

## ORIGINAL RESEARCH

# Perceived stress level of the postoperative coronary artery bypass graft patients in the intensive care unit

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## ABSTRACT

**Objective:** The purpose of this study was to measure the level of stress perceived by postoperative coronary artery bypass graft (CABG) patients. Coronary artery bypass graft is the most used surgical intervention to treat patients with coronary artery disease (CAD). Many patients consider CABG surgery as life threatening and stressful. There is a need for nurses to be aware of the patient's perception of stress to create a more therapeutic environment within the intensive care unit (ICU).

**Methods:** The research method was a quantitative descriptive survey design and descriptive statistics were used for data analysis. A convenience sampling method was used resulting in a sample size of 60 participants who had recently undergone a CABG surgical procedure. The participants completed the Intensive Care Unit Environmental Stressor Scale (ICUESS) survey.

**Results:** The results of the ICUESS survey were analyzed according to rank order and mean with standard deviation scores for each of the 40 items. Findings showed the following stressors were ranked as the highest level of stress: "Being in pain", "missing your husband or wife", "having tubes in your nose or mouth", and "only seeing family and friends for a few minutes each day".

**Conclusions:** The participants in this study were not highly stressed. Pain was the highest ranked stressor. Nurses need to be aware of the perceived level of stress by the postoperative CABG patients to reduce stressors and enhance recovery. The Neuman Systems Model was appropriate for this study.

**Key Words:** Coronary artery bypass graft, Intensive care unit, Stressors, Neuman systems model, Intensive care unit environmental stressor scale

## 1. INTRODUCTION

Coronary artery bypass graft (CABG) is a most used surgical intervention to treat patients with coronary artery disease (CAD).<sup>[1]</sup> Annually in the United States (US), about 18 million Americans are diagnosed with coronary artery disease (CAD), in fact, it is estimated that about one-third of all deaths is due to CAD.<sup>[2,3]</sup> Although CABG surgery contributes to an overall improvement in the quality of life for many individuals, the surgery itself can be a significant stressor.<sup>[4,5]</sup> Although CABG is a vital surgical treatment, it is considered by many CABG patients as life threatening and stressful which can invoke fear and anxiety in many

patients and their families.<sup>[6,7]</sup> All post CABG surgical patients will spend at least 24 hours in the intensive care unit (ICU) due to having many short and long-term complications despite the beneficial effects of surgery in controlling the signs and symptoms of coronary artery disease.<sup>[3]</sup> The ICU environment is known to be stressful with physical and psychological factors that affect patients.<sup>[8]</sup> The presence of strange machinery, disturbing alarms, high noise levels, bright lights, invasive procedures, cardiac monitoring, fear of pain and discomfort, sleep disturbances, and constant interruptions of nursing care contributes to making the ICU a stressful environment.<sup>[9]</sup>

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In an ICU environment, there are a host of devices and treatment regimens used to improve and promote recovery such as the insertion of a chest tube to collect blood and drainage; a heart monitor to record heart rate and rhythm, having tubes in the nose and mouth for airway management; urinary catheter to drain and monitor urine output; and intravenous (IV) lines to provide fluids, blood products, and medications.<sup>[10]</sup> These stressors present in the ICU may have an adverse effect on recovery, therefore; it is necessary to identify the patient's perceived stressors to improve nursing care.<sup>[11]</sup> If nurses were aware of the patients' perceived causes of stress, nurses may be able to reduce or eliminate the stressors. Although it has been acknowledged that CABG surgical patients experience stress, few studies examining ICU experiences and/or stressors in the cardiac surgical population have been published.<sup>[12]</sup> The purpose of this study was to measure the level of perceived stressors by the postoperative CABG surgical patients in the ICU.

