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Psychological Distress as Predictor of Adherence and Prognosis among Patients undergoing Coronary Artery Bypass Grafting

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This study examined the role of psychological distress—anxiety and depression—in adherence and prognosis among patients subjected to Coronary Artery Bypass Grafting (CABG). By using an interrupted time-series design with one group, 100 patients were observed. They responded to the Hospital Anxiety and Depression Scale before surgery, at the first review (a week after hospital discharge), and at the second review (a month after first review). Participants also completed the Adherence Scale for Cardiac Patients, and the Biopsychosocial Prognosis Scale for CABG at the second review. Hierarchical multiple linear regression analyses revealed that anxiety and depression at three time-points before and after surgery together predicted participants' outcomes by significantly explaining up to 21% of variance in adherence and 52% of variance in prognosis. However, simple linear regression analysis showed that adherence significantly explained only 5% of variance in prognosis. Psychological distress, thus, affects how effectively patients follow the post-operative care regimen and how well they recover after CABG.

Keywords: Adherence, CABG, Interrupted time-series design with one group, Prognosis, Psychological distress

The exponentially rising rate of Coronary Artery Disease (CAD) has met with the growing popularity of revascularisation treatments such as Coronary Artery Bypass Grafting (CABG) in developing and developed nations alike (Centers for Disease Control and Prevention, 2015; Kasliwal, Kulshreshtha, Agrawal, Bansal, & Trehan, 2006; NHS Choices, 2014a). The procedure involves surgically creating blood vessel graft(s) on the heart to re-route the flow of blood, which otherwise is constricted by blockages (Cleveland Clinic, 2010). Being invasive, CABG generates the need for patients' preparation for surgery and their coping with the accompanying psychological distress namely, anxiety and depression. Addressing these psychological needs of the mushrooming cardiac population is a pressing yet often ignored concern in healthcare (Chivukula, Hariharan, Rana, Thomas, & Swain, 2014; Mental Health Foundation, 2011). Anxiety and depression are not only reported frequently by these patients but are further evidenced to impede their recovery and well-being (Ebadi, Moradian, Feyzi, & Asiabi, 2011). Adherence and prognosis after surgery are two notable outcomes that are affected by anxiety and depression. Adherence (also referred to as compliance) is the extent to which patients follow their doctor's advice about medication and lifestyle, while prognosis is the estimation of the course and outcome of a disease (Christakis, 1999; Jin, Sklar, Oh, & Li, 2008). Typically, adherence and prognosis are considered as parameters that are judged by a doctor. In this era of chronic diseases, patient-reported outcomes are gaining momentum given that the patient can inform about the first-hand experience and impact of the illness and/or treatment in the various domains of everyday life (Deshpande, Rajan, Sudeepthi, & Nazir, 2011; Murri et al., 2004). We, thus, investigated the role of psychological distress in adherence and prognosis as reported by patients subjected to CABG.

Psychological distress among medical patients generally refers to the presence of

anxiety and depression (Russ et al., 2012). Anxiety is a prominent experience prevalent among hospital patients, presenting in two ways—first, as a natural outcome of being subject to possibly threatening and/or invasive medical protocols; secondly, such worry may blow out of proportion and disrupt recovery due to erroneous beliefs coupled with real and potential losses (House & Stark, 2002). A research group stated that 72% of patients awaiting CABG were feeling moderate to severe anxiety (McCormick, Naimark, & Tate, 2006). Given that CABG is a complex and invasive surgery, depression is also commonly encountered by patients. One study revealed that 40.8% of patients in the pre-operative phase demonstrated borderline depression while 10.8% were found to manifest case depression. Further, 44.1% of patients were found to have borderline anxiety and 11.8% had case anxiety (Ebadi et al., 2011). Another study detailed that 43.3% of patients demonstrated anxiety before CABG, and that this rate reduced to just 36.7% a week after surgery. Additionally, 30% of the sample demonstrated depression in the pre-operative phase while 40% reported depression after CABG (Chaudhury et al., 2006). The prevalence rates of anxiety and depression cited above are considerably high, and necessitate the examination of their subsequent effects in patients' well-being.

