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Research

Is there a triage sieve knowledge and application gap between clinical team leaders and their team members?

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Abstract

Introduction
Ambulance service team leaders may be required to provide organisational leadership at complex incidents, such as a mass-casualty incident involving triage sieve. It may be expected that team leaders have a greater understanding of, and should be able to better apply their skills, than their team members during such an incident. The objective of this study was to determine if team leaders have a higher theoretical knowledge and better triage sieve application skills than their team members.

Methods
Team leaders were allotted into one of two groups: the first (control) group completed a questionnaire without any supporting documentation (ie. aide-memoir), whereas the second (intervention) group completed the same questionnaire, as the control group, but utilising supportive documentation.

Results
The results show that the team leaders from the control group achieved significantly better results than their team members when completing a questionnaire, without the use of supportive documentation. There was no significant difference between team leaders from the intervention group and their team members when completing the same questionnaire using supportive documentation.

Conclusion
It has been shown that the use of printed supportive material in the form of an aide-memoir decreases the knowledge and application gap between team leaders and their team members, and increases triage sieve accuracy. The results from this study reinforces the results from previous studies, showing that supporting documentation should be used to ensure greater triage sieve accuracy rates and thereby reducing under- and over-triage rates.

Keywords:
triage sieve; mass casualty incident; team leader; paramedic

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Introduction

Triage has been defined as 'a process of sorting casualties and [generally] assigning a numerical [but can be colour code or key word] priority based on their needs for first aid, resuscitation, emergency transport and definitive care' (1). This definition is somewhat simplistic and could be applied across a wide operational spectrum from a single trauma patient through to a multiple patient scenario or a mass-casualty incident (MCI).

When narrowing the operational focus of triage to a MCI event in the pre-hospital context, the literature describes several common pre-hospital adult triage systems, these systems are: SALT (Sort, Assess, Lifesaving interventions, Treatment/transport); START (Simple Triage and Rapid Treatment), which is supported by SAVE (Secondary Assessment of Victim Endpoint); as well as Triage Sieve and Sort (2-5). The agreed MCI triage process in Australia is the triage system known as Triage Sieve and Sort (6) – a two-step physiological triage methodology (7). The first step – known as triage sieve or primary triage – has the goal of determining a casualty priority for movement to a treatment area, but also allows for the provision of immediate lifesaving actions. The second step (triage sort or secondary triage) focusses on a more in-depth casualty assessment allowing greater treatment to be followed up with transport to definitive care (5). Each of the above-mentioned triage systems has modifications to suit paediatric casualties (8-10).

There is limited national (11-15) and international literature (16-19) focussing on triage sieve accuracy. There is currently only one identified Australian study specifically looking at triage sieve accuracy by paramedics (15). This recent study by Cuttance, Dansie and Rayner (15) drew upon a sample from South Australia Ambulance Service (SAAS) metropolitan paramedics, where the outcomes of their study showed that the key to achieving triage sieve accuracy is the use of supportive material, such as an aide-memoir. The authors identified as a limitation to their study several different organisational groups that were excluded from their study; one of these groups was the metropolitan-based team leader group.

Metropolitan-based team leaders in the SAAS deliver a mixture of on-road clinical and operational support to their team members. Part of the operational support role is to function as a Bronze (Forward) Commander overseeing scene management functions at MCI events, which includes ensuring the delivery of the triage sieve at incidents when the need arises. It may be expected that the team leader is required to have a mixture of non-technical and technical skills, and that their skill base is built on a higher level of theoretical knowledge and superior practical application of these skills than that of the paramedics on their team.

Cuttance et al (15) showed that when a paramedic sample utilised an aide-memoir, technical knowledge gaps are negated and high triage sieve accuracy rates are achieved with both under- and over-triage rates being well below the currently documented rates of 5% and 50% respectively (20).

