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**Airway Management Experience of Rural Physicians in New Mexico  
and the Impact of ATLS: A Descriptive Study**

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## Introduction:

The management of trauma revolves around the ABCDE's; standing for airway, breathing, circulation, disability (neurological status), and exposure or environmental control, and are attended to in that order [1]. This acronym is a primary survey method for assessing a trauma patient to identify any potential life-threatening conditions that may be present. Attaining and maintaining an airway is an essential step in the management of any trauma patient and failure to do so results in drastically increased morbidity and mortality. There is such a vast array of techniques and complicating factors that getting past the first two steps of A (airway) and B (breathing) can be extremely difficult [2]. Thus, being adequately trained and skilled in this area of initial trauma management is essential to not only progress through the ABC's, but to the patient's life [1,2].

The importance of adequate skills in trauma management is amplified in New Mexico due to the fact that this state is geographically large and composed of many rural towns with the only one level one Trauma Center located in Albuquerque, New Mexico, at the University of New Mexico Hospital (UNMH). UNMH alone has approximately 2600 admissions due to major trauma annually. The majority of the other rural towns with emergency departments can be located hundreds of miles away from UNMH and each other, and physicians working in these facilities are often not board-certified emergency physicians. This is due to the fact that one of the key requirements to work in an emergency department is simply completion of the ATLS course [3].

These issues as stated above and the studies showing that it is trauma volume alone that helps to improve ones abilities to manage trauma [4,5] lead to the thought that

the ATLS course may not be adequate to prepare the rural physicians working in emergency departments to properly manage critical patients, particularly in terms of the airway. Thus, it is crucial to understand exactly how much airway management experience physicians working in rural emergency departments have. It was our suspicion that the majority of rural physicians in New Mexico have limited airway management experience. If our suspicion is true then ATLS may need to be modified or supplemented with additional airway training.

### Methods:

Our questionnaire was comprised of 14 questions that asked about items relating to area of specialty, level of training, trauma volume at their primary hospital, personal trauma management volume per year, and overall confidence level in skills. The questionnaire was designed not to take more than 15 minutes to complete. The questionnaire was designed using a combination of Likert scales, yes/no answers, short answer questions, as well as having the participants completing questions using “circle all that apply”.

We conducted the study over 2 years with the questionnaires given at each of the four yearly ATLS courses offered at the University Of New Mexico School Of Medicine. The questionnaires were given via two methods: either on the first day of the ATLS course prior to beginning the course (first 4 courses) or they were sent out with the ATLS course material packets and asked to bring completed questionnaires to the first class (remaining 4 courses) at which point they were placed into a storage container. The change was made to limit time impacts on the courses themselves. Whichever way they were collected, they were deposited into the storage container, picked up by the primary

investigator and then stored in a locked storage container until the data was to be analyzed. The participants were given proper consent for the questionnaires and the willing participants then completed the questionnaires.

The data was entered into an Excel spreadsheet and the results were analyzed and calculated using the data analysis tools found on Excel. For purposes of this study, the data collected from participants with different backgrounds as EMT-Paramedic, Nurses, and that of Resident Physicians still in training were removed prior to data analysis.

### Results:

We collected a total of 83 questionnaires over the 2 year course of this study from participants of differing backgrounds and training levels. After removal of the questionnaires from respondents with the backgrounds stated above we were left with a total of 39 questionnaires to be analyzed. The results show a diverse background of training among the remaining 39 respondents as seen in Table 1 below.

Table 1:

<b>Training</b>	<b>Number in each specialty</b>
<b>Emergency Medicine</b>	10
<b>Family Practice</b>	14
<b>Internal Medicine</b>	2
<b>Pediatrics</b>	2
<b>Combined Family Practice and Emergency Medicine</b>	2
<b>General Surgery</b>	6
<b>Unspecified</b>	3

The mean number of intubations reported over the last 5 years was determined to be 45.5 intubations total. The range varied from 0-200 with 2 of the respondents not reporting a number on the Likert scale. Among each given specialty the mean number of intubations performed over the last 5 years varied as shown in Table 2.

