EXAMINING THE RELATION BETWEEN DEPRESSION AND ANXIETY DISORDERS AND CORONARY ARTERY BYPASS GRAFTING (CABG) SURGERY OUTCOMES

A Thesis Presented to the
Faculty of the College of Education
University of Houston

In Partial Fulfillment
of the Requirements for the Degree

Master of Education

by

Julia Poritz

May 2012

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Abstract

Age, gender, and medical comorbidities (e.g., diabetes) are known to contribute to poor outcomes following CABG surgeries, but recent research has suggested that these traditional risk factors cannot sufficiently explain signs of poor outcome following CABG surgery (Blumenthal et al., 2003; Saur et al., 2001). For this reason, psychological risk factors have been considered as additional explanations for CABG outcomes. Thus, the present study investigated the relation between diagnoses of depression, anxiety disorders, and PTSD, and outcome variables, such as length of stay, mortality, and discharge disposition following CABG. Results showed that preoperative depression, anxiety, and PTSD independently contributed to increased length of stay, increased in-hospital mortality, and increased likelihood of non-routine discharge following CABG surgery. The results from this study provide additional support for the importance of pre-surgical screening for psychological disorders as well as the development and implementation of pre-surgical interventions to facilitate better outcomes following CABG surgeries.

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Chapter I

Introduction

It is estimated that 82,600,000 American adults have one or more types of Cardiovascular Disease (CD; American Heart Association, 2011), which is the leading cause of death in the United States, resulting in the deaths of over 600,000 Americans in 2008 (National Vital Statistics System, National Center for Health Statistics, CDC, 2008). The most common type of CD is Coronary Heart Disease (CHD), which affects 16,300,00 Americans, and killed over 200,000 Americans in 2009 (American Heart Association, 2011). Similar to CHD being the most prevalent type of CD, anxiety disorders are the most prevalent type of psychological disorder and major depressive disorder is the most prevalent lifetime disorder. In any year, it is estimated that 6.7% of Americans will receive a diagnosis of major depressive disorder and that 18.1% of Americans will be diagnosed with any anxiety disorder (Kessler, Chiu, Demler, & Walters, 2005). The estimated lifetime prevalence of major depressive disorder in Americans is 16.6%, and is 28.8% for any anxiety disorder (Kessler, Berglund, Demler, Jin, Merikangas, & Walters, 2005). Coronary Artery Bypass Grafting (CABG) is the procedure recommended for individuals with CHD, with over 400,000 CABG surgeries performed in the United States in 2009 (National Hospital Discharge Survey, 2009).

Chapter II

Review of Related Literature

Age, gender, and medical comorbidities (e.g., diabetes) are known to contribute to poor outcomes following CABG surgeries, but recent research has suggested that these traditional risk factors cannot sufficiently explain in-hospital mortality and other signs of poor outcome following CABG surgery , such as length of stay and non-routine discharge (Blumenthal et al., 2003; Saur et al., 2001). For this reason, psychological risk factors, such as depression and anxiety, have been considered as additional explanations for CABG outcomes. Depression was found to contribute independently to medical morbidity and a high level of medical complications during the 6 months following CABG surgery. Specifically, individuals with preoperative anxiety (Tully, Baker, Turnbull, & Winefield, 2008) and preoperative depression (Burg, Benedetto, Rosenberg, & Soufer, 2003; Oxlad, Stubberfield, Stuklis, Edwards, & Wade, 2006a; Saur et al., 2001) were more likely to be readmitted to the hospital than were individuals without anxiety or depression within 6 months following CABG surgery. Similar results were also found for individuals with postoperative anxiety (Oxlad, Stubberfield, Stuklis, Edwards, & Wade, 2006a) and postoperative depression (Tully, Baker, Turnbull, & Winefield, 2008).

