

Dying in the dark: sunshine, gender and outcomes in myocardial infarction

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We report a natural experiment that took place in a cardiac intensive care unit (CICU). We had been alerted to the possibility that sunny rooms would be conducive to better outcomes by our findings in the psychiatric unit, and by reports that depressed cardiac patients did less well than those in normal mood. The 628 subjects were patients admitted directly to the CICU with a first attack of myocardial infarction (MI). Outcomes of those treated in sunny rooms and those treated in dull rooms were retrospectively compared for fatal outcomes and for length of stay in the CICU.

Patients stayed a shorter time in the sunny rooms, but the significant difference was confined to women (2.3 days in sunny rooms, 3.3 days in dull rooms). Mortality in both sexes was consistently higher in dull rooms (39/335 dull, 21/293 sunny). We conclude that illumination may be relevant to outcome in MI, and that this natural experiment merits replication.

INTRODUCTION

When conducting a trial of light therapy in depression¹ we noticed that the natural sunlight in some rooms was so bright as to overpower the effects of the artificial light boxes in use. On inspection, the rooms in our symmetrical psychiatric unit turned out to be sunny in half the instances and, because of their opposite orientation, sunless and dull in the rest. Reasoning that the patients in the sunny rooms were inadvertently getting phototherapy, we looked at the lengths of stay of depressed patients in sunny rooms compared with the lengths of stay of depressed patients in sunless rooms, these data being available from the hospital records. We found that depressed patients in sunny rooms stayed an average of 2.6 days (15%) less than the others ($P < 0.05$).

Of course, we soon wondered whether there were other conditions of similar dangerousness which might be affected by levels of illumination and which had been managed in the same ward over a period of years. In the course of reorganization of our local health system, divisions and clinical departments had been moved around a lot in our hospital. The CICU had not been moved.

Patients with MI and depression do less well than euthymic cardiac victims, as regards both their cardiac² and their affective states³. Women with MI but normal mood also do less well than might be expected. At some centres women seem, or did once seem, to be less vigorously treated than men^{4–7}. We were to find no indicator among

our statistics of any sex bias. Still, it is usually the case that, even when appropriate allowances are made for their greater average age and other risk factors, females with MI do less well than we would expect⁸.

Our range of choice was limited when it came to looking at the cumulative records of outcomes of different illnesses according to the sunniness of rooms, because most units cannot be clearly demarcated into sunny and dark, and few units have a single condition which dominates their intake.

The CICU had not only stayed in the same place, but fulfilled our hopes in various other ways. It is symmetrical, with 4 beds in rooms facing north, 4 facing south and 2 facing due east. For economy's sake, only 8 of these 10 beds are now open. The nurses avoid using the east-facing rooms because they are close to the busy nursing station. That proviso aside, patients are admitted to whichever of the beds is empty. The north-facing beds are sunless, of course. In Edmonton, Alberta, the sun shines year round for a total of 2300 hours, the winter sunlight being intensified over a four-month period by reflection from the snow, and the south-facing rooms are distinctly bright. On 26 June 1996 at 0945, the north-facing rooms registered 200–400 lux, the south-facing rooms 1200–1300 lux, and the east-facing rooms 2000 lux; on 21 November 1996, when the outside temperature was -25°C the readings at 1245 were north 200 lux, south 2500 lux (vertical blinds half drawn), and east 400 lux.

Some patients are admitted to the CICU postoperatively—for example, after bypasses or transplants. Most, however, have suffered a MI. We wanted to compare samples which were as near homogeneous as possible, and

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settled on abstracting data from patients with a first attack of MI who had been admitted directly to the CICU. Because patients are transferred from the CICU as soon as their condition permits it, we made the assumption that length of stay in the CICU would be a measure of the rapidity with which the patients had improved.

METHOD

We looked at abstracts of all CICU admissions, over the four years ending March 1996, whose diagnoses contained a first episode of MI. We excluded those whose cardiac condition had been treated with major surgery—bypass operations or transplants. We excluded those who had not been admitted directly to the CICU. We excluded those who had stayed in the two easterly rooms.

We abstracted data when the patients had stayed only in bright southerly or only in dark northerly rooms, and we recorded sex, age, length of stay and brightness or otherwise of the rooms; and whether the patient had died.

RESULTS

Morbidity

568 cases with a non-fatal outcome were processed, 272 of whom had been in bright rooms (men 209; women 63) and 296 in dark (men 222; women 74). The mean age of all subjects was 62, comprising men with a mean age of 60, and women with a mean age of 68. The average age in the light rooms was 62 and in the dark, 61.

