Stress is a response to change from the norm. Stress affects all individuals to varying degrees and can be positive, such as eustress, or negative, such as distress. The purpose of this qualitative, cross-sectional study was to investigate the stressors of the typical student registered nurse anesthetist (SRNA), with the objective of identifying trends in the perceptions, manifestations, and coping mechanisms of stress. An online (SurveyMonkey) questionnaire composed of 54 study-specific questions was developed to assess stress in the SRNA population. The questionnaire was sent to members of the American Association of Nurse Anesthetists via email invitation. The study yielded a sample of 1,282 SRNA participants. Analysis revealed statistically significant relationships between self-reported stress and negative outcomes, such as increased sick days, decreased health and wellness, and depression. The study demonstrated that SRNAs perceive their stress as above average, and it remains a central concern for them.

Keywords: Coping, depression, stress, student registered nurse anesthetist, suicide.
level of stress and physiological manifestations such as elevated heart rate and salivary α-amylase levels, further emphasizing the internal reaction to stress. McKay et al. noticed that stress not only influenced subjects’ motor and mental abilities but also brought about changes in homeostasis (quantifiable adjustments of the body), leading to increased demand and consumption of oxygen and glucose. The study further noted that stressful situations, if prolonged, could lead to impaired academic performance.3

Stress can build an SRNA’s knowledge base and improve academic performance when it remains at a tolerable level. However, continual exposure to stress, both acute and chronic, may lead to decreasing levels of self-esteem or other, more serious psychological consequences. When stress reaches a harmful level, it can lead to forgetfulness, preoccupation, depression, headaches, fatigue, diarrhea, and other similar adverse manifestations.2

Personal life events are known to contribute to depression and alcohol consumption in the general population. Positive life events are less common in students during medical education than in the general population; however, when life events and stress are perceived negatively or become excessive, students experience physical and psychological impairment, including major depression.8

According to Barrios et al., suicide is the third leading cause of death among the US college-aged population, and Compton et al. noted that “the prevalence of reported suicidal ideation is highest in this age range.” Compton et al. found that stress was detrimental to productivity and often led to depression and thoughts of suicide in medical students. They stated that “depressive symptoms among medical students affect students’ lives, and may specifically have detrimental effects on academic performance.” The symptoms of depression outlined by Compton and coworkers include: (1) depressed mood most of the day, (2) diminished interest or pleasure in activities, (3) either major weight loss when not dieting or weight gain, (4) insomnia or hypersomnia, (5) psychomotor agitation or retardation, (6) fatigue or loss of energy, (7) feelings of worthlessness, (8) diminished ability to think or concentrate, and (9) recurrent thoughts of death, recurrent suicidal ideation without a specific plan, or a suicide attempt or a specific plan for committing suicide.

This investigational study expands on the aspects of SRNA stress examined in prior investigations. Self-reported data were collected to examine stress differences across demographic statistics, family status, and lifestyle changes. Replication and comparison over time help lead to better understanding of this phenomenon. Prior work established that SRNAs are stressed. The present investigation will address the gap in knowledge regarding the differences between stress in students in front-loaded vs integrated education programs, the differences in stress in students by progression in the program, and suggestions from students on how their professional organization can help them deal with stress.

Methods
A descriptive study was designed to aid in the understanding of stress in the nurse anesthetist population. The study included both practicing CRNAs and SRNAs; however, this investigational study focuses on only the results obtained from students.

After approval by the institutional review board of the Medical University of South Carolina, a multifactorial, study-specific questionnaire was formulated, focusing on stress and its effects. This survey tool was a modification of one created by the senior author (AC) in 2008 to assess wellness and burnout among American Association of Nurse Anesthetists (AANA) members, including students. The survey was administered using an online survey tool (www.SurveyMonkey.com). Paul Santoro, CRNA, AANA president at that time, invited all SRNAs to participate via email. A follow-up invitation was distributed on December 1, 2010, and the survey closed on December 31, 2010. Data were collected between September and December 2010. In this sample, there were 1,374 associate members of the AANA.

The larger survey was a self-assessment questionnaire requesting information in the following domains:

• Demographics: age, gender, employment descriptions, years in anesthesia practice, race or ethnicity, and marital status.

• Associated experiences of stress: stress symptoms, life changes in the last year, self-assessment of stress levels, satisfaction with work and life, stress coping assessment, and, at the request of the AANA Foundation, an assessment of chronic illnesses.

• Suggestions for how the AANA wellness initiative, managed by the Wellness Committee of the AANA, can help decrease stress and promote wellness of the AANA members.

