THE COMFORT LEVELS OF OREGON PREHOSPITAL EMERGENCY MEDICAL SERVICE PROVIDERS IN CARING FOR PEDIATRIC PATIENTS BY GENDER AND CHILD STATUS

By

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CERTIFICATE OF APPROVAL

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List of Abbreviations

IOM	The Institutes of Medicine
EMS	Emergency Medical Services
EMT	Emergency Medical Technician
EMT-B	Emergency Medical Technician - Basic
EMT-I	Emergency Medical Technician - Intermediate
EMT-P	Emergency Medical Technician - Paramedic
NREMT	National Registry of Emergency Medical Technician
IV/IO	Intravenous therapy/ intraosseous infusion

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Abstract

Prehospital emergency care is stressful and requires Emergency Medical Technicians (EMTs) to work well under pressure, especially when it comes to the rarity of pediatric emergency calls. However, very few studies have examined the association between the gender of the EMTs and their child status to their reported comfort levels with pediatric care. This was a quantitative secondary analysis of surveys collected at two Oregon Emergency Medical Services (EMS) during 2009 and 2010. The surveys covered 18 pediatric care topics for comfort levels in which four conceptual care domains were created and the 5-point Likert scale responses were averaged for each domain for an outcome of "Uncomfortable" and "Comfortable". The odds ratios were calculated with logistic regression analysis. This analysis showed female EMTs and EMTs without children were more likely to report higher odds of discomfort with vascular access, newborn resuscitation, and airway management. There was also an interaction found in which male EMTs reported odds of discomfort decreased as their years in their current level of training increased, however the same was not found among female EMTs. Similar to other studies, more pediatric specific training resulted in increased odds of comfort with pediatric care, however, only in male EMTs.

Background

Prehospital emergency medical service providers and pediatric care

The Institutes of Medicine (IOM) completed a nationwide assessment of the emergency care of children in the United States and published its report, entitled *Emergency Care for Children: Growing Pains* (IOM, 2006). In this report, the IOM recognized the unique challenges presented when caring for children who have different medical needs, such as health conditions and injuries, than adults. The way in which emergency medical providers need to assess and treat children differ from adults (IOM, 2006). Treating medical conditions of pediatric patients in the emergency care setting requires specific skills and appropriately trained staff which can only be obtained by specialized training (Langhan et al, 2003). Some investigators have reported that prehospital emergency providers' pediatric skills decline after a short time without practice (IOM, 2006; Wood et al, 2004). Emergency medical technicians (EMTs) face challenges to maintain their skills for treating pediatric patients, which may, in part, be attributed to the rarity of pediatric emergency calls. Pediatric emergency calls only comprise between be 5% to 13% of all Emergency Medical Service (EMS) calls (IOM, 2006; Shah, 2008).

The majority of pediatric prehospital emergency calls were for major injuries and illnesses (IOM, 2006). Investigators have noted that the type of trauma differs between children and adults. Children tend to experience head trauma incidents more frequently than adults, 40% versus 24% (Siedel et al 1984). A more recent study by Wood et al (2004), based on eight states' pediatric pre-hospital emergency run data, reported that among 5- to 20-year-olds, soft tissue and blunt/head-neck-spine injuries represented the top two most frequent injury and illness categories of prehospital emergency calls, at least 20% and 14%, respectively. Within the same categories infants less than one-year-old, respiratory illness ranked first and represented 29% of pediatric emergency calls (Wood et al, 2004).

The scope of practice among Oregon EMTs varies by each level. With each higher level of training, the EMTs are trained and certified to perform more multifaceted procedures. Below is a brief summary of the differences in the levels and training by examining the complexity of the procedures within each scope of practice (Table 1). A detailed list of the scope of practice for each level can be found on the Oregon State Archives website containing the Oregon Administrative Rules (OARS) filed through October 15, 2012.

Table 1 – Summary of the scope of practice for each level of Oregon prehospital emergency providers.

First Responder	**EMT-Basic**	**EMT-Intermediate**	**EMT-Paramedic**
• Conduct primary and secondary patient examinations; • Take and record vital signs; • Perform basic life support; • Assist with pre-hospital childbirth; • With a physician's standing order and qualifications, perform other basic procedures.	• Perform all procedures that an Oregon-certified First Responder can perform; • Administration of activated charcoal for poisonings and aspirin for suspected myocardial infarction; • Transport patients with in-dwelling vascular devices; • Assist the on-scene EMT-I or EMT-P in various tasks (i.e. preparation of IV fluid administration sets).	• Perform all procedures that an Oregon-certified EMT-B or Advanced EMT can perform; • Initiate and maintain intraosseous infusion (IO); • Prepare and administer certain medications under specific written protocols from a supervising or direct order from a licensed physician; • Maintain during the transport any intravenous medication infusions initiated at a medical facility with written and verbal instructions provided; • Perform cardiac defibrillation with a manual defibrillator.	• Perform all procedures that an Oregon-certified EMT-I can perform; • Initiate various airway management techniques; • Provide advanced life support in the resuscitation of patients in cardiac arrest; • Access indwelling catheters and implanted IV ports for fluid and medication administration; • Prepare and initiate or administer any medication or blood products under specific written protocols under a physician.

(Oregon State Archives, 2012)

The pediatric training hours required of new EMTs varied by the levels and the program through which potential EMTs were accepted. In order to become an EMT-Intermediate (EMT-I) or EMT-Paramedic (EMT-P), potential candidates must be certified at the Oregon EMT-Basic (EMT-B) level before being eligible to enroll into a higher level course. Since July 1, 1999, new Oregon EMT-Paramedics were also required to have an Associate's degree or higher from an accredited institution. The minimal educational requirements of new EMTs for each level are as follows in Table 2:

Table 2 – Educational requirements of new Oregon EMTs

EMT-Basic	EMT-Intermediate	EMT-Paramedic
• High school diploma. • Completion of EMT-Basic program at an accredited Oregon EMS provider school. • Completion of a minimum of 8 hours in emergency department (ED). • Completion of a minimum of 8 hours in pre-hospital setting. • Complete certification requirements stated in the Oregon Health Division and NREMT. • Successful completion of the NREMT-Basic certification exam.	• Certified at the EMT-Basic level. • Completion of EMT-Intermediate program at an accredited Oregon EMS provider school. • Completion of a minimum of 8 hours, 20 patient contacts in the ED or medical clinic performing skills within scope of practice. • Completion of a minimum of 8 hours in pre-hospital setting. • Complete certification requirements of the Oregon Health division. • Successful completion of the Oregon State EMT-Intermediate certification exams.	• Certified at the EMT-Basic level and an Associate's degree or higher from an accredited institution. • Completion of EMT-Paramedic program at an accredited Oregon EMS provider school. This will include approximately 1000 to 1200 hours in: Didactic instruction, Skills laboratory, Field internship (details below. • Completion of field internship in which student must actively participate in providing care for at least 40 ambulance calls (a minimum of 10 in each of the following calls: cardiac, respiratory, general medical, and trauma emergencies. • Successful completion of the NREMT-Paramedic certification exam.

(Oregon Health Authority: Public Health, 2012)

In 1996, it was reported that 38 states used the Paramedics exam from the National Registry of Emergency Medical Technicians (NREMT) to certify and license EMT-P in which 31% of potential EMT-P

had failed. Of those whom had failed the exam for EMT-P, 66% failed the Pediatric/ Obstetrics section (Glaeser et al, 2000).

The Oregon Emergency Medical Services requires continuing education in Pediatrics and Obstetrics for EMTs, but requirements differ by level (2007). EMTs and First Responders can receive the continuing education training through state approved programs and courses, which can be in the form of classroom didactic, interactive online courses, or hands-on practice through an accredited Oregon EMS provider school or mobile training unit. First Responders are required to obtain only 1 hour of training. EMT-B are required to receive 3 hours of training, EMT-I 6 hours, and EMT-P need to receive 8 hours.

A majority of EMTs selected from the NREMT database were satisfied with their overall pediatric training (Glaeser et al, 2000), but reports of discomfort from the EMTs arose when specific topics were examined. In a study by Glaeser et al (2000), using the NREMT database to mail out surveys as part of the reregistration materials, the authors reported 79% of all EMTs identified infants (<1 year old) as the age group of greatest concern if they had to manage a critical case; 94% of all providers responded that children from birth to three-years of age as the most concerning age group. In a different study using the NREMT to collect a stratified random sample of EMT-B and EMT-P, investigators found that 29% of EMT-B and 44% of EMT-P said they were “very well prepared” with childbirth. Only 36% of EMT-B and 38% of EMT-P reported being “very well prepared” for pediatric patient management; compared to 59% or more reporting being “very well prepared” with eight other specific clinical activities and tasks involving care for adult patients (Dawson et al, 2003). Overall, EMTs were uncomfortable with pediatric patients nationally. However, feelings of discomfort may be related to other variables outside of training and education.

Gender of EMT and comfort levels in pediatric care topics

Few studies have published the reported EMTs' comfort levels providing pediatric care, and fewer have stratified results by gender. Both male and female EMTs receive the same education and training, so gender differences in perceived ability and comfort may be due to other factors, such as societal gender roles. Literature from other medical fields indicate that there is a difference between genders with their reported comfort performing patient examinations, abilities among peers, and communication with patients.

Differences in self-perceived competence and confidence between male and female physicians have been reported. A literature review by Blanch et al (2008) of medical students reported females performed equally to their male counterparts. Female students, regardless of actual ability or training, tended to consistently report lower self-confidence and increased anxiety. They furthered their investigations by having standardized patient interaction coders review videotapes of third-year medical students at Indiana University School of Medicine during their objective structured clinical examination. Female students were rated to appear to be less confident than the male students (Blanch et al, 2008). This notion was further supported by a study that examined the gender differences among the self-perceived competencies of physicians as clinical investigators. Prior to attending a clinical-research workshop, female physician clinical investigators rated their abilities lower than male physician clinical investigators' self-ratings on 22 of 35 learning objectives (Bakken et al, 2003). The same study also found that female physicians reported to be less adequate in applying time to develop and advance their own area of scientific knowledge and clinical research (Bakken et al, 2003).