Diagnoses of preoperative depression and preoperative anxiety in CABG patients were found to increase postoperatively (Oxlad, Stubberfield, Stuklis, Edwards, & Wade, 2006a; Tully, Baker, Turnbull, & Winefield, 2008). Although preoperative and postoperative depression declined from 60% to 40% by 6 months post-CABG, it increased to 44% at a 9-month follow-up (Khoueiry et al., 2011). Moreover, during the

first 12 months following CABG surgery, 27% of patients with depression had cardiac events, compared with 10% of patients who were not diagnosed with depression (Connerney, Shapiro, McLaughlin, Bagiella, & Sloan, 2001). Postoperative depression diagnosed 1 month following CABG was also the most significant predictor of chest pain following CABG when compared with preoperative depression and depression diagnoses 1 year and 5 years following CABG (Borowicz, Royall, Grega, Selnes, Lyketsos, & McKhann, 2002).

Some studies have shown no relation between depressive symptoms before CABG and length of stay after CABG (Burg, Benedetto, Rosenberg, & Soufer, 2003; Saur, 2001), whereas other research has shown that preoperative depression predicted longer postoperative length of hospital stay, independent of demographic and medical factors (Oxlad, Stubberfield, Stuklis, Edwards, & Wade, 2006b). Also, patients receiving daily supportive psychotherapy postoperatively had a shorter total length of stay than patients not receiving daily supportive psychotherapy, and the group not receiving daily supportive psychotherapy experienced more medical complications following surgery than did the group receiving therapy (Schindler, Shook, & Schwartz, 1989).

One month following CABG surgery, patients had lower health-related quality of life (HRQoL) than the age and gender-standardized general population and lower HRQoL than their significant others, whose HRQoL did not differ from that of the general population. Lower HRQoL consisted of difficulty with moving, breathing, sleeping, usual activities, vitality, and sexual activitiy. Additionally, patients had more symptoms of depression and anxiety (Rantanen, Kaunonen, Sintonen, Koivisto, Astedt-Kurki, & Tarkka, 2007). Six months following CABG, patients who had had

preoperative depression were more likely to report pain and less likely to report a return to their previous level of functioning (Burg, Benedetto, Rosenberg, & Soufer, 2003). Similarly, preoperative and postoperative depressive symptoms were associated with lower HRQoL for vitality, social role functioning, and physical and general health 6 months following CABG (Tully, Baker, Turnbull, Winefield, & Knight, 2009).

Early research found no relation between depressive symptoms prior to CABG and mortality in the 24 months following CABG (Saur, 2001). However, more recent research has shown that preoperative anxiety symptoms were associated with an increased risk of mortality following CABG (Tully, Baker, & Knight, 2008). Additionally, depression (Blumenthal et al., 2003; Burg, Benedetto, & Soufer, 2003; Dao et al., 2010) and Posttraumatic Stress Disorder (PTSD; Dao et al., 2010) were found to be independent predictors of mortality following CABG, in that patients with depression or PTSD had an increased risk of death following CABG over patients without depression or PTSD. Moreover, comorbid depression and PTSD was the strongest predictor of mortality following CABG. Individuals with comorbid depression and PTSD were four times more likely to die in the hospital following CABG surgery than individuals without comorbid depression and PTSD. Finally, it has been asserted that depression, PTSD, and comorbid depression and PTSD increase the risk of death following CABG to levels similar to those of physical health risks, such as age (Dao et al., 2010). Furthermore, at the end of the first 12 months following CABG surgery, more patients with depression had died than had patients who did not have depression (Connerney, Shapiro, McLaughlin, Bagiella, & Sloan, 2001).

Although research has been conducted to investigate medical and psychological predictors of poor outcomes following CABG surgery, further research pertaining to psychological risk factors is needed to develop a fuller explanation of poor outcomes following CABG surgery. Thus, the present study investigated the relation between diagnoses of depression, anxiety disorders, and PTSD, and the outcome variables of length of stay, mortality, and routine or non-routine discharge following CABG. Based on previous research, it was hypothesized that a diagnosis of depression, an anxiety disorder, or PTSD would contribute independently to longer hospital stay, increased risk of mortality, and increased likelihood of non-routine discharge following CABG surgery, beyond the contributions of age, gender, race, medical comorbidities, admission type, and health insurance status.