A new domain was inserted to address a previously noted deficiency in understanding the effect of education status on stress. Students were asked to indicate the type of nurse anesthesia program they were enrolled in and where they were in the progression of their education (i.e., which semester).

Statistical procedures used to analyze data included independent t test for response levels in various domains and Pearson correlation coefficient. Internal consistency was determined by calculating the averages of split-half correlations using statistical analysis software (PASW Statistics 18, SPSS Inc, Chicago, Illinois). A resulting Cronbach α (r = 0.80) indicates that the SurveyMonkey questionnaire retained internal consistency.
### Table 1. Gender and Stress of Students (N = 1,374)

<table>
<thead>
<tr>
<th>Gender</th>
<th>No. (%) of SRNAs</th>
<th>Mean stressa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>901 (66.8)</td>
<td>7.6</td>
</tr>
<tr>
<td>Male</td>
<td>462 (33.4)</td>
<td>7.1</td>
</tr>
<tr>
<td>Overall</td>
<td>1,363 (100)b</td>
<td>7.2</td>
</tr>
</tbody>
</table>

a Score is based on a 10-point Likert scale.

b Numbers do not total to 1,374 because some students did not reply to the question about gender.

Abbreviation: SRNA, student registered nurse anesthetist.

### Results

- **Demographics.** According to the Council on Accreditation of Nurse Anesthesia Educational Programs, there were 5,365 students enrolled in nurse anesthesiology programs at the time of the study. The sample size of responses from associate members (SRNAs) was 1,374, or 25.6% of all students enrolled. Self-reported level of stress was assessed on a 10-point Likert-type scale. The mean level of stress, as reported by the individuals, was determined by gender, marital status, race, age, and program type (front loaded vs integrated).

The mean overall level of stress was reported to be 7.2 for all associate members (students). When comparing the reported mean level of stress between male students (7.1) and female students (7.6), stress was found to be statistically significant (t = 9.47, P < .05, Table 1).

The effect of marital status on self-reported stress was assessed. Of those responding, 31.5% were single, 3% divorced, and 65.5% married. There was no statistical significance in the mean level of stress between singles, single with children, married, or married with children. However, there was a significantly higher mean level of stress for divorced students with or without children (data not shown).

When we compared the mean level of stress among students by race or ethnicity, there was a significantly higher level of perceived stress among minority students than in white/non-Hispanic students (Table 2). This difference was statistically significant for both the black/African American and Hispanic students compared with white/non-Hispanic students (t = 11.81 and 10.60, P < .01). The population of both American Indian/Alaska native and native Hawaiian/Pacific Islander was too small to infer significance to the data.

Age did not significantly affect stress levels. There was, however, a consistent trend downward in the mean level of stress as the student increased in age. However, this was not statistically significant.

There were 2 types of nurse anesthesia programs: front loaded, in which all or most of the didactic portion of the program was presented before the clinical experiences, and integrated programs, in which students were in the classroom and receiving clinical education simultaneously. A comparison of the mean level of stress scores for the 2 types of programs was made (Table 3). Analysis showed a statistically significant difference in the amount of stress that students in integrated programs experienced compared with those in front-loaded programs (7.9 vs 7.1; t = -2.42, P < .05).

The length of time in school showed a continual increase during the first 5 semesters, then a leveling off until the final 3 semesters in the program (Table 4).

- **Depression and Suicidal Ideation.** Stress is known to be a leading cause of depression in many individuals. This study found that 47.3% (n = 554) of SRNAs who responded reported being depressed at some time while in school and that 21.2% (n = 245) had suicidal ideation (Table 5). Using comparison of means, both of these numbers were statistically significant at the 99% confidence interval (stress vs depression: t = 12.14, P < .05; stress vs suicidal thoughts: t = 14.33, P < .01). Of those who admitted to being depressed, 21.2% had suicidal ideation, which was significant at the 95% confidence interval (t = -11.81, P < .01, Table 5). In addition, many of the students (n = 60, 6.3%) personally knew someone who committed suicide while in nurse anesthesia school. When we compared the means between male and female students (1.9 vs 1.9, t = 0.62, P < .05), there was no difference in those who had suicidal ideation.
Table 4. Stress vs Time in Program
Abbreviation: SRNA, student registered nurse anesthetist.

- Stressful Events. There are many events in life known to be stress provoking, and a student entering into or continuing in school would expect a certain number of these, for example, quitting a job, moving, starting school, and decreasing income. In addition to these known stressors, a large number of the SRNAs in this survey also encountered emotional events: birth of a child (5%), death of family member (13%), divorce (2.5%), marriage/legal union (12.2%), and personal injury (9.4%).