Other related research reported differences between female and male physicians related to how they communicate to their patients, suggesting that gender specific communication styles may influence the physician-patient encounter (Christen et al, 2008). Another study found a difference between male and female pharmacy students in the use of expressive, interrogative, and interactive

skills depending on the gender of the patient. Interviews with the same-sex of pharmacy student and patient resulted in higher patient satisfaction compared to opposite-sex interviews. However, female pharmacy students were more thorough and complete in allergy-asking while interviewing male patients, which the authors proposed that asking about allergies was used to alleviate communication apprehension as it was non-specific and non-threatening (Gettman et al, 1996).

Studies have reported that the use of patient-centered communication utilized by females was the crucial factor that influenced patient satisfaction and compliance (Christen et al, 2008; Hojat et al, 2002; Roter et al, 2002) in which the broader context of patients' lives and conditions were addressed with related questioning and counseling, the use of emotional talk, more positive talk, and an active patient input (Roter et al, 2002).

Data from small focus group studies of EMTs from the 2009 Oregon EMS for Children Conference demonstrated that many of the feelings of discomfort from the EMTs stem from the inability of the EMTs to communicate with pediatric patients. Both male and female EMTs reported being uncomfortable when having to communicate with the patients' parents as well (Fleischman et al, 2011).

Many factors can attribute to the difference in comfort levels between genders in the medical field, some of which may be influenced by societal gender roles and how these roles can impact reported self-confidence and self-competence. Communication is used to ascertain vital information necessary to manage a pediatric emergency call, however can involve two sets of patients: the pediatric patient and their parents/guardians. Communication styles can be used as a non-intimidating approach to increase patient satisfaction and compliance. However, gender differences in comfort levels among pre-hospital emergency care providers has not been well studied and is necessary to begin to assess why the difference of discomfort in care for pediatric patients.

Child status of EMT and comfort levels of pediatric care topics

If an EMT has children of his/her own, it could naturally influence their perceived and actual ability to provide care for pediatric patients, as well as influence their comfort level in doing so. The comfort levels would assumed to be projected towards increased comfort for EMTs with children, or perhaps it could go either way.

However, currently there is limited literature exploring the relationship between EMTs' child status (having their own children or not) to their comfort levels providing pediatric care. The nationally administered survey by Glaeser et al (2000) did ask whether EMTs had children, but there was no analysis directly addressing the pediatric care comfort levels. Of the 18,218 EMS providers, 54% of all EMTs did have children living in their household, less than 6% had infants. Over 70% of respondents said they were comfortable to some degree with their own abilities with pediatric calls. The relationship between these two items was not assessed.

Focus groups of Oregon EMT-P collected during the 2008 Oregon EMS Conference in Bend, OR, revealed discomfort with pediatric patients exists regardless of child status. Participants who did not have children admitted that they sometimes cannot tell the difference between a healthy child and an ill child because they rarely interacted with them and did not know how to physically handle them. Many also expressed the increased stress they experienced when they care for a child who could not verbally express themselves. However, EMT-P with children also expressed discomfort because they knew of the challenges that could occur with certain types of injuries and illnesses
(Fleischman et al, 2011).

Even though discomfort with pediatric patients was reported regardless of child status, a quantifiable amount of discomfort has not been studied and may contain information for future implications in the training and continuing education of Oregon EMTs.

Significance

Regardless of gender or child status, the training that EMTs of all levels are required to be trained by an Oregon accredited schools which follow similar guidelines. Research conducted thus far indicated that EMTs are uncomfortable with pediatric care to some degree, but a majority of EMT pediatric calls were not for minor injuries.

If EMT gender or having children were found to be positively associated with increased reports of discomfort, then perhaps training programs can be created or adapted so that the EMTs can be prepared accordingly. There were already training programs in existence that catered specifically to physically caring for pediatric patients through simulations, however rarely educate or provide EMTs with the experience of how to interact and communicate with the younger population. Communicating with children could potentially be challenging, especially those who were pre-pubescent as it might be difficult for those children to express to paramedics how they feel or children who could not yet communicate verbally. Those with children have had first-hand experience of how children might act under illness or pain as opposed to those without children and might perceive the injured child to be behaving “normal”.

Having confirmed the lack of comfort among EMTs with pediatric emergencies, I sought to explore the relationship between gender and child status of Oregon EMTs to their comfort levels with pediatric care. I hypothesized that gender of the EMTs and child status would differ in the reports of discomfort in pediatric care.

Specific Aims

This thesis was a secondary analysis of a study conducted by Fleischman et al (2011) in which a 62-question survey was distributed and collected during the 2008 Oregon EMS Conference and the 2009 Oregon EMS for Children Conference. The main focus of this study was to evaluate whether the EMT’s

comfort in caring for children was associated with gender or personally having children. Specifically, this study aimed to:

1) Group the pediatric topics from the survey into conceptual domains and to measure the EMTs' self-reported levels of comfort.
2) Descriptively report and compare the levels of comfort of the EMTs with the conceptual domains of pediatric care topics by gender and children status.
3) Measure the association of the gender of the EMTs and child status to their reported discomfort to the statistically significant conceptual domains of the pediatric care topics from the survey.

Methods

Recruitment

The EMS provider surveys pertaining to pediatric emergencies were distributed to participants during registration at two Emergency Medical Services conferences; the2008 Oregon EMS Conference in Bend, OR held October 10-11, 2008 and the 2009 Oregon EMS for Children Conference in Seaside, OR held February 27-28 and March 1, 2009. There were 313 attendees total at both conferences.

At the conferences, a package was distributed to participants at the time onsite of registration containing the survey and a letter to the participants explaining the purpose and intent of the surveys. Boxes were placed around the conference so participants could drop off the completed surveys at their convenience. To increase survey response rate, participants were entered into a raffle for an Apple iPod Nano® when they returned the completed survey. To keep duplicate responses to a minimum, during the recruitment process at the 2009 Oregon EMS for Children Conference, the EMTs were asked if they had previously completed the survey at the 2008 Oregon EMS Conference in Bend, and if so, were asked not to complete another survey. However, they were still eligible to enter the prize drawing at the Seaside conference.

The survey

The instrument was a 62-question, anonymous survey based on the one used by Fleischman et al (2011), as part of a three-phase needs assessment of Oregon EMTs. Survey items were selected from other instruments from published data describing the needs of pre-hospital providers in pediatric training and in accordance to the study group (Fleischman et al, 2011). The current study focuses on Questions 1 through 18 of this survey, as well as demographic information. The first question asked respondents how they "feel about caring for pediatric patients" with 5 possible responses on a Likert scale ranging from "dislike" to "like". Items 2 through 18 asked the respondents' comfort levels with a variety of pediatric patient topics and procedures, plus comfort levels providing care for various infant and child age groups. These items also had five-point Likert response scales that ranged from "very uncomfortable" to "very comfortable". Examples of the question styles for this section are displayed in Figure 1.

Figure 1 – Survey response style example.

Please rank your answers on the scale below, circling only one number.

	Dislike	Dislike Somewhat	Neutral	Like Somewhat	Like
1. How you feel about caring for pediatric patients?	1	2	3	4	5

How comfortable you are with the following topics in **pediatrics**?

	Very Uncomfortable	Uncomfortable	Neutral	Comfortable	Very Comfortable
2. Vascular access (IV and IO)	1	2	3	4	5

The next section used, asked respondents to check all of the boxes of pediatric specific training courses taken within the past two years that were applicable. There were 13 continuing education courses to choose from in addition to an "Other" response if they participated in something not listed,

as shown below in Figure 2. All of the courses taken were added up to be used as an independent variable in the analysis.

Figure 2 – Continuing education in pediatric care choices from the EMS provider survey.

What pediatric specific training courses or topics have you had during the past 2 years? (Mark all that apply)

○ PALS	○ Pediatric trauma	○ Pediatric resuscitation
○ PEPP	○ Pediatric respiratory	○ Pediatric assessment
○ NRP	○ Pediatric medications	○ Non-accidental trauma/child abuse
○ Pediatric shock	○ Pediatric airway/intubation	○ Pediatric intraosseus (IO) insertion

○ Other:_____

The final section of the survey contained demographic information. For the questions asking of age, the number of years since current level of training was obtained, total years in EMS, and the agency of employment's zip code, respondents filled in the blanks. For gender, child status, highest level of training, percentage of transport experience with pediatric patients, the type of position and type of agency (paid, volunteer, or combination), the response choices were multiple choice. For the type of role(s) within EMS, these responses were a check list for all that applied. There was also a portion which contained a map of Oregon split into nine trauma regions for respondents to circle for their agency.

Completion of the survey implied consent as there was no identifying information requested of the participants. A statement of research and voluntary participation was included. The study was deemed exempt by the Oregon Health and Sciences University Institutional Review Board as it was an anonymous survey.

Analysis

Data Entry

Data from the paper surveys were entered into Microsoft Excel Spreadsheet 2010 (Microsoft, Redmond, Washington) by a single reviewer, and random quality control measures were conducted on a

regular basis. A checkpoint would be created for every 20 surveys entered into the database, one would be randomly chosen and compared to the original paper copy for any discrepancies to the information that was entered into the database. If any discrepancies were, then all of the surveys within the checkpoint of the discrepancy and the prior checkpoint would be compared to the original paper copies.

Respondent Selection

A total of 313 EMTs attended both conferences, but there were respondents who were not EMTs and not all were from Oregon. The survey was investigating EMTs, all participants who indicated on the survey that they were not First Responders, or EMT-B, EMT-I, or EMT-P were dropped from the dataset. If they did not respond to the question asking about their highest level of training, they were kept in the dataset.

