

ASSESSING THE DEGREE OF INVOLVEMENT OF CERTIFIED REGISTERED NURSE ANESTHETISTS IN AIRWAY MANAGEMENT AND TRAUMA STABILIZATION IN RURAL HOSPITALS

Marlo Penn, CRNA, MSN, TNS
Jacklyn Ruthman, RN, PhD
Bloomington, Illinois

Certified Registered Nurses Anesthetists (CRNAs) are airway experts who can stabilize the condition of trauma patients with skills acquired from practice as an anesthesiologist. CRNAs practice in a variety of settings; one of the most challenging is the rural hospital. Anesthetists have a wide range of skills. However, the setting in which CRNAs practice may influence the skills needed.

This study was designed to address the issue of CRNA involvement in airway management and trauma stabilization in rural hospitals through a descriptive, quantitative, nonexperimental design study. A random sample of 382 CRNAs who practice in rural hospitals were invited to answer questions using a practice pattern questionnaire

about these experiences developed for this study. Data were analyzed descriptively. The 13-item Airway Management and Trauma Stabilization Practice Pattern Questionnaire performed reliably ($\alpha = .8320$).

Results revealed the majority of CRNAs working in rural and semirural settings manage airways and stabilize the condition of trauma patients. Practice patterns suggest that nurse anesthesia students be trained to manage airways and stabilize trauma, particularly if they plan to work in rural or semirural settings.

Key words: Airway management, airway management and trauma stabilization scale, Certified Registered Nurse Anesthetists, rural hospitals, trauma stabilization.

The “golden hour” in trauma refers to the first hour after a trauma victim sustains injury.¹ This time frame refers to the time in which a patient who receives early intervention or stabilization will have the best possible outcome after sustaining a trauma. Trauma is a diverse condition that has a critical time element and is greatly dependent on highly specialized skills to make an accurate diagnosis and improve its outcome.²⁻¹⁰ When a trauma occurs in a rural area, others may not notice the victim, simply due to the nature of the rural setting. Rural areas are more rugged and sparsely populated and have more poorly kept roads, all of which are complicated by an inferior communication system and possibly no “911” system.¹¹ Rural trauma patients usually have more than one severe injury when they are admitted to the rural hospital emergency department. Rural hospitals must have personnel present who are competent in providing adequate stabilization to trauma patients. Certified Registered Nurse Anesthetists (CRNAs) practice nurse-administered anesthesia in a variety of settings within metropolitan, urban, and rural areas. However, in rural hospitals, CRNAs are often the experts who manage the patient’s airway and help to stabilize the patient’s condition before the patient is transferred to a trauma facility.

Patients whose conditions are stabilized at the rural hospital and then are transferred to a trauma center have a better outcome than those who are admitted to a nontrauma (rural) hospital for diagnostic studies.¹¹

One basic factor in the practice of anesthesia in a rural hospital is the fact that a nurse anesthetist, as opposed to an anesthesiologist, is often the only anesthesia provider for that particular hospital.¹² This situation forces the anesthetist to have communication lines established with other anesthesia providers in similar settings when consultation needs arise. The anesthetist has a 24-hours-a-day, 7-days-a-week responsibility to the rural hospital and the patients who have had or need anesthesia. This means the anesthetist has complete autonomy and independence.¹³ Many nurse anesthetists find the autonomy and independence a positive aspect of the job. Consequently, the sole anesthesia provider may be alone, with no one else to consult with or to assist with difficult cases. Autonomy enables CRNAs to develop excellent airway management and trauma resuscitation skills. It also facilitates the CRNA in becoming a resource person to support staff for stabilization measures in response to trauma and resuscitation emergencies.¹⁴

Anesthesia providers are airway experts. However, the current shortage of CRNAs has forced some disci-

plines to provide services previously not provided by that particular discipline. One example is airway management by respiratory therapists in emergency situations, particularly in rural settings where the therapist may attempt to manage the airway before the CRNA can arrive at the hospital. In the rural setting, initial airway management may be provided by the responding emergency medical technician or paramedic at the trauma scene, or management may be in the emergency department by the emergency physician until the CRNA arrives at the hospital. Due to these interventions by other disciplines, it is unknown how often and to what extent CRNAs manage airways for trauma patients. Current literature shows that CRNAs are involved in airway management and stabilization in traumas, but minimal information exists about the actual frequency that they are involved. The purpose of this study was to assess the practice patterns of CRNAs in airway management and trauma stabilization in rural hospitals.

