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Kathleen H. Miller
University of Massachusetts Medical School

Et al.

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Kathleen H. Miller, EdD, RN, CS-ACNP, and Cecelia Gatson Grindel, PhD, RN

As people age, their incidence of coronary heart disease increases. The majority of persons undergoing invasive procedures such as coronary artery bypass surgery are 65 and older. Because of population trends related to aging, it is projected that there will be exponential increases in the numbers of people requiring treatment for this health problem in the future. Changes in health care reimbursement have significantly decreased hospital length of stay, resulting in many patients completing their recovery either in a rehabilitation facility or at home. Patients with multiple preoperative comorbidities are at risk for postoperative complications. Older patients usually have more health problems after coronary artery bypass surgery because they have more risk factors prior to the procedure. It is not known whether there are differences in outcomes between comparatively older and younger patients when they are matched by risk classification. Information on the recovery of patients at home will enable nurses to meet their care needs prior to surgery and after discharge from the hospital. ~

Coronary heart disease is one of the major causes of morbidity and mortality for people in this country.[1] The incidence of this health problem increases as people age. In 1997, 56% of the people undergoing cardiac surgery were older than 65.[2] Treatment for this disease can include conservative management with medications or invasive procedures such as coronary angioplasty and coronary artery bypass surgery (CABS).

CABS is an option for treating patients with coronary heart disease who may not be candidates for other therapies. Elderly and high risk patients undergoing CABS have the potential to use more health care resources prior to this procedure, during recovery in the hospital, and after discharge than younger patients. Although the majority of people would prefer to convalesce at home after this procedure, many go into rehabilitation facilities for more intensive care. As reimbursement for services continues to change, health care providers need to seek ways to manage the care of patients of varying ages with increasingly limited resources.

Recovery from coronary artery bypass surgery is a complex process that involves not only physical recuperation but also improvement of psychological and social factors. The incidence of disability from coronary heart disease and multiple morbidities increases with age.[3] Elderly patients are particularly at risk for complications after CABS because of preexisting health problems and organ dysfunctions.[4] To care for these patients, there needs to be more information on their recovery at specific points during the illness-wellness trajectory. Few studies have investigated the progressive recovery of patients from a multidimensional perspective using functional measures at different time intervals. In addition, no studies to date have matched younger and older patients according to their risk for postoperative morbidity and mortality and compared them using functional measures. Thus, the specific aims of this study were to answer the following questions:

1. What are the differences in the preoperative health status and physiological, psychological, and social recovery at 1 and 6 weeks after hospital discharge for younger and older patients undergoing coronary artery bypass surgery who are matched according to risk classification?
2. Are there differences in the preoperative risk factors, postoperative complications, and length of hospital stay for younger and older patients undergoing coronary artery bypass surgery who are matched on risk classification?

Clinical Relevance

As a result of changes in surgical techniques and improved postoperative management, many

more elderly and high risk people are undergoing CABS. Relatively few nursing studies have compared the recovery of younger and older patients after this procedure. Existing studies tended to investigate these variables individually rather than using a multidimensional perspective to examine age-related outcomes in these patients.

Perioperative Factors

Elderly patients, ages 65 or older, have been reported to have more preoperative risk factors such as low ejection fractions, unstable angina, preexisting cardiovascular disease, and peripheral vascular disease than younger patients.[5–8] In addition, they have more postoperative complications than younger patients such as bleeding, stroke, wound infection, inotropic drug support, and prolonged ventilation.[4,6,9] As a result of these problems, elderly patients often have longer intensive care unit and hospital stays.[6,7,10,11] Elderly patients also have a higher mortality than younger patients after CABS because of comorbidities and postoperative complications.[8,12] Other investigators have reported no significant differences between older and younger patients during their hospitalization for variables such as postoperative complications and length of stay either in the intensive care unit or hospital.[13] Artinian et al.[14] also found no significant age-related differences for ventilator and intensive care unit hours although elderly patients did have significantly longer hospital stays than younger patients. A limitation of these two studies was that they had smaller sample sizes than reported in most of the prior studies.