In addition, the study was interested in Oregon EMTs, if they indicated on the survey's map that their agency's region was outside of Oregon, they were also dropped from the dataset. A visual inspection of the zip codes was also carried out and any zip code that was not 97_ _ _ was also dropped. From the EMTs' station zip codes, they were categorized as either "rural" or "urban" according to the definitions provided by the Oregon Office of Rural Health. Their definition of "rural" was "all geographic areas 10 or more miles from the centroid of a population center of 40,000 or more". The website provided a list of zip codes which were already categorized based upon their definition. However, participants that did not respond to their agency's region and/or zip code were not dropped from the dataset.

Grouping of the Pediatric Care topics into Conceptual Domains

Conceptual domains of the individual care topics were created based on the necessary skills and processes of the individual topics. For example, there were some topics which were more "hands-on"

while others utilized more cognitive abilities. Questions 2 through 18 were itemized into one of four conceptual domains (Figure 3):

Figure 3 – The four conceptual domains and the pediatric care topics within each domain.

Technical Skills	Knowledge-Based Skills	Non-Technical Skills	Age Groups
Vascular access (IV/IO) Airway management Newborn resuscitation	Respiratory illness Shock Trauma Cardiac arrests & arrhythmias Medication dosing Seizures Infectious disease	Pain assessment Giving bad news Child abuse/Non-accidental trauma	Infants < 1 year Young children 1 to 4-years-old Children 5 to 10-years-old Older children & adolescents

Cronbach's alpha (Tavakol et al, 2011) was used to measure the internal consistency of the variables as the domains. Cronbach's alpha is a correlation-like index that measures the extent to which items within a domain measure the same concept. Cronbach's alpha ranges from 0 to 1, and increases as the internal consistency among the variables increases. Thus, when Cronbach's alpha was high (>0.70), summary scores could be created by summarizing over the items in the domain (e.g. taking an average or sum

Outcome Variable Coding

Survey responses were first evaluated descriptively by evaluating frequencies of responses to each item (Figure 2). The 5-point Likert responses for comfort were collapsed to "comfortable" and "uncomfortable". Those who responded as either "very uncomfortable" or "uncomfortable" were categorized as "Uncomfortable" while those who responded as either "neutral", "comfortable", or "very comfortable" were categorized as being "Comfortable". Since one of the primary objectives was to ascertain correlates of discomfort, "neutral" responses were more appropriately included in the "Comfortable" category.

For outcome modeling, four domain scores were computed by taking the average of the original 5-point items within that domain. The summation of each pediatric topic's Likert score (from 1 = very uncomfortable to 5 = very comfortable) was taken and divided by the number of topics within that domain. If the averaged score was less than three, the outcome for that domain was coded as "Uncomfortable" [1]; if the averaged score was greater than or equal to three, the outcome was coded as "Comfortable" [0].

Data Analysis

Descriptive summaries of the EMTs' gender, having children status, age, highest level of training, the number of years at their current level of training, total years in EMS, and their agency setting were compared. For the variable corresponding to the EMTs' highest level of training, First Responders (n = 7) and EMT-B (n = 57) were combined into one category since they were licensed to perform similar duties, and there were very few First Responder participants.

The percent reported uncomfortable in each binary domain score was compared by gender and child status using chi-squared tests of homogeneity. When the domain-level result was statistically significant ($p < 0.05$), then chi-squared tests of each of the individual topics within the domain was performed to ascertain which topics contributed to the domain difference. The topics of vascular access (IV/IO), medication dosing, and seizures were examined by the stratification of the EMTs' highest level of training since these topics entailed scopes of practice only EMT-I and EMT-P were trained to perform.

Multivariable logistic regression modeling was used to assess the association between gender and having children with the comfort levels of the statistically significant domain(s) as the outcome. Selected potential confounders were examined by unadjusted logistic regression between the comfort level of EMTs in statistically significant domains and selected potential confounders. Potential confounders were entered into the preliminary logistic regression models upon meeting the unadjusted significance level ($p < 0.25$). However, the potential confounders were not entered into the main effects

logistic regression models if they did not meet the statistical significance of $p \leq 0.05$. The potential confounding variables were also considered a confounder if it altered the unadjusted odds ratio and the adjusted odds ratio by at least 10%. In addition, the interaction between gender and having children was also examined and retained in the model if $p \leq 0.10$.

The potential confounders were the age of the EMTs, highest level of training (EMT-P vs. EMT-I vs. First Responder/EMT-B), the number of years since obtaining their highest level of training, total years in EMS, the percentage of the EMTs' own transport experiences that involve pediatric patients (< 10% vs. $\geq$ 10%), agency station's setting (rural vs. urban), and the number of pediatric specific training courses the EMTs have taken in the past two years (i.e. PALS, PEPP, etc.). As studies have shown, increased level of training (Wood et al, 2004) and more pediatric specific training were associated to increased comfort among EMTs (IOM, 2007; Wood et al, 2004), however the opportunities to attain those may differ between the genders as their child status and familial roles influence their careers. The age of the EMTs can be related to their experience as EMTs (as the years in EMS increase) in addition to the increase in age and the likelihood of having children can also affect their comfort levels. The agency station's setting (rural versus urban) can affect the percentage of pre-hospital pediatric emergency calls, which can influence the comfort levels of EMTs due to their experience with these rare calls.

The Goodness-of-fit of the multivariate logistic regression model was determined using the Hosmer – Lemeshow goodness-of-fit test, as well as visually assessing the residuals.

Statistical analysis was carried out using the software package STATA version 10 SE.

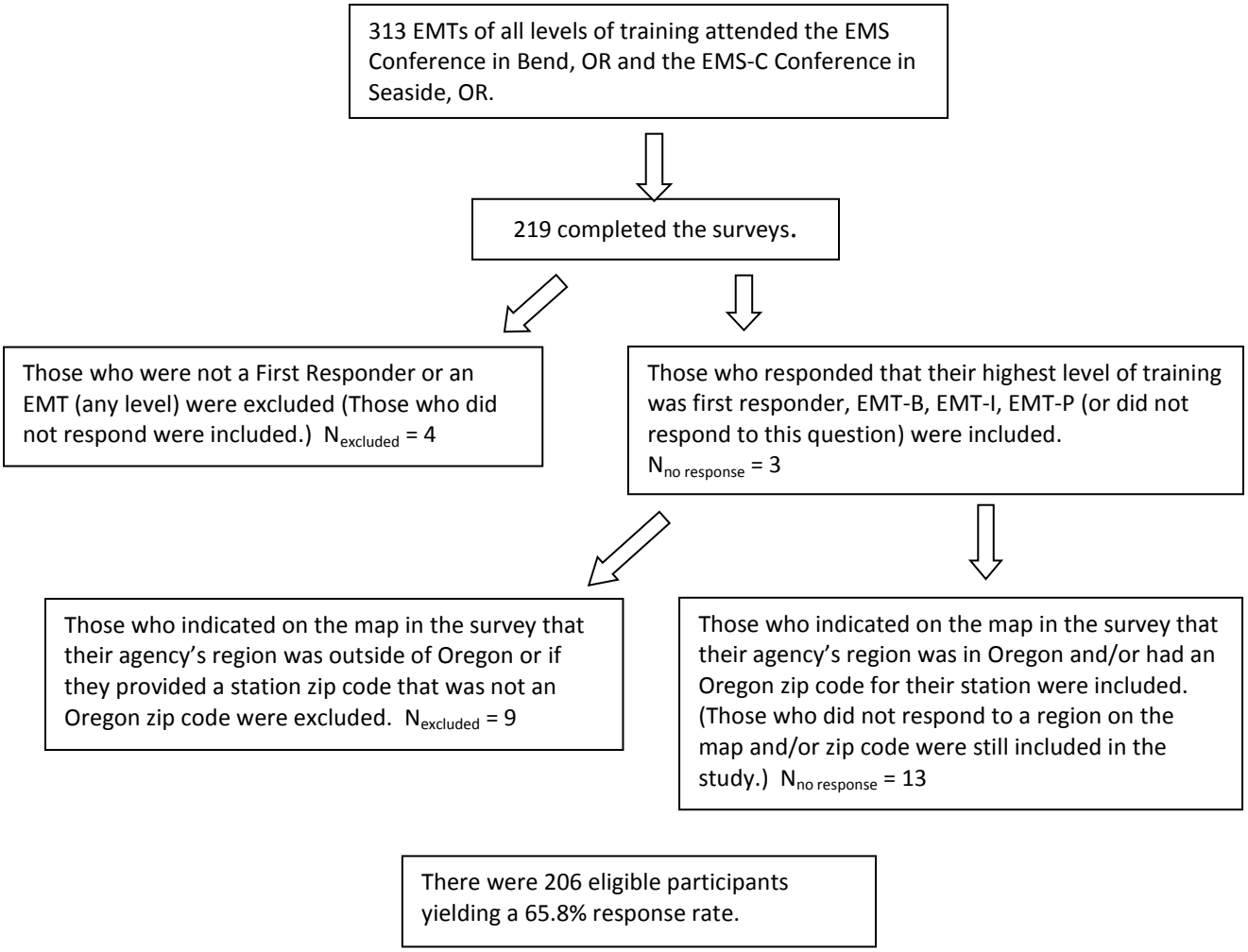
Results

Descriptive Summary of the EMTs

Of the 313 EMTs who attended both the 2008 Oregon State Emergency Medical Services conference in Bend, OR and the 2009 Oregon Emergency Medical Services for Children conference in

Seaside, OR, 219 completed the surveys in which 206 eligible surveys were included in this study which yielded a 65.8% response rate (Figure 4).

Figure 4 – Study Population (Flowchart)



As shown in Table 3, over half of the respondents were male (56%) while 42% were females (four participants did not respond). A majority of the respondents had children (77%) while 22% of both male and female EMTs did not have children. The mean and median age of all of the EMTs was 42-years-old, with the youngest being 22-years-old and the oldest being 69-years-old.

The mean number of years working in emergency medical services (EMS) was 14 years (median, 11 years; [0.5 to 40 years]. The mean number of years since the EMTs obtained their current level of training was about nine years (median, 7 years; [0.5 to 31 years]) (Table 3).

