Low major trauma confidence among Emergency Physicians working outside Major Trauma Services: inevitable result of a centralised trauma system or evidence for change?

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Abstract

INTRODUCTION: Regionalised civilian trauma systems improve patient outcomes, but may deskill clinicians outside Major Trauma Services (MTS). We aimed to characterise experience and confidence in trauma management among emergency physicians working in MTS to those working elsewhere.

METHODS: Emergency Physicians working within the Victorian State Trauma System were surveyed about their pre and post fellowship training experience, their estimated hours per fortnight in different centres, the frequency of performance/supervision of critical emergency skills, and their confidence in a range of trauma skills.

RESULTS: The 138 respondents analysed represented 33% of active Victorian FACEMs. The cohort were mostly (69.6%) males, younger than 50 (75.4%) and were generally (69.6%) 6 or more years post fellowship. FACEMs working in a MTS were more likely to have been a trauma registrar prior to fellowship (13.3% vs 3.7%, $p=0.046$). MTS clinicians performed more, supervised more and were more confident in trauma team leading, traumatic airway management, and rapid infusion catheter and multi-access catheters. Confidence in trauma team leading was only associated with exposure to performance or supervision of trauma team leading. Performance of trauma team leading was more common in clinicians at a MTS (Odds Ratio 3.19, 95%CI 1.00 - 10.20, $p=0.05$).

CONCLUSIONS: Exposure to major trauma is associated with time spent working in a MTS and

exposure is associated with confidence. A mature inclusive trauma system must ensure clinicians across the system gain the experience or training to provide trauma care that will result in similar outcomes for patients regardless of initial presenting hospital.

Background

Regional civilian trauma systems have been evolving since the mid-20th Century when the first trauma centres were designated in the USA.⁽¹⁾ Regional trauma systems concentrate patients, expertise and resources in a limited number of centres to which major trauma patients are allocated by a pre-hospital triage and transport system.⁽²⁾ In most jurisdictions, it is impossible to deliver every major trauma patient directly to a major trauma centre. As such, trauma systems covering large geographic areas require a second tier of regional trauma receiving hospitals, prepared to receive and stabilise major trauma patients, supported by inter-hospital transfer protocols. All the Australian health jurisdictions include one or more concentrated population centre and a very large and more sparsely populated rural and regional area, necessitating this approach.⁽³⁾

The Victorian State Trauma System (VSTS) was created at the end of the 1990s, following a ministerial review that had a goal of reducing preventable deaths of critically ill and injured patients ⁽⁴⁾, following publication of preventable trauma death research.⁽⁵⁾ The VSTS serves the State of Victoria, Australia, which covers a land mass of 237,629km² and a population of 6,179,249⁽⁶⁾. It aims to deliver the 'right patient to the right place at the right time'⁽⁷⁾ and provide definitive care to major trauma patients at one of three (2 adult and 1 paediatric) Major Trauma Services (MTS) located in the capital, Melbourne. As an inclusive trauma system the VSTS designates all hospitals in the state with a role within the system. Major rural "base" hospitals are designated Regional Trauma Services (RTS) and non-MTS tertiary metropolitan public hospitals and urban district hospitals are designated as Metropolitan Trauma Services (MeTS). RTS and MeTS are involved in the reception and resuscitation of major trauma patients

prior to transfer (to a MTS) and in consultation with a MTS, provide definitive care for selected major trauma patients, performing a role similar to the Royal Australasian College of Surgeons Level 3 Trauma Centre⁽⁸⁾. The RTS has the added role of providing some trauma leadership and education for their region.

