produce drowsiness or sedation as side-effects, possibly reducing their need for sleeping pills or tranquilizers. To test this inverse relation, antianxiety dose frequencies were compared when patients took either no or one strong or moderate analgesic dose or at least two strong or moderate analgesic doses. The observed frequency of doses was lower than the expected frequency when two or more strong or moderate analgesics were taken on the same day [$\chi^2(1) = 10.45$, $P < 0.01$]. The intake of narcotic analgesics by patients with the wall view may have lowered their use of antianxiety drugs to that of patients with the tree view.

A weighted score of minor postsurgical complications (excluding routine postanesthetic occurrences such as nausea) was computed for each patient, with criteria and procedures similar to those used by Cohen and Lazarus (*9, 11*). Although tree-view patients had lower scores, the difference was not statistically significant. This small difference found may be due to the greater intake of potent analgesics by the wall-view group rather than to a possibly higher frequency of conversion reactions.

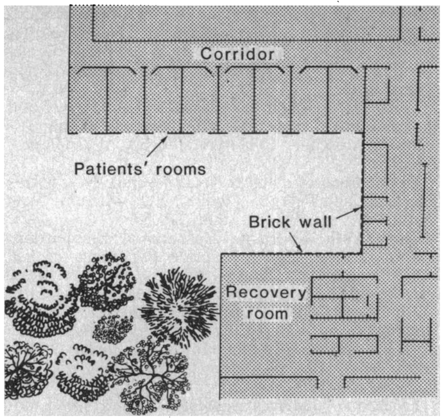

Fig. 1. Plan of the second floor of the study hospital showing the trees versus wall window views of patients. Data were also collected for patients assigned to third-floor rooms. One room on each floor was excluded because portions of both the trees and wall were visible from the windows. Architectural dimensions are not precisely to scale.

In summary, in comparison with the wall-view group, the patients with the tree view had shorter postoperative hospital stays, had fewer negative evaluative comments from nurses, took fewer moderate and strong analgesic doses, and had slightly lower scores for minor postsurgical complications. Although the findings suggest that the natural scene had comparatively therapeutic influences, it should be recognized that the "built" view in this study was a comparatively monotonous one, a largely featureless brick wall. The conclusions cannot be extended to all built views, nor to other patient groups, such as long-term patients, who may suffer from low arousal or boredom rather than from the anxiety problems typically associated with surgeries. Perhaps to a chronically understimulated patient, a built view such as a lively city street might be more stimulating and hence more therapeutic than many natural views. These cautions notwithstanding, the results imply that hospital design and siting decisions should take into account the quality of patient window views.

ROGER S. ULRICH
Department of Geography,
University of Delaware, Newark 19716

References and Notes

1. J. F. Wohlwill, in *Human Behavior and Environment*, I. Altman and J. F. Wohlwill, Eds. (Plenum, New York, 1976), vol. 1, pp. 37–86; E. H. Zube, D. G. Pitt, T. W. Anderson, in *Landscape Assessment: Values, Perceptions, and Resources*, E. H. Zube, R. O Brush, J. G. Fabos, Eds. (Dowden, Hutchinson, & Ross, Stroudsburg, Pa., 1975), pp. 151–167; J. F. Palmer, in *Priorities for Environmental Design Research*, S. Weidemann and J. R. Anderson, Eds. (Environmental Design Research, Washington, D.C., 1978), pp. 92–103.
2. R. S. Ulrich, *Landscape Res.* **4**, 17 (1979); *Environ. Behav.* **13**, 523 (1981).
3. ——, in *Human Behavior and the Natural Environment*, I. Altman and J. F. Wohlwill, Eds. (Plenum, New York, 1983), pp. 85–125.
4. A. Martinez-Urrutia, *J. Consult. Clin. Psychol.* **43**, 437 (1975); E. J. Langer, I. L. Janis, J. A. Wolfer, *J. Exp. Soc. Psychol.* **11**, 155 (1975).
5. C. R. Chapman and G. B. Cox, *J. Psychosom. Res.* **21**, 7 (1977).
6. B. L. Collins, *Windows and People: A Literature Survey* (NBS Building Science Series 70, National Bureau of Standards, Washington, D.C., 1975).
7. Analgesic doses were classified as weak, moderate, or strong on the basis of the drug, dosage, patient's weight, and whether the drug was administered orally or by injection. Examples in the weak category include acetaminophen and acetaminophen with small amounts of codeine. Examples in the moderate strength class are injections of meperidine hydrochloride (Demerol) in doses up to 50 mg, and tablets of oxycodone hydrochloride–oxycodone terephthalate (Percodan); strong analgesics include hydromorphone hydrochloride (Dilaudid) and large doses of meperidine hydrochloride.
8. Tranquilizers and barbiturates doses were classified as weak, moderate, or strong according to similar criteria used for analgesics. The antianxiety drugs in the weak category were tranquilizers; the moderate class was dominated by tranquilizers; and the vast majority in the strong category were large dosages of barbiturates. No distinction was made between tranquilizers and barbiturates in terms of function because tranquilizers were often prescribed as sleeping medications.
9. F. Cohen and R. S. Lazarus, *Psychosom. Med.* **35**, 375 (1973).
10. D. F. Morrison, *Multivariate Statistical Methods* (McGraw-Hill, New York, ed. 2, 1976), p. 137.
11. Minor complications were scored as follows: nausea (1 point); nausea requiring medication (2 points); antacids given (1 point); rectal tube for gas (1 point); inability to move bowels, enema given (2 points); inability to void, catheterization required (2 points); medication for diarrhea, gut irritability, or both (1 point); medication for constipation or for urine stimulation (1 point); and antibiotics given for postoperative fever and infection (3 points).
12. The collection of data was facilitated by the full cooperation of W. M. Tomlinson and A. King, president and director of medical records, respectively, of Paoli Memorial Hospital, Paoli, Pa. I thank M. Mozzani for reading patient records, A. E. Hoerl for statistical consultation, and several physicians for their helpful comments on research methods. I also thank S. M. Parnes, L. P. Herrington, M. Zuckerman, and T. C. Meierding. Supported by grant 23170 from the Consortium for Environmental Forestry Studies, U.S. Department of Agriculture Forest Service.

24 January 1983; accepted 1 November 1983