Table 2:

<b>Training</b>	<b>Mean # of Intubations in last 5 years</b>	<b>Range</b>
<b>Emergency Medicine</b>	68.6	12-200
<b>Family Practice</b>	30.4	2-120
<b>Internal Medicine</b>	100	0-200
<b>Pediatrics</b>	3	1-5
<b>Combined Family Practice and Emergency Medicine</b>	112.5	25-200
<b>General Surgery</b>	13.5	0-60
<b>Unspecified</b>	53.3	0-150

However, when analyzing the number of both pediatric intubations and nasal intubations the numbers were significantly lower. We found the mean number of pediatric intubations to be 6.3 and the mean number of nasal intubations to be 0.75.

The mean general airway management skills confidence level was determined to be 7.2 with a confidence interval of 6.5-7.9 using a p-value of 0.05. The reported general airway skill confidence varied with the area of training that each of the respondents reported. Emergency Medicine trained had the highest general airway management skills confidence while those trained in Internal Medicine had the lowest as shown in Table 3.

Table 3:

<b>Training</b>	<b>Mean Airway Skills Confidence</b>
<b>Emergency Medicine</b>	8.6

<b>Family Practice</b>	6.1
<b>Internal Medicine</b>	5
<b>Pediatrics</b>	8
<b>Combined Emergency Medicine and Family Practice</b>	8.75
<b>General Surgery</b>	7
<b>Unspecified</b>	7.3

However, when looking at the various other methods of airway management the confidence levels varied quite significantly from that of the respondents general airway management confidence levels as shown in Table 4.

Table 4:

	<b>RSI*</b>	<b>Oral</b>	<b>Nasal</b>	<b>Surgical</b>	<b>Pediatric</b>
<b>Mean Confidence level</b>	6.6	7.6	5.2	5.2	5.9

\*RSI stands for Rapid Sequence Intubation

The preferred method of intubation was determined to be Oral intubation using both a paralytic and a sedative with 28 of the 39 respondents (72%) stating as such.

The respondents who stated that they were the primary person responsible for airway management at their institution were found to have a higher average general airway management skills confidence level of 8.3. Additionally it was found that RSI was stated to be the preferred method of intubation among 22 of the 24 respondents. The average number of intubations over the last 5 years was 71 giving 14 intubations a year. This subgroup also showed a higher average confidence level in RSI giving an average value of 8 on a 10-point scale.

Of interest, we did find a vast difference of the confidence levels of those physicians stating they were the primary person responsible for airways in regard to pediatric intubations. The average confidence level of those stating such was found to be 7.3 whereas the average confidence level among those not the primary person responsible was 3.7. However when looking at the total number of pediatric intubations for those that are primarily responsible the average was 9 over 5 years equaling 1.8 a year. Of those that are not the primary person responsible the average number of pediatric intubations over the last 5 years was 1.9 equaling less than 0.4 pediatric intubations a year.

Surgical airway confidence was also analyzed among those who are the primary person responsible for airway management and those that are not. In those that are the average confidence level was found to be 5.26 whereas in the group that is not primarily responsible their confidence level was slightly higher at 5.36. However, general surgeons comprised 4% of those that are primarily responsible vs. 33% in those that are not.

## Discussion

Advanced Trauma Life Support (ATLS) is a course sponsored by the American College of Surgeons Committee on Trauma (ASCOT). The course was first introduced in the late 1970's and is updated about every 5 years. The course was developed to provide a standardized method for the initial assessment and treatment of severely injured patients at rural and community hospitals. The course is offered to any physician who may be involved in the management of acute trauma. The ATLS course is used in more than 29 countries worldwide and there are approximately 13,000 physicians trained annually [6].

The course is two days in length and covers all areas of trauma management including all organ systems and specific topics such as environmental trauma and trauma at extremes of age [1]. The ATLS course is offered four times a year in New Mexico, with the only teaching site at the University of New Mexico Health Science Center (UNMHSC) [3]. Upon completion of the course with a passing grade the participant receives certification for a period of four years. The course is revised every four years by the American College of Surgeons [3].

The benefit of ATLS training has been researched immensely and has proven to make a dramatic difference in the mortality rates of patients in the first 60 minutes following a severe trauma, otherwise known as the “golden hour” [7,8]. In one study, it was shown that of the 228 physicians who took the ATLS course, almost 97% of them felt that it had improved their trauma management and of those 97%, 25% felt that it was a large improvement [9]. Some studies on the ATLS course have evaluated what exactly it is that affects the attrition of the skills acquired in this course. In these studies, it was shown that the key factor influencing attrition in trauma management skills was trauma volume [4,5].