Over a third of the major trauma patients across the state initially present to RTS and MeTS hospitals. RTSs are a diverse group of hospitals ranging from hospitals of less than 100 beds with no intensive care unit and no Australasian College for Emergency Medicine (ACEM) training accreditation to major regional teaching hospitals with over 200 beds⁽⁹⁾, well equipped intensive care units and a significant specialist and trainee emergency physician presence.⁽¹⁰⁾ Distances to a MTS can range from under 80km for near-tertiary level hospitals (e.g. University Hospital Geelong), to around 300km for smaller more remote hospitals (e.g. Wimmera, Hamilton Base Hospitals) and over 500km for Mildura Hospital. Most undergo secondary transfer to a MTS for definitive care. Whilst hospital roles and designations are clear, it is unclear what the major trauma exposure per Emergency Physician (EP) is across the system.

Prior to the implementation of the VSTS, hospitals now designated as a RTS managed high acuity trauma patients throughout their inpatient journey. A review of the Victorian State Trauma Outcomes Registry Monitoring (VSTORM) data from 2005/06 to 2014/15 showed the proportion of patients who receive initial care at MeTS and RTS centres is now stable at just over one third (range 33.6 – 39.1%) and the proportion receiving definitive care at these centres is also stable, (range 16.1 - 20.3%) at approximately half of the patients who initially present there.

Concerns about potential skill degradation in staff working outside MTS has been cited as a concern with regional trauma systems^(5, 11, 12). Major trauma patients may arrive at any ED

within the trauma system. This is challenging for emergency doctors with minimal exposure who are then tasked with providing the clinical leadership and procedural skills to manage the 'occasional' major trauma presentation. Skill degradation in resuscitation is a well-known and studied phenomenon^(13, 14). Skill degradation is not specific to the management of trauma patients. For instance, recent work on out-of-hospital cardiac arrest has clearly demonstrated the link between clinician's exposure and patient outcome⁽¹³⁾. Furthermore, in a system with an increasing number of trainees, skill degradation represents a significant challenge to all senior medical staff.

In the Australian trauma care model, initial trauma reception and resuscitation occurs in the ED by trauma teams comprising EPs, Anaesthetists, General Surgeons, Nurses and Radiographers. Role designation varies from hospital to hospital depending on resources and local protocols but in general, team leadership in the resuscitation phase falls to the EP, with the General Surgeon responsible for decisions about operative intervention⁽¹⁵⁾. The specialty qualification for an EP in Australia is the Fellowship of ACEM.

Hypothesising that FACEMs working predominantly in non-MTS hospitals have less exposure to trauma team leading, perform less trauma specific procedures than FACEMs who work in MTS hospitals, and could have reduced levels of confidence in trauma management first requires an understand of their spread of experience and confidence in trauma management. This study therefore aimed to report the frequency of exposure and experiences of initial management of major trauma patients of FACEMs working within the VSTS. These data could then inform a needs' analysis for trauma education amongst FACEMs working in the VSTS and for education of providers of initial hospital trauma care in other similar jurisdictions.

Methods

Design: A survey of FACEMs whose principal practice is in Victoria was performed. There were 419 active FACEMs in Victoria at the time of the study⁽¹⁶⁾. Subjects were identified and contacted via email to Directors of Emergency Medicine and Directors of Emergency Medicine Training in all Victorian EDs and by direct email through the personal and professional networks of the authors. Background data on the distribution of major trauma cases around the different levels of the hospital system was sourced from the Victorian State Trauma Registry (VSTR).

Questionnaire: The link to an online questionnaire (www.surveymonkey.com) comprising 11 questions was made available to potential participants. The survey was sent to every ED in Victoria. The questionnaire is presented in Appendix 1. Anonymity of respondents was protected by collection of data through an anonymous online survey. Although this created a risk that an enthusiastic respondent might complete the survey multiple times, it was felt that this was unlikely to occur. Anonymity of health services is protected by VSTORM which releases only aggregate information. Data was not available on the actual numbers or characteristics of trauma cases attending individual hospitals. Names of health services were not collected by the survey.

Data Analysis: Normally distributed continuous variables were presented using the mean and standard deviation (SD). Ordinal or skewed data were presented using the median and inter-quartile range (IQR). Qualitative data were grouped into categories of similar answers using a thematic analysis. Proportions were compared using the chi-squared test.