Materials and methods

Demographic data were collected to describe participants. In addition, a 13-item Airway Management and Trauma Stabilization Practice Pattern Questionnaire was developed for this study based on the literature and discussions with experts. The questions were based on an exhaustive literature search, the State of Illinois Trauma Nurse Specialist Course, and personal conversations with leading rural anesthesia experts. The practice pattern questions were used to assess the degree of involvement in airway management and trauma management. Four experienced CRNAs who practice in a rural setting evaluated the questions as relevant, accurate, and comprehensive, lending content validity. Minor modifications were made based on expert feedback before the study.

The university's institutional review board approved the study before implementation. The sample was based on recommendations for sampling by Leedy¹⁴ and consisted of a random sample of 382 CRNAs provided by the American Association of Nurse Anesthetists (AANA) from selected zip codes that excluded large urban areas. The provided sample was based on the most recent membership surveys by the AANA. Only certified AANA members who worked in a rural setting and spoke English were included in the study.

A cover letter inviting participation and explaining the purpose for the study was sent with the questionnaire. A self-addressed stamped envelope was included for easy return. Two weeks later, follow-up postcards were sent thanking those who had already

completed the questionnaires and asking those who had not yet completed the questionnaires to do so.

Results

Data were analyzed using Statistical Package for Social Sciences, version 11.5 (SPSS, Chicago, Ill). Because the questions on the practice pattern questionnaire had no established reliability as a tool, frequencies were run to describe each practice pattern question independently. In addition, the questions were evaluated for their reliability as a scale.

There were 382 questionnaires mailed to rural practicing CRNAs as described. A total of 202 questionnaires were returned for a response rate of 52.9%. Of the 202 respondents, 102 indicated they practiced anesthesia in a rural setting. Of those 102 respondents, 44 replied they worked in a community with a population of fewer than 2,500. The population of 2,500 was consistent with the federal definition of rural as defined by the US Census Bureau.

Because such a large percentage of respondents (n = 58 [56.9% of the sample]) exceeded the population limit of 2,500, the federal definition of rural, it is important to note that if respondents regarded their practice setting as rural, they were included in the sample. Therefore, the term "rural/semirural" was adopted to account for this deviation from the federal definition. The rural and rural/semirural groups also were described.

Of the respondents who identified themselves as anesthesia practitioners in a rural setting (n = 102), ages ranged from 30 to 72 years (average, 50.32 years; SD = 8.75 years). The respondents were 62.7% male and 37.3% female. There were 59.8% of respondents who reported working in a hospital with fewer than 50 beds. Another 25.5% reported working in a hospital with 51 to 100 beds. The remaining 14.7% worked in a hospital with more than 100 beds (Table 1). The majority (62.7%) reported having 15 or more years of

Table 1. Size (no. of beds) of 102 rural hospitals

No. of beds	Valid percentage*
< 50	60.0
51-100	25.0
101-150	9.0
151-200	2.0
More than 200	4.0
Total (2 missing)	100.0

*Represents respondents who fit the description of "rural" by the US Census Bureau.

Table 2. Descriptive statistics for involvement in airway management and trauma stabilization statements