### Conceptual framework

The Neuman Systems Model (NSM) was the conceptual framework used to guide this study. The NSM is based on two major components: stress and the reaction to stress. The NSM is an open system with lines of defense to protect the patient from internal and external environmental forces or stressors. The patient is in a state of constant change adjusting to the effects of physiological, psychological, spiritual, socio-cultural, and developmental stressors to protect the core. A compromised inner core of a patient may lead to death of the system. The role of the nurse is to assist in strengthening the lines of defense and/or reduce or eliminate stressors to protect the integrity of the inner core. According to NSM the lines of defense are identified as the flexible line of defense, the normal line of defense, and the lines of resistance. The NSM provides a systematic approach to care of the CABG surgical patient who is interacting with and adjusting to the stressors of the ICU environment. The goal of the NSM is to promote system stability and equilibrium.<sup>[13]</sup>

## 2. METHODS

### 2.1 Study design

The study design used was a quantitative descriptive survey design and descriptive statistics were used to analyze the data. Postoperative CABG patients were asked to recall their level of perceived stressors identified on the survey tool during their time spent in the ICU.

### 2.2 Setting

The setting of the study was in a 30-bed medical telemetry unit of a 201-bed, private hospital in the southeastern region of the United States.

### 2.3 Sample

A convenience sampling method was utilized and consisted of 60 patients who met the criteria for the study. The participants were all patients of one cardiovascular and thoracic surgeon who agreed to have his patients be included in the study. Inclusion criteria consists of the following: elective or emergent CABG with minimum or non-existent complications; at least 18 years of age; able to speak, read, and write English; alert and cooperative.

### 2.4 Procedures

The nurse practitioners for the surgeon informed the researchers of potential subjects while they were in the ICU. After the patients arrived on the medical telemetry unit in a private room, the primary investigator (PI) and a co-investigator approached the patients to invite them to participate in the study. The purpose of the study was explained, and all questions were answered to obtain informed consent. The informed consent was provided to the participants electronically and was accessed using the investigators' iPad or laptop. Participants were then provided electronic access to the survey tool and a demographic profile using google forms. Data was collected from September 2020 to February 2021.

### 2.5 Ethical considerations

The institutional review boards (IRBs) of the university and hospital approved the study and the sampling method for participant recruitment prior to data collection. Each participant was provided informed consent and clicking on the electronic link of the investigator's iPad to begin the survey was voluntary agreement to participate in the study. Informed consent included a time of questioning and an explanation that participants could withdraw from the study at any time without repercussions and they were not obligated to answer all questions on the survey. There was an absence of bribery or coercion of any type. Participants' names were not used in the data collection process to maintain anonymity and confidentiality. Results were reported as aggregate data and was exported from a password protected computer that was always secured and kept by the PI. There were no linkages of information to identify the participants. All data was stored on a password protected computer where only the research team had access. Data will be deleted from the computer by August 2025.

### 2.6 Instrumentation

The instrument used in this study was the Intensive Care Unit Stressor scale (ICUESS). The ICUESS is a 40-item survey tool that uses a 4-point Likert scale to measure stressors (1) not stressful; (2) mildly stressful; (3) moderately stressful; and (4) very stressful. The ICUESS used in this study is

the revised version developed by Soehran<sup>[12]</sup> which utilized the ICUESS to determine factors perceived as stressful by cardiac post-surgical ICU patients. Soehran’s investigation was a partial replication of a study by Cochran and Ganong<sup>[9]</sup> who developed the ICUESS from the Ballard Q-SORT used to measure the stressfulness of commonly occurring items in the ICU environment. The Ballard Q-Sort tool was originally developed to study how patients ranked ICU environment stressors.<sup>[14]</sup> Content validity of the revised ICUESS was established by Soehran<sup>[12]</sup> utilizing a panel of critical care nursing experts. After usage of the tool, reliability has been established as 0.96 using Cronbach’s alpha. The ICUESS has been evaluated as having a 9th grade literacy level.<sup>[12]</sup> The questionnaire was designed to be completed in approximately 30 minutes. The patients’ demographic profile was attached at the end of the ICUESS survey and covered data such as the patient’s age, gender, occupation, marital status, level of education, and income. An additional question was asked at the end of the demographic profile pertaining to the impact of COVID-19 on the level of stress during hospitalization.