Outcome: We compared 3 groups of participants (clinicians with no MTS work, clinicians who predominantly work in RTS or MeTS, and those working exclusively in MTS) to determine the impact one shift at a MTS per week may have on their confidence. We adjusted for potential confounders (i.e. age, years as a FACEM, pre-fellowship trauma registrar role, total number of shifts worked in a week, the number of times a team leadership role was performed and supervised during trauma resuscitation. The primary outcome of the study was to determine any differences amongst the participant groups' self-perceived confidence in team leadership during trauma resuscitation (ranked from 1-5).

Ethics: Human Research Ethics Approval for the study was obtained through the Monash University Human Research Ethics Committee.

Results

There were 145 survey responders. We excluded responders who identified themselves as either i) non-Emergency-Physicians or ii) non-FACEMs working in a consultant EP position (n=6), and a blank response (n=1) leaving 138 responses for analysis.

The study cohort comprised a third (32.9%, n=138/419) of the currently active FACEMs. The responders were predominantly males (69.6%), less than 50 years of age (75.4%) and with most clinicians (69.6%) being 6 or more years post fellowship (Table 1).

FACEMs who identified as working in MTS were more like to have been a trauma registrar before fellowship (13.3% vs 3.7%, $p=0.046$), and more likely to work full time with paediatric patients (16.7% vs 0.9%, $p<0.01$). Otherwise the two groups were comparable (Table 1).

Overall, FACEMs in Victoria work on average 4 (IQR 3-4) shifts per week (Table 2). There was no overall difference in total number of shifts between the clinicians at MTS (4, IQR 3-5) compared to clinicians not at MTS (3.5, IQR 3-4), $p=0.21$).

FACEMs in Victoria report performing trauma team leading (TTL) a median 2-5 times per year, a median of 1 trauma airway and 1 intercostal catheter (ICC) insertion per year, and more than 12 episodes of extended FAST exam (eFAST). Overall FACEMs in Victoria supervise the above skills in the same proportion as they perform them individually.

There were considerable differences between the two cohorts in performance, supervision and confidence, when examined by exposure to work at an MTS (Table 3 and 4). MTS clinicians (i.e. at least 1 MTS shift per fortnight) performed more, supervised more and were more confident in TTL, trauma airway management, and Rapid Infusion Catheter / Multi-

lumen Access Catheter (RIC/MAC) lines. MTS clinicians also performed more and were more confident in eFAST, with three quarters (76.7%) performing > 12 eFAST per year. There were no differences in confidence with regards to non-trauma airway management and ICC insertion (trauma or non-trauma). Although MTS clinicians reported higher confidence in RIC/MAC line management compared to non-MTS clinicians, 50% of MTS clinicians had no exposure to the procedure in the preceding 12 months.

The combined confidence score across the 7 entities was higher in the MTS group compared to the non-MTS group (24.4 versus 29.9, $p=0.002$) (Table 4). When dichotomised, the MTS clinicians were more like to be confident overall, with two thirds rating themselves with a combined confidence score of 28 or above across the entities compared to a quarter in the non-MTS cohort ($p<0.001$). The MTS clinicians were also less like to lack confidence in any of the entities (i.e. a confidence score $<3/5$) compared to the non-MTS cohort (33.3% versus 56.5%, $p=0.025$).

Univariate ordinal logistic regression revealed several factors associated with TTL confidence, including working at an MTS (OR 5.97, 95%CI 2.67 - 13.37, $p<0.01$). Multivariate ordinal logistic regression on TTL confidence, adjusting for amount of TTL supervised and performed, experience as an MTS consultant, total number of shifts per week, gender, age and current work at an MTS, showed only TTL experience (performing or supervising) to be associated with increased confidence in TTL (Table 5).