The frequency of stress symptoms is shown in Table 6.

- Coping With Stress. Many students had sought help or were currently under treatment of a mental health professional to help manage their stress. Of those responding, 17.1% (n = 183) indicated they were taking prescription medications to help decrease their stress or to at least help manage their stress symptoms.

Being empowered to control one’s life and surroundings is considered important by many individuals. Of those responding, 69.9% of the respondents believed they were not empowered to effect change in their learning environment, which added to dissatisfaction with their choice of a career or school (t = –9.08, P < .01). This perception was reversed when compared with their perceived ability to effect change in their personal lives (64.8%) and its effect on life satisfaction (t = –17.90, P < .01).

Adapting to stress is an individualized activity and can be maladaptive in nature. The respondents were presented with alternative ways of managing stress and asked to choose how frequently they used each of these methods, with lower numbers indicating more frequent use. The responses are outlined in Table 7.

Exercise is a known stress reliever. Students who exercised more frequently (daily or several times per week) had significantly lower reported stress scores (Table 8). When comparing students who exercised several times per week and those who exercised infrequently, there was a significant difference in the mean stress score, from 6.7 to 8.3. These values were statistically significant (t = –3.27, P < .05).

- Wellness Suggestions. Finally, students were asked to provide suggestions for the AANA wellness initiative that they thought would be useful for increasing wellness. Some of their suggestions (edited) included:
  1. Provide peer support.
  2. Formulate an exercise program that will “get me out of the house.”
  3. Suggest ways to find affordable gyms for SRNAs.
  4. Provide personal health and stress management tips.
  5. Offer guidelines to promote a healthy stress-free lifestyle.
  6. Show videos on interacting with difficult people.
  7. Propose integrating wellness into anesthesia school as an advertised resource.

Table 5. Stress vs Depression and Suicidal Ideation
Abbreviation: SRNA, student registered nurse anesthetist.

<table>
<thead>
<tr>
<th>Response</th>
<th>No. (%) of SRNAs</th>
<th>Mean stress</th>
</tr>
</thead>
<tbody>
<tr>
<td>Been depressed Yes</td>
<td>554 (47.3)</td>
<td>8.5</td>
</tr>
<tr>
<td>No</td>
<td>587 (52.7)</td>
<td>7.0</td>
</tr>
<tr>
<td>Suicidal ideation Yes</td>
<td>245 (21.2)</td>
<td>8.1</td>
</tr>
<tr>
<td>No</td>
<td>905 (78.7)</td>
<td>7.1</td>
</tr>
</tbody>
</table>

Table 6. Stress Symptoms by Frequency
Abbreviations: SRNA, student registered nurse anesthetist; GERD, gastroesophageal reflux disease.

<table>
<thead>
<tr>
<th>Symptom</th>
<th>No. of SRNAs experiencing weekly (N = 1,275)</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agitation/Anxious/irritable</td>
<td>814</td>
<td>1.3</td>
</tr>
<tr>
<td>Annoyed by trivial things</td>
<td>634</td>
<td>1.6</td>
</tr>
<tr>
<td>Cravings/Compulsions</td>
<td>456</td>
<td>1.5</td>
</tr>
<tr>
<td>Decreased concentration</td>
<td>433</td>
<td>1.5</td>
</tr>
<tr>
<td>Digestion problems: GERD</td>
<td>508</td>
<td>1.7</td>
</tr>
<tr>
<td>Eating disorders</td>
<td>274</td>
<td>1.8</td>
</tr>
<tr>
<td>Frequent back/neck pain</td>
<td>458</td>
<td>1.5</td>
</tr>
<tr>
<td>Headaches</td>
<td>375</td>
<td>1.4</td>
</tr>
<tr>
<td>Impatient with others</td>
<td>367</td>
<td>1.3</td>
</tr>
<tr>
<td>Mood swings</td>
<td>398</td>
<td>1.5</td>
</tr>
<tr>
<td>Nervousness/tremors</td>
<td>288</td>
<td>1.9</td>
</tr>
<tr>
<td>Overuse of alcohol</td>
<td>150</td>
<td>1.7</td>
</tr>
<tr>
<td>Sleep disturbance</td>
<td>417</td>
<td>1.8</td>
</tr>
<tr>
<td>Too busy for things I used to do</td>
<td>772</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Table 7. Coping Mechanisms

8. Describe different types of stress relief that individuals or cultures use, from the perspective of someone using them, such as meditation.
9. Ensure affordable insurance coverage for all students enrolled in health professions. (“Half of my classmates do not have insurance because they can’t afford it, yet we take care of the sick.”)
10. Require schools to integrate wellness into the curriculum in a more routine way.
11. Reach out to students in anesthesia school more often.
12. Incorporate some of the researchers’ ideas to help minimize stress to students.
13. Give large discounts toward massage.