Risk Classification Systems

Several investigators have linked the presence of preoperative risk factors to the development of multiple postoperative complications through the use of risk classification systems.[15–17] Risk classification systems enable health care providers to determine the relative risk/benefit ratio for patients considering cardiac surgery. These models can be used to predict postoperative morbidity and/or mortality using preoperative risk factors. These models use multiple factors such as age, gender, and ejection fraction to determine the risk of cardiac surgery.[15–18] Elderly patients classified as having lower risk for postoperative morbidity based on their comorbidities have a similar incidence of health problems and length of stay after cardiac surgery as younger patients.[19]

Functional Measures

A few investigators have examined age-related outcomes in recovery from CABS. Artinian et al.[14] investigated the physical, psychological, and social recovery of patients at 1, 3, and 6 weeks after discharge from the hospital after CABS. The sample was divided into three age groups: less than 60 years (n = 54), 60–70 years (n = 91), and more than 70 years (n = 39). No significant differences were found in the recovery of patients based on age using the ambulation, body care and movement, and sleep-rest subscales of the Sickness Impact Profile (SIP) as measures of physical recovery. There also were no significant between-group differences for psychological recovery using the Beck Depression Inventory and social recovery as measured on the home management, social interaction, and recreation and pastime subscales of the SIP. There were significant within-group differences in the recovery of the subjects on the Beck Depression Inventory and for each of the subscales of the SIP.

A study by Gortner et al.[13] examined the differential recovery of elders using multiple variables such as preoperative cardiac status, recovery, and mood states after cardiac surgery. The investigators compared a group of elderly patients 70 and older (n = 11) to two other age groups consisting of subjects less than 50 (n = 8) and 51–69 years of age (n = 48). Elderly patients undergoing cardiac surgery had more functional impairment using the New York Heart Association criteria. Recovery after discharge from the hospital was more prolonged for elderly patients because they experienced exacerbations of previous health problems such as atrial fibrillation and emphysema. Using the Profile of Mood States (POMS) to measure mood states at 3- and 6-month intervals, elderly patients were found to have lower anger/hostility than younger patients. They also had lower depression scores, although these results were not significant. Similar findings were demonstrated in a study by Yates and Belknap[20] that examined depression in male patients (n = 46) 9 weeks following a CABS, percutaneous transluminal coronary angioplasty, or myocardial infarction. The investigators reported that depression was inversely associated with age.

In summary, most elderly patients have more preoperative risk factors, postoperative complications, and longer lengths of stay than younger patients. There also are age-related differences in the physiological, psychological, and social recovery of patients after cardiac surgery, although several of these findings were not statistically significant. There is a knowledge gap as to whether younger and older patients matched according to risk for postoperative morbidity and mortality have similar patterns of recuperation. This study addressed this deficit by exploring the recovery of these patients after CABS using a

multidimensional approach that matched them by age and risk classification.

Method

This study was a secondary analysis of data from a larger study. A comparative, repeated measures design was used for the primary study. The subjects consisted of a convenience sample of 80 patients who had undergone coronary artery bypass surgery at an urban teaching hospital in the Northeast. A purposive sampling technique was used to ensure equal numbers of subjects in the two groups based on age and risk classification. The subjects were divided into two groups (< 65 years [n = 40] and > 65 years [n = 40]) and were matched using the System 99 instrument into either risk classification groups I or II.[18] Inclusion criteria consisted of age 50–80 years; ability to read, write, and understand English; first-time CABS; absence of chronic neuromuscular diseases; absence of problems with cognition; and hemodynamic stability prior to surgery. Those subjects who were transferred to a subacute facility or rehabilitation hospital after their initial hospital stay were excluded from the study because of the focus on home recovery after the procedure.