Chapter III

Methodology

Participants

Institutional Review Board approval was obtained from the hospital facility as well as from the authors' University Human Subjects Committee. The Nationwide Inpatient Sample (NIS) databases from the year 1998 through the year 2008 were used to select patients for this study. The NIS is part of the Healthcare Cost and Utilization Project (HCUP) and contains about 80,000,000 discharges. The NIS database provides medical and psychological disease severity measures, postoperative complications, discharge disposition, as well as procedure and diagnostic codes classified according the International Classification of Diseases, 9th Edition, Clinical Modification (ICD-9, CM).

Procedure

Using the NIS databases from 1998 through 2008, the discharge records of the 3,239,843 patients who underwent primary CABG were identified. Independent variables in this study included age, gender (1 = Female, 0 = Male), race (1 = Caucasian, 0 = All Others), the Deyo Comorbidity Index (Deyo, Cherkin, & Ciol, 1992), admission type (1 = Elective, 0 = All Others), health insurance status (1 = Medicare and Medicaid, 0 = All Others), and a diagnosis of depression, an anxiety disorder, or PTSD (1 = Clinical Diagnosis and 0 = No Clinical Diagnosis). The following ICD-9 codes were used: 296.21 (major depressive affective disorder, single episode, mild), 296.22 (major depressive affective disorder, single episode, moderate), 296.23 (major depressive affective disorder, single episode, severe, nonpsychotic), 296.24 (major depressive affective disorder, single episode, severe, psychotic), 296.25 (major depressive affective

disorder, single episode, in partial remission), 296.26 (major depressive affective disorder, single episode, in full remission), 296.31 (major depressive affective disorder, recurrent, mild), 296.32 (major depressive affective disorder, recurrent, moderate), 296.33 (major depressive affective disorder, recurrent, severe, nonpsychotic), 296.34 (major depressive affective disorder, recurrent, severe, psychotic), 296.35 (major depressive affective disorder, recurrent, in partial remission), 296.36 (major depressive affective disorder, recurrent, in full remission), 296.82 (atypical depressive disorder), 311 (depressive disorder, not elsewhere classified), 300.00 (anxiety state, unspecified), 300.01 (panic disorder), 300.02 (generalized anxiety disorder), 300.09 (other anxiety states), 300.20 (phobia, unspecified), 300.21 (agoraphobia with panic attacks), 300.22 (agoraphobia without mention of panic attacks), 300.23 (social phobia), 300.29 (other isolated or simple phobias), 300.3 (obsessive-compulsive disorders), and 309.81 (prolonged posttraumatic stress disorder).

The Deyo Comorbidity Index (Deyo, Cherkin, & Ciol, 1992) assesses for comorbid medical conditions recorded in the inpatient setting using ICD-9-CEM diagnosis and procedure codes. Examples of comorbid medical conditions captured by the Deyo Comorbidity Index include: myocardial infarction (MI), congestive heart failure (CHF), peripheral vascular disease, cerebrovascular disease (CVD), dementia, chronic obstructive pulmonary disease (COPD), rheumatologic disease, liver disease, diabetes, diabetes with complications (DWC), hemiplegia or paraplegia, renal disease, malignancy, metastatic solid tumors, and human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS).

Outcome variables in this study were length of inpatient hospital stay (LOS), in-hospital mortality, and nature of discharge. Length of inpatient hospital stay was measured in days and was defined as the difference between the hospital admission date and the discharge date for the patient. Mortality was defined as the status of the patient following surgery (1 = death and 0 = alive). Nature of discharge was defined as the status of the patient's release (1 = routine and 0 = non-routine). Non-routine discharge included discharge to a nursing home or rehabilitation center. Standard multivariable regression analysis was used to examine the relation between depression or anxiety diagnosis and LOS. Direct logistic regression analyses were performed to examine the association between depression or anxiety diagnosis and in-hospital mortality and the association between depression or anxiety diagnosis and nature of patient discharge.