Statement	N	Mean	SD
1. When a trauma patient arrives in the emergency department, I am notified as a member of the trauma team.	101	3.21	1.329
2. I provide/secure a patent airway for trauma patients in the emergency department.	101	3.34	1.151
3. I am the only anesthesia provider present in the emergency department when I am called for a trauma patient.	101	4.30	1.331
4. I personally participate in a plan of care to stabilize trauma patients in general.	101	3.01	1.375
5. I personally participate in a plan of care to stabilize trauma patients hemodynamically.	101	2.98	1.356
6. I personally participate in a plan of care to stabilize trauma patients for anesthesia purposes only.	99	3.73	1.331
7. I am called upon to manage the airway of trauma patients in the emergency department when the physician is unable or temporarily unavailable.	101	3.88	1.329
8. I am the first person called to manage the airway in an emergency situation.	101	3.42	1.409
9. I am called upon to help manage stabilization of a trauma patient in the emergency department when the physician is unable or temporarily unavailable.	101	3.11	1.421
10. I have primary responsibility in my practice and am not a member of an anesthesia care team (CRNA and anesthesiologist) in the rural hospital.	97	4.16	1.525
11. Respiratory therapists are first-line airway managers in my facility.	100	2.43	1.233
12. Respiratory therapists are called to manage airways before I am called in an emergency situation.	100	2.30	1.322
13. The Glasgow Coma Scale and Revised Trauma Score influence my care in emergency situations.	98	3.00	1.201

experience in anesthesia, and only 8.8% had 5 years or less experience.

Respondents reported 5-digit zip codes that began with the numbers 0 through 9, suggesting that all areas in the country were represented. The mode for the zip codes was 1, and only 3 zip codes had 2 respondents.

The CRNAs were asked to identify factors that influenced their choice to practice in a rural setting. They were instructed to identify all factors that applied to their choice. There were 76.4% of the 102 respondents who identified more than one factor; the total numbers of the factors identified are as follows: autonomy or more responsibility, 81; better use of skills, 71; place of residence, 58; change of pace, 32; and rural hospital patient acuity and trauma involvement, 17. For “other,” respondents were asked to specify, and there were many responses identified as influences.

Respondents were asked to rate the 13 questions that described their involvement in airway management and trauma stabilization using a Likert scale in

which 1 = never, 2 = rarely, 3 = sometimes, 4 = usually, and 5 = always. The range of responses for all 13 questions was 5. The mean (SD) are given for each question (Table 2).

In general, data were distributed fairly evenly among the 5 possible responses for most of the statements. Questions for which responses deviated from even distribution are elaborated in the following text.

Nearly 65% of respondents indicated they usually or always “... personally participate in a plan of care to stabilize trauma patients for anesthesia purposes only.”

For the statement, “I am called upon to manage the airway of trauma patients in the emergency department when the physician is unable or temporarily unavailable,” data revealed nearly 50% replied always, and only 7% indicated never. Overall, 80.2% of CRNAs surveyed were involved in managing the airway in the emergency department at least some of the time.

For the statement, “I am the first person called to manage the airway in an emergency situation,” more

Table 3. Descriptive statistics for questions related to involvement in airway management and trauma stabilization for participants from communities with populations of fewer than 2,500

Question no.	N	Mean (SD)	Responses				
			1	2	3	4	5
1	43	3.49 (1.298)	4.7	20.9	30.2	9.3	34.9
2	43	3.70 (1.103)	0	16.3	30.2	20.9	32.6
3	43	4.63 (1.001)	4.7	2.3	2.3	7.0	83.7
4	43	3.21 (1.489)	16.3	20.9	18.6	14.0	30.2
5	43	3.16 (1.479)	16.3	20.9	23.3	9.3	30.2
6	43	4.02 (1.300)	7.0	11.6	4.7	25.6	51.2
7	43	4.14 (1.125)	2.3	11.6	7.0	27.9	51.2
8	43	3.67 (1.340)	7.0	16.3	18.6	18.6	39.5
9	43	3.30 (1.423)	14.0	18.6	18.6	20.9	27.9
10	41	4.49 (1.325)	12.2	0	0	2.4	85.4
11	44	2.45 (1.284)	29.5	27.3	18.2	18.2	6.8
12	44	2.30 (1.322)	38.6	22.7	15.9	15.9	6.8
13	44	2.91 (1.217)	15.9	18.2	36.4	18.2	11.4

than 50% of the responses indicated that CRNAs are usually or always called on to manage the airway in an emergency situation.

The statement, "I have primary responsibility in my practice and am not a member of an anesthesia care team (CRNA and anesthesiologist) in the rural hospital" may have caused some confusion regarding the concept of anesthesia care team because there were 5 missing responses. However, of the 97 anesthetists who responded, 74.2% replied they always have primary responsibility in their anesthesia practice.