Almost half of the respondents were EMT-P; 73% of males were EMT-P while only 27% of females were EMT-P (Table 1). Across the other three levels of training, there were more female EMTs than male EMTs. A majority of the EMTs, regardless of their highest level of training have children (Table 3).

From Appendix 1, a majority (69%) of the EMTs were from agencies in rural areas according to the zip codes they provided.

Personal transport experience involving pediatric patients

As illustrated in Table 3, a majority (71%) of the EMTs' personal transport experience involving pediatric patients was less than 10% of their transports. Almost 20% of the EMTs reported that their personal transport experience involving pediatric patients was 10% to 25%. Less than 4% of EMTs reported that their personal transport experience with pediatric patients exceeded 25%.

By the number of pediatric specific course(s) taken in the past two years

From Appendix 2, almost all of the EMTs (at least 93%), regardless of their level of training, had taken at one to four pediatric specific training courses in the last two years. Male EMTs and female EMTS were more likely to have taken one to four pediatric specific courses (69% and 58%, respectively) than more than four pediatric specific courses. EMTs with children and those without children were more likely to have taken one to four pediatric specific courses within the past two years (67% and 53%, respectively).

Gender (Table 3)

The mean age of male EMTs was 43-years-old (median, 43-years-old) and the mean age of female EMTs was almost 41-years-old (median, 39-years-old). There was no statistically significant difference between the mean ages of male and female EMTs.

The mean number of years served in EMS for male EMTs was 16 years (median, 15 years; [0.5 to 34 years]) and for female EMTs was 11 years (median, 9 years; [0.5 to 40 years]), which was statistically

significantly different ($p = 0.0001$, $t_{197} = 4.096$; two-sample t-test). On average, male EMTs had been in EMS for almost 5 years more than female EMTs (95% CI: 2.7 years to 7.8 years more).

There was a statistically significant difference ($p = 0.0004$, $t_{192} = 3.59$; two-sample t-test) in the mean years since the EMTs obtained their current level of training between males (mean, 11 years; median, 9 years; [0.5 to 30 years])and females (mean, 7 years; median, 5 years; [0.5 to 31 years]). On average, male EMTs had been in their current level of training for about 4 years more than female EMTs (95% CI: 1.8 years to 6.1 years more).

Children status (Table 3)

The mean age of EMTs with children was 44-years-old (median, 43.5-years-old) while the mean age of EMTs without children was about 35-years-old (median, 29-years-old) which was statistically significantly different ($p<<0.001$,$t_{193} = -5.53$; two-sample t-test). Those with children were, on average, nine-years older than those without children (95% CI: six years to almost 13 years older on average).

The mean number of years that EMTs with children had served total in emergency medical services was 15 years (median, 14 years) while the mean number of years that EMTs without children had served total in EMS was 9 years (median, six years) and was statistically significantly different ($p = 0.0001$, $t_{198} = -4.05$; two-sample t-test). On average, EMTs with children had served six more total years in emergency medical services than those without children (95% CI: three years to nine years on average).

The mean number of years of EMTs with children since they obtained their current level of training was 10.5 years (median, 8.5 years) while the mean number of years of EMTs without children since they obtained their current level of training was 5.6 years (median, three years), which was significantly different ($p = 0.0002$, $t_{193} = -3.74$; two-sample t-test). On average, EMTs with children had been in their current level of training five more years than those without children (95% CI: 2.3 years to 7.4 years more on average).

Table 3 – Descriptive summary of the EMTs

	Totals	Male	Female	Have children	Does not have children
		56.3% (n_{males} = 116)	41.8% ($n_{females}$ = 86)	77.8% ($n_{w/kids}$ = 158)	22.2% ($n_{w/o\ kids}$ = 45)
Have children		77.6% (n = 90)	77.9% (n = 67)	--	--
Do not have Children		22.4 % (n = 26)	22.1% (n = 19)	--	--
Mean age years-old (range)	42.0 (22 – 69) (sd = 10.558)	43.0 (24 – 69) (sd=10.806) n_m = 115	40.5 (22 - 62) (sd=10.08) n_f = 79	44.0 (22 – 69) (sd = 9.43) n = 152	34.7 (22 – 60)* (sd = 11.17) n = 43
Mean total years in EMS (range)	13.75 (0.5 – 40) (sd = 9.289)	15.98 (0.5 – 34) (sd = 9.49) n_{males}= 115	10.71 (0.5 – 40)* (sd = 8.18) $n_{females}$ = 84	15.0 (0.5 – 40) (sd = 9.24) n = 155	9.0 (0.5 – 34)* (sd = 7.85) n = 45
Mean years since obtaining current level of training (range)	9.35 (0.5 – 31) (sd = 7.82)	11.04 (0.5 – 30) (sd = 8.43) n_{males} = 111	7.08 (0.5 – 31)* (sd = 6.35) $n_{females}$ = 83	10.45 (0.5 – 31) (sd = 7.79) n = 150	5.64 (1 – 28)* (sd = 6.79) n = 45
Highest Level of Training		**(n_{males} = 116)**	**($n_{females}$ = 85)**	**($n_{w/kids}$ = 157)**	**($n_{w/o\ kids}$ = 45)**
EMT-Paramedic	49.5% (n = 100)	62.1%	31.8%	49.0%	51.1%
EMT- Intermediate	18.9% (n = 38)	12.9%	27.1%	18.5%	20.0%
First Responder/ EMT-Basic	31.8% (n = 64)	25.0%	41.2%	32.5%	28.9%
Percentage of EMTs' own transport experience involving pediatric patients				**($n_{w/kids}$ = 151)**	**($n_{w/o\ kids}$ = 44)**
		(n_{males} = 113)	**($n_{females}$ = 81)**		
< 10% (n = 145)	70.4%	77.9%	70.4%	73.5%	77.3%
10 – 25% (n = 40)	19.4%	17.7%	23.5%	20.5%	20.5%
25 – 50% (n = 7)	2.4%	3.5%	3.7%	4.0%	2.2%
> 50% (n = 3)	1.5%	0.9%	2.5%	2.0%	0%

§The percentages for the level of training were calculated with each gender and child status as the denominator. The total number of EMT-P for the gender category = 99.
§§ The percentages of the EMTs' own transport experience involving pediatric patients were calculated by each gender and child status.
**Statistically significant differences between the means (α = 0.05)using two-sample t-test.*

Specific Aim 1: Grouping of pediatric care topics into conceptual domains and measurement of EMTs' comfort levels.

Figure 5 summarized how the participating EMTs reported about caring for pediatric patients and their comfort with various pediatric care topics. Sixteen percent of EMTs report they "dislike" caring for pediatric patients, while 65% of the respondents "like" caring for pediatric patients. Thirty-nine EMTs (19%) did not respond to this question. Those who did not respond to this question were still included in the study because they responded to the other primary questions of interest.

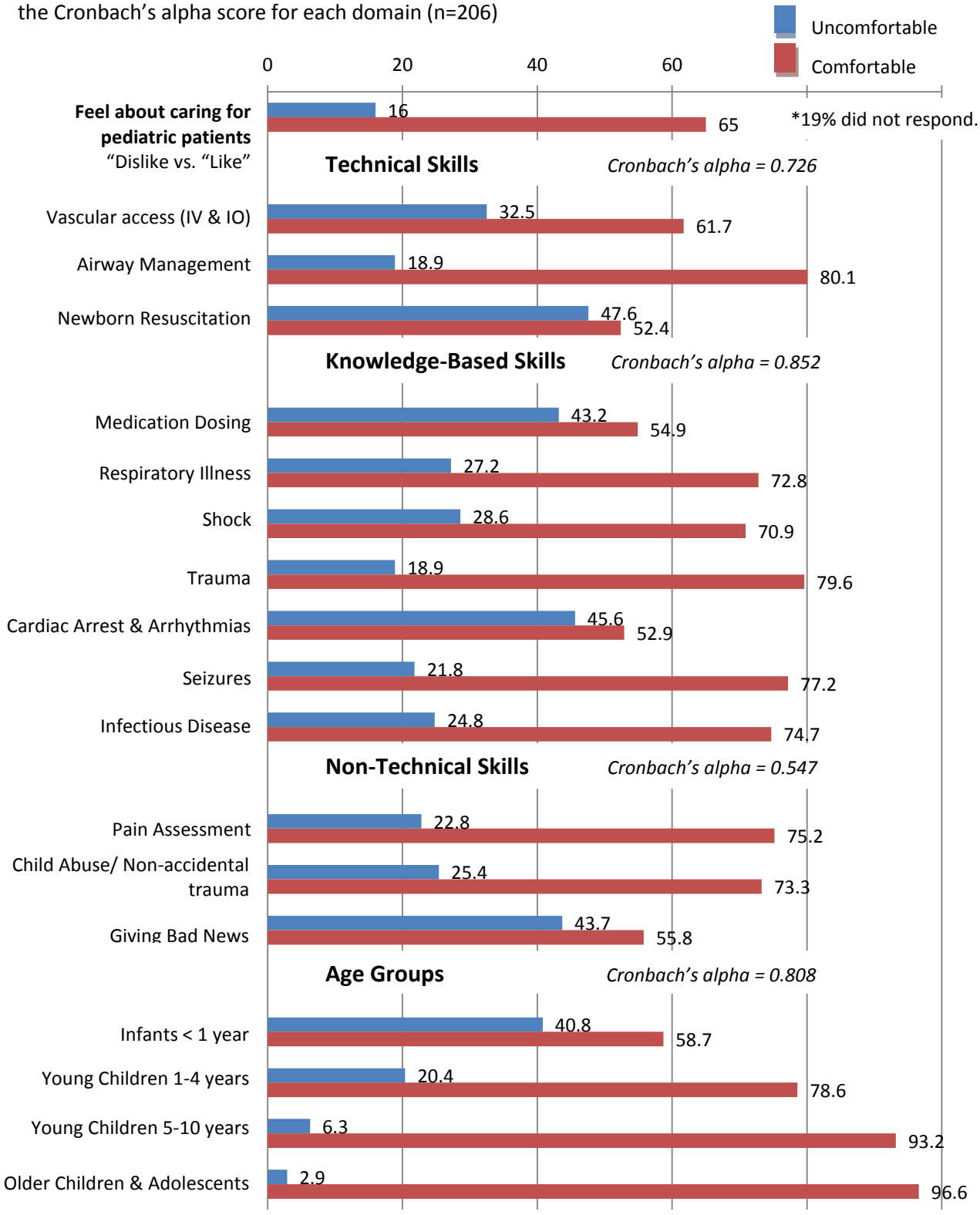
For a majority of the pediatric care topics, many EMTs were comfortable (at least 70% for the topics); there was at most a 9% no response rate to one topic (vascular access). However, the comfort was lower in the topics of newborn resuscitation, cardiac arrest and arrhythmias, medication dosing, giving bad news, infants less than one-year-old, and vascular access. They ranged from slightly over half (52%) for newborn resuscitation to the most being almost two-thirds (62%) of "comfortable" responses for vascular access.