Chapter IV

Results

Table 1 provides the demographic and clinical data for the sample. The sample (N = 3,239,843) consisted of mostly Caucasian (60.4%) males (71.1%) with a mean age of 65.44 (*SD* = 10.85) years. Of the sample, 4.6% had a diagnosis of depression, an anxiety disorder, or PTSD. Table 2 contains the results of a multivariable regression analysis with length of in-hospital stay as the dependent variable. The adjusted R^2 of .095 indicates that almost a tenth of the variability in length of stay is predicted by age, gender, race, health insurance status, admission type, medical comorbidities, and a diagnosis of depression, an anxiety disorder, or PTSD. Independent significant predictors included age (*B* = .081), gender (*B* = .794), race (*B* = -.197), admission type (*B* = -.2.22), health insurance status (*B* = .813), Deyo Comorbidity Index (*B* = .1.184), and a diagnosis of depression, an anxiety disorder, or PTSD (*B* = 3.158).

Table 3 contains the results of a logistic regression analysis assessing the influence of a diagnosis of depression, an anxiety disorder, or PTSD on in-hospital mortality among CABG patients. The Nagelkerke R^2, a comparable statistic to the R^2 in linear regression, was .068. Independent significant predictors of mortality included age (OR: 1.05), gender (OR: 1.43), race (OR: .94), Deyo Comorbidity Index (OR: 1.30), admission type (OR: .66), health insurance status (OR: 1.27), and a diagnosis of depression, an anxiety disorder, or PTSD (OR: 1.59). Table 4 contains the results of a logistic regression analysis assessing the influence of a diagnosis of depression, an anxiety disorder, or PTSD on discharge following CABG surgery. The Nagelkerke R2 was .142. Independent significant predictors of non-routine discharge included age (OR:

.95), gender, (OR: .69), race (OR: .87), Deyo Comorbidity Index (OR: .79), admission type (OR: 1.17), health insurance status (OR: .78), and a diagnosis of depression, an anxiety disorder, or PTSD (OR: .69).

Chapter V

Conclusions and Summary

The results of the present study and their implications make important contributions to research in the area of psychological disorders as predictors of CABG surgery outcomes because 10 years of data from the NIS database were used to examine the postoperative outcomes of over 3 million patients who underwent CABG surgery. Furthermore, although previous research has investigated psychological disorders as predictors of poor outcomes following CABG surgery, their results have conflicted on whether or not preoperative depression and anxiety are predictive of specific CABG outcomes, such as postoperative length of stay (Burg, Benedetto, Rosenberg, & Soufer, 2003; Oxlad, Stubberfield, Stuklis, Edwards, & Wade, 2006b; Saur, 2001) and mortality (Connerney, Shapiro, McLaughlin, Bagiella, & Sloan, 2001; Dao et al., 2010; Saur, 2001; Tully, Baker, & Knight, 2008). The present study found that preoperative depression, anxiety, and PTSD independently contributed to increased length of stay, increased in-hospital mortality, and increased likelihood of non-routine discharge following CABG surgery. Other variables including age, gender, race, admission type, health insurance status, and medical comorbidities also contributed to poor outcomes following CABG surgery.

A comparison of means revealed that CABG patients with a psychological diagnosis (M = 12.33 d) stayed in the hospital an average of 3 days longer than CABG patients without psychological disorders (M = 9.17 d). Furthermore, logistic regression analyses indicated that a psychological diagnosis was the strongest predictor of postoperative mortality in the present study. The odds of in-hospital mortality following

CABG surgery were 1.5 times higher in patients with a psychological diagnosis than in patients without a psychological diagnosis. Thus, a psychological diagnosis was a stronger predictor of mortality than were age, gender, or medical comorbidities, which have often been used in research to explain poor outcomes following CABG surgery. Finally, although a psychological diagnosis was not the strongest predictor of non-routine discharge, it was a significant predictor of non-routine discharge following CABG surgery. These findings are consistent with previous research (Connerney, Shapiro, McLaughlin, Bagiella, & Sloan, 2001; Dao et al., 2010; Oxlad, Stubberfield, Stuklis, Edwards, & Wade, 2006b; Tully, Baker, & Knight, 2008), and thus contribute further to the body of research concerning psychological factors as predictors of poor CABG surgery outcomes.