The average length of stay for all our subjects was 2.46 (SD 2.0) days. Those in bright rooms stayed a mean of 2.3 (1.7) days and those in dark 2.6 (2.2). Men in bright rooms stayed an average of 2.3 days, and in dark rooms 2.4. Women in bright rooms stayed an average of 2.3 days, and in dark rooms 3.3.

A 2-factor analysis of variance using lighting conditions and gender as factors indicates that there is a main effect of light on length of stay ($F=6.5$, $df=2$; $P<0.006$). Also, a 2-way interaction between lighting and gender was significant ($F=6.34$, $df=1$; $P<0.012$).

Women were somewhat older than men on average, and we computed an analysis of covariance with age as the covariate. Age did not appear to be a significant factor in determining length of stay.

Mortality

Some patients are admitted directly to the CICU because they are moribund. We considered only deaths that happened more than one day after entering the CICU. Deaths were consistently more frequent on the dark side in each of the four years studied. If we assume deaths should

Table 1 Mortality by gender and lighting conditions

	Live/light	Die/light	Live/dark	Die/dark
Men	209	10	222	23
Women	63	11	74	16

have been evenly distributed, the binomial probability of this trend, 0.06, approached conventional significance. In all, 39 died on the dark side (men 23; women 16) and 21 on the bright side (men 10; women 11). We analysed the deaths of males and females in bright and dark rooms, using χ^2 , and the distribution was other than might have been expected by chance (Table 1. $\chi^2=13.44$, $df=3$; $P<0.005$).

DISCUSSION

We have shown a difference in outcomes between patients with MI who were treated in certain parts of our CICU, sunny rooms being associated with better outcomes. Further analysis shows that although men's stays were not significantly affected by their orientation, women spent only 2.3 days in sunny rooms compared with 3.3 days in sunless rooms. As noted earlier, women who have MI generally do less well than men⁷, and the difference cannot be accounted for by such factors as less vigorous treatment or their higher average age at the time of infarction. If length of stay in CICU is a guide, the women did less well in the sunless rooms in accordance with the general trend mentioned above, but did just as well as men when treated in the sunny rooms.

Mortality was higher in the sunless rooms, in both sexes. We defer speculative interpretation of our suggestive data on mortality until the results of other studies are available.

CICU nurses said that, as far as north and south were concerned, they simply allocated patients to the next empty bed. The actual distributions of women and men, and of old and young, were as might have been expected, so that these data tend to confirm that patients were not being sorted before they were allocated to bright or dark rooms. On reviewing the whole natural experiment we could find no evidence that patients were admitted to dark or light rooms other than at random.

We undertook this investigation because our discovery that sunny rooms were beneficent for depressed patients prompted us to consider the possible effects of sunny environments on other life-threatening conditions. Few nonmalignant conditions are as hazardous as major depression, but MI and the associated coronary artery disease are comparable. Our CICU had an informative

orientation and providential symmetry. We knew that depression was said to have an adverse effect on outcome in MI. We did not then and do not now have a coherent theoretical underpinning for our findings, and can only refer to some well known observations. Women become depressed more commonly than do men, by a factor of between 2:1 and 3:1⁹. Seasonal affective disorder, the first affective illness shown to be responsive to phototherapy, is also predominantly a disorder of women¹⁰. Phototherapy seems to be helpful in various depressive illnesses¹¹. Obviously, sunlight may act to improve a morbidly depressed mood, and by doing so diminish one of the risk factors.

The relevance of light to outcome in MI seems, on the basis of our findings, to merit further investigation. As a rule, the publication of observations such as we present here opens the way to the organization of a controlled trial. This is much less easy than it might seem at first sight. To be informative, such a trial would have to be double blind, which would be virtually impossible to arrange. Also, sunshine has many positive connotations for patients, and the requisite full disclosure of the background to the experiment would, we believe, discourage the great majority from freely giving informed consent. Controlled trials are more familiar to many researchers than are natural experiments, but each has advantages and disadvantages. Our reported natural experiment has the great advantage that it is being spontaneously undertaken all over the world; there are hundreds of CICUs in existence, and of these some will have both informative orientation and adequate records so that we may expect that soon several replications will be produced.

Sunshine may affect favourably one or more of the mechanisms concerned with regaining health, and prove to be advantageous in a range of conditions.

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