**2.7 Data analysis**

Data analysis was performed using the computer program Statistical Package for the Social Sciences (SPSS) version 27. Statistical analysis for descriptive methods included frequency distributions, means, standard deviations, cross-tabulations, and Fisher’s exact test. Descriptive statistical analysis was used to characterize clinical and demographic data. The mean score was calculated for each of the 40 stressors and ranked from the most stressful to the least stressful. The total stress score for each participant was obtained from the sum of the ICUESS answers. The mean score was calculated from each participant. The level of statistical significance was set as 5% (*p* value = .05). The Mann Whitney U test was used to determine associations between stress variables and demographic characteristics and the Fisher’s exact test was used to determine an association between two variables.

**3. RESULTS**

**3.1 Demographic profile data**

The number of participants who completed the ICUESS survey was 60 (n = 60). The mean age of participants was 63.72 (SD 9.48). Of the participants 39 (65%) were female and 21 (35%) were males. With respect to race, black or African Americans were 33 (55%) and white were 27 (45%). The number of married participants was 26 (43%), divorced 17 (28%), never married 12 (20%), widowed 4 (7%), separated 1 (2%). The educational level of participants was high school diploma/GED 25 (42%), some college 18 (30%), less than high school 7 (12%), bachelor’s degree 5 (8%), associate

degree 3 (5%), graduate degree 2 (3%). The work status of participants was described as full time 26 (43%), retired 23 (38%), unemployed 8 (13%), part-time 3 (5%). Income levels were divided into 3 categories with the following results: twenty-three (38%) of the participants has and income range of \$30,000-\$69,999; twenty (33%) had an income range of \$70,000 or more; seventeen (28%) of the participants had an income level range of \$0-\$29,999. When asked if the occurrence of COVID-19 added to your stress level during your hospitalization, 42 (70%) answered no, with 18 (30%) answering yes (see Table 1).

**Table 1. Demographic profile**

	M (SD)	N (%)
Age	63.72 (9.48)	
Gender		
Male		21 (35)
Female		39 (65)
Race		
Black or African American		33 (55)
White		27 (45)
Marital Status		
Divorced		17 (28)
Married		26 (43)
Never Married		12 (20)
Separated		1 (2)
Widowed		4 (7)
Education Level		
Less than High School		7 (12)
High School Diploma/GED		25 (42)
Some College		18 (30)
Associate Degree		3 (5)
Bachelor’s Degree		5 (8)
Graduate Degree		2 (3)
Work Status		
Full-time		26 (43)
Part-time		3 (5)
Retired		23 (38)
Unemployed		8 (13)
Income Level		
\$0 - \$29,999		17 (28)
\$30,000 - \$69,999		23 (38)
\$70,000 or more		20 (33)
Has the occurrence of COVID-19 added to your stress level during your hospitalization?		
No		42 (70)
Yes		18 (30)

**3.2 Ranking of stressors**

The results of the ICUESS survey were analyzed according to rank order and mean (SD) scores for each of the 40 items evaluated by the participants. The highest level of stress was

identified as “being in pain” with a mean score of 2.92 (SD 1.24). The second highest level of stress was “missing your husband or wife” with a mean score of 2.80 (SD 1.33). The third level of stress was “having tubes in your nose or mouth with a mean score of 2.58 (SD 1.39). The fourth highest level of stress was “only seeing family and friends for a few minutes each day” with a mean score of 2.57 (SD 1.33).

The least ranked items were “being aware of unusual smells around you” with a mean score of 1.00, not stressful (SD 0.00), “having to look at patterns of holes in the ceiling” with a mean score of 1.02 (SD 0.13), “hearing the telephone ring” with a mean score of 1.12 (SD 0.13). A complete ranking of all 40 items is listed (see Table 2).