This study has potential limitations that can arise from use of the Nationwide Inpatient Sample database (NIS). The findings are based on the ICD-9-CM diagnosis codes, which may not capture all cases and thus may underestimate the prevalence of psychological disorders. A related limitation is that the database does not contain information about the proximity of the diagnosis to the CABG procedure, nor does it provide details about course or severity of the diagnosis. Despite these limitations, the present study's examination of 10 years worth of CABG surgery outcomes provides additional support for the importance of pre-surgical screening for psychological disorders as well as the development and implementation of brief, evidence-based interventions prior to surgery to facilitate better outcomes following CABG surgeries, such as decreased mortality. To decrease mortality following CABG surgery, doctors, nurses, and other health professionals must be trained to assess for psychological

disorders prior to CABG surgeries. If assessment yields psychological diagnoses, doctors and nurses should inform patients of the possible risks of poorer outcomes following their procedures. Additionally, pre-surgical interventions should be offered to these patients as a means of improving their postoperative outcomes.

Decreasing length of stay following CABG surgeries is important for patients and their families, but it is also important for hospitals and physicians. According to the 2011 Comparative Price Report of Medical and Hospital Fees by Country (International Federation of Health Plans, 2011), total hospital and physician costs for one CABG procedure in the United States averages approximately $67,583, and the average cost of hospital stay is $3,949 per patient, per day. In the present study, patients with a psychological diagnosis stayed an average of 3 days longer following CABG surgery than did patients without a psychological diagnosis. This difference amounts to an average of an additional $11,847 spent on patients with psychological diagnoses. Of the total number of patients included in the present study, 150,380 patients had psychological diagnoses. If each of these patients stayed an average of 3 additional days following their surgery, this cost the hospitals and physicians approximately $1,781,551,860. Thus, in order to save hospitals money, it is imperative that patients with preoperative depression, anxiety, or PTSD receive treatment prior to surgery.

Future studies should continue to examine how psychological factors contribute to CABG surgery outcomes and which psychological disorders may be more predictive of poor outcomes than others. Additionally, because the present study's use of the NIS database did not allow for examination of the amount of time between the diagnosis and the CABG surgery, future research should explore how the time period between

diagnosis and surgery contributes to poor outcomes following CABG surgeries. For example, it is important to understand the differing influences psychological diagnoses can have on surgical outcomes in terms of whether the patient was diagnosed several years before the surgery or relatively recently. The application of the results of the present study will also be an important avenue for further research in order to develop and implement pre-surgical interventions and then assess their efficacy in improving CABG outcomes.

Table 1. Demographic and Clinical Data

Demographics	Total (n = 3,239,843)
Age (y)	65.44 (10.851)
Male sex	2,304,200 (71.1%)
White race	1,955,568 (60.4%)
Deyo, Cherkin, & Ciol Comorbidity Index	1.24 (1.100)
Myocardial infarction	1,175,230 (36.3%)
Congestive heart failure	575,472 (17.8%)
Peripheral vascular disease	216,368 (6.7%)
Cerebrovascular disease	196,517 (6.1%)
Dementia	2,045 (.1%)
Chronic obstructive pulmonary disease	527,221 (16.3%)
Rheumatologic disease	38,780 (1.2%)
Peptic ulcer disease	36,904 (1.1%)
Mild liver disease	7,420 (.2%)
Diabetes	935,922 (28.9%)
Diabetes with chronic complications	129,176 (4.0%)
Hemiplegia or paraplegia	12,139 (.4%)
Renal disease	17,681 (.5%)
Malignancy	38,599 (1.2%)
Moderate or severe liver disease	2,132 (.1%)
Metastatic solid tumor	3,356 (.1%)
HIV/AIDS	183 (.0%)
Psychological Diagnosis	150,380 (4.6%)

Table 2. Standard Multiple Regression Analysis Predicting Length of Stay
(n = 3,239,843)

Variable	*B*	SE *B*	β
Constant	2.754**	.029	
Age	.081**	.000	.113
Gender (1 = Female, 0 = Male)	.794**	.009	.046
Race (1 = White, 0 = All others)	-.197**	.008	-.012
Health insurance status (1 = Medicare and/or Medicaid, 0 = All others)	.813**	.010	.052
Admission type (1 = Elective, 0 = All others)	-2.220**	.008	-.141
Deyo et al. Comorbidity Index	1.184**	.004	.167
Psychological diagnosis (1 = Diagnosis, 0 = No diagnosis)	3.158**	.020	.085

Note: **p < .001.