Subjects

Fifty-two men and 28 women participated in the study. The mean age of the sample was 64.34 (SD = 7.62). The mean age of the younger patients was 58.75 (SD = 4.00), while the mean age of the older patients was 69.93 (SD = 6.12). The majority of women were 65 or older (n = 17, 60.7%). Most of the subjects were married (n = 62, 77.5%), while several of the older patients in Group II were widowed (n = 8, 20%). Although most of the sample lived with others (n = 65, 81.3%), many of the subjects lived alone (n = 14, 17.5%); 11 of those living alone were in the older group (Group II). Thirty-three persons (82.5%) in the older group were retired, while only 12 (30.0%) members of the younger group were retired. Approximately 80% (n = 32) of the older subjects reported Medicare as their insurance source, while 35 (87.5%) of those in the younger group used commercial insurers. Demographic data are reported in Table 1.

Measures

Perioperative Factors. The perioperative factors included the operative procedure (e.g., number of coronary artery bypass graphs), postoperative complications, and lengths of stay in the hospital and critical care unit. Each of these variables was calculated by summing the totals for each age group.

System 99. The System 99 instrument was used to classify the subjects into four levels of predictive operative mortality.[18] The risk classifications were I (0–3%), II (3–6 %), III (6–9%), and IV (> 9%).[18] The System 99 instrument assigns a specific score for each preoperative risk factor. The scores for each item are summed and translated into a specific risk classification. Some of the items for this instrument are age, female gender, congestive heart failure, severe COPD, ejection fraction, diabetes, dialysis dependency, hypertension, left-main disease, peripheral vascular disease, reoperation, preoperative intraaortic balloon pump, and special conditions such as cardiogenic shock, pulmonary hypertension, and cirrhosis.[18] Validity and reliability have been previously established for this instrument.[18] Previous versions of this instrument have been used in patients undergoing CABS and valve replacement surgery.[10,21]

Sickness Impact Profile. The SIP is a behavioral outcome measure of health status consisting of 12 subscales.[22] Each subscale measures sickness-related dysfunction. The instrument has been used with many patient populations, including those undergoing cardiac surgery.[14,23,24] The four subscales used to measure physiological recovery were ambulation, body care and movement, mobility, and rest-sleep. Social recovery was measured by the home maintenance, recreation and pastimes, and social inter-

Table 1
Demographic Characteristics of Sample

	Younger Patients (n = 40)		Older Patients (n = 40)	
	n	(%)	n	(%)
Gender				
Male	29	(72.5)	23	(57.5)
Female	11	(27.5)	17	(42.5)
Marital Status				
Single	2	(5.0)	2	(5.0)
Married	34	(85.0)	28	(70.0)
Widowed	0	(0.0)	8	(20.0)
Divorced	4	(10.0)	2	(5.0)
Living Arrangements				
Alone	4	(10.0)	11	(27.5)
With others	36	(90.0)	29	(72.5)
Occupation				
Unemployed	3	(7.5)	2	(5.0)
Employed	25	(62.5)	5	(12.5)
Retired	12	(30.0)	33	(82.5)

action subscales. Validity and test-retest reliability were previously established.[22] Cronbach's alpha coefficients for the scales were ambulation (α = 0.79), body care and movement (α = 0.62), mobility (α = 0.74), home maintenance (α = 0.47), recreation and pastimes (α = 0.46), rest-sleep (α = 0.42), and social interaction (α = 0.63).

Profile of Mood States. The POMS version used for this study is a standardized 30-item scale that measures the six mood states of tension-anxiety, anger-hostility, vigor-activity, fatigue-inertia, confusion-bewilderment, and depression-dejection.[25] This form was developed for people recovering from surgery. In addition, this and other versions of the POMS have been widely used in patients undergoing cardiac surgery.[13,24,26,27] Validity and reliability for this instrument were previously established.[25] Cronbach's alphas for the different subscales at 6 weeks were tension-anxiety (α = 0.80), anger-hostility (α = 0.84), vigor-activity (α = 0.85), fatigue-inertia (α = 0.84), confusion-bewilderment (α = 0.48), and depression-dejection (α = 0.63).