**Table 2.** Stressors’ ranking & descriptives

Questions	Rank	M	SD
Being in pain	1	2.92	1.24
Missing your husband or wife	2	2.80	1.33
Having tubes in your nose or mouth	3	2.58	1.39
Only seeing family and friends for a few minutes each day	4	2.57	1.33
Not knowing what time it is	5	2.35	1.41
Being tied down by tubes	6	2.33	1.39
Not being able to sleep	7	2.23	1.38
Not knowing what day it is	8	2.00	1.38
Being thirsty	9	1.93	1.18
Not being able to move your hands or arms because of IV lines	10	1.92	1.33
Not being in control of yourself	11	1.80	1.30
Uncomfortable bed and/or pillow	12	1.70	1.15
Not knowing when to expect things will be done to you	13	1.68	1.19
Not knowing where you are	14	1.65	1.18
Having to wear oxygen	15	1.62	1.14
Being in a room which is too hot or too cold	16	1.60	1.12
Being awakened by nurses	17	1.58	1.09
Not having treatments explained to you	18	1.57	1.11
Having the nurses be in too much of a hurry	19	1.53	1.03
Hearing the buzzers and alarms from the machinery	20	1.48	0.98
Being stuck with needles	21	1.47	0.98
Having strange machines around you	22	1.45	0.95
Having nurses constantly doing things around your bed	23	1.42	1.00
Hearing your heart monitor alarm go off	24	1.40	0.99
Not having the nurses introduce themselves	25	1.38	0.94
Frequent physical exams by doctors and nurses	26	1.35	0.86
Having lights on constantly	27	1.35	0.90
Hearing other patients cry out	28	1.32	0.79
Unfamiliar and unusual noises	29	1.30	0.79
Feeling the nurses are watching the machines closer than they are watching you	30	1.28	0.87
Being cared for by unfamiliar doctors	31	1.23	0.65
Nurses and doctors talking too loudly	32	1.20	0.68
Having no privacy	33	1.20	0.71
Seeing IV bags over your head	34	1.20	0.63
Being bored	35	1.17	0.59
Having nurses use words you cannot understand	36	1.17	0.59
Having your blood pressure taken often	37	1.13	0.47
Hearing the telephone ring	38	1.12	0.56
Having to look at the pattern of holes in the ceiling	39	1.02	0.13
Being aware of unusual smells around you	40	1.00	0.00

### 3.3 Associations of stressors to demographic characteristics of the participants

There are no associations between gender and the stress-level questions. For the race comparisons, there was an association between race and the stress-level questions: "Hearing the buzzer" ( $p$ -value = .003); and "not able to sleep" ( $p$ -value = .012). For the work status comparisons, there was an association between work status and the stress-level questions: "Having strange machinery around you" ( $p$ -value = .022); "having nurses constantly doing things around your bed" ( $p$ -value = .023); and "having nurses use words you cannot understand" ( $p$ -value = .024). For the higher education status comparisons, there was an association between higher education and the stress-level questions. "Not being able to sleep" ( $p$ -value = .012).

For the income comparisons, there was an association between income and the stress-level questions: "Missing your husband or wife" ( $p$ -value = .046); "not knowing what time it is" ( $p$ -value = .045); and "only seeing family and friends for a few minutes each day" ( $p$ -value = .027). For the age comparisons, there was an association between age and the stress-level questions: "Having strange machines around you" ( $U = 122.0$ ,  $p$ -value = .026); "feeling the nurses are watching the machines more than you" ( $U = 65.5$ ,  $p$ -value = .015); "not having the treatment explained to you" ( $U = 134$ ,  $p$ -value = .010); "having nurses constantly around you" ( $U = 103.5$ ,  $p$ -value = .023) in favor of no stress; "being in a room that is too hot or cold" ( $U = 195.5$ ,  $p$ -value = .027) in favor of stress. For the marital comparisons, there was an association between marital and the stress-level questions: "Not having the nurse introduce themselves" ( $p$ -value = .015); "feeling the nurse is watching the machines more than they are watching you" ( $p$ -value = .003); "nurses and doctors talking loudly" ( $p$ -value = .035); "having nurses constantly doing things around your bed" ( $p$ -value = .033); "having tubes in your nose and mouth or both" ( $p$ -value = .037), "not being able to move hands or arms because of IV" ( $p$ -value = .008); and "having lights on constantly" ( $p$ -value = .019).