Discussion

Student registered nurse anesthetists experience stress from a variety of sources. Jimenez et al11 reported that nursing students experience academic stressors, clinical stressors, and external or everyday stressors. Data from this study were used to quantify the stress that SRNAs experience, how that stress is manifested in terms of acute vs chronic illness, and what coping mechanisms SRNAs use. The current study also tested for a correlation between the type of education program and stress.

The overall mean score for level of stress was reported to be 7.2 for all associate members of AANA (students) responding to the survey. The overall student mean stress score for students from the 2008 survey reported by Chipas and McKenna5 was 7.1. With use of an independent t test, this increase was significant (t = 8.5, P < .05). It would appear from the data that female students (Table 1) are more susceptible to experiencing stress than are male students (t = 9.47, P < .05). This increased risk of stress should probably be addressed by the program administrators early in the educational cycle.

There appears to be a major difference in perceived stress among minority students. The sample size of 2 of the minority groups, American Indian/Alaska native and Native Hawaiian/Pacific Islander, is a limitation, as the size was too small to be able to draw conclusions about significance. However, the African American/black and Hispanic groups were large enough for statistical comparison, which found an increased level of stress compared with the white (non-Hispanic) group (7.53 and 7.42, respectively, vs 7.1). In a 2009 study, Martyn-Nemeth et al12 concluded that in minority students (1) stress and low self-esteem were related to avoidant coping and depressive mood, and that (2) low self-esteem and avoidant coping were related to stress, depression, and unhealthy eating behavior. Results suggest that teaching skills to minority students to reduce stress, build self-esteem, and use more positive approaches to coping may prevent stress as well as lower the risk of depression and unhealthy eating.12

Age and marital status were not identified as major sources of stress in our study. There was a slight increase in stress levels between divorced students and their single or married counterparts. Gender did show statistical significance, however. Male students tended to have a lower perception of stress than female students (7.1 vs 7.6, t = 9.47, P < .05).
The type of program was identified as a significant component leading to increased stress. Students in front-loaded programs (all classroom work completed before starting the clinical experience) had an approximate 10% reduction in their perceived level of stress compared with students from integrated programs (7.1 vs 7.9). The increased stress of the integrated program could come from the fact that students are performing anesthetics and cases for which they have little academic preparation.

Another factor that influenced stress levels is the length of time the student was in the training program. During the first semesters, as students experienced new knowledge and skills, their stress levels rose. Later, as the students continued to refine their skills, the level of stress declined, only to rise again during the last semesters. This increase in stress in the last months of their education would correlate with the time that students are starting to prepare for their board examinations and finding jobs. This rise, then fall in stress levels was also described by Zupriya Gorostidi et al. in nursing students as they progressed through their education toward graduation and preparation for board examinations.

Student registered nurse anesthetists experience a variety of symptoms and ailments (Table 6) that have been linked to increasing levels of stress. To our knowledge, agitation, trivial annoyances, chronic back and neck pain, headaches, obesity, hypertension, gastroesophageal reflux disease, compulsions, and substance abuse/misuse are not usually experienced by individuals under the age of 30 years, but they are experienced to a great degree by SRNAs. Students often use maladaptive coping mechanisms (boldface items in Table 7) such as using alcohol, goofing off, and expressing inappropriate negative feelings. According to Jimenez et al., "Stress has been identified as an important psycho-social factor in the educational process because it may influence academic performance and student well-being." Because of this, early identification may improve academic outcomes and program efficiency, while limiting manifestations experienced, such as absenteeism due to illness. Furthermore, developing coping skills to reduce harmful reactions to stress may translate into the benefit of increased productivity and learning.

Relaxation and destressing techniques used by students include music, meditation, and exercise. This study shows that students who exercise several times per week have lower stress than those who exercise infrequently (6.2 vs 8.3). According to Papathanassoglou et al., "Limbic and extra-limbic brain structures along with specific stress neuropeptides [corticotrophin releasing hormone (CRH), adrenocorticotropic hormone (ACTH), neuropeptide Y, vasopressin, prolactin, oxytocin, substance P, cholecystokinin, endorphins, enkephalins, somatostatin, noradrenaline, melatonin] are involved in emotional and stress responses." Carrasco and associates showed that exercise such as swimming increased the release of endorphins, which counter the negative effects of stress and anxiety.