Procedure

After Human Subjects Committee approval for the primary study, the principal investigator approached the subjects about participation in the study. Prior to surgery and following completion of the consent form, the investigator recorded the participants' responses to the SIP and POMS questionnaires. Demographic and clinical perioperative data were gathered from the medical record and hospital computer system during the patients' hospital stay. At 1 week and 6 weeks after discharge, the subjects were mailed the SIP and POMS questionnaires and asked to complete the surveys, returning them in a stamped self-addressed envelope. A follow-up letter was mailed to the subjects if the instruments were not returned within 2 weeks.

Findings

Matching on Perioperative Factors

The subjects were matched according to their risk for postoperative morbidity and mortality using preoperative risk factors on the System 99 instrument. There were no significant differences in the surgical procedures (CABG 1, 2, 3, 4, and 5) that younger and older patients had as part of their cardiac surgery (χ^2 = 2.85, p = 0.59). There were no significant age-related variations in the postoperative complications such as atrial dysrhythmias, ventricular dysrhythmias, congestive heart failure, respiratory insufficiency, renal insufficiency, bleeding, and wound infections that the patients experienced. Older patients had longer stays in the hospital (M = 6.17) than younger patients (M = 5.60), but these results also were not significant (t = -1.59, p = 0.81).

Functional Measures

Although there were age-related variations in outcomes on the functional subscales of the SIP and POMS, the between-group differences were not significant. The mean scores for the groups differed across the subscales (Table 2).

For psychological recovery as reported on the POMS, younger and older patients had comparable mood states related to anger, confusion, depression, fatigue, and tension over time. They

Table 2

Functional Measures of Sickness Impact Profile

SIP Subscales	Preoperative Mean (SD)	1 Week Mean (SD)	6 Weeks Mean (SD)	F	p
Ambulation					
Younger	8.50 (7.01)	15.09 (9.48)	3.23 (4.39)	1.684	0.192
Older	8.56 (6.27)	19.31 (10.48)	5.37 (5.01)		
Body care movement					
Younger	3.07 (9.03)	14.90 (14.96)	1.67 (3.42)	1.49	0.23
Older	2.69 (5.07)	19.53 (20.93)	4.34 (8.78)		
Mobility					
Younger	7.89 (14.67)	11.77 (9.76)	3.39 (9.72)	0.126	0.29
Older	8.08 (13.70)	14.66 (12.48)	1.94 (4.90)		
Rest and sleep					
Younger	11.31 (9.05)	16.41 (9.61)	4.96 (4.72)	1.220	0.30
Older	12.97 (7.64)	14.66 (7.22)	5.96 (6.33)		

SIP, Sickness Impact Profile; SD, standard deviation.

differed on their reports of vigor, with younger patients reporting fewer positive mood states preoperatively and higher levels of vigor at 6 weeks (Table 3).

The results for the social recovery subscales are reported in Table 4. Although older patients reported lower social functioning throughout the 6 weeks, there were no significant differences between groups on the home maintenance, recreation and pastimes, and social interaction subscales.

Discusssion

This study demonstrated that there were few differences between younger and older patients when they were matched according to risk classification. Using select perioperative factors for this study, the postoperative complications for older patients and length of stay were in contrast to the findings of other investigators but similar to the findings of Gortner, Rankin, and Wolfe,[15] who found no significant differences between older and younger patients on postoperative complications and length of stay. The elderly patients in the other studies may have had multiple comorbidities that resulted in a higher incidence of health problems after cardiac surgery and an increased length of stay.

Although older patients generally had slightly higher mean scores for most of the time intervals using the functional subscales of the SIP, their recovery was comparable to younger patients. Similar to findings by Artinian et al.,[14] the results of this study indicated that there were no age-related variations in the recovery of patients across the different time intervals for the ambulation, body care movement, and rest-sleep subscales.[14] In addition, the recovery of younger and older patients was comparable using the social subscales of the SIP. Younger patients had higher mean dysfunction scores on the social interaction subscales at 6 weeks, while older patients experienced more difficulty with recreation and pastimes during the same period. In addition, older patients had higher mean dysfunction scores for each time interval on the home maintenance subscale than younger patients. The differences on these subscales must be interpreted cautiously because they did not result in significant age-related outcomes. These findings may reflect the fact that many elderly patients lived alone and thus had to assume more responsibility in initiating their hobbies and for the care of their home. People living with others may have assistance in resuming their recreational interests along with sharing the responsibility for household chores.

