

Randomized trial of a patient-centered hospital unit

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Abstract

Patient-centered hospital units have grown out of the national trend to greater consumerism, but few of these units have been evaluated rigorously. We used a randomized controlled trial to compare patient outcomes on the Planetree Model Hospital Unit with other medical-surgical units in the hospital. Planetree patients were significantly more satisfied than controls with their hospital stay, the unit's environment and nursing care, but did not differ in ratings of physician care. Planetree patients reported more involvement in their care while hospitalized and higher satisfaction with the education they received. There were few differences between Planetree and controls in health behaviors. While Planetree patients reported better mental health status and role functioning after discharge, their health status was similar to controls after 3 to 6 months. There were no differences in length of stay and charges for the index hospitalization, readmissions or outpatient care during the following year. © 1998 Elsevier Science Ireland Ltd.

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1. Introduction

During the past decade there has been a return to patient-centered care, away from technological and professional oriented care. Patient-centered care treats patients as individuals and defines quality of care from the patient's perspective. Hospitals have

been especially interested in focusing more attention on the patient [1,2]. They have embraced the concept of patient-centered care to improve quality of care and increase their competitive advantage [3]. Donabedian categorized the activities for the management of illness into two domains: the technical and the interpersonal [4]. Most patient-centered units have focused on improving the interpersonal aspects of care involving physician, nurse and patient interactions, as well as the amenities of care, while

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hoping that the technical aspects of care would also be improved.

Patient-centered care units emphasize greater involvement and support of the patients, more personalized care, and increased health education. This concept has grown out of the international trend towards greater consumerism. Health educators have advocated a model which increases knowledge about health and illness, and which emphasizes active partnership and participation in a client-provider relationship [5]. Gerteis et al define patient-centered care as: (1) respect for patient values, preferences, and expressed needs; (2) coordination and integration of care; (3) information, communication, and education; (4) physical contact; (5) emotional support and alleviation of fear and anxiety; (6) involvement of family and friends; and (7) transition to home and continuity of care [6].

Although the active patient is promoted by popular and professional literature, most examples of hospital patient-centered care in the literature are descriptive, i.e. tri-care systems [7], cooperative care units for stable ambulatory patients [8] or for specialized patients [9–11]. Very little research has explicitly tested the effects of patient involvement or patient-centered care [12–14]. To our knowledge, there have been no comprehensive evaluations of patient outcomes comparing patient-centered units with traditional hospital units. Therefore, we evaluated the Planetree Model Hospital Unit in San Francisco, which provides a more homelike environment, incorporates the patient as a partner in the care process, and has specially trained nurses who provide nurturing care and increased patient education. The purpose of the research was to compare the Planetree unit with traditional units regarding patient satisfaction, patient education and involvement in care, health behavior and compliance, health status, and use of services.

1.1. Description of the Planetree program

The Planetree Model Hospital Unit was one component of Program Planetree, a non-profit organization founded in 1978 to provide the public with access to health information and to improve the quality of hospital care. The Planetree unit was a demonstration program, intended by its founders to

serve as a model for hospitals and health care providers throughout the country. The Planetree inpatient unit is located at California Pacific Medical Center (CPMC), a 272-bed tertiary care hospital located in San Francisco, which offers a full range of medical services including heart, kidney, and bone marrow transplantation. The unit opened in June 1985, providing services to a wide range of general medical-surgical patients.

The purpose of the Planetree Model Hospital Project was to provide more patient-oriented hospital care than was the practice in United States medicine. Planetree implemented patient-centered care in the following ways. First, they renovated a 13-bed medical surgical unit to create an environment which was home-like, comfortable, and soothing. Second, Planetree used primary nurses who were trained to provide personalized care, to educate patients, and to promote patient involvement. In addition, the unit employed a half-time nutritionist and a half-time health educator. Third, Planetree trained patients to be partners in learning about their condition and taught skills regarding self-care, nutrition, and healthy behaviors. Patients were given written materials as well as being taught through verbal techniques and demonstrations. Planetree nurses encouraged involvement of the patient, family and friends in the care process. They emphasized strengthening the patient/nurse/physician interactions. Fourth, art and entertainment were included in the healing process. Original artwork hangs in each patient room. Music, meditation and relaxation cassettes, as well as a wide range of videos with a preponderance of humor, were available.

Planetree became the first unit in the hospital to implement primary nursing. A special hiring process was carried out and those selected were given intensive initial training and received on-going education about the Planetree philosophy. During the course of this study, Planetree nurses rarely worked on other units nor did other nurses rotate to Planetree.