For the statement, "Respiratory therapists are first-line airway managers in my facility," only 22.2% of responders indicated that respiratory therapists usually or always fulfilled this first-line role.

The statement, "Respiratory therapists are called to manage airways before I am called in an emergency situation" generated a 61.7% response of never or rarely, and only 6.1% indicated always for respiratory therapists managing airways first.

To the final statement, "The Glasgow Coma Scale and Revised Trauma Score influence my care in emergency situations," nearly 40% of the respondents reported sometimes using the scales influentially, but the remaining 60% of the responses were evenly distributed among the possible responses.

Data from the subset (n = 44) of respondents who met the federal definition of rural also were examined.

This included respondents who worked in hospitals with a bed size of 100 or fewer 95% of the time. Similar to the rural/semirural group, 31 (70%) of respondents had 15 or more years of experience and only 3 (7%) had 5 or fewer years of experience (Table 3). The mean for 11 of the 13 items was higher for the rural group vs the rural/semirural group. It was the same for 1 item, and only item 13 had a mean slightly lower for the rural group (2.91 vs 3.00) compared with the rural/semirural group. Once again, item responses ranged from 1 to 5 for all items, and only 2 of the 65 possible responses were not used. No one replied that respiratory therapists rarely or sometimes were first responders to item 10 in which 35 respondents replied they were always first responders and 5 replied that respiratory therapists were never first responders.

In addition to individual analysis of questions, a Cronbach α was run to test the internal consistency of the items' performance as a scale. A Cronbach α of .8340 was achieved, which lends support that the items all were measuring the same construct and offers evidence of reliability of the items' performance as a scale for this sample. Because the scale performed reliably for this sample, means for the scale were tested for differences between the rural and semirural groups. An independent-samples *t* test comparing the mean scores of the semirural and the rural groups revealed a significant difference between the means of

the 2 groups ($t(97) = 2.231; P = .028$). The mean of the rural group was significantly higher (45.50 [SD = 10.36]) than the mean of the semirural group (40.98 [SD = 9.47]).

Discussion

The results of this study answered the main question of the study that was assessing the degree of involvement of CRNAs in airway management and trauma stabilization in rural hospitals. There was a response rate of 52.9%. Of the 100 who identified themselves as nonrural, there were 3 respondents who added a comment that the population of a rural town of 2,500 was too stringent, suggesting parameters needed to be broader. Of the 102 who identified themselves as rural practitioners, 58 actually identified themselves as rural but stated they practiced in a setting with a town population of more than 2,500. This suggests that practitioners hold a broader view of what is rural than what is defined by the US Census Bureau. Because so many respondents fell outside of the federal definition of rural, data were analyzed using groups meeting the definition of rural ($n = 44$) and respondents who regarded their practice setting as rural but may or may not have met the definition of rural ($n = 102$). Findings from both groups were similar in sex, age, and experiences.

Of the 13 statements regarding involvement in airway management or trauma stabilization, 10 met or exceeded a score of 3 (which had a “sometimes” label) on the Likert scale. This lends support that CRNAs are involved in airway management and trauma stabilization in rural/semirural and rural hospitals. In particular, the statements in which CRNAs identified that they were the only anesthesia provider in the emergency department during a trauma situation, they were not members of an anesthesia care team, they provided an airway when a physician was unable or unavailable, and they participated in a care plan for anesthesia provided strong means, lending support to CRNA involvement. The 2 questions that addressed respiratory therapists as primary airway managers had means of 2.30 and 2.43, which suggests that respiratory therapists are not primary airway managers in rural or in rural/semirural areas. The remaining statement related to hemodynamic stabilization and management had a mean of 2.98, which places it very close to the numeric middle (with a “sometimes” label). When the mean for the scale was compared between the semirural and the rural groups, the rural group showed a significantly higher mean than the semirural group. This suggests that all practitioners in semirural and rural environments are involved in air-

way and trauma management, with those in the rural environment even more involved than those in semirural settings.