The recovery of younger and older patients was similar using the POMS. Contrary to the findings of other investigators,[15,20] older patients reported more feelings of depression than younger patients, but these findings were not significant. Younger patients also reported fewer

Table 3

Mood States of Profile of Mood States

POMS	Preoperative Mean (SD)	1 Week Mean (SD)	6 Weeks Mean (SD)	*F*	*p*
Anger					
Younger	1.73 (2.73)	2.60 (3.02)	1.80 (2.47)	0.677	0.51
Older	1.65 (3.10)	2.50 (2.40)	1.05 (1.84)		
Confusion					
Younger	2.94 (1.76)	3.96 (1.91)	2.45 (1.58)	2.09	0.13
Older	2.93 (2.41)	5.48 (3.95)	2.70 (1.71)		
Depression					
Younger	2.28 (2.75)	2.23 (2.68)	.93 (1.69)	0.826	0.37
Older	2.93 (3.35)	3.35 (3.79)	1.50 (2.17)		
Fatigue					
Younger	4.73 (4.67)	8.40 (4.66)	3.55 (3.56)	0.371	0.69
Older	4.40 (4.68)	8.85 (4.61)	3.20 (3.80)		
Tension					
Younger	8.50 (4.67)	4.12 (2.86)	2.90 (3.20)	1.27	0.29
Older	7.78 (4.39)	4.25 (2.99)	1.80 (1.93)		
Vigor					
Younger	6.85 (4.67)	4.92 (13.62)	10.0 (3.88)	7.03	0.002
Older	10.0 (5.39)	4.62 (3.32)	8.95 (3.93)		

POMS, Profile of Mood States; SD, standard deviation.

Table 4

Social Recovery Measures of the Sickness Impact Profile

SIP Subscales	Preoperative Mean (SD)	1 Week Mean (SD)	6 Weeks Mean (SD)	F	p
Home maintenance					
Younger	15.18 (11.85)	22.43 (11.20)	7.48 (5.80)	0.156	0.86
Older	17.34 (11.71)	26.30 (11.45)	9.99 (8.25)		
Recreation and Pastimes					
Younger	9.99 (5.42)	13.58 (6.83)	4.02 (5.18)	1.07	0.35
Older	9.73 (5.36)	13.37 (6.52)	5.72 (5.57)		
Social interaction					
Younger	9.84 (11.47)	20.32 (14.83)	4.96 (9.66)	0.455	0.64
Older	7.40 (8.63)	22.18 (17.57)	4.06 (7.43)		

SIP, Sickness Impact Profile; SD, standard deviation.

feelings of vigor prior to surgery and more positive mood states postoperatively. It could be speculated that this health problem more acutely impacted their multiple roles and thus contributed to less positive mood states and feelings of well-being experienced by the younger individuals.

Implications

The findings of this study have several implications for nurses and other health care providers who care for patients after CABS. Although only one measure was significant on the different instruments, the elderly generally had higher mean dysfunction scores on the different subscales and reported more negative mood states. Elderly patients may recovery more slowly after this procedure and may need more time to resume their previous activities of daily living.

In summary, this study demonstrated that the preoperative health status and physiological, psychological, and social recovery of older and younger patients were similar after CABS when they were matched according to risk classification. This information can be used by nurses and other health care providers to plan for the care of these patients during the perioperative period and as they recuperate in the home setting.

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Kathleen H. Miller, EdD, RN, CS-ACNP, *is Associate Professor, Graduate School of Nursing, University of Massachusetts Medical School, Worcester, Massachusetts.*

Cecelia Gatson Grindel, PhD, RN, *is Associate Professor, School of Nursing, Georgia State University, Atlanta, Georgia.*

Address correspondence to Kathleen H. Miller, EdD, RN, CS-ACNP, 40 Colburn Drive, Sharon, MA 02067; kathleen.miller@umassmed.edu