Performing TTL was more common in clinicians at a MTS (5 IQR 4-5 vs 3 IQR 2-4, $p<0.01$). When adjusting for total number of shifts, gender and age, both MTS consultant role (OR 3.42, 95%CI 1.14 - 10.23, $p=0.03$) and current work at an MTS (OR 3.19, 95%CI 1.00 - 10.20, $p=0.05$) had higher odds of performing TTL. The odds of performing more TTL was 3.3

times greater (95%CI 1.13 – 9.68) in the group that had worked as a MTS consultant compared to those that had not worked as a consultant in a MTS when adjusting for current work in MTS ($p=0.03$), suggesting there is a lasting effect of some MTS work.

Discussion

This survey of Victorian FACEMs highlights a clear difference in frequency of exposure and in confidence in trauma management by clinicians working at a MTS, compared to those not working at a MTS. These results are unsurprising. As fewer trauma patients present to facilities outside the MTS hospitals, exposure to trauma procedures and TTL by FACEMs in these facilities is diminished, reducing confidence in performing these tasks when required. A significant minority of trauma patients continue to receive initial treatment at a MeTS or RTS. Given the large number of MeTS and RTS hospitals compared to MTS, individual exposure of any single EP in one of these settings to major trauma is inevitably low.

Clinicians responsible for governance of trauma care, for leadership of resuscitation teams and for provision or supervision of life, limb and sight saving trauma procedures in these settings have less exposure to this patient population, and may have less mastery of these skills as a result. In a mature trauma system, major deficits in patient care have been addressed, and as such only marginal further gains can be sought. Narrowing gaps in quality of resuscitation and early management of major trauma patient care between MTS and non-MTS hospitals may be a suitable area to target.

While achieving a uniform level of expertise in trauma skills among all FACEMs working across the trauma system is likely to be unrealistic, it may be possible to narrow the gap

between FACEMs working in a MTS and non-MTS hospitals through telemedicine, simulation and cadaveric training, and targeted trauma training within the ACEM fellowship curriculum. Trauma (and, by analogy, other sub-specialised areas within emergency medicine) may benefit from specific requirements within the ACEM continuing professional development system. Fellowship training could be developed to require a period of trauma training or to include trauma specific modules or more procedure training. A program similar to the American College of Surgeons Rural Trauma Team Development Course⁽¹⁷⁾ could be developed for the Australian setting to build trauma expertise at a hospital level outside the MTSSs. Our study goes some way to informing an educational needs analysis for FACEMs working in non-MTS to improve confidence in trauma team leading and trauma procedures.

Interestingly, our study suggests that just one shift per fortnight at a MTS is sufficient to raise confidence in early trauma management. Whether this means non-MTS FACEMs should do periodic shifts at MTS needs to be considered carefully. Given the number of active FACEMs across the state, periodical rotation of all FACEMs through a MTS may indeed compromise the care delivered at the MTS through dilution of expertise. Exposure by non-MTS FACEMs to major trauma cases may also be increased by less direct methods. These could range from online training packages and state-wide case discussions, and telecast teaching rounds, to more hands-on trauma team training and dedicated trauma procedures courses. Regular simulation training in trauma reception and resuscitation will improve team leader exposure, and has been shown to impact patient care positively⁽¹⁸⁾. Our results call for an integrated education package which aims to standardise the knowledge and skills of clinicians managing patients across the trauma system. Further research will be required to assess the efficacy of such

programs. Once such programs are established and shown to be effective, they may contribute to annual competencies for FACEMs and other clinicians working within the trauma system.