Unaddressed psychological distress holds enduring consequences for patients' self-care and recovery. Research findings show that patients with anxiety are less likely to comply with their treatment regimen, maintain a healthy lifestyle, and effectively return to their normal life (Moser, 2007). Depression likewise worsens prognosis in patients with CAD. In a 5-year longitudinal study on 1,000 cardiac patients, Whooley and colleagues found that depressive symptoms at the baseline were associated with adverse events over the follow-up through behavioural factors namely physical inactivity (Whooley et al., 2008). Here, depression-related lethargy decisively influenced physical well-being. These findings demonstrate that psychological distress in the form of anxiety and depression, if not identified, would prolong and hence may decrease patients' well-being. Additionally, these point out the need for clarity in terms of the time continuum of anxiety and depression around the period of CABG, and the impact thereof on patients' well-being. For instance, do pre- and post-operative psychological distresses exhibit distinctive roles in the process and outcomes of CABG, or do they function in union rather than progression? Evidence on these issues will aid in drawing guidelines concerning the nature, timing, and frequency of psychological assessments and interventions essential for patients undergoing CABG.

Objectives

The first objective of the study was to assess whether psychological distress (anxiety and depression) at different time-points (before and after surgery) played a role in adherence as well as prognosis among patients who had undergone CABG. The second objective was to understand the individual and combined predictive roles of anxiety and depression in adherence and prognosis separately. The third objective was to investigate the contribution of adherence towards prognosis.

Method

Participants

As the study involved an interrupted time-series design with one group, initially 150 patients who were undergoing CABG for the first time were contacted at five corporate hospitals in Hyderabad, India. Out of them, 131 patients who had provided their informed consent were recruited. Owing to subject mortality, 100 patients were finally considered as participants in the analyses. The age of the participants ranged between 35 and 68 years (M = 55.2, SD = 7.5). Men made up 85% of the sample, while women constituted 15%. The educational qualifications of the participants were: primary school (15%), middle school (17%), secondary school (22%), senior secondary school (17%), graduation (17%), post-graduation (3%), and non-literacy (9%). The sample consisted of employees (42%), retirees (19%), businessmen (17%), housewives (12%), farmers (7%), and unemployed persons (3%).

Measures

Three scales were used—Hospital Anxiety and Depression Scale, Adherence Scale for Cardiac Patients, and Biopsychosocial Prognosis Scale for CABG. Demographic details were collected from the participants after obtaining their informed consent.

Hospital Anxiety and Depression Scale (HADS). With 14 items on a 4-point scale of 0–3 (response categories varied item wise), HADS (Zigmond & Snaith, 1983) was a self-report measure used to assess the severity of anxiety and depression in the hospital population. The scale comprised two subscales—Anxiety (e.g.: Worrying thoughts go through my mind) and Depression (e.g.: I have lost interest in my appearance). The scores of each sub-scale ranged between 0 and 21. Scores above 7 on the sub-scales suggested the presence of anxiety and depression. For this study, the degree of anxiety and depression was taken into consideration while interpreting the score, such that higher the score in a sub-scale, higher was the anxiety or depression. The internal consistency was found to be .83 and .82, respectively for the anxiety and depression sub-scales (Bjelland, Dahl, Haug, & Neckelmann, 2002). Within the current sample, the internal consistency of the anxiety sub-scale was seen to be .75, and of the depression sub-scale was .65. In order to use HADS, the required licence was purchased from GL Assessment, and the translation into the local language was obtained from Mapi Research Trust.

Adherence Scale for Cardiac Patients (ADSCAP). It is a self-report measure developed by the investigators for this study following the standard procedure for the construction of a scale. The aim of the scale was to measure the patient's adherence to medication, diet, exercise, avoidance of health risk behaviours, and consultation for complications. Initially, 32 items were written, which were presented to an expert panel of doctors and psychologists. Using the criterion of absolute agreement about item relevance among the experts, 20 items were finalised for ADSCAP. The items were in the form of questions (e.g.: Did you fail to do your prescribed exercise/walking?), on a 4-point scale (1 = Always, 4 = Never). The composite score, ranging between 20 and 80, was calculated to find out the patient's level of adherence. The higher the score, the greater was the adherence behaviour. This scale was translated and back-translated for the local language version using the standard procedure. The reliability of ADSCAP was checked, and Cronbach's alpha was found to be .67.