There was a trend of decreased reporting of discomfort by the EMTs with the pediatric patients' increase in age (Figure 5). This trend was investigated in Appendix 3 which kept the responses in the 5-point Likert response scale, ranging from "very uncomfortable" to "very comfortable". As the ages increased, the responses shifted from "neutral" to "comfortable".

Cronbach's Alpha

The grouping of Technical Skills, Knowledge-Based Skills and Age Groups as domains fitted fairly well, Cronbach's alpha = 0.73, 0.85, and 0.81, respectively. However, the grouping of the Non-Technical Skills domain (pain assessment, child abuse/non-accidental trauma, and giving bad news) resulted in a low Cronbach's alpha of 0.55 (Figure 5). Those three topics of were placed into the Technical Skills and Knowledge-Based Skills domains in different combinations which resulted in the decrease of the Cronbach's alpha of those domains each time, therefore those three topics into their own domain

Figure 5 – Percentages of EMTs "Uncomfortable" vs. "Comfortable" with each pediatric care topic and the Cronbach's alpha score for each domain (n=206)



§ Each pediatric care topic was calculated as a row percentage.

Specific Aim 2: Compare the comfort levels of the EMTs in the conceptual domains of pediatric care by gender and children status.

Statistical Analysis of Pediatric Care Domains:

By Gender

As shown in Table 4, although not statistically significant (p = 0.08), the odds of female EMTs feeling that they "dislike" caring for pediatric patients was twice the odds of male EMTs feeling that they disliked caring for pediatric patients (95% CI: 0.92 – 4.35). There was a statistically significant difference in Technical Skills domain and Knowledge-Based Skills domain (p = .003 and p = .029, respectively) between male and female EMTs.

Given the averaged study population of male EMTs and female EMTs and the averaged proportion of discomfort of the conceptual domains, the minimum detectable OR of discomfort is 1.58 at 80% power. This projection did not include data from Question # 1.

Technical Skills (Table 4)

In the Technical Skills domain, the odds of discomfort for female EMTs were 2.5 times higher than the odds of male EMTs (95% CI: 1.37 – 4.55). From the Technical Skills domain, two of topics differed significantly by gender. For the topic of vascular access, 27% of male EMTs were uncomfortable with this topic while 46% of female EMTs were uncomfortable. The odds of discomfort for female EMTs with vascular access were 2.26 times greater than male EMTs (95% CI: 1.23 – 4.14).

For newborn resuscitation, 40% of male EMTs were uncomfortable while 59% of female EMTs were uncomfortable. The odds of female EMTs who were uncomfortable with newborn resuscitation were 2.22 times higher than male EMTs reporting discomfort (95% CI: 1.26 – 3.92).

Table 4 – Summary and the unadjusted OR (female EMTs) of discomfort of Question # 1 and the 4 domains and the topics within Technical Skills and Knowledge-Based Skills domains, by gender

	Percent of Uncomfortable male EMTs	**Percent of Uncomfortable female EMTs**	**$OR_{discomfort}$ (95% CI)** (female EMTs)
Question # 1 **"How you feel about caring for pediatric patients?"** (n_{male} = 87, n_{female} = 77)	7.9 (n = 13)	12.2 (n = 20)	2.00 (0.92, 4.35)
Technical Skills * (n_{male} = 109, n_{female} = 79)	18.1 (n = 34)	22.3 (n = 42)	2.50 (1.37, 4.55)
Vascular access * (n_m=111, n_f=79)	27.0	45.6	2.26 (1.23, 4.14)
Airway management (n_m=114, n_f=86)	16.7	23.3	1.18 (0.58, 2.38)
Newborn resuscitation * (n_m=116, n_f=86)	39.7	59.3	2.22 (1.26, 3.92)
Knowledge-Based Skills * (n_{male} = 112, n_{female} = 80)	21.4 (n = 41)	21.9 (n = 42)	1.91 (1.07, 3.42)
Medication dosing * (n_m=114, n_f=84)	36.8	54.8	2.08 (1.17, 3.69)
Respiratory illness (n_m=116, n_f=86)	23.3	33.7	1.68 (0.90, 3.13)
Shock (n_m=116, n_f=86)	24.1	36.0	1.77 (0.96, 3.26)
Trauma * (n_m=116, n_f=84)	14.7	26.2	2.07 (1.02, 4.20)
Cardiac arrest & arrhythmias * (n_m=115, n_f=85)	35.7	60.0	2.71 (1.52, 4.83)
Seizures * (n_m=116, n_f=85)	14.7	31.7	2.71 (1.36, 5.39)
Infectious disease (n_m=115, n_f=86)	27.0	23.3	0.82 (0.43, 1.56)
Non-Technical Skills (n_{male} = 116, n_{female} = 82)	24.2 (n = 48)	18.7 (n = 37)	1.16 (0.66, 2.05)
Age Group (n_{male} = 115, n_{female} = 86)	10.9 (n = 22)	7.5 (n = 15)	0.89 (0.43, 1.84)

** Indicates a statistically significant p-value at $\alpha = 0.05$. Unadjusted ORs were calculated*

§Percentage of comfortable EMTs is calculated by using the total number of each gender as the denominator

§§ Given the study population of male EMTs vs. female EMTs of the conceptual domains, the minimal detectable OR of discomfort = 1.58 at 80% power. Does not include the proportions of Question # 1.

Knowledge-Based Skills (Table 4)

Female EMTs had 1.9 times higher odds of reporting discomfort than male EMTs in the Knowledge-Based Skills domain (95% CI: 1.07 – 3.42). Half of the topics that comprised this domain were found to be statistically significant. In the topic of trauma, it was found that 15% of male EMTs and 26% of female EMTs were uncomfortable. The odds of female EMTs who were uncomfortable with the topic of trauma were 2.07 times higher than of male EMTs reporting discomfort (95% CI: 1.02 – 4.20).

For cardiac arrest and arrhythmias, 36% of male EMTs and 60% of female EMTs reported discomfort. The odds of female EMTs reporting discomfort with cardiac arrests and arrhythmias was 2.71 times more than that of male EMTs (95% CI: 1.52 – 4.83).

In the topic of seizures, only 15% of male EMTs were uncomfortable while 32% of female EMTs were uncomfortable. The odds of discomfort for female EMTs with seizures were 2.71 times greater than male EMTs (95% CI: 1.36 – 5.39).

Thirty-seven percent (37%) of male EMTs were reported to be uncomfortable with medication dosing while 55% of female EMTs were uncomfortable. Female EMTs had twice the odds of reporting uncomfortable with medication dosing than male EMTs (95% CI: 1.17 – 3.69).

By Children Status

From Table 5, there were no statistically significant differences in the reported discomfort between EMTs without children and EMTs with children across the four domains. For the Age Group domain, the odds of reported discomfort among EMTs with children was 0.78 times lower than EMTs without children (95% CI: 0.32 – 1.92). Further investigation into each individual age group was conducted. As shown in Appendix 4, although not being statistically significant, there was a trend among EMTs without children were more likely to report higher odds of discomfort with children up to 10 years than EMTs with children (Appendix 4). However, as the ages of the pediatric patients

increased, the percentage of EMTs reported discomfort decreased, regardless of child status (Appendix 4) indicating that EMTs were more comfortable as patients were presented as more adult-like.

Given the averaged study population of EMTs with children and EMTs without children and the averaged proportion of discomfort of the conceptual domains, the minimal detectable OR is 2.56 at 80% power. This projection did not include results from Question # 1.

Table 5 – Summary and unadjusted OR (EMTs without children) of EMT discomfort of Question # 1 and the 4 domains by children status

	Percent of Uncomfortable EMTs with children	**Percent of Uncomfortable EMTs w/o children**	**$OR_{discomfort}$ (95% CI)** (EMTs w/o children)
Question # 1 **"How you feel about caring for pediatric patients?"** ($n_{w/kids}$ = 128, $n_{w/o\ kids}$ = 37)	13.3 (n = 22)	6.7 (n = 11)	2.04 (0.88, 4.73)
Technical Skills ($n_{w/kids}$ = 147, $n_{w/o\ kids}$ = 42)	28.6 (n = 54)	11.6 (n = 22)	1.89 (0.95, 3.78)
Knowledge-based Skills ($n_{w/kids}$ = 152, $n_{w/o\ kids}$ = 41)	33.7 (n = 65)	9.3 (n = 18)	1.05 (0.52, 2.10)
Non-technical Skills ($n_{w/kids}$ = 154, $n_{w/o\ kids}$ = 45)	32.2 (n = 64)	10.6 (n = 21)	1.23 (0.63, 2.40)
Age Group ($n_{w/kids}$ = 157, $n_{w/o\ kids}$ = 45)	14.9 (n = 30)	3.5 (n = 7)	0.78 (0.32, 1.92)

§The percentages were calculated as row percentages.