There are limitations to this study. As a survey of subjectively recalled experience and self-assessment the data only describes the participants view of themselves as trauma providers. The response rate of 33% leaves a risk of non-response bias however the demographics of the respondents (age, gender and years of experience) were similar to those of the active Victorian FACEM population. Whether the sample is representative of the target population in terms of hours spent in the different levels of hospital is difficult to know as there is no population data readily available. Certainly, we were able to sample FACEMS from every tier of trauma hospital as well as FACEMS working outside of ED. We only targeted FACEMs, however EDs across the state of Victoria are staffed by a variety of senior medical and nursing staff. This includes, but is not limited to rural General Practitioners, Nurse Practitioners, and emergency doctors who are not specially trained in emergency medicine. We would expect that the difference in confidence would be magnified in this group, and it is likely that this group would benefit even more from dedicated education. It is also important to note that confidence does not equate to competence. It has been suggested that the incompetent are more likely to over-estimate their own performance than the competent⁽¹⁹⁾ such that reported confidence is not a reliable indicator of competence. The range of confidence levels reported by our participants however suggest significantly more preparedness to admit lack of confidence than reported by Dunning and Kruger in their seminal work.

Conclusion

Our study demonstrates that Victorian EPs perform relatively few trauma related critical procedures and that MTS and non-MTS FACEMs have a significantly different exposure to and confidence in performing these tasks. Improving the confidence and skills of FACEMs working in non-MTS centres represents a potential for significant improvement in outcomes as a large minority of major trauma patients are initially managed in these centres. We suggest this gap may be best addressed by a combination of increased exposure to major trauma reception and resuscitation by non-MTS hospital FACEMs, targeted education focussing on key trauma team training and procedures, and revision of pre and post-fellowship trauma training requirements from ACEM, with a view to developing a competency framework for FACEMs working within the VSTS.

Table 1 – Demographics of the FACEM EP's working in Victoria divided into those with and without Major Trauma Service (MTS) practice

Variable		No MTS (n=108)	Any MTS (n=30)	p- value
Male	n, %	71 (65.7%)	25 (83.3%)	0.064
Age	30-39	23 (21.3%)	8 (26.7%)	0.16
	40-49	62 (57.4%)	11 (36.7%)	
	50-59	22 (20.4%)	11 (36.7%)	
	≥60	1 (0.9%)	0 (0.0%)	
Years as a FACEM	0-5	32 (29.6%)	10 (33.3%)	0.15
	6-10	31 (28.7%)	3 (10.0%)	
	11-15	21 (19.4%)	5 (16.7%)	
	16-20	16 (14.8%)	9 (30.0%)	

	>20	8 (7.4%)	3 (10.0%)	
EM Registrar experience at MTS	n, %	67 (62.0%)	22 (73.3%)	0.25
Trauma Registrar experience at MTS	n, %	4 (3.7%)	4 (13.3%)	0.046
Surgical Registrar experience at MTS	n, %	2 (1.9%)	0 (0.0%)	0.45
Pre-FACEM EMST/ATLS course	n, %	74 (68.5%)	21 (70.0%)	0.88
Pre-FACEM ETM course	n, %	3 (2.8%)	3 (10.0%)	0.086
Pre-FACEM In-house trauma skills course	n, %	24 (22.2%)	7 (23.3%)	0.9
Ever worked as consultant in MTS	n, %	11 (10.2%)	27 (90.0%)	<0.001
Post-FACEM EMST/ATLS course	n, %	20 (18.5%)	6 (20.0%)	0.85
Post-FACEM ETM course	n, %	6 (5.6%)	3 (10.0%)	0.38
Post-FACEM In-house trauma skills course	n, %	32 (29.6%)	8 (26.7%)	0.75
Paediatric Proportion of workload	Close to 0%	32 (29.9%)	18 (60.0%)	<0.001
	25%	72 (67.3%)	7 (23.3%)	
	50%	2 (1.9%)	0 (0.0%)	
	Close to 100%	1 (0.9%)	5 (16.7%)	

Table 2 – Working hours and locations of the EP FACEMs in Victoria divided into those with and without Major Trauma Service (MTS) practice