## 4. DISCUSSION

The purpose of this study was to measure the level of perceived stressors by the postoperative CABG surgical patients in the ICU. Overall, the participants in this study were not highly stressed with the highest stress measured as mildly stressful. The stressors were ranked from highest to lowest (see Table 2). The participants in this study found "pain," "missing your husband or wife," "having tubes in the nose and/or mouth," and "only seeing family and friends for a few minutes each day" as the highest ranked stressors. The mean range for the four highest ranked stressors was (2.92-

2.57). These findings were consistent with other studies examining ICU stressors in cardiac surgical patients in the ICU.<sup>[7,8,11,15-18]</sup> Several studies used the ICUESS as a measurement of stress; however, the samples varied to include patients recovering from CABG surgery and non-surgical ICU patients.<sup>[16,18-20]</sup>

The highest ranked stressor in this study was pain. This finding is consistent with a systematic review including 42 investigations of prospective cross-sectional quantitative observational studies revealing pain as the highest ranked stressor in the domain of physical, treatment and disease related stressors.<sup>[21]</sup> Pain after CABG surgery is very common because of the sternal incision. The perception of pain in cardiac surgery patients is influenced by factors associated with the surgical trauma, psychological, biological, and sociological factors.<sup>[22]</sup>

The second ranked highest stressor in this study was "missing your husband or wife." This finding is consistent with a cross-sectional study that ranked this stressor as the third most stressful for patients in the ICU.<sup>[23]</sup> This stressor is similar to the fourth highest ranked stressor "only seeing family and friends for a few minutes each day." However, "missing your husband or wife" only applies to 43% of the sample whereas only seeing family or friends for a few minutes each day applies to 100% of the sample. Married participants only had slightly higher stress from the total sample measuring limited visitation from family and friends.

The third highest ranked stressor was "having tubes in your nose or mouth". Some studies showed that having tubes in the nose and or mouth is among the highest ranked stressor.<sup>[17,21]</sup> With CABG surgical patients, routine procedures such as oral and nasal tubes are significant stressors because of the inability to speak which affects the communication with ICU staff.<sup>[24]</sup> Other research studies conducted noted that the presence of tubes in the nose or mouth was the second most common stressor of postoperative patients in the ICU.<sup>[8,15]</sup>

The participants in this study were asked if COVID-19 added to their stress level during hospitalization. Interestingly, 42 out of 60 participants (70%) shared that COVID-19 did not increase their stress level during their hospitalization stay. This finding contrasts with a study which showed COVID-19 has had an enormous impact on patients needing surgery due to increased risk for patients and staff.<sup>[25]</sup> It would be reasonable to suggest that restrictive hospital COVID-19 protocols would have an impact on the stress level. However, it can be concluded that the high ranking of stress from restricted visitation of spouse, family, and friends was not due to the impact of COVID-19.

The lowest ranked stressors by the participants in this study was “being aware of unusual smells around you”, followed by “having to look at the pattern of holes in the ceiling, “hearing the telephone ring,” and “having your blood pressure taken often”. These findings are consistent with a study using the ICUESS survey that also ranked having the blood pressure taken often as low.<sup>[18]</sup> Also, this study ranked “being aware of unusual smells and hearing the telephone ring” as low.<sup>[18]</sup>

Data analysis revealed that there were statistically significant associations between stressors and demographic characteristics of the participants. The demographic characteristics of race, marital status, work status, educational level, income level, and age had associations with stressors. The associations with the highest ranked stressors were identified. There was an association to the stress of “missing your husband or wife” and “only seeing family for a few minutes each day” with income levels. The stressor of “having tubes in the nose and mouth” had an association with marital status. The highest ranked stressor, pain, had no associations with the sample characteristics.

#### 4.1 Limitations

Generalizability of the findings of this study is limited due to the small sample size and sampling was restricted to the medical telemetry unit. The convenience sampling was drawn from one geographic area in the southeastern region of the US. Use of a prepared list of stressors may have caused other pertinent stressors to be overlooked.