§§ Given the study population of EMTs with children vs. EMTs without children, the minimal detectable OR of discomfort = 2.56 at 80% power. Does not include the proportions of Question # 1.

Specific Aim 3: Measure the association between the gender and children status of the EMTs to their reports of discomfort.

Potential confounding variables were logistically regressed with Technical Skills domain and Knowledge-Based Skills domain (unadjusted). Based upon Appendix 7, confounding variables that met the criteria (α = 0.25) to be entered into multivariable logistic regression analysis of the preliminary main effects model for both the Technical Skills and Knowledge-Based Skills domains were:

- Gender
- Child status
- Total years in EMS
- Highest level of training (by levels)
- Years since obtaining current level of training
- Personal experiences with pediatric patients
- The number of pediatric specific courses taken in the past 2 years

The independent variables age and agency station setting were not entered into the preliminary main effects model of both domains. The variable of the EMTs' personal transport experiences with pediatric patients was borderline statistically significant (p = 0.252) for Technical Skills domain and was entered into the preliminary main effects model.

Preliminary Main Effects Model

From the results of Table 6, all of the independent variables in the table, except for the years since the EMTs obtained their current level of training, total years in EMS, and percent of the EMTs' transport experience with pediatric patients were kept in the both of the models. Despite the EMTs' highest level of training being statistically insignificant, this variable held a tremendous amount of clinical significance, especially for those responsible for their education and training and was kept in the model. The variables of total years in EMS and the number of years since obtaining current level of training were highly significant in the unadjusted analysis to the outcomes of the comfortableness of the Technical Skills and Knowledge-Based Skills, but were no longer statistically significant in the preliminary main effects model (Table 6).

Main Effects Model Variables

Therefore, the main effects model for both the Technical Skills model and the Knowledge-Based model will include the following independent variables:

- Gender
- Level of training (as a whole)
- The number of pediatric specific courses taken in the past 2 years
- Child status
- Level of training, by each level

Main Effects Model and Possible Interactions

Main Effects Model for Technical Skills (Table 6)

Female EMTs had 2.45 times higher odds of reported discomfort with the Technical Skills domain after adjusting for children status, highest level of training (as a whole and by each level), and the number of pediatric specific courses taken in the past two years (95% CI: 1.24 – 4.82). EMTs with

children had 0.37 times lower odds of discomfort with the Technical Skills domain than EMTs without children after adjusting for gender, highest level of training (as a whole and by each level), and the number of pediatric specific courses taken in the past two years (95% CI: 0.17 – 0.82). The results for the main effects model for Technical Skills showed that only one variable was statistically insignificant (α =0.05), EMT-I in the level of training of EMTs.

From Table 6, First Responders/ EMT-B 2.90 times higher odds, respectively, of discomfort with the Technical Skills than EMT-P (95% CI: 1.35 – 6.24). The number of pediatric specific courses taken in the past two years had a protective effect. For each additional pediatric specific course taken, EMTs had 0.80 times lower odds of reporting discomfort with the Technical Skills category (95% CI: 0.54 – 0.92).

Main Effects Model for Knowledge-Based Skills (Table 6)

For the main effects model of Knowledge-Based Skills (Table 6), only two variables resulted to be statistically insignificant (α=0.05), gender and children status. After adjusting for gender, children status, and the number of pediatric specific courses taken in the past two years, First Responders/ EMT-B and EMT-I had three times greater odds of discomfort in the Knowledge-Based Skills category in comparison to EMT-P (95% CI: 1.41 – 6.05 and 1.37 – 7.24, respectively). In addition, the number of pediatric specific courses taken in the past two years remained statistically significant for the outcome of the comfort of Knowledge-Based Skills domain (p = 0.007). For each additional pediatric specific course taken in the past two years, EMTs had 0.84 times lower odds of discomfort in the Knowledge-Based Skills domain (95% CI: 0.32 – 0.95).

Table 6 – Results of Preliminary Main Effects Model, Main Effects Model, and an Interaction for Technical Skills domain and Knowledge-Based Skills domain (OR and 95% CI)

	Preliminary Main Effects Model		**Main Effects Model**		**Main Effects Model with Interaction**	
	Technical Skills $OR_{discomfort}$ (95% CI)	Knowledge-Based Skills $OR_{discomfort}$ (95% CI)	Technical Skills $OR_{discomfort}$ (95% CI)	Knowledge-Based Skills $OR_{discomfort}$ (95% CI)	Technical Skills $OR_{discomfort}$ (95% CI)	Knowledge-Based Skills $OR_{discomfort}$ (95% CI)
Male	--	--	--	--	--	--
Female	2.41 (1.16, 5.01)	1.43 (0.70, 2.90)	2.45 (1.24, 4.87)	1.67 (0.86, 3.25)	1.01 (0.35, 2.92)	0.67 (0.24, 1.87)
No children	--	--	--	--	--	--
Have children	0.57 (0.24, 1.34)	1.29 (0.56, 3.01)	0.37 (0.17, 0.82)	0.82 (0.38, 1.77)	0.52 (0.23, 1.22)	1.21 (0.53, 2.77)
EMT (level as a whole)	--	--	p-value = 0.021	p-value = 0.003	p-value = 0.26	p-value = 0.05
EMT-P	--	--	--	--	--	--
EMT-I	1.91 (0.78, 4.22)	2.91 (1.20, 7.03)	1.98 (0.84, 4.63)	3.15 (1.37, 7.24)	1.61 (0.66, 3.97)	2.74 (1.15, 6.55)
First Responder/EMT-B	1.77 (0.71, 4.41)	1.80 (0.77, 4.22)	2.90 (1.35, 6.24)	2.92 (1.41, 6.05)	1.97 (0.85, 4.53)	1.96 (0.88, 4.26)
# of ped. specific courses taken in the past 2 yrs.	0.81 (0.70, 0.94)	0.88 (0.77, 1.01)	0.80 (0.54, 0.92)	0.84 (0.32, 0.95)	0.78 (0.68, 0.91)	0.85 (0.74, 0.97)
Years since obtaining current training	0.90 (0.89, 1.05)	0.95 (0.88, 1.02)	--	--	--	--
Total years in EMS	0.97 (0.91, 1.04)	0.99 (0.93, 1.05)	--	--	--	--
% of transport experiences w/pediatric patients (<10% vs. ≥10%)	1.30 (0.58, 2.91)	1.74 (0.79, 3.84)	--	--	--	--
Gender x Years since obtaining current level of training	--	--	--	--	Males: 0.89 (0.82, 0.97) Females: 1.00 (0.83, 1.21)	Males: 0.94 (0.84, 0.97) Females: 1.00 (0.84, 1.18)

§ EMT-P, male EMTs, and EMTs without children were the referent categories.

§§ All statistically significant ($p \leq 0.25$) independent variables from Appendix 8 were entered simultaneously into the Preliminary Main Effects Model.

Interactions (Table 6)

There was a difference between male EMTs and female EMTs in their comfort levels in Technical Skills and Knowledge-Based Skills by the level of the number of years since they obtained their current level of training (Table 6). The odds of discomfort in Technical Skills domain of male EMTs were 0.89 times lower discomfort (95% CI: 0.82 – 0.97) and 0.90 times lower in Knowledge-Based Skills (95% CI: 0.84 – 0.97) as the years since they had obtained their current level of training increased. There did not appear to be a difference for female EMTs in their odds of reported discomfort in either Technical Skills or Knowledge-Based Skills domains as their years since they obtained their current level of training increased (OR = 1.00).

The Hosmer-Lemeshow goodness-of-fit test for both the Technical Skills domain model and Knowledge-Based Skills domain model in Table 6 showed that these models, including the interaction, fit the data well ($p = 0.55$ and $p = 0.40$, respectively).

Discussion

The majority of Oregon EMTs reported being comfortable with the individual topics of pediatric care. However, more than a third reported discomfort with newborn resuscitation, medication dosing, and giving bad news. In the Technical Skills domain after adjusting for confounders, female EMTs had significantly higher odds of reporting discomfort than male EMTs. EMTs with children had significantly lower odds of reported discomfort in the Technical Skills domain than EMTs without children after adjusting for confounders.

An interaction was found between gender and number of years since obtaining their current EMT level in the Technical Skills and Knowledge-Based Skills domains. For every additional year since male EMTs obtained their current level of training, the odds of discomfort within these two domains decreased. However, this effect did not hold for female EMTs; no matter how many years had passed since female EMTs obtained their current level of training, there was no change in their reported odds of

discomfort. In the study by Bakken et al (2003) a similar effect was observed. Increased training and education did not improve the female physicians' assessment of their own abilities to perform or apply knowledge related to clinical research. Females rated themselves lower on a 4-point Likert scale than their male counterparts on 33 of 35 learning objectives after an intensive introductory clinical research workshop, whereas they rated themselves lower than males on only 22 of 35 objectives prior to the workshop. However, females did rank themselves higher on the learning objectives after the workshop program, but so did their male counterparts. The mean difference in postprogram survey ratings versus preprogram survey ratings was greater for men than women (Bakken et al, 2003), resulting in a more pronounced gender difference.

The female respondents in this survey overrepresented female EMTs in the state of Oregon (43% versus Oregon's 17%); therefore the odds ratio may overestimate the odds of discomfort of female EMTs in Oregon. However, the trend of higher odds (unadjusted) of discomfort was consistent among female EMTs, when compared to male EMTs, in the Technical Skills and Knowledge-Based Skills domains (Table 4) and should not be discounted especially with the finding that the self-reported odds of discomfort did not change for female EMTs as their years in their current level of training increased. Although other studies have found that female physicians tend to rate and report lower confidence in their abilities (Bakken et al, 2003; Blanch et al 2008), perform equally to their male counterparts in academic competence, clinical communication, and patient-centered care (Blanch et al, 2008). This study did not assess this and further research is necessary to distinguish between potential reporting bias in self-reported comfort levels versus actual performance between the genders.