Shifts weekly based on yearly average		No MTS (n=108)	Any MTS (n=30)	p-value
MTS	0	108 (100.0%)	0 (0.0%)	<0.001
	1	0 (0.0%)	8 (26.7%)	
	2	0 (0.0%)	9 (30.0%)	
	3	0 (0.0%)	9 (30.0%)	
	≥4	0 (0.0%)	4 (13.3%)	
MeTS	0	39 (36.1%)	22 (73.3%)	0.006
	1	10 (9.3%)	0 (0.0%)	
	2	21 (19.4%)	4 (13.3%)	
	3	19 (17.6%)	2 (6.7%)	
	≥4	19 (17.6%)	2 (6.7%)	
RTS	0	69 (63.9%)	26 (86.7%)	0.16
	1	10 (9.3%)	2 (6.7%)	
	2	16 (14.8%)	1 (3.3%)	
	3	6 (5.6%)	1 (3.3%)	
	≥4	7 (6.5%)	0 (0.0%)	
Private ED	0	85 (78.7%)	25 (83.3%)	0.68
	1	13 (12.0%)	3 (10.0%)	
	2	4 (3.7%)	2 (6.7%)	
	3	4 (3.7%)	0 (0.0%)	
	≥4	2 (1.9%)	0 (0.0%)	
Other Victorian ED	0	93 (86.1%)	28 (93.3%)	0.83
	1	7 (6.5%)	1 (3.3%)	
	2	5 (4.6%)	1 (3.3%)	
	3	2 (1.9%)	0 (0.0%)	
	≥4	1 (0.9%)	0 (0.0%)	
Non-Victorian MTS	0	108 (100%)	28 (93.3%)	0.026
	1	0 (0%)	1 (3.3%)	
	3	0 (0%)	1 (3.3%)	
Retrieval	0	97 (89.8%)	24 (80.0%)	0.34
	1	8 (7.4%)	4 (13.3%)	
	2	2 (1.9%)	2 (6.7%)	
	3	1 (0.9%)	0 (0.0%)	
Intensive Care	0	106 (98.1%)	30 (100.0%)	0.75

	1	1 (0.9%)	0 (0.0%)	
	≥4	1 (0.9%)	0 (0.0%)	
Total everywhere	0	1 (0.9%)	0 (0.0%)	<0.001
	1	6 (5.6%)	1 (3.3%)	
	2	18 (16.7%)	4 (13.3%)	
	3	29 (26.9%)	9 (30.0%)	
	≥4	54 (49.9%)	16 (53.4%)	
Total MTS	0	108 (100.0%)	0 (0.0%)	<0.001
	1	0 (0.0%)	8 (26.7%)	
	2	0 (0.0%)	8 (26.7%)	
	3	0 (0.0%)	9 (30.0%)	
	≥4	0 (0.0%)	5 (16.6%)	
Total MeTS/RTS	0	14 (13.0%)	18 (60.0%)	<0.001
	1	10 (9.3%)	2 (6.7%)	
	2	25 (23.1%)	5 (16.7%)	
	3	23 (21.3%)	3 (10.0%)	
	≥4	36 (33.3%)	2 (6.7%)	
MeTS/RTS Only		94 (87.0%)	0 (0.0%)	<0.001

Table 3: Frequency of performance and supervision for common procedures among FACEM EP's working in Victoria divided into those with and without Major Trauma Service (MTS) practice