As a companion to this study, we conducted a qualitative study to identify how Planetree implemented patient-oriented care compared to other units of the hospital [15]. These results and a more detailed description of the Planetree Model Hospital Program have been published elsewhere [16].

2. Methods

We used a randomized controlled trial to compare patient outcomes on the Planetree unit with standard care provided by four other general medical-surgical units in the hospital. It was hypothesized that a stay on the Planetree unit would improve the outcomes of care, e.g., patient satisfaction, health education, patient involvement in care, health behaviors, perceived health status, and use of services. Many of these concepts and measures were adapted from the Medical Outcomes Study [17] and from past work on patient satisfaction [18,19]. In addition, original items and scales were developed by the research team, and testing revealed that they were internally consistent and valid [20]. Each scale reported in this paper consists of 4 to 12 items. Higher scale scores represent higher satisfaction or better outcomes.

Patients were eligible for the study if they were 18 years of age or older, were to be admitted to a general medical bed in the hospital, understood English, and were well enough to complete an admission interview. Study staff randomly assigned eligible patients to either the Planetree unit or another medical unit in the hospital using a computerized system, blocked in groups of 20. However, due to high occupancy rates, there was often only one study bed available and patients could not be randomized, so they were assigned to that bed (see Fig. 1). After extensive analysis, we found the randomized and non-randomized groups to have similar characteristics upon entry (see Table 1). Thus, we combined the two groups.

Patients were entered into the study from December 1986 to February 1990, and a total of 760 patients completed an admission interview: 315 Planetree patients and 445 patients on other medical units. Study participants (85% of those eligible) were significantly younger, and more likely to be male and Caucasian than those patients who were eligible but declined to participate.

Six experienced interviewers were hired to collect data for the study. They participated in a one-week training session and weekly meetings during the study. Each patient in the study was asked to complete: a 20-minute interview at admission to the hospital to obtain baseline characteristics, a questionnaire one week after discharge to assess short

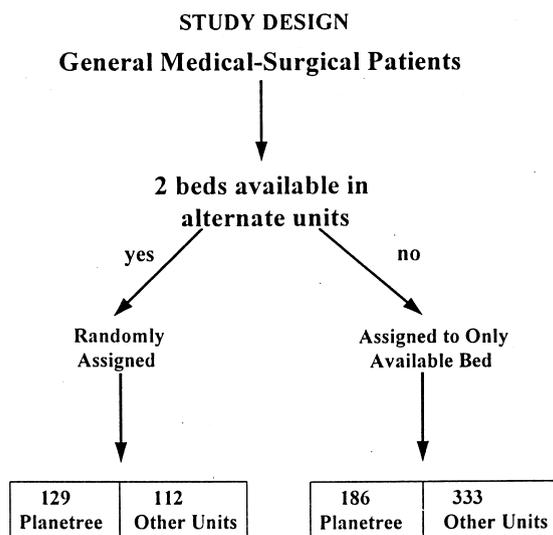


Fig. 1. Study design

Table 1
Comparison of selected characteristics for those randomly assigned versus non-randomly assigned*

	Random assignment (n = 241)	Non-random. assignment (n = 519)
\bar{x} Age	47.1	46.7
% Males	63.5	62.3
Education		
% High school or less	25.8	23.9
% College only	53.4	53.6
% Post-graduate	21.0	22.2
% Work full time	38.7	40.1
% Poor or fair health status	38.8	39.0

*There were no significant differences.

term effects of the hospitalization, and questionnaires at three months and six months post-discharge to assess any longer term effects on outcomes. The study was not blinded, except at the admission interview. Questionnaire completion rates for each of the four questionnaires was approximately 80% for both Planetree and control patients. Older and sicker patients dropped out of both groups at a similar rate.

Our study also evaluated the differences in the use of resources per patient during their index hospitalization (defined as the hospitalization at entry to the study) and over the following year. We obtained

from California Pacific Medical Center all billed hospital charges as a proxy for resource use. We obtained information on admissions at other hospitals or skilled nursing facilities, use of emergency care, and outpatient visits from self-reported questions on the questionnaire. Natural log transformations of length of stay and charges were used as dependent variables in the analyses, and examination of log normal probability plots indicated that these transformations resulted in a near normal distribution of error terms. We hypothesized that length of stay and total charges per admission to the Planetree unit would be similar to or less than they would be for admission to other medical units in the hospital.