Biopsychosocial Prognosis Scale for CABG (BIPROSCAB). The self-report BIPROSCAB was developed by the investigators for this study following the standard procedure for the construction of a scale. The objective was to measure the patient's subjective post-surgical experience of recovery and functional capacity in bio-physical and psychosocial domains. During scale construction, a pool of 47 items was developed and presented to an expert panel consisting of doctors and psychologists. Using the criterion of absolute agreement concerning item relevance among the experts, 25 items were retained in BIPROSCAB. The items were in the form of statements (e.g.: I noticed swelling in both my feet) to evaluate the patient's perception of physical symptoms and abilities, and psychosocial experiences during the month after CABG, on a 5-point scale (1 = Very often, 5 = Never). The composite score, varying between 25 and 125, was calculated to find out the nature of the patient's prognosis. Higher score indicated better prognosis. This scale was translated and back-translated for the local language version using the standard procedure. The reliability of the scale was verified, and Cronbach's alpha was found to be .73.

Procedure

This study was approved by the Institutional Ethics Committee of the university where the authors work. Written permission for conducting the research study was taken from five corporate hospitals in Hyderabad, India. Informed consent from the concerned cardiothoracic surgeons and the patients awaiting CABG were obtained. During the study, the assessment of psychological distress using HADS was done in three phases—prior to CABG (n = 131), at

the first review, which was about a week after participants' discharge from the hospital (n = 117), and at the second review, which was about a month after the first review or approximately six weeks after the participants were discharged from the hospital (n = 100). At the second review, participants were additionally requested to complete ADSCAP and BIPROSCAB along with HADS. The assessment before surgery and at the first review lasted about 15 minutes, whereas the duration of the assessment at the second review was about 50 minutes. On completion of the assessment, the participants were debriefed.

Results

The data were analysed in order to determine the levels of and changes in psychological distress (anxiety and depression) across the three assessment phases, and to understand their role in adherence and prognosis among patients undergoing CABG. In view of this, descriptive statistics (means and standard deviations), and inferential statistics (one-way repeated measures ANOVA, Pearson's product-moment correlation coefficients, and regression analyses) were computed.

From the analyses (see Table 1), it was found that although the mean scores of anxiety and depression were less than 8 (i.e., the cut-off score for clinical diagnosis of anxiety and depression), the mean scores in the pre-operative phase were higher in comparison with the mean scores of the subsequent phases. To understand the nature of variation across the three phases, one-way repeated measures ANOVAs were computed for anxiety and depression separately. A significant difference in mean scores across the three phases was found for anxiety, $F(2, 198) = 64.18$, $p < .001$, and depression, $F(2, 198) = 36.22$, $p < .001$. By means of post-hoc analyses (Bonferroni), the mean anxiety score in the pre-operative phase ($M = 4.90$, $SD = 3.95$) was observed to be significantly higher ($p < .001$) than that of the first review ($M = 1.63$, $SD = 2.23$), and the second review ($M = 1.86$, $SD = 2.03$), although no significant difference was found between the mean anxiety scores of the two post-surgery reviews. For depression, the mean score at the pre-operative phase ($M = 4.10$, $SD = 3.30$) was significantly higher ($p < .001$) than the mean score during the first review ($M = 2.03$, $SD = 2.60$), and the second review ($M = 1.26$, $SD = 1.82$). The mean depression score of the first review was also significantly higher ($p = .019$) than that of the second review.

Table 1. Pearson's product-moment correlation coefficients between predictor variables and criterion variables

Predictors	M[a]	SD[a]	Adherence	Prognosis
Anxiety				
Pre-operative	4.90	3.95	–.16	–.53***
First review	1.63	2.23	–.25*	–.42***
Second review	1.86	2.03	–.24*	–.62***
Depression				
Pre-operative	4.10	3.30	–.06	–.27**
First review	2.03	2.60	–.44***	–.30**
Second review	1.26	1.82	–.33**	–.47***
M[b]	-	-	76.55	105.00
SD[b]	-	-	2.89	11.35

Note. [a]Means and standard deviations of predictor variables.

[b]Means and standard deviations of criterion variables during second review.