As team leaders were excluded from this initial study, it was questioned whether a sample of metropolitan team leaders from a state-based ambulance service would have a higher theoretical knowledge and better application skills of the triage sieve than their team members. Therefore, the goal of this study is to determine if a sample of metropolitan team leaders from a state-based ambulance service have a higher theoretical knowledge and better application skills of the triage sieve than their team members when completing a paper-based exercise.

Ethics

Ethics approval was granted by SA Health (335.14 - HREC/14/SAC/349) and SA Ambulance Service (SSA/13/SAH/47). All participants voluntarily signed a consent form.

Methodology

Study design

This study is a cohort study, using a previously utilised triage sieve questionnaire (15,16), to collect data from two groups of metropolitan-based team leaders: one group without supporting documentation – the control group – and the second group with supportive documentation (in the form of an aide-memoir), the intervention group. This new data will be compared with historical data from a previous study of paramedics using the same triage sieve questionnaire.

Data collection

Data collection took place on 28 November 2014 at a quarterly SAAS metropolitan team leader meeting; this provided a sample of convenience. None of the participants were directly contacted for recruitment by the principle researcher. A recruitment flyer and information sheet outlining the study project was emailed to the prospective participants via the meeting convenor and included as part of the meeting agenda under the title of 'research'.

The inclusion criteria for enrolment into this study was: team leaders whose team members were enrolled in a previous study project titled 'Paramedic application of a triage sieve: a paper-based exercise' (15). Metropolitan Adelaide is divided into two emergency regions: the northeast and the southwest, and one non-emergency region that covers the entire metropolitan area. Each region is managed by an operations manager. At the time of the study each operations manager had six to eight team leaders reporting to them. Team leaders who met the inclusion criteria were divided into one of the two groups based on their geographical work location. Team leaders were excluded if their team members were not eligible for inclusion in the previous study project (15).

Table 1. Team leader demographics	Control group	Intervention group	Total (%)
Number	10	7	17 (100%)
Age (years)			
20 to 30	0	0	0 (0%)
31 to 40	4	2	6 (35.29%)
41 to 50	3	4	7 (41.18%)
51 to 60	3	1	4 (23.53%)
61+	0	0	0 (0%)
Gender			
Male	8	5	13 (76.47%)
Female	2	2	4 (23.53%)
Clinical status			
Paramedic intern	0	0	0 (0%)
Paramedic	1	1	2 (11.76%)
Intensive care paramedic	7	6	13 (76.47%)
Extended care paramedic	2	0	2 (11.76%)
Length of service (in years)			
1 to 5	0	0	0 (0%)
6 to 10	0	1	1 (5.88%)
11 to 15	2	1	3 (17.65%)
16 to 20	4	0	4 (23.53%)
21 to 25	1	3	4 (23.53%)
26 to 30	2	2	4 (23.53%)
31 to 35	1	0	1 (5.88%)
36+	0	0	0 (0%)
Highest education level achieved			
Associate Diploma	0	0	0 (0%)
Diploma	4	3	7 (41.18%)
Advance Diploma	1	0	1 (5.88%)
Associate Degree	0	0	0 (0%)
Bachelor Degree	3	4	7 (41.18%)
Honours Degree	0	0	0 (0%)
Graduate Certificate	0	0	0 (0%)
Graduate Diploma	2	0	2 (11.76%)
Master Degree	0	0	0 (0%)
Doctoral Degree	0	0	0 (0%)
Other	0	0	0 (0%)
Number of participants who have undertaken formal triage sieve training			
	10	6	16 (94.12%)
Number of participants who have undertaken a triage sieve			
	7	6	13 (86.67%)
In an emergency ambulance where is the triage pack kept – above passengers visor correct location			
Grab-n-go	2	0	2 (11.76%)
Between front seats	0	2	2 (11.76%)
Passenger visor	8	5	13 (76.47%)
Other/not answered	0	0	0 (0%)
Level of training undertaken			
Bronze	4	5	9 (52.94%)
Silver	6	2	8 (47.06%)
Gold	0	0	0 (0%)
During a declared incident is SAAS a:			
Control agency	1	0	1 (5.88%)
Hazard leader	0	0	0 (%)
Functional service	9	7	16 (94.12%)

On the day of data capture the principal researcher outlined the research project, including the risks and benefits associated with the research project. Instructions were given to the participants by the principal researcher regarding completing the demographics and baseline triage data questionnaires, as well as instructions for completing the triage sieve questionnaire. Once this was completed the principal researcher handed data collection over to the research assistant. The principal researcher was blinded to the data collection.