Patient characteristics were compared between Planetree and other units using chi-square or t-tests to assess statistical significance. We analyzed the outcome variables using analysis of covariance to adjust for differences in these patient characteristics between the units [21]. In addition, we tested three different methods to adjust for case mix variation. All methods used personal characteristics and health status measures at admission, and all discharge diagnoses from the index hospitalization. In the first method, patient medical condition was controlled for using the disease stage and patient severity algorithm of Gonnella, Hornbrook, and Louis [22] with the weights for the major categories of the diagnosis related groups (DRGs). The second method used Horn and colleagues severity of illness index [23]. In the third method, diagnoses were represented by dummy variables for the 26 major categories of ICD9. We also adjusted for severity by constructing a variable representing the number of secondary diagnoses for an admission reported on the discharge summary. However, there were no important differences using the three methods to adjust for severity of diagnoses, so we report the first method.

3. Results

3.1. Patient characteristics

In general, Planetree patients and patients on other medical units had similar characteristics. However, Planetree patients were significantly older and had a lower level of education, and fewer worked full-time

(Table 2). There were no differences in gender, race, marital status, social support, health status, or prior utilization. Nor were there any significant or important differences in discharge diagnosis categories between Planetree and other units. In particular, there were no significant differences in the percentage of AIDS patients, with 16% in Planetree and 19% in other medical units. All results are controlled for differences in patients' demographic and diagnostic characteristics.

3.2. Patient satisfaction and outcomes

Overall, Planetree patients were significantly more satisfied with their hospital stay as assessed at discharge than patients on other units (Table 3). They were significantly more satisfied with the unit's environment and architecture, and with the technical aspects of care. They reported significantly greater opportunity to see family and friends and to interact with other patients on Planetree. Planetree patients were also more satisfied with the involvement of nurses in providing personalized and nurturing care. However, there were no differences between the units in physician involvement or communication, perhaps because physicians treat all of their patients similarly, regardless of unit.

Patients' perception of their health education and involvement in care, which includes such concepts as independence and style of interaction with providers, were also assessed. The first three scales, shown in Table 4, were measured after discharge. Compared with controls, Planetree patients said they learned significantly more about their illness and self-care, and were included more often in the care process. They were also more satisfied with the health education they received while hospitalized. They reported that they implemented this education and participated in programs such as nutritional reform, a self-medication regimen and customer-oriented medical records. The last two scales in Table 4 were measured at admission, discharge, three months and six months post-discharge to evaluate both the immediate effects of the Planetree hospitalization and longer term effects. Units were similar in patients' perception of control over their health, after discharge or long term. This scale measures the patients' attitudes and reported behavior regarding

Table 2
Selected characteristics of study participants at index admission

	Planetree (n = 315)	Other (n = 445)
\bar{x} Age (S.D.)	48.6 (17.3)	46.3* (15.8)
% Male	64.1	61.6
% Caucasian	81.9	79.3
<i>Marital status (%)</i>		
Married	38.4	34.8
Never married	37.8	41.1
Separated	2.5	3.6
Widowed, divorced	21.3	20.5
% With spouse or partner	51.4	52.1
<i>Education (%)</i>		
High school or less	29.5	21.8*
College only	53.0	53.9
Post-graduate	17.5	24.3
<i>Work status</i>		
Full time	35.9	42.2*
Part time (health reasons)	2.9	3.1
Part time (other reasons)	5.4	5.4
Retired	22.2	18.7
Disabled	21.0	21.8
Laid off/unemployed	2.5	4.3
Homemaker	4.8	3.1
Not working/other	5.4	1.3
\bar{x} Total family income (S.D.)	\$40 262 (33 184)	\$37 612 (29 779)
<i>Health status index at admission (%)</i>		
Poor	16.5	16.0
Fair	21.9	23.8
Good	30.5	29.0
Very good	20.0	21.1
Excellent	11.1	10.1
% Health keeps from working	41.0	37.5
% Health keeps from housework	28.6	30.8
% Ever admitted to a hospital	86.7	89.9
\bar{x} Admissions in prior year (S.D.)	0.82 (1.37)	0.73 (1.21)
\bar{x} Patient days at PPMC In prior year (S.D.)	2.8 (7.59)	2.5 (6.58)
<i>Major diagnostic category at discharge (%)</i>		
Nervous system	6.7	7.6
Respiratory	30.8	31.1
Circulatory	4.2	8.4
Digestive	13.3	11.9
Hepatobiliary	7.1	5.2
Musculoskeletal	6.3	4.1
Skin, subcutaneous	5.8	6.7
Endocrine	4.2	3.8
Kidney and urology	3.8	5.8
Infectious disease	7.1	6.1
Other	10.8	9.3

* $P < 0.05$

Table 3
Patient satisfaction after discharge

	Planetree (n = 273)	Other (n = 345)
Unit environment	70.0%	67.7%*
Technical aspects of care	85.6%	81.0%*
Social needs met	79.3%	74.1%*
Nurse involvement	81.6%	76.4%*
Physician involvement	68.9%	68.4%*
Physician communication	84.4%	82.4%*

Numbers are expressed as percentage of maximum possible score on a scale. Higher scale scores reflect higher satisfaction.