*p < .05, **p < .01, ***p < .001

Using Pearson's product-moment correlation coefficients (Table 1), we determined the relationships between the predictors—anxiety and depression—at the three time-points and the criterion variables—adherence and prognosis. Significant, negative correlations were found between adherence and anxiety at the first review, $r(98) = –.25$, $p < .05$, and the second review, $r(98) = –.24$, $p < .05$. There were significant, negative correlations between

adherence and depression at the first review, r(98) = –.44, p < .001, as well as the second review, r(98) = –.33, p < .01. In addition, significant, negative correlations were found between prognosis and anxiety in the pre-operative phase, r(98) = –.53, p < .001, at the first review, r(98) = –.42, p < .001, and the second review, r(98) = –.62, p < .001. Similarly, there were significant, negative correlations between prognosis and depression in the pre-operative phase, r(98) = –.27, p < .01, at the first review, r(98) = –.30, p < .01, and the second review, r(98) = –.47, p < .001.

In order to explore the predictive role of psychological distress in adherence and prognosis, hierarchical multiple linear regression analyses were undertaken. Before computing these, the assumptions of the presence of normality, linearity and homoscedasticity, along with the absence of multicollinearity were tested. Thereafter, we assessed the role of anxiety and depression in adherence and then in prognosis.

Role of anxiety and depression in adherence

A 3-block hierarchical multiple linear regression analysis for adherence using enter method was computed (see Table 2), wherein pre-operative anxiety and pre-operative depression were entered in Model 1. The resulting model was not found to be significant, F(2, 97) = 1.39, p = .254. In Model 2, anxiety at first review and depression at first review were added. This model significantly explained 17% of variance in adherence, adjusted R^2 = .17. Thus, Model 2 was found to be significant, F(4, 95) = 6.06, p < .001. Finally, when anxiety at second review and depression at second review were entered in Model 3, it significantly explained 5% of more variance in adherence than Model 2, F change (2, 93) = 3.26, p = .043; thereby

Table 2. Hierarchical multiple linear regression model of adherence

	B	SEB	β	t	p
Model 1					
Constant	77.07	.50	-	-	-
Pre-operative anxiety	–.14	.09	–.18	1.57	.120
Pre-operative depression	.04	.10	.04	0.34	.735
Model 2					
Constant	77.65	.48	-	-	-
Pre-operative anxiety	–.08	.09	–.10	0.87	.387
Pre-operative depression	.06	.09	.07	0.61	.546
Anxiety at first review	.01	.16	.003	0.03	.977
Depression at first review	–.48	.12	–.43	4.02	< .001
Model 3					
Constant	78.02	.50	-	-	-
Pre-operative anxiety	–.06	.09	–.08	0.67	.504
Pre-operative depression	.04	.09	.05	0.47	.640
Anxiety at first review	.12	.16	.09	0.76	.451
Depression at first review	–.46	.12	–.41	3.89	< .001
Anxiety at second review	–.12	.15	–.08	0.77	.446
Depression at second review	–.33	.16	–.21	2.01	.048

Note. B = Unstandardised Beta Coefficient, SEB = Standard Error of Beta, β = Standardised Beta Coefficient, t = t-test, p = probability

accounting for a total of 21% of significant variance in adherence, adjusted R^2 = .21. Model 3 was also observed to be significant, F(6, 93) = 5.32, p < .001. Two significant individual predictors emerged in Model 3 in respect of adherence—depression at first review (β = –.41, t = 3.89, p < .001), and depression at second review (β = –.21, t = 2.01, p = .048).

Role of anxiety and depression in prognosis

A 3-block hierarchical multiple linear regression analysis for prognosis using enter method was run (see Table 3) for understanding the role of anxiety and depression in prognosis. In Model 1, the role of pre-operative anxiety and pre-operative depression was evaluated. This model significantly explained 27% of variance in prognosis, adjusted R^2 = .27. Thus, Model 1 was found to be significant, F(2, 97) = 18.91, p < .001. Anxiety at first review and depression at first review were added in Model 2, which significantly explained 5% of more variance in prognosis, when compared with Model 1, F change (2, 95) = 3.25, p = .043; thereby accounting for a total of 30% of significant variance in prognosis, adjusted R^2 = .30. Therefore, Model 2 was observed to be significant as well, F(4, 95) = 11.52, p < .001.