The percentage of EMTs reporting they were uncomfortable providing care for pediatric patients decreased as the age of the pediatric patients increased. Although not statistically significant, the odds of discomfort for female EMTs were less than the odds of discomfort of male EMTs which

could be influenced by societal gender roles as caring for children tends to be a "natural" role for women while it would be viewed "unmanly" for males (Robb, 2004).

Interestingly, for the domain of Age Groups, EMTs without children, although not statistically significant, had lower (unadjusted) odds of discomfort than EMTs with children. Twenty-two percent of both male and female EMTs did not have children, in which given the proportion of those with children and those without children, with the power of the study at 80%, the OR that can be detected was calculated to be at least 4.9. It has been suggested that perhaps EMTs without children may feel more comfortable with the Age Groups domain due to a lack of experience and knowing the challenges and difficulties that potentially complicate a pediatric call, which EMTs with children anticipate. Research outside of the pre-hospital emergency setting has reported gender differences in a child-focused community activities and advocacy. Results from a national survey of pediatric residents demonstrated that female residents were more likely to have been involved with community activities and exposure to child health advocacy before and during medical school, which resulted in a positive influence for greater future community involvement (Minkovitz et al, 2006). The approach of encouraging EMT students to increase involvement within the community may be a means for exposure with children to help EMTs without children feel more comfortable with future pediatric patients. Perhaps in the training of new EMTs and/or the continuing education of EMTs, an additional requirement to the pediatric hours would be to spend time in community activities or daycare centers for increased exposure with children.

We also found that additional pediatric-specific training courses had a significant protective effect in both the Technical Skills and the Knowledge-Based Skills domains, and remained significant after other variables were introduced into the model. At least 93% of all respondents had taken at least one pediatric specific training course in the two years prior to completing the survey (Appendix 2). These results were consistent with previous studies that have reported that EMS providers' pediatric

emergency care skills tend to decline significantly within one year of training (Wood et al, 2004), and that increased hours of continuing education was associated to increased comfort level of all areas of EMTs (Stevens et al, 2005).

There was an association in the trend of decreasing odds of discomfort as the level of training of the EMTs increased for Technical Skills and Knowledge-Based Skills domains, which was consistent with finding from a study of EMTs in Maine by Stevens et al (2005). However, this study sample was overrepresented by EMT-Paramedics (50% versus Oregon's 38%) and underrepresented by EMT-Basics (28% versus Oregon's 43%). The odds of discomfort found in this study may actually underestimate the odds ratio EMTs of Oregon especially since EMT-Basics represent over a third of Oregon's pre-hospital emergency medical services workforce. Concerns arose about the possibility of a difference between those who attended the conferences and those who did not. For example, requesting time off, the ability to afford time off and for travels, and traveling from urban areas were factors considered to be hindering. A majority of EMTs who attended the conferences were from rural areas (Appendix 1) and over a third of all EMTs were volunteers (results not shown). The standardized survey was distributed to every conference attendee who had the choice of whether or not they wanted to participate, as would the situation had been if the survey were to be administered state-wide,

Nineteen percent (19%) of EMTs did not respond Question 1, which asked the EMTs "How do you feel about caring for pediatric patients". Those who did not respond were from all levels of training. Upon closer examination of the instrument itself, this question appeared to blend into the instructions of the survey so perhaps due to inadequate spacing, respondents actually missed the question and proceeded to the next section. The participants who did not answer this question were kept in the study because they responded to the other questions in the survey of primary interest. Among First Responders/EMT-Basics, 10% did not respond; among EMT-Intermediates and EMT-Paramedics, 26% and 21%, respectively, did not respond to Question 1.

Medication dosing is a topic that inherently has both hands-on and cognitive aspects. For example, know what doses of medication to provide pediatric patients by calculating the dosage based on the patient's weight and vial concentrations and how to administer doses to children with the proper size equipment to the actual administration of medication (via sublingual, intravenous, intramuscular, etc.) We opted to place this topic into the Knowledge-Based domain because: 1) calculation of dosage was determined by familiarity of medication and to the usage of the Broselow tape; 2) inclusion of medication dosing into the Technical Skills domain lowered the Cronbach's alpha, indicating inconsistency of the responses to this question in relation to others in this domain. Further investigation of medication dosing by level of training and gender was conducted and presented in Appendix 4. The odds of discomfort with medication dosing for EMT-Intermediates (unadjusted) were 2.5 times higher than EMT-Paramedics, which was statistically significant. Over 50% of EMT-Intermediates reported discomfort, but so did one third of EMT-Paramedics. Almost half of those who reported discomfort were female EMT-Paramedics (Appendix 5).

As stated in Table 1, EMT-Intermediates, with certain medications and under a supervising physician or direct order from a licensed physician, and EMT-Paramedics are allowed to prepare and administer medication. Even among those qualified for medication dosing, the reported frequency of discomfort is of concern, especially if incorrect dosage being administered is a cause of discomfort, the effects can be life-threatening. A study in Los Angeles County reported that overall rate of medication dosage errors for children exceeded 70% (Kaji et al, 2006). A potential cause of discomfort may be the use of the Broselow tape, in addition to incorrect medication dosage calculations still occurring with pediatric calculation aids (Bernius et al, 2008), is a standardized weight-estimation system to calculate medication dosage for children and equipment size, that is not specific to the medications or the drug vial concentrations used in a particular hospital or pre-hospital system. A study by Kaji et al (2006) compared the rates of incorrect dosage of epinephrine administered to pediatric patients in Los Angeles

County with only the use of the Broselow tape and after implementation of the LA Kids Program. The LA Kids program was implemented which required EMT-Paramedics to use the Broselow tape in addition to the use of a color zone chart with pre-calculated drug dosages in which the EMT-P had to report the color zone to the base station with staff whom were also trained in the usage of the color zone charts. Prior to the program, 28% of pediatric patients received the correct dosage of epinephrine however after the LA Kids was applied, 54% of pediatric patients received the correct dosage (Kaji et al, 2006).

Limitations in the scope of practice of First Responders and EMT-Basics

There were several pediatric care topics which First Responders and EMT-Basics were not trained to do or very little could be done in a pre-hospital setting. However, there was no "not applicable" or "n/a" response choice on the survey. Further examination was conducted in medication dosing, IV/IO, and seizures to investigate how First Responders and EMT-Basics responded to these topics that they were not certified to perform or very limited to treat.

As shown in Appendix 6, First Responders/EMT-Basics tended to respond to pediatric topics as "Uncomfortable" for things that they were not certified to perform or had very limited procedural training for. For example, over 50% of First Responders/EMT-Basics reported discomfort in medication dosing and IV/IO, both of which they were not certified to execute. These responses may have skewed the odds ratios slightly in Table 4 for these individual pediatric care topics and have a slight effect on the odds ratios of the Technical Skills domain (contained vascular access) and Knowledge-Based Skills domain (included medication dosing). The odds of discomfort among EMT-Intermediates in vascular access and medication dosing was higher than EMT-Paramedic, OR = 3.18 and OR = 2.51, respectively (unadjusted, results not shown). Even though they are not trained to perform procedure described in these two topics, they may be the first to respond to these types of pediatric emergency calls and therefore be uncomfortable in a situation where they cannot do anything. Almost half of First Responders/EMT-Basics reported discomfort with seizures, which tend to be treated with medication to

suppress convulsions and require calculation of medication dosage. Given that EMT-Basics were underrepresented in the study, the odds may be underestimated for the level of discomfort for Oregon EMT-Basics.

Limitations

There are some limitations to this investigation that should be noted. The response of comfort levels was categorized into dichotomous outcomes from a 5-point Likert scale for the conceptual domains to be used for logistic analysis may mask important information. Nonetheless, the outcomes were based on an averaged score derived from the full 5-point scale before the outcomes (either "Uncomfortable" or "Comfortable") was assigned for each respondent of the domain. Furthermore, the analysis was modeled for discomfort so those who were in the neutral zone assigned a "Comfortable" score.

In addition, the ambiguity of the definition of the definition of "pediatric patient" may be confusing. Within the survey, participants were asked how comfortable they were with pediatric patients by age groups. The age groups were clearly defined until after ten-years-of-age; older children and adolescents were an age group which could be problematic in what the respondents perceived as adolescents and the cut-off age of adolescence. A study by Wood et al (2004) surveyed pre-hospital emergency run from all states, territories, and districts to gather a definition for "pediatric" in which 38 states participated and the eldest age for the definition of "pediatric patient" ranged from 8-years-old to 21-years-old. Twelve out of 38 states did not have a definition while two out of 26 states used a definition other than age (Wood et al, 2004); Oregon did not participate.

Implications

Given that Oregon EMTs, within their respective levels, received similar basic training and education and required to meet standardized certifications, the tendency for female EMTs to report discomfort with pediatric patients raised concern. Female EMTs were more likely to have higher odds of

discomfort with vascular access, airway management, and newborn resuscitation. However, if this discomfort is associated to self-confidence, then part of the training of EMTs should address this for female EMTs or a lecture about how self-confidence is not necessarily a measurement of competence.

This study also found that EMTs without children reported higher odds of discomfort in the Technical Skills domain, which consisted of hands-on procedures. If not knowing how to physically handle children contributes to the discomfort, a future consideration in the new training or continuing education of EMTs is to require involvement in community activities with children, for example an afterschool program or daycare center.

Further research of Oregon EMTs, with an emphasis on gender, may be necessary to differentiate between reported discomfort and actual performance and competence of certain pediatric topics. This information may be used to help create or adapt programs and workshops to better serve Oregon's out-of-hospital emergency medical services workforce for increased comfort effectively.

Conclusions

Oregon emergency medical technicians responded being comfortable in many of the pediatric care topics that were surveyed. It was found that female EMTs and EMTs without children were more likely to report higher odds of discomfort with vascular access, airway management, and newborn resuscitation. Among male EMTs, their reported odds of discomfort decreased as their years in their current level of training increased. Furthermore, having taken more pediatric specific training courses in the past two years resulted in increased odds of comfort with pediatric care.