As a whole, the course has been shown highly useful, but it has been shown to have some weaknesses as well. In one study done on the overall effectiveness and benefit of the ATLS course, the anesthesiologists taking the course felt that the respiratory management part of the course was the weakest [9]. This is not totally surprising due to the fact that the total time spent on airway management training per ATLS course is approximately four hours, which is a very small amount for such an important and complicated part of trauma management [3]. Another study showed that the majority of

physicians who retook the multiple-choice exam for the ATLS course failed the exam just six months after completing and passing the course. However, those who worked in larger trauma patient volume populations showed superior performance on this exam further proving that trauma volume is necessary to maintain adequate skills in trauma management. The Objective Structured Clinical Exam (OSCE) scores, which are a measure of clinical skills, were also much lower in those who worked in low trauma population volumes after two years, half the certification time [4]. This is particularly important as most of the rural doctors in New Mexico are practicing in low trauma volume populations and rely mainly on the ATLS course every 4 years for their trauma management training and practice.

With regards to procedural competence there are 2 main perspectives that are commonly quoted in the literature. The most common is by that of Fitts and Posner who state that skill competency attainment progresses from a cognitive level in which the participant can explain and demonstrate a certain task but cannot perform that task consistently. The next level is advancement to the integrative level meaning that the participant has improved consistency of performance as well as an improved understanding of the skill. This then advances to the autonomous level meaning that the participant can perform a given task without having to fully think about it as well as focusing on constant improvement. Ericsson further improved on this concept by adding that deliberate practice is absolutely essential to progress to the integrative and autonomous levels [10].

These concepts, specifically that it is essential for a physician to practice their airway management skills continuously to become experts, have clear relevance to our

study results. With the mean number of 45.5 intubations over the last 5 years or approximately 9 every year there is not a lot of practice in the realm of airway management skills. This is even more profound when looking at the area of pediatric airway confidence and number of intubations performed. The average number of pediatric intubations performed every year is very low at slightly greater than 1 per year with a confidence level that is much less than general airway management confidence level. There has not been a study that has directly examined the number of intubations necessary to deem competence in that area. In one recent study looking at pediatric intubations among Pediatric Emergency Departments it was determined that an average of 5.4 pediatric intubations a year was deemed inadequate by the majority of directors in this study [14]. This data suggests that approximately 1 pediatric intubation a year as discovered by our study is inadequate to maintain competence and adequate skills in that area.

There are many ways that one can improve upon their airway management skills. One of the methods that has been recently studied is that of human patient simulation-based education. In a study of critical care and procedure skills it was found that simulation is a well-accepted and practical method of not only improving a resident's skills in these areas, but also their confidence. [11] Other studies have also found a significant impact on the accuracy and management of airways after attending a simulation-based training course. It was also found that the participants were better able to handle a difficult airway situation [11, 15]. Another method that has been shown to improve one's procedural competence in the area of thoracentesis skills is that of deliberate practice in a simulated environment where constructive feedback can be given.

In theory, this method of training could easily translate to the field of airway management and could be adapted into either the ATLS training or in a clinical setting to further improve one's confidence and mastery of airway management [12]. Another potential answer to this problem could lie in the area of procedural teaching videos that can be viewed prior to the practice of said skill. There was a significant, moderate correlation to the performance of skills in the area of prosthodontics when viewing an educational video in the area of a given procedure as well as a drastic subjective improvement in the given skills [13]. This is more difficult when the procedure is being performed in an emergency setting.

New Mexico faces unique circumstances in the realm of trauma airway management: lack of Level 1 trauma institutions, large amount of rural areas with only small community hospitals seeing major trauma infrequently and the highest rate of unintentional injury and death in the nation [16]. However, when looking at any given population it has been determined by several studies that becoming competent in a given skill such as airway management requires that one must have constant practice of those skills in order to maintain/attain the expertise needed to be confident and successful. This is even more important in the field of airway management as it is the first step in the treatment of any critically injured or sick patient.