#### 4.2 Implications for nursing

Nurses are in a key position to enhance the impact of the ICU experience through knowledgeable care. Stress perceptions by patients should be assessed frequently, and measures should be taken to reduce stress, particularly during the postoperative period and in high acuity healthcare settings. The results of this study suggest that nurses can potentially decrease a patient’s stress by diminishing eventful factors that contribute to making the ICU a stressful environment. In caring for postoperative CABG patients, nurses should pay particular attention to pain management as this is the highest stressor identified by numerous studies. Findings from this study support monitoring and prompt treatment of post-operative discomfort experienced by CABG surgical patients. The study by Vilite et al.<sup>[26]</sup> indicated that mid-sternal and leg incisional pain was heightened by sudden movement, coughing, and deep breathing. As a result, nurses should advocate more liberally for standing orders for pain management.

The stressor of having tubes in the nose and mouth cannot be avoided due to the necessity for a patent airway, oxygenation,

and other life supporting measures while recovering from anesthesia and general recovery. Several studies related to intubation time after CABG procedures suggest early extubation.<sup>[27,28]</sup> Nurses can use anticipatory guidance to prepare patients for extubation and assure them that the presence of tubes in the mouth or nose is temporary. Reminding patients of the plan of care may decrease anxiety as well as communicating with patients since studies show the lack of ability to communicate is a cause of stress while being intubated or having tubes in the nose or mouth. An additional implication is to realize the importance of visitation time for spouses, family members, and friends. Nurses’ awareness of known stressors for postoperative CABG patients can prompt the nurses to reduce the stressors and help patients to cope to strengthen the lines of defense. All stressors require nursing intervention since nursing assists the patient to build and maintain strong lines of defense leading to a more successful recovery.<sup>[13]</sup>

A study that supports the effort of improving patient outcomes details the obstacles of implementing a cardiac specific enhanced recovery after surgery (ERAS) program. The purpose of the ERAS program is to improve patient outcomes by minimizing postoperative trauma and pain, reducing complications, expediting recovery after cardiac surgeries.<sup>[29]</sup> Implementation of an ERAS program may help reduce stressors for postoperative CABG patients in the ICU.

#### 4.3 Recommendations for future research

Future research is needed to determine the universality of stressors that patients encounter in the Intensive Care Unit environment. Cross sectional studies using the ICUESS with larger sample sizes and demographically diverse populations are needed to increase generalizability of findings. Many studies related to postoperative CABG patients are from countries outside of the US, therefore more studies within the US are needed. Future research is needed to identify and verify nursing interventions that prevent, reduce, or alleviate the impact of stressors that CABG surgical patients experience in the ICU. Future studies that modify the environment by decreasing known stressors such as decreasing noise levels, sleep promotion, liberal visitation by spouses, family, and friends, early extubation, and removal of tubes from the nose and mouth could measure the impact on stress reduction. It is evident that further study of CABG patients’ perceptions and nurses’ observations are needed to determine the effect of the ICU environment and the care patients receive on their total experience and recovery.

## 5. CONCLUSION

The main emphasis of this study was to determine the perceived stressors encountered by postoperative CABG pa-

tients. Patients' perceptions of stressors are a valuable source of information for nursing practice and impact assessment of their plan of care. The present study utilized the ICUESS survey to measure the level of stress of known stressors and to rank them from highest to lowest. The four highest ranked stressors were: "Being in pain," "missing your husband or wife," "having tubes in the nose and/or mouth," and "only seeing family and friends for a few minutes each day." The finding of pain as the major stressor is consistent with a systematic review. Nurses should continue to prioritize pain assessments and intervene to reduce postoperative pain.

During this study ICU visitation policy was altered by the emergence of COVID-19. The researchers considered the possibility of the alteration in visitation policy being a factor

in the stress level of the participants. The findings from this study were consistent with studies conducted before COVID-19 visitation restrictions. Therefore, it can be concluded COVID-19 visitation restrictions were not a factor in participants missing their loved ones. Overall, the findings show the participants had either no or mild levels of stress. The NSM was used as the conceptual framework for the study and is an effective intervention to reduce environmental stressors in the postoperative CABG patient. It appears from the findings of this study that nursing care is effective in reducing stress in the ICU.

## CONFLICTS OF INTEREST DISCLOSURE

The authors declare that there is no conflict of interest.

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