Table 3. Hierarchical multiple linear regression model of prognosis

	B	*SEB*	*β*	*t*	*p*
Model 1					
Constant	112.37	1.70	-	-	-
Pre-operative anxiety	–1.54	.29	–.54	5.31	< .001
Pre-operative depression	0.05	.35	.01	0.14	.892
Model 2					
Constant	113.21	1.73	-	-	-
Pre-operative anxiety	–1.29	.31	–.45	4.11	< .001
Pre-operative depression	0.10	.34	.03	0.30	.765
Anxiety at first review	–0.69	.56	–.14	1.23	.222
Depression at first review	–0.59	.43	–.13	1.36	.177
Model 3					
Constant	116.56	1.52	-	-	-
Pre-operative anxiety	–1.01	.26	–.35	3.84	< .001
Pre-operative depression	–0.07	.28	–.02	0.24	.812
Anxiety at first review	0.39	.50	.08	0.78	.438
Depression at first review	–0.51	.36	–.12	1.41	.163
Anxiety at second review	–2.27	.47	–.41	4.80	< .001
Depression at second review	–1.34	.50	–.22	2.69	.008

Note. B = Unstandardised Beta Coefficient, SEB = Standard Error of Beta, β = Standardised Beta Coefficient, t = t-test, p = probability.

Finally, in Model 3, anxiety at second review and depression at second review were also included. This model, combining anxiety and depression at the three time-points as predictors, significantly explained an added 22% of variance in prognosis as compared with Model 2, F change (2, 93) = 22.59, $p < .001$; thereby accounting for a total of 52% of significant variance in prognosis, adjusted $R^2 = .52$. Model 3, too, was noted to be significant, $F(6, 93) = 18.70$, $p < .001$. There were three significant individual predictors in this model with respect to prognosis, i.e., pre-operative anxiety ($\beta = –.35$, $t = 3.84$, $p < .001$), anxiety at second review ($\beta = –.41$, $t = 4.80$, $p < .001$), and depression at second review ($\beta = –.22$, $t = 2.69$, $p = .008$).

Relationship between adherence and prognosis

Having found Model 3, which was inclusive of psychological distress at the three time-points, to be significant for adherence and prognosis, we further attempted to understand the relationship between adherence and prognosis. The correlation was observed to be significant ($r = .23$, $p < .05$). Owing to this result, it was found from simple linear regression analysis, taking adherence as a predictor and prognosis as a criterion, that adherence significantly explained 5% of variance in prognosis, $F(1, 98) = 5.57$, $p = .020$.

In summary, the findings indicated that anxiety and depression before and after CABG had acted in conjunction as a significant model to predict patients' adherence behaviour and prognosis. The contribution of psychological distress from across three time-points towards prognosis was relatively higher than that of adherence towards prognosis.

Discussion

The study set out to determine the level of psychological distress and its significance for patients' adherence and prognosis in context of CABG. The results depicted a reduction in anxiety and depression from before to after surgery. Yet, pre- and post-operative anxiety and depression had a significant effect on patients' level of adherence and prognosis even six weeks after they were discharged from the hospital.

Psychological distress prior to CABG was significantly higher than psychological distress following surgery. Indeed, the mean anxiety and depression scores did not warrant clinical diagnoses. Yet, the trends of change in these scores across time alongside their significant contributions to adherence and prognosis scores imply the need for periodical psychological assessment with intervention for patients during the period of surgery.

Adherence is touted as the cornerstone of prognosis after CABG, and involves following the doctor's advice concerning medication and lifestyle on returning home (Zarani, Sarami, & Sadeghian, 2014). Interestingly, we observed that adherence could explain, albeit significantly, only 5% of variance in prognosis. Conversely, a model comprising pre- and post-operative psychological distress significantly predicted prognosis, explaining up to 52% of significant variance. The same model involving psychological distress before and after surgery also significantly predicted adherence and accounted for a considerable 21% of significant variance. The low amount of variance explained by adherence in context of prognosis hints at the possibility that other variables besides adherence had played a role in predicting prognosis six weeks after the participants had been discharged from the hospital. For instance, factors such as age, co-morbidities, severity of illness, and personality have been found to impact upon patients' recovery and well-being (Karimi et al., 2008; NHS Choices, 2014b). Within the framework of this study, psychological distress was a significant predictor of prognosis. In line with Moser's (2007) argument, the current findings underline that psychological distress shapes the process and outcomes of recovery among patients subjected to CABG.