		Performance			Supervision		
		No MTS (n=108)	Any MTS (n=30)	p-value	No MTS (n=108)	Any MTS (n=30)	p-value
Trauma Team Leading							
	No exposure	21 (20.6%)	0 (0.0%)	<0.001	32 (31.1%)	2 (6.7%)	<0.001
	Simulation	0 (0.0%)	1 (3.3%)		3 (2.9%)	0 (0.0%)	
	Single case	17 (16.7%)	0 (0.0%)		16 (15.5%)	2 (6.7%)	
	2 - 5 cases	32 (31.4%)	6 (20.0%)		26 (25.2%)	7 (23.3%)	
	6 - 12 cases	18 (17.6%)	6 (20.0%)		13 (12.6%)	2 (6.7%)	
	>12 cases	14 (13.7%)	17 (56.7%)		13 (12.6%)	17 (56.7%)	
Trauma Airway Management							
	No exposure	37 (37%)	6 (20%)	0.005	39 (38.2%)	5 (16.7%)	<0.001
	Simulation	7 (7%)	3 (10%)		5 (4.9%)	0 (0.0%)	
	Single case	24 (24%)	3 (10%)		13 (12.7%)	5 (16.7%)	
	2 - 5 cases	27 (27%)	11 (37%)		35 (34.3%)	6 (20.0%)	
	6 - 12 cases	3 (3%)	3 (10%)		9 (8.8%)	4 (13.3%)	
	>12 cases	1 (1%)	4 (13%)		1 (1.0%)	10 (33.3%)	
Non-Trauma Airway Management							
	No exposure	6 (6%)	0 (0%)	0.099	10 (9.8%)	3 (10.0%)	0.76
	Simulation	2 (2%)	1 (3%)		2 (2.0%)	0 (0.0%)	
	Single case	6 (6%)	5 (17%)		6 (5.9%)	1 (3.3%)	
	2 - 5 cases	47 (47%)	9 (30%)		31 (30.4%)	11 (36.7%)	
	6 - 12 cases	25 (25%)	7 (23%)		27 (26.5%)	5 (16.7%)	
	>12 cases	13 (13%)	8 (27%)		26 (25.5%)	10 (33.3%)	
Trauma Intercostal Catheter							
	No exposure	44 (43.6%)	6 (20.0%)	0.003	36 (35.6%)	4 (13.3%)	<0.001
	Simulation	8 (7.9%)	1 (3.3%)		5 (5.0%)	1 (3.3%)	
	Single case	27 (26.7%)	8 (26.7%)		23 (22.8%)	3 (10.0%)	
	2 - 5 cases	19 (18.8%)	9 (30.0%)		31 (30.7%)	10 (33.3%)	
	6 - 12 cases	3 (3.0%)	3 (10.0%)		5 (5.0%)	2 (6.7%)	
	>12 cases	0 (0.0%)	3 (10.0%)		1 (1.0%)	10 (33.3%)	
Non-Trauma Intercostal Catheter							
	No exposure	17 (17.0%)	10 (34.5%)	0.044	20 (20%)	5 (17%)	0.069
	Simulation	7 (7.0%)	0 (0.0%)		1 (1%)	1 (3%)	
	Single case	25 (25.0%)	4 (13.8%)		16 (16%)	4 (13%)	
	2 - 5 cases	46 (46.0%)	11 (37.9%)		52 (53%)	11 (37%)	
	6 - 12 cases	5 (5.0%)	3 (10.3%)		7 (7%)	4 (13%)	
	>12 cases	0 (0.0%)	1 (3.4%)		3 (3%)	5 (17%)	
E-FAST							
	No exposure	11 (10.8%)	4 (13.3%)	0.014	20 (19.6%)	3 (10.0%)	0.24
	Simulation	1 (1.0%)	0 (0.0%)		1 (1.0%)	0 (0.0%)	
	Single case	7 (6.9%)	2 (6.7%)		6 (5.9%)	0 (0.0%)	
	2 - 5 cases	17 (16.7%)	0 (0.0%)		28 (27.5%)	8 (26.7%)	
	6 - 12 cases	21 (20.6%)	1 (3.3%)		15 (14.7%)	3 (10.0%)	
	>12 cases	45 (44.1%)	23 (76.7%)		32 (31.4%)	16 (53.3%)	
RIC / MAC							
	No exposure	72 (71.3%)	15 (50.0%)	0.011	78 (76.5%)	14 (46.7%)	<0.001
	Simulation	10 (9.9%)	2 (6.7%)		11 (10.8%)	1 (3.3%)	
	Single case	10 (9.9%)	4 (13.3%)		6 (5.9%)	3 (10.0%)	
	2 - 5 cases	8 (7.9%)	5 (16.7%)		4 (3.9%)	6 (20.0%)	
	6 - 12 cases	0 (0.0%)	3 (10.0%)		2 (2.0%)	3 (10.0%)	
	>12 cases	1 (1.0%)	1 (3.3%)		1 (1.0%)	3 (10.0%)	

RIC = Rapid Infusion Catheter. MAC = Multi-lumen Access Catheter.