Table 3. Logistic Regression Analyses Assessing Psychological Diagnosis in Predicting Mortality after CABG Surgery

Variable	*B*	SE *B*	Odds Ratio (95% CI)
Constant	-7.423	.029	.001
Age	.049	.000	1.050
Gender	.358	.007	1.431
Race	-.067	.007	.936
Health insurance status	.241	.010	1.273
Admission type	-.421	.008	.656
Deyo et al. Comorbidity Index	.265	.003	1.304
Psychological diagnosis	.466	.014	1.593

Table 4. Logistic Regression Analyses Assessing Psychological Diagnosis in Predicting Routine Discharge after CABG Surgery

Variable	*B*	SE *B*	Odds Ratio (95% CI)
Constant	3.908	.009	49.803
Age	-.047	.000	.954
Gender	-.372	.003	.689
Race	-.137	.002	.872
Health insurance status	-.379	.006	.777
Admission type	.155	.002	1.168
Deyo et al. Comorbidity Index	-.235	.001	.790
Psychological diagnosis	-.379	.006	.685

References

American Heart Association. (2011). Heart disease and stroke statistics – 2012 update. *Circulation, 125*, e2-e220. Retrieved from http://circ.ahajournals.org/content/125/1/e2.full

Blumenthal, J. A., Lett, H. S., Babyak, M. A., White, W., Smith, P. K., Mark, D. B., … Newman, M. F. (2003). Depression as a risk factor for mortality after coronary artery bypass surgery. *Lancet, 362*(9384), 604-9.

Borowicz, L. R., Royall, R., Grega, M., Selnes, O., Lyketsos, C., & McKhann, G. (2002). Depression and cardiac morbidity 5 years after coronary artery bypass surgery. *Psychosomatics: Journal Of Consultation Liaison Psychiatry*, *43*(6), 464-471. doi:10.1176/appi.psy.43.6.464

Burg, M. M., Benedetto, M. C., Rosenberg, R., & Soufer, R. (2003). Presurgical depression predicts medical morbidity 6 months after coronary artery bypass graft surgery. *Psychosomatic Medicine, 65*(1), 111-8.

Burg, M. M., Benedetto, M. C., & Soufer, R. (2003). Depressive symptoms and mortality two years after coronary artery bypass graft surgery (CABG) in men. *Psychosomatic Medicine, 65*(4), 508-10.

Connerney, I., Shapiro, P. A., McLaughlin, J. S., Bagiella, E., & Sloan, R. P. (2001). Relation between depression after coronary artery bypass surgery and 12-month outcome: A prospective study. *Lancet, 358*(9295), 1766-71.

Dao, T. K., Chu, D., Springer, J., Gopaldas, R. R., Menefee, D. S., Anderson, T., … Nguyen, Q. (2010). Clinical depression, posttraumatic stress disorder, and comorbid depression and posttraumatic stress disorder as risk factors for in-

hospital mortality after coronary artery bypass grafting surging. *Journal of Thoracic and Cardiovascular Surgery, 140*(3), 606-10.

Deyo, R. A., Cherkin, D. C., Ciol, M. A. (1992). Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. *Journal of Clinical Epidemiology, 45*(6), 613-9.