Questionnaire

Triage sieve application was measured using a questionnaire developed by Kilner (16) who granted permission (personal communication) to utilise the questionnaire in this study. The questionnaire, including the determination of the correct triage sieve classification and time limitations for completion by the participants has previously been described elsewhere (15).

Supportive documentation

The supportive documentation (aide-memoir) utilised for this study was the same supportive documentation as utilised in the previous study by the same authors (15). Instructions were given to the intervention group regarding when to utilise the supportive documentation as part of this study, ie. to use the supportive documentation to complete the triage sieve question, once instructed to by the research assistant, but not on how to use or interpret the information contained within the supportive documentation.

Data analysis

Completed triage sieve questionnaires were collected and coded by the research assistant. Coding the triage sieve questionnaires was based on the previous study by the same authors (15). Each question was coded either: correct, incorrect under-triaged, incorrect over-triaged. Data was recorded into an Excel spread sheet (Version 14 Microsoft Corporation; Redmond, Washington USA). These data were analysed to provide descriptive statistics and then analysed for statistical difference using SPSS (Version 22 IBM Corporation, Armonk, New York USA). A two-sample Z test was used to determine the statistical significance of the differences in proportions between groups.

Casualty number 6 (a child, eight years of age), was excluded from the data analysis as the appropriate paediatric assessment tool was not available for the participants to use.

Results

Across the metropolitan operating region, 25 team leaders (out of a total of 31) were identified as meeting the inclusion criteria. However, two participants were upwards relieving into the role and were excluded, having taken part in the previous study as paramedics; 17 data sets were obtained from this sample population.

Table 1 shows the demographics for the sample group: 76.47% male and 23.53% female. Most participants were between 31 and 50 years of age (76.5%) with an overwhelming majority qualified as intensive care paramedics (76.47%). In general, participants had between 11 and 30 years of service and had completed either a Diploma or Bachelor degree (41.2% respectively).

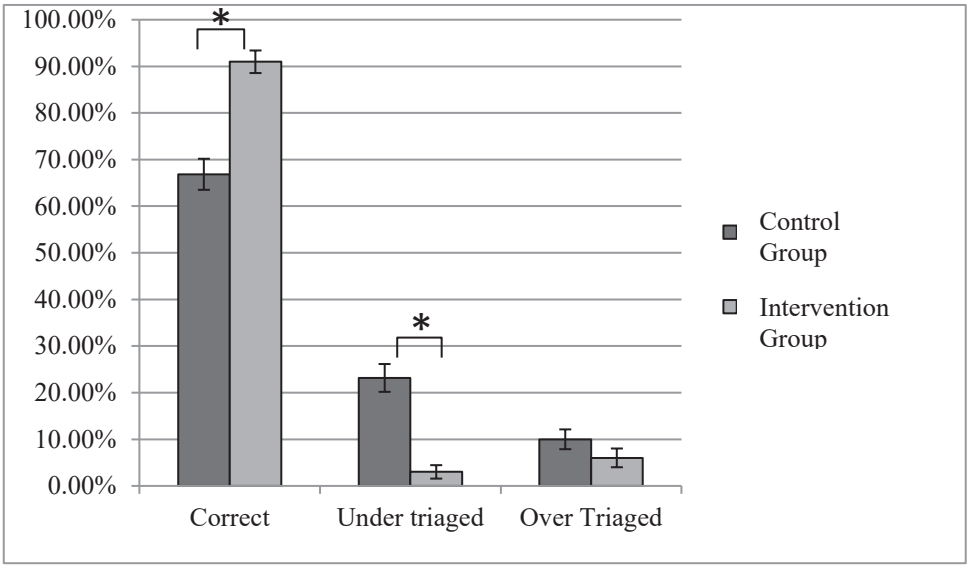
94.12% of participants had undertaken formal triage sieve training and 86.67% reported they had undertaken a triage sieve as part of their training or in a real life situation; 76.47% of participants knew the correct location of the triage pack in an emergency ambulance.