* $p < 0.0001$.

Table 4
Patient education and involvement after discharge

	Planetree (n = 273)	Other (n = 345)
Patient education and involvement	79.2%	74.6%*
Implemented education	72.3	61.3**
Satisfaction with education	73.5	65.1**
Patient control over health	73.6	74.0
Coping strategies	62.3	62.2

Numbers are expressed as percentage of maximum possible score on a scale. Higher scale scores reflect higher satisfaction.

* $p < 0.001$; ** $p < 0.0001$.

such concepts as their participation in medical decisions, ability to affect health or illness, and confidence in managing health problems. There were also no significant differences between units in patients' reported use of coping strategies when they have physical or emotional problems.

To assess how effective Planetree education was, patients were asked (after discharge) about 6 commonly recommended health behaviors: use of prescription medication, change in diet or nutrition, exercise regularly, reduce alcohol, quit or cut down smoking, or reduce stress (data not shown). Only a change in diet or nutrition was recommended significantly more often for Planetree patients ($P < 0.0005$), which probably reflects the role of the half-time nutritionist hired by the unit. Patients on the Planetree unit were more likely to receive written information about prescription medications ($P < 0.02$), a special diet ($P < 0.008$), or how to reduce stress ($P < 0.02$). However, neither recommendations nor written information appeared to be related to patients' reported compliance.

We also assessed health behaviors, from admission to three or six months post-discharge, using a nutrition scale, body mass index, minutes of exercise per week, alcohol and cigarette use, and a relaxation/stress scale. A higher percent of Planetree patients had cut down the amount they smoked at 6 months ($P < 0.003$), but all other health behaviors were similar for the two groups.

General health perceptions, disability days, physical functioning, mental health, family, social and role functioning were measured using the SF-36 at the four points in time. It was hypothesized that admission to the Planetree unit might lead to improved health status. Planetree patients did report better mental health status ($P < 0.05$) and role functioning ($P < 0.019$) a week after discharge, but these improvements disappeared at 3 months.

Lastly, we assessed whether the unit on which a patient stays affects the resources used during the index hospitalization or for readmissions and outpatient care within the following year. There were no significant differences between Planetree and other units in length of stay (6.8 vs. 6.9 days) or charges (\$8420 vs. \$8572) for the index hospitalization or for subsequent hospital or skilled nursing facility admissions within one year. Nor were there any differences in outpatient visits to physicians, outpatient surgery, or the percentage using emergency care. Length of stay for the index hospitalization (corrected for a decreasing trend over the study period) was considered as an indicator of exposure to the intervention, but was not associated with any of the outcomes.

4. Discussion

This evaluation of the Planetree Model Hospital Project is one of the few rigorous studies of patient-centered hospital units. Compared to other medical patients, Planetree patients were more satisfied with their hospital stay and with patient education, learned more about their illness and were more involved in their care while in the hospital. There were no differences in patient control over health or coping strategies, nor were there any differences in the six health behaviors which were assessed, or in the use

of health services. While Planetree patients reported slightly better mental health status and role functioning after discharge, they were similar to other patients at 3 and 6 months.

There are a number of methodological issues that should be considered when contemplating the results of this evaluation. First, there is a potential selection bias between the two groups of subjects studied. We believe that the effect of selection bias on our results is minimal because we found no differences in personal characteristics and no significant differences when we examined the interaction of the treatment effect (Planetree versus other units) and the randomized and non-randomized groups. We also compared patients randomly assigned to Planetree with those assigned by the admitting department and found the two groups to be similar. Furthermore, the analysis of covariance yielded similar results to the unadjusted results. We compared attrition at each of the four time points for Planetree and non-Planetree patients. Because patients who were sicker and older dropped out of both groups at a similar rate over time, attrition bias was similar between the two groups. However, both selection and attrition affect the representativeness of our findings. We compared our participants with all medical patients admitted to CPMC during the same period, and found our study patients to be younger and more likely to be male and Caucasian. While these groups may differ on some unmeasured attribute, we believe we have measured the most important variables which indicate bias and may affect the outcomes.