While anxiety and depression across the three time-points were found to operate

as a combined significant model predicting adherence and prognosis through hierarchical multiple linear regression analyses, the individual roles played by the two forms of psychological distress are also worth deliberating upon. Relative to anxiety, depression at the first and second reviews each acted as a significant individual predictor of adherence. One of the principal symptoms of depression is reduced interest and engagement in one's activities (American Psychiatric Association, 2013). Such anhedonia or loss of motivation can have an adverse effect on adherence to one's self-care regimen, thus, revealing the impact of depression on adherence among the current participants. Research evidences suggest that depressed patients are less likely to consume their prescribed medicines regularly (Carney, Freedland, Eisen, Rich, & Jaffe 1995; Gehi, Haas, Pipkin, & Whooley, 2005). These findings justify our results. In case of prognosis, anxiety experienced in the pre-operative phase and at the second review alongside depression at the second review each stood out as a significant individual predictor. Larsen and Christenfeld (2009) posited that the propensity for rumination and cognitive inflexibility among anxious individuals impedes healing and can provoke cardiovascular damage. These observations only restate the need to assess and address psychological distress so that the goals of CABG are achieved.

The results provided by this study come at a time when the world is being cautioned about the CAD pandemic, i.e., heart disease tops the charts for mortality and years of life lost prematurely (World Health Organisation, 2014; 2015). The success of the concurrently rising CABG procedures should, however, not be blunted by unaddressed and far-reaching psychological distress. The findings, therefore, must trigger remedial action. Assessment of psychological distress may be mandated in the biomedical healthcare. Pertinently, assessment needs to be repeatedly undertaken (before and after surgery) for a comprehensive evaluation of patients' psychological status. This would foster an understanding of patients' vulnerabilities and support needs at different points during the period of surgery. Acknowledging psychological distress should prompt the development and implementation of timely and cost-effective interventions in healthcare.

Psycho-education is one example found suitable in other studies; educating patients during the phase of CABG led to minimal psychological distress and higher ability for self-care, culminating in better recovery (Cebeci & Çelik, 2008; Martin & Turkelson, 2006). Psychological techniques such as relaxation can also be beneficial. Reports indicate that patients experience reduced pain and anxiety when they use a relaxation technique (Dehadri, Heidarnia, Ramezankhani, Sadeghian, & Ghofranipour, 2009; Firoozabadi & Ebadi, 2014; Miller & Perry, 1990). The long-term effects of relaxation (e.g., after hospital discharge) await further investigation. Social support is another relevant factor when discussing patients' well-being during the period of surgery. It promotes health behaviours and adherence, while low support is linked to the onset and exacerbation of depression and physiological dysregulation (Lett et al., 2005). One study testified to this proposition in finding that perceived social support significantly predicted anxiety and depression, thus, indicating that social support is critical for psychological well-being (Chivukula, Swain, Rana, & Hariharan, 2013). It may be worthwhile to combine psycho-education and social support such as to explore the role of peer patients who have undergone CABG in educating new patients as they await surgery. Evidence-based psychosocial interventions, thus, must be validated and implemented.

Implications

The present study shows that self-report measures constitute an appropriate and satisfactory means to quantify the experience pattern of patients in medical settings where diagnostic scans and tests are typically preferred

(Verghese & Horwitz, 2009). The focus, as the findings highlight, should also be drawn to patients' psychological well-being, which influences clinical outcomes of self-care and recovery. The current design facilitated the linking of these variables across time. This study additionally underlines that information on psychological distress before and after CABG can help to design individualised psychological interventions.

Limitations

There are a few potential limitations in the study. We relied on correlational data to understand the research problem. A relatively small sample in five corporate hospitals was recruited and retained, which might have affected the statistical analyses. In addition to measurement, qualitative method could have been used to understand the lived experiences of patients undergoing CABG. The current findings merit further research, based across cultures, to establish how psychological distress can be sensitively attended to and attenuated.

Conclusion

Psychological distress, stirred up by the event of CABG, reduced between pre-surgery and post-surgery assessments, yet acted as a significant predictor of adherence and prognosis for the participants. Anxiety and depression before and after surgery worked in combination to influence the variance in adherence behaviour and overall prognosis, six weeks after surgery. The contribution of anxiety and depression across time to prognosis was higher in comparison with that of adherence to prognosis. Timely psychological assessment and individualised psychosocial intervention during the period of surgery and convalescence are essential to optimise the therapeutic benefits of CABG.

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