Table 4: Confidence for common procedures among FACEM EP's working in Victoria divided into those with and without Major Trauma Service (MTS) practice

Confidence in		No MTS (n=108)	Any MTS (n=30)	p-value
Trauma Team Leading				
1		3 (2.9%)	0 (0.0%)	<0.001
2		15 (14.6%)	0 (0.0%)	
3		32 (31.1%)	3 (10.0%)	
4		32 (31.1%)	10 (33.3%)	
5		21 (20.4%)	17 (56.7%)	
Trauma Airway Management				
0		3 (2.9%)	0 (0.0%)	0.002
2		15 (14.6%)	2 (6.7%)	
3		37 (35.9%)	4 (13.3%)	
4		37 (35.9%)	12 (40.0%)	
5		11 (10.7%)	12 (40.0%)	
Non-Trauma Airway Management				
0		1 (1.0%)	0 (0.0%)	0.066
2		3 (2.9%)	0 (0.0%)	
3		14 (13.6%)	4 (13.3%)	
4		52 (50.5%)	8 (26.7%)	
5		33 (32.0%)	18 (60.0%)	
Trauma Intercostal Catheter				
2		4 (3.9%)	1 (3.3%)	0.22
3		18 (17.5%)	2 (6.7%)	
4		40 (38.8%)	9 (30.0%)	
5		41 (39.8%)	18 (60.0%)	
Non-Trauma Intercostal Catheter				
2		1 (1.0%)	1 (3.3%)	0.11
3		13 (12.6%)	2 (6.7%)	
4		43 (41.7%)	7 (23.3%)	
5		46 (44.7%)	20 (66.7%)	
E-FAST				
0		6 (5.8%)	1 (3.3%)	0.035
2		12 (11.7%)	2 (6.7%)	
3		23 (22.3%)	4 (13.3%)	
4		33 (32.0%)	5 (16.7%)	
5		29 (28.2%)	18 (60.0%)	
RIC / MAC				
0		16 (15.5%)	2 (6.7%)	0.014
2		32 (31.1%)	5 (16.7%)	
3		25 (24.3%)	4 (13.3%)	
4		16 (15.5%)	8 (26.7%)	
5		14 (13.6%)	11 (36.7%)	
Combined overall confidence, mean (SD)				
		24.4 (7.3)	29.9 (5.2)	0.002
Lack of confidence (i.e. any entities with confidence scores <3/5)				
No		47 (43.5%)	20 (66.7%)	0.025
Yes		61 (56.5%)	10 (33.3%)	
Confident (ie combined confidence scores >=28/35)				
No		80 (74.1%)	10 (33.3%)	<0.001
Yes		28 (25.9%)	20 (66.7%)	

RIC = Rapid Infusion Catheter. MAC = Multi-lumen Access Catheter.

1 = "Not at all confident"; 3 = "Moderately confident"; 5 = "Completely confident"; 2 and 4 = unlabelled intermediates.

Table 5: Multivariable ordinal logistic regression displaying factors potentially associate with confidence in trauma team leading (TTL).

Variable	OR (95% CI)	p
Supervised TTL	1.41 (1.04 – 1.92)	0.027
Performed TTL	1.48 (1.05 – 2.08)	0.026
Ever worked as MTS consultant	2.92 (0.94 – 9.06)	0.064
Currently work at MTS	1.07 (0.32 – –)	0.91

	3.60)	
Total	1.13	0.33
number of	(0.89	
shifts	–	
	1.44)	
Age	1.24	0.37
	(0.78	
	–	
	1.99)	

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