In line with the increased level of training and responsibility of a team leader, and the themes identified by Lee et al (21), 100% of participants reported having undertaken commander training with the SAAS (52.94% Bronze Commander and 47.05% Silver Commander) with 94.11% of participants correctly identifying the SAAS's role as a 'functional service' within the state emergency management arrangements (22). When comparing the team leader responses with the triage sieve-specific demographic information obtained from paramedics (paramedic data reproduced with permission from Cuttance et al) (15), Table 2 shows that the level of underlying triage sieve training was identical between the two groups, although team leaders were more likely to have performed a triage sieve as part of an exercise or in real life. Similarly, team leaders were more likely to know the correct location of the triage pack.

Table 2. Triage sieve – comparison between paramedics and team leaders

	Paramedics	Team leaders
Triage sieve training completed	93.75% (n=135)	94.11% (n=16)
Triage sieve performed in the field	59.72% (n=86)	76.47% (n=13)
Correct location of triage pack identified	54.86% (n=79)	76.47% (n=13)

The combined responses from all the team leader triage sieve questionnaires are collated in Table 3 with the results comparing the groups with or without supportive documentation shown in Figure 1. The provision of supportive documentation ensured that casualties were triage sieved correctly 90% of the time, leading to very low under- and over-triage sieve rates (Figure 1). In the absence of the supportive documentation however, the number of casualties correctly triage sieved was significantly reduced by 24% ($z=5$, $p<0.001$). This was matched by a similar significant increase in the under-triage sieve rate (by 20%) and no difference in the over-triage sieve rate, suggesting the team leaders had a tendency to under-triage sieve when they could not refer to the supportive documentation.



* Indicates a p value of <0.05

Figure 1. Team leader triage sieve comparison of correct, under- and over-triage

Table 3. Overall triage sieve questionnaire results

	Questionnaire answers			Number of surveys entered	Percentages			
	Correct	Under	Over		Correct	Under	Over	Total
Casualty 1	8	0	9	17	47.1%	0.0%	52.9%	100.0%
Casualty 2	13	3	1	17	76.5%	17.6%	5.9%	100.0%
Casualty 3	15	1	1	17	88.2%	5.9%	5.9%	100.0%
Casualty 4	13	3	1	17	76.5%	17.6%	5.9%	100.0%
Casualty 5	15	2	0	17	88.2%	11.8%	0.0%	100.0%
Casualty 6	12	3	2	17	70.6%	17.6%	11.8%	100.0%
Casualty 7	15	2	0	17	88.2%	11.8%	0.0%	100.0%
Casualty 8	11	6	0	17	64.7%	35.3%	0.0%	100.0%
Casualty 9	15	2	0	17	88.2%	11.8%	0.0%	100.0%
Casualty 10	15	2	0	17	88.2%	11.8%	0.0%	100.0%
Casualty 11	16	1	0	17	94.1%	5.9%	0.0%	100.0%
Casualty 12	11	6	0	17	64.7%	35.3%	0.0%	100.0%
Casualty 13	11	6	0	17	64.7%	35.3%	0.0%	100.0%
Casualty 14	14	2	1	17	82.4%	11.8%	5.9%	100.0%
Casualty 15	16	1	0	17	94.1%	5.9%	0.0%	100.0%
Casualty 16	13	1	3	17	76.5%	5.9%	17.6%	100.0%
Casualty 17	12	2	3	17	70.6%	11.8%	17.6%	100.0%
Casualty 18	14	3	0	17	82.4%	17.6%	0.0%	100.0%
Casualty 19	14	3	0	17	82.4%	17.6%	0.0%	100.0%
Casualty 20	7	2	8	17	41.2%	11.8%	47.1%	100.0%