We have shown that there is a broad range of confidence levels in the realm of general airway management skills among rural physicians practicing in New Mexico. This is true among the various subgroups including pediatric intubations and surgical airway management as well. Additionally, we have found that the number of pediatric intubations to be very low and is considered by many institutions to be inadequate [14].

Based on these results we have determined a need for further training in airway management for physicians practicing in rural areas in New Mexico as well as possible revisions to the ATLS course to increase the training amount in this area. Further research is needed to determine the best method of handling this crucial problem.

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Appendix 1: Research Questionnaire

**Airway Management Experience Among Rural Physicians Working in ED's and the Effect of ATLS.**

Craig Lehrman, MS IV

Darren Braude, M.D.

**Airway Management Survey**

Instructions: Please fill in answers in space provided.

1. Do you currently work in a clinic or urgent care facility? Yes No  
a. If yes, please write how many beds are in that facility. \_\_\_\_\_
2. Do you currently work in an emergency department? Yes No  
a. If yes, please write how many beds are in that area. \_\_\_\_\_
3. If you answered No to both question 1 and 2, please write the name of the department you work in and the number of beds in that area. \_\_\_\_\_
4. What is your level of training? (Please circle only one)
  - a. Physician
    - i. Internship only
    - ii. Residency:
      1. Family Practice
      2. Internal Medicine
      3. Pediatrics
      4. Emergency Medicine
      5. Anesthesiology
      6. General Surgery
      7. Other:
  - Are you currently in training? Yes No
  - Are you board certified in that department: Yes No
  - b. PA
  - c. NP
  - d. Other: \_\_\_\_\_ (please indicate level of training in space given)
5. Approximately how many major trauma patients do you encounter annually?  
Please write the number in the space provided according to your best estimate:  
\_\_\_\_\_
6. Approximately how many patients that you treat require advanced airway management (intubation, surgical airway, non-invasive positive pressure) each year: (Please write number next to corresponding category in space provided)
  - a. Medical: \_\_\_\_\_
  - b. Trauma: \_\_\_\_\_

7. At your facility are you the primary person responsible for airway management?  
Please circle answer: Yes No
8. What is your preferred mode of intubation? (Please circle only one answer)  
 Oral without medications  
 Oral with sedatives only  
 Oral with sedative and paralytic (RSI)  
 Nasal  
 Surgical
9. How many adult patients have you orally intubated in the last 5 years? (Please write your estimated answer in space provided) \_\_\_\_\_  
 a. Please repeat for nasal intubations: \_\_\_\_\_  
 b. Please repeat for pediatric intubations: \_\_\_\_\_
10. Please circle the corresponding number below according to your confidence level in your general airway management skills. (1 being not confident at all and 10 being extremely confident) Please circle only one:
- 1    2    3    4    5    6    7    8    9    10
11. Using a 1-10 scale (1 being not confident at all and 10 being extremely confident) please write a number corresponding to your confidence level in the following categories below. (Use whole numbers only and use space provided)  
 a. Rapid Sequence Intubation: \_\_\_\_\_  
 b. Basic Oral Intubation: \_\_\_\_\_  
 c. Basic Nasal Intubation: \_\_\_\_\_  
 d. Surgical Airway Skills: \_\_\_\_\_  
 e. Pediatric Intubation: \_\_\_\_\_
12. Which medications are available to you in your practice setting? (Please circle all that apply)  
 Morphine  
 Fentanyl  
 Succinylcholine  
 Rocuronium  
 Vecuronium  
 Pancuronium (Pavulon)  
 Propofol (Diprivan)  
 Ketamine  
 Midazolam (Versed)  
 Lorazepam (Ativan)  
 Diazepam (Valium)  
 Don't Know....

13. Which of the following airway supplies are available to you in your practice setting? (Circle all that apply)

- Laryngeal Mask Airway (LMA)
- Fastrach LMA (Intubating LMA)
- King LT
- Combitube
- Gum-elastic bougie (endotracheal tube introducer)
- Lighted stylette
- Fiberoptic device

14. My airway training consists of: (Circle all that apply)

- Medical School/PA school/NP school only
- Residency
- Previous ATLS
- OR practice
- ACLS
- PALS
- APLS
- Workshop:
  - National Emergency Airway Course
  - UNM RSI course
  - SLAM course
  - Other: (Please write in space provided): \_\_\_\_\_