Kessler, R. C., Berglund, P., Demler, O., Jin, R., Merikangas, K. R., & Walters, E. E. (2005). Lifetime Prevalence and Age-of-Onset Distributions of DSM-IV Disorders in the National Comorbidity Survey Replication. *Archives Of General Psychiatry*, *62*(6), 593-602. doi:10.1001/archpsyc.62.6.593

Kessler, R. C., Chiu, W., Demler, O., & Walters, E. E. (2005). Prevalence, Severity, and Comorbidity of 12-Month DSM-IV Disorders in the National Comorbidity Survey Replication. *Archives Of General Psychiatry*, *62*(6), 617-627. doi:10.1001/archpsyc.62.6.617

Khoueiry, G., Flory, M., Abi Rafeh, N., Zgheib, M. H., Goldman, M., Abdallah, T., … McGinn, J. T. (2011). Depression, disability, and quality of life after off-pump coronary artery bypass grafting: A prospective 9-month follow-up study. *Heart & Lung: The Journal of Critical Care, 40*(3), 217-25.

International Federation of Health Plans. (2011). [Graph hospital charges, total hospital and physician costs]. *2011 Comparative Price Report Medical and Hospital Fees by Country*. Retrieved from http://www.ifhp.com/documents/2011iFHPPriceReportGraphs_version3.pdf

National Hospital Discharge Survey. (2009). [Table number of procedures by category

and age]. *Number of All-Listed Procedures from Discharges from Short-Stay Hospitals by Procedure Category and Age: United States, 2009*. Retrieved from http://www.cdc.gov/nchs/data/nhds/4procedures/2009pro4_numberprocedureage.pdf

National Vital Statistics System, National Center for Health Statistics, CDC. (2008). [Table leading causes of death]. *10 Leading Causes of Death by Age Group, United States – 2008*. Retrieved from http://www.cdc.gov/Injury/wisqars/pdf/10LCD-Age-Grp-US-2008-a.pdf

Oxlad, M., Stubberfield, J., Stuklis, R., Edwards, J., & Wade, T. D. (2006a). Psychological risk factors for cardiac-related hospital readmission within 6 months of coronary artery bypass graft surgery. *Journal Of Psychosomatic Research*, *61*(6), 775-781. doi:10.1016/j.jpsychores.2006.09.008

Oxlad, M., Stubberfield, J., Stuklis, R., Edwards, J., & Wade, T. D. (2006b). Psychological risk factors for increased post-operative length of hospital stay following coronary artery bypass graft surgery. *Journal Of Behavioral Medicine*, *29*(2), 179-190. doi:10.1007/s10865-005-9043-2

Rantanen, A., Kaunonen, M., Sintonen, H., Koivisto, A., Åstedt-Kurki, P., & Tarkka, M. (2008). Factors associated with health-related quality of life in patients and significant others one month after coronary artery bypass grafting. *Journal Of Clinical Nursing*, *17*(13), 1742-1753. doi:10.1111/j.1365-2702.2007.02195.x

Saur, C. D., Granger, B. B., Muhlbaier, L. H., Forman, L. M., McKenzie, R. J., Taylor, M. C., & Smith, P. L. (2001). Depressive symptoms and outcomes of coronary artery bypass grafting. *American Journal of Critical Care, 10*(1), 4-10.

Schindler, B. A., Shook, J., & Schwartz, G. M. (1989). Beneficial effects of psychiatric intervention on recovery after coronary artery bypass graft surgery. *General Hospital Psychiatry, 11*(5), 358-64.

Tully, P. J., Baker, R. A., & Knight, J. L. (2008). Anxiety and depression as risk factors for mortality after coronary artery bypass surgery. *Journal Of Psychosomatic Research*, *64*(3), 285-290. doi:10.1016/j.jpsychores.2007.09.007

Tully, P. J., Baker, R. A., Turnbull, D., & Winefield, H. (2008). The role of depression and anxiety symptoms in hospital readmissions after cardiac surgery. *Journal Of Behavioral Medicine*, *31*(4), 281-290. doi:10.1007/s10865-008-9153-8

Tully, P. J., Baker, R. A., Turnbull, D. A., Winefield, H. R., & Knight, J. L. (2009). Negative emotions and quality of life six months after cardiac surgery: The dominant role of depression not anxiety symptoms. *Journal Of Behavioral Medicine*, *32*(6), 510-522. doi:10.1007/s10865-009-9225-4