The results from casualty number 6 (a paediatric casualty) have not been reported in the results section but have been included in Table 3 to give an overview of all responses received. The appropriate paediatric assessment tool to accurately determine the correct triage sieve priority for paediatrics was not made available to the participants.

A comparison was performed using data from a previously published study that reported triage sieve rates in paramedic subjects following an identical protocol. Confirming a consistency of outcome, Figure 2 shows there is a strong, significant correlation between the combined correct response rates from team leaders and paramedics (R2=0.78, p<0.001).

When the 'without supportive documentation (control) groups were compared' it was evident from Figure 3a that team leaders had a significantly higher accuracy rate (66.8%) compared to paramedics (46.9%). Similarly, team leaders when compared to paramedics demonstrated significantly lower under (23.2% vs. 37.4%) and over (10% vs. 15.6%) triage sieve rates (Figure 3a). Providing supportive documentation resulted in identical results across the triage sieve parameters for both team leaders and paramedics (Figure 3b).

Discussion

The purpose of this study was to assess whether metropolitan-based team leaders in the SAAS have a higher theoretical knowledge and better application skills of the triage sieve than their team members. SAAS team leaders demonstrated a higher triage sieve accuracy rate than their team members when no supporting documentation was provided, indicating they had a higher baseline level of theoretical knowledge and application skills surrounding the triage sieve.
When supporting documentation was provided however (replicating standard ambulance practice), there was no difference in the responses between team leaders and team members, indicating a similar ability to interpret and apply the outcomes of the triage sieve aide-memoir (supportive documentation).

Currently MCI triage accuracy rates are measured against the following documented field triage accuracy rates for field triage (20): an under-triage rate of less than 5% to ensure that critically injured casualties are captured, and an over-triage rate of less than 50% to ensure that medical facilities are not overwhelmed with casualties. It has been shown that the current field triage accuracy rates for MCI triage may be inappropriate (23) and overstated for MCI triage. Cuttance et al (15) have shown that it is possible to achieve under- and over-triage rates of 2.8% and 7.0% respectively using supportive documentation. Achievement of the aforementioned triage accuracy rates was dependant on the use of supportive documentation (aide-memoir) with the ability to correctly locate the triage pack imperative, as the triage pack contains the most up-to-date triage sieve aide-memoir. On average, team leaders are more likely to correctly locate the triage pack in an emergency ambulance than the paramedics on their team. Therefore, more timely access to supportive documentation may result in better triage sieve accuracy rates and a decrease in mortality.