Second, since many of the outcomes were self-reported, the difference in Planetree versus other medical units might be an artifact of social desirability. Planetree patients were not blinded and knew that they were on a renovated unit, so this may have biased their responses to follow-up questionnaires. However, the physical plant for the other medical units is relatively new and patients throughout the hospital report high satisfaction with their care [24]. We would expect no bias in utilization and charge data since they were obtained from the hospital billing and case mix information systems where the data is recorded in a similar way for all hospital units.

Third, the finding of no difference in patients' control over health and coping strategy between

Planetree and other medical units may be partially accounted for by the fact that these were newly developed scales with lower reliability and validity than other measures. On the other hand, the health status findings are probably not a function of measurement error. We used a number of different measures to assess health status, all of which have been used in other studies and have demonstrated high reliability and validity.

The findings from this study have implications for other hospitals developing patient-centered care. The results provide evidence of where the unit succeeds and point out areas in which there are no differences between the patient-centered unit and other general medical units. In this study, Planetree patients were significantly more satisfied with their hospital stay than patients on other medical units. This probably reflects changes in the Planetree unit's architecture and policies, which created a more comfortable environment and greater opportunities for patients to interact with their families, providers, and other patients. Planetree's goals of greater nurse involvement and providing more personalized care were realized in the patients' higher satisfaction with nursing care. Our results differ from a study at the Samuels Planetree model hospital unit which found no difference in satisfaction between Planetree patients and those on comparable units [25].

Although increased patient involvement in the hospital has been advocated by many [12–14], the research findings to date have shown that actual patient interactions with providers remain predominantly traditional [13,14]. These findings were also true for this study. While Planetree patients reported receiving more education and involvement in their care than controls, patients in both types of units held traditional beliefs about control over health and participation in major decisions about their care. This was also seen in patients' relationships with their physicians. Patients in both units reported interactions with physicians in which the doctor rarely included the patients in the planning and management of their health problems. Future iterations of the Planetree program could attempt to increase the involvement of physicians which may lead to improved physician-patient interactions [10]. Perhaps increased discussion with physicians would lead to better outcomes. In outpatient settings, effective

physician-patient communication has been positively associated with improved patient outcomes [26].

Our results suggest that hospitals do not have to fear that patient-centered units will use more health resources than comparable units. There has been relatively little research reported on the length of stay or costs of patient-oriented programs versus traditional hospital care. Roach et al found that patients who received patient education prior to hip or knee replacement had a shorter length of stay [27]. Woods and colleagues, studying a 19 bed cooperative care unit at Methodist Hospital of Indiana, found that cooperative care obstetrical patients had significantly lower total hospital costs than patients in a traditional maternity unit [10]. When the same group compared the costs for a cooperative care program for gynecology patients versus traditional inpatient care, they found no significant differences in costs. The authors did find savings for those co-op patients cared for by physicians who were frequent users of the unit [11]. However, our study found no significant savings for Planetree patients cared for by physicians who used the unit frequently. A recent randomized trial of a hospital medical unit designed to improve functional outcomes of acutely ill older patients, found that patients in the intervention group had improved functional status at discharge and fewer were sent to long term care facilities. Length of stay and hospital charges were similar for the intervention and control groups [28].

This study showed little effect of Planetree on health behaviors. Planetree patients did report better mental health status and role functioning than controls, and it seems probable that education and involvement in their care while hospitalized resulted in these short term improvements in health. It is interesting to note that there were no differences between groups in those domains of health which are more related to the physical dimension, such as physical activity. A hospital stay may not improve health status, especially for people who are chronically ill or have a progressively debilitating disease [29].

The hospital unit is just one link in the care provided longitudinally to a patient. An average stay of seven days in the hospital may not be sufficient time to change life-long habits and behavior. Thus, patient-centered care must bridge inpatient and out-

patient settings. It will be necessary to educate providers, family and friends and provide ongoing support and education on an outpatient basis. It is likely that the patient-centered care provided by the primary care physician or community nurse will have a greater influence on patient outcomes than a short hospital stay.

The underlying issue is whether the Planetree unit provides higher quality care. Some studies suggest that more personal care is associated with better quality of care, but more research on this relationship has been recommended [26,30,31]. Our study emphasized the social/psychological aspects of the quality of care, rather than the technical. However, Planetree patients also rated the technical aspects of their care significantly higher than patients on other medical units. If Planetree patients have better communication with their nurses, there may be greater understanding of patients' values and expectations and ultimately the quality of care may be improved [32]. Lastly, patient-centered care units can work in concert with TQM/CQI initiatives to facilitate long lasting improvement [33].

In conclusion, the Planetree Model Hospital Project has been a successful example of patient-centered hospital care. Such units have the potential for improving the quality of care and making the hospital more attractive in today's competitive environment.

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