The 13 statements of the survey performed reliably as a scale ($\alpha = .8320$). This encourages further exploration for research tool development. AANA archivist, Kathy Koch, recommended development of a tool for measuring involvement of CRNAs in airway management and trauma stabilization in rural hospitals. Because content experts deemed the 13 questions relevant, clear, and comprehensive, this lends support for content validity. Responses to the questions among this sample showed great variability. This suggests further testing is warranted for use as the Airway Management and Trauma Stabilization Practice Pattern Questionnaire.

Many CRNAs who responded to the survey reported having 15 or more years of experience in anesthesia. Perhaps they grow more comfortable over time or have to because they are the only anesthesia providers where they practice. There were 76.5% of the CRNAs who indicated that they were the sole airway managers where they practice.

Perhaps the population number of a rural town alone is insufficient to define rural. A better assessment of rural may include not only town population, but also broader measures, modifying the rural definition based on perception, facilities, and services available.

The sample size was respectable ($n = 382$), but further research is needed for this population. The percentage of respondents, 52.9%, reflects a need for more research in the CRNA population practicing in rural areas. The definition of *rural* by the US Census Bureau also places limitation on the study because so many respondents did not meet the federal definition of rural but thought they practiced in a rural area.

CRNAs in rural areas are managing airways and stabilizing traumas. Although not all CRNAs in rural settings report these activities, the majority report that they do engage in these activities. This has ramifications for the educational preparation of CRNAs. CRNAs need skills and knowledge to assume responsibility if they practice in semirural or rural areas.

The overall shift of means to higher in the truly rural responders compared with the rural/semirural group suggests that CRNAs in true rural settings are even more involved in airway management and trauma stabilization.

REFERENCES

1. State of Illinois. Trauma nurse specialist course curriculum. Springfield, Ill: Illinois Department of Public Health. 1998.
2. Carley S, Driscoll P. Trauma education. *Resuscitation*. 2001;48:47-56.
3. Barton CR, Beeson M, Campbell J. Anesthesia for the trauma

- patient, part II. *Curr Rev Nurse Anesthetists*. 1998;20:253-264.
4. Kaufman HJ, Ciraulo DL. Traumatic fracture of the hyoid bone: three case presentations of cardiorespiratory compromise secondary to missed diagnosis. *Am Surg*. 1999;65:877-880.
 5. Kirk JA. Pediatric trauma. *CRNA Clin Forum Nurse Anesthetists*. 1997;8:135-143.
 6. Roback MG. America's tragedy: pediatric trauma. *Emerg Med Serv*. April 2000;29(4):61-65.
 7. Laskowski-Jones L, Salati DS. Responding to pediatric trauma. *Dimens Crit Care Nurs*. November/December 2000;19(6):2-8.
 8. Wright MM. Resuscitation of the multitrauma patient with head injury. *AACN Clin Issues*. 1999;10:32-45.
 9. Block EFJ, Cheatham ML. Ingested endotracheal tube in an adult following intubation attempt for head injury. *Am Surg*. 1999; 65:1134-1135.
 10. Wheeler M. Management strategies for the difficult pediatric airway. *Anesthesiol Clin North Am*. 1998;16:743-761.
 11. Fassett S, Miles P. Trauma in the rural setting. *CRNA: Clin Forum Nurse Anesthetists*. 1997;8:13-21.
 12. Gunn I. Rural health care and the nurse anesthetist. *CRNA: Clin Forum Nurse Anesthetists*. 2000;11:77-86.
 13. Giefer CK, Peters T, Stuckey S. A rural nursing experience. *Kansas Nurse*. March 1996;71(3):1-2.
 14. Leedy PD. *Practical Research: Planning and Design*. 6th ed. Upper Saddle River, NJ: Merrill; 1997.

AUTHOR

Marlo Penn, CRNA, MSN, TNS, is currently practicing with Anesthesiology Consultants in Bloomington, Ill. She is a trauma nurse specialist.

Jacklyn Ruthman, RN, PhD, is a faculty member in the nursing department and chairman of the Committee on the Use of Human Subjects in Research at Bradley University, Peoria, Ill. She served as directed research advisor on this project.