Depression is a disabling disorder that can disrupt an individual's occupational, social, and physiological functioning. "The lifetime prevalence of major depression is estimated at 16% in the general population. University students represent a group thought to be at particular risk for developing depression and emotional disorders. Indeed, depression is one of the most common psychiatric disorders affecting university students, with current prevalence rates estimated at 10% in undergraduate samples. The prevalence of depression may be due, in part, to the myriad stressors confronting students (e.g., financial concerns, academic performance, and relationship issues). Such stressors represent significant predisposing factors to developing depressive symptoms. Depressive symptoms in students can compromise learning and memory processes, adversely affecting academic performance, and are associated with problem drinking and suicidal ideation." Compton and coworkers identified a rate of depression of 7% to 14% among medical students, residents, and the general university population. Our study's rate of depression in SRNAs, 47% (n = 554), is significantly higher.

In addition to a high rate of self-reported depression, one of the most disturbing trends we noted was that 245 respondents (21.3%) expressed thoughts of suicide at some time during their education. According to Compton et al., "Suicide is the third leading cause of death in the United States for individuals 18 to 24 years, and the prevalence of reported suicidal ideation is highest in this age range." This high rate of suicidal ideation in the SRNA population speaks to the increased stress under which they are placed. When comparing the means, there was no difference between male and female students in this suicidal thought process.

Of the 554 respondents who reported symptoms of depression, 314 (56.6%) had sought assistance and 125 (22.5%) were currently receiving medical treatment of stress and depression. Drugs that students took for relief of depression included alcohol (29.3%), antidepressants (11.7%), benzodiazepines (1.3%), histamine 2 (H2) blockers (11.4%), over-the-counter sleep aids (29.5%), and prescription sleep aids (10.6%). Many of these medications, while decreasing symptoms of stress, may also decrease mental acuity and the ability to concentrate and learn, and may impair motor function.

*Limitations and Suggestions for Further Study.* As with a previous study published in 1999 by Perez and Caroll-Perez, a major strength of this study was a large sample population. However, since the perception of stress is an individual experience, even with a large sample, it remains highly subjective and a difficult construct to assess. This is one of the major limitations of this
study because only the person responding to the survey knows how stressed he or she is.

All respondents were asked if they participated in the 2008 Wellness and Burnout in Nurse Anesthesia survey, and 121 indicated that they had as students but were currently practicing CRNAs. When asked about their current level of stress, these respondents indicated it had decreased to a mean stress score of 4.6, from 7.2 in 2008. Subsequent studies will determine if this statistic is reproducible.

**Recommendations.** This study clearly indicates that SRNAs have a substantially higher level of stress than do practitioners. This high level may not have been fully appreciated by educators, clinical staff, or the AANA. No doubt, stress will continue to be a norm in nurse anesthesia education. However, “converging evidence suggests that the multiple stressors endemic to university life, such as academic pressure, financial strain, and social adjustment, may contribute to vulnerability to emotional disorders.”

It remains incumbent on the nurse anesthesia community to understand the issues contributing to the high level of stress in the SRNA population and to work toward implementing solutions to reduce stress and to teach students stress reduction techniques they can carry from their program of study into the profession. It is important that SRNAs as well as teaching faculty have the ability and knowledge to identify when stress is overwhelming before it manifests itself in unhealthy symptoms.

The study suggests that the academic community and the AANA have a role in helping students cope with stress. Consideration should be given to including education in the curriculum on how to deal with difficult people and situations, effective coping mechanisms, and encouraging physical activity. Universities should review current benefits and programs available to students and help ensure wider participation. The physical, emotional, and mental symptoms identified in this student population are very concerning. The AANA, through its Wellness Initiative, should consider programs, activities, and national efforts to promote physical and mental health, such as discounts to gyms and health insurance programs.

Identifying key traits in the perception, manifestations, and coping mechanisms of stress remain important. As studies on this topic progress, perhaps SRNAs and the anesthesia community will be able to more effectively engage in the never-ending battle against stress, reduce its detrimental effect on productivity, and help students, educators, and clinical personnel recognize an extreme level of stress before it manifests into a maladaptive behavior, putting the students and their patients at risk. Additionally, this insight may provide a basis for assisting nurse anesthesia graduates to successfully navigate the negative stress they will encounter as working healthcare professionals in the discipline of anesthesia.

**REFERENCES**


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