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Appendix

Appendix 1 – EMTs' agency setting type by stations' zip code

Rural	Urban
68.5%	31.5%

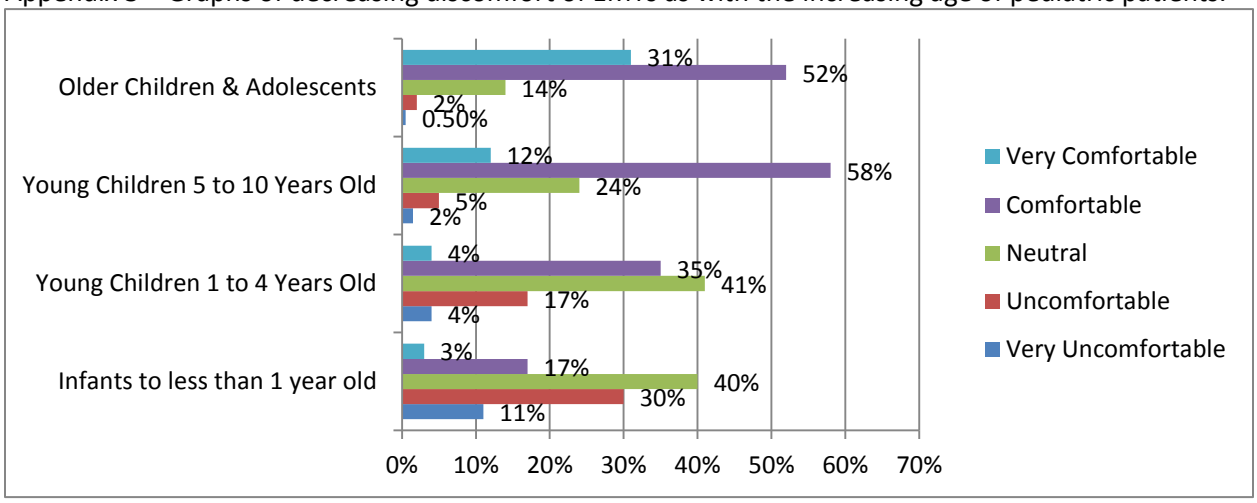
§ The definition of "urban" was based upon the definition provided by the Oregon Office of Rural Health

Appendix 2 – Highest level of training of EMTs and the number of pediatric specific courses they have taken in the past 2 years (%)

	Total % who have taken courses	O courses (n =10)	1 to 4 courses (n = 128)	5 to 8 courses (n = 46)	9 to 10 courses (n = 17)
Males (n = 115)	95.7	4.3	68.7	21.7	5.2
Females (n = 86)	94.2	5.8	58.1	24.4	11.6
Have children (n = 157)	96.5	4.5	66.9	21.0	7.6
Does not have children (n = 45)	98.5	6.7	53.3	28.9	11.1
EMT-P (n = 100)	96.0	4.0	61.0	24.0	11.0
EMT – I (n = 38)	94.7	5.3	60.5	26.3	7.9
EMT-B/ First Responder	93.7	6.3	69.8	19.0	4.8

§Percentages calculated by each gender, children status and each level of training.

Appendix 3 – Graphs of decreasing discomfort of EMTs as with the increasing age of pediatric patients.



Appendix 3 shows that for infants less than one year, almost a third of EMTs were "uncomfortable" and 40% responded as "neutral". In the age group of children one to four-years-old, 41% of EMTs responded

as “neutral” and 35% were “comfortable”. With children five-years-old to adolescents, over half of the EMTs responded as “comfortable”.

Appendix 4 – Summary and unadjusted odds ratios of individual age groups by children status

	Percent of Uncomfortable EMTs with Children	**Percent of Uncomfortable EMTs w/o Children**	**$OR_{discomfort}$ (95% CI)** (EMTs w/o children)
Infants to < 1 year ($n_{w/o\ children}$ = 45, $n_{w/children}$ = 158)	30.1	11.3	1.66 (0.85, 3.24)
Young Children 1 – 4 years ($n_{w/o\ children}$ = 45, $n_{w/children}$ = 157)	15.4	5.5	1.31 (0.61, 2.85)
Children 5 – 10 years ($n_{w/o\ children}$ = 45, $n_{w/children}$ = 158)	4.9	1.5	1.05 (0.30, 3.75)
Older Kids & Adolescents ($n_{w/o\ children}$ = 45, $n_{w/children}$ = 158)	3.0	0	--

§The percentages were calculated as row percentages

As shown in Appendix 4, EMTs without children were more likely to report higher odds of being uncomfortable with each age group, except older children and adolescents, than EMTs with children; however, this was statistically insignificant.

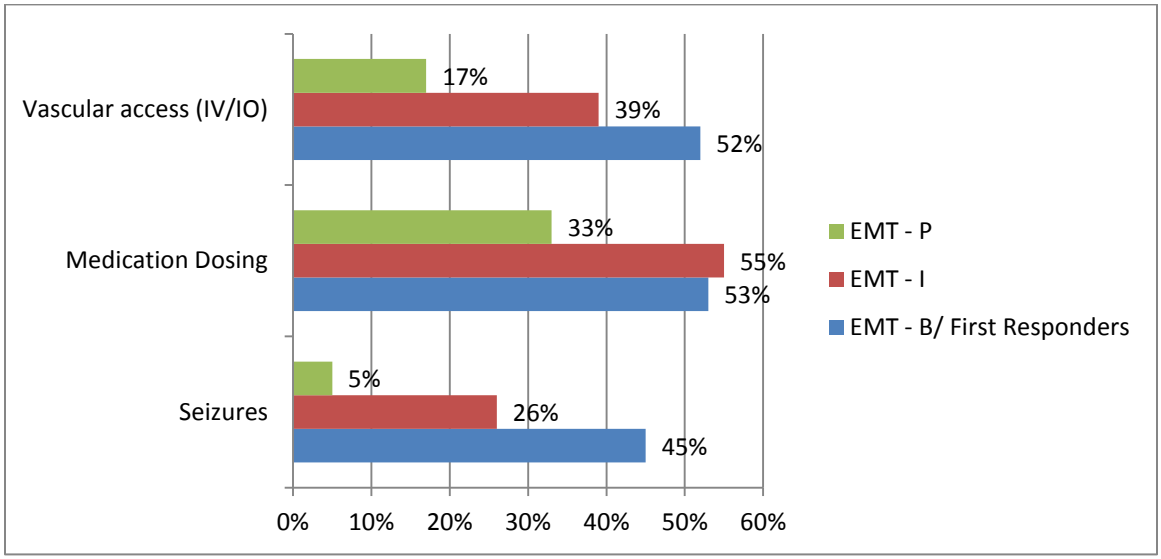
Appendix 5 – Percentage of comfort levels of EMTs and OR of reporting being uncomfortable with medication dosing, stratified by gender and training level (unadjusted ORs)

	Percent Uncomfortable	**Percent Comfortable**	**$OR_{discomfort}$ (95% CI)**
EMT-Paramedic	**33.0**	**67.0**	**--**
Male	27.8	72.2	--
Female	48.1	51.9	2.41 (0.97, 4.48)
EMT-Intermediate	**55.3**	**44.7**	***2.51 (1.17, 5.38)**
Male	53.3	46.7	--
Female	56.5	43.5	1.49 (0.40, 5.51)
First Responder/EMT-Basic	**56.7**	**43.3**	***2.66 (1.37, 5.13)**
Male	51.9	48.1	--
Female	60.6	39.4	1.43 (0.51, 4.00)

**Indicates a statistically significant p-value at $\alpha = 0.05$. Unadjusted ORs were calculated. The ORs for each level of training were shown in bold; EMT-P is the referent category.*
§ Percentages calculated as row percentages

From Appendix 5, about 34% of respondents answered this topic as “neutral”. Among those who responded “neutral”, 4% were EMT-P, 24% were EMT-I, and 72% were either EMT-B or First Responders (results not shown).

Appendix 6 – EMTs reporting of being uncomfortable in the topics of seizures, medication dosing, and vascular access by level of training (%)



Appendix 7 – Summary of potential confounders for Technical Skills and Knowledge-Based Skills domains

	Technical Skills		Knowledge – Based Skills	
	OR	**p-value**	**OR**	**p-value**
Male EMTs	--	--	--	--
Female EMTs	2.50(1.37, 4.56)	0.003	1.91(1.07, 3.43)	0.029
No Children	--	--	--	--
Have Children	0.53(0.26, 1.05)	0.070	0.95(0.48, 1.91)	0.896
Age	0.98(0.96, 1.01)	0.298	0.99(0.96, 1.02)	0.504
EMT- P	--		--	
EMT-I	2.77(1.27, 6.03)	0.010	3.98(1.81, 8.74)	0.001
EMT-B/ 1st responder	3.78(1.86, 7.68)	<0.001	3.56(1.79, 7.09)	<0.001
Years since obtaining current training	0.90(0.86, 0.95)	<0.001	0.93(0.88, 0.96)	<0.001
Total years in EMS	0.92(0.88, 0.95)	<0.001	0.94(0.91, 0.98)	0.001
Agency station setting (rural vs. urban)	0.89(0.46, 1.73)	0.732	0.77(0.40, 1.49)	0.439
# of ped. specific courses taken in the past 2 yrs.	0.81(0.71, 0.91)	0.001	0.83(0.74, 0.94)	0.002
% of transport experiences w/ pediatric patients (< 10% vs. ≥ 10%)	1.51(0.75, 3.06)	0.252	1.98(0.97, 4.03)	0.059

§ Unadjusted logistic regression analysis.

Each potential confounding variable from Appendix 7 was entered into an unadjusted logistic regression with the outcome variables of Technical Skills and Knowledge-Based Skills. If the potential confounding variables met the significance criteria ($\alpha = 0.25$), they were entered into the adjusted preliminary main effects model.