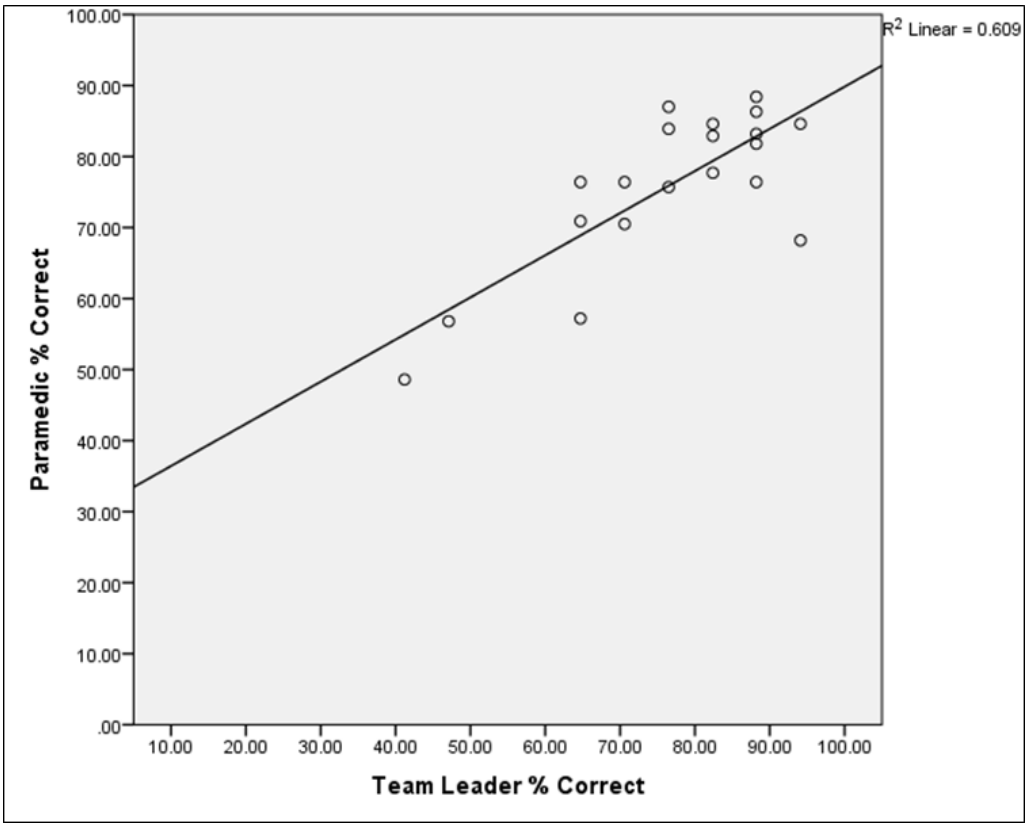


Figure 2. Correlation of correct responses between paramedic and team leaders

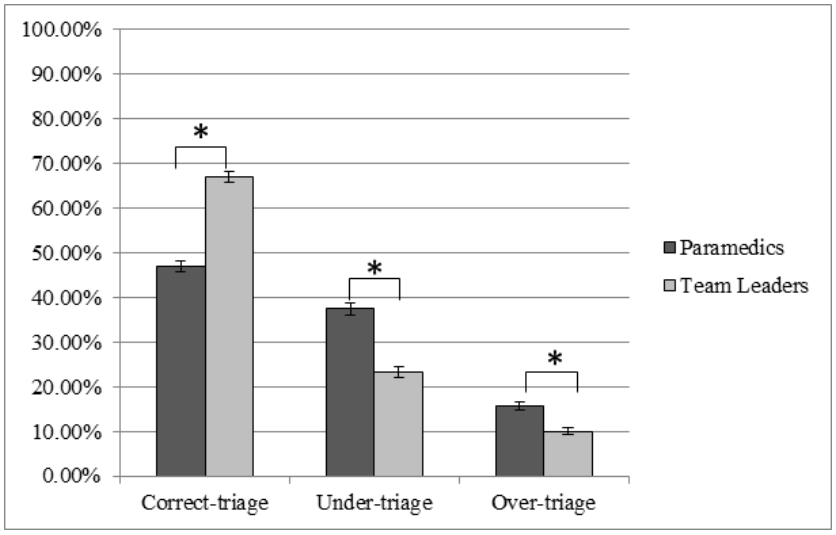
Not all the participants from both the paramedic and team leader groups had undergone formal triage sieve triaging (knowledge acquisition) or undertaken the practical (skills) application of a triage sieve as part of their training, in an exercise or as part of a real-life event. Lack of knowledge and skill application may have implications for those casualties involved in an MCI event. While the immediate impact of this knowledge and skills application deficit may be debatable, undertaking a triage sieve as part of a much larger and often complex and chaotic scenario, where the compounding effects of actions (or inaction) such as due to lack of training, is yet to be proven and requires further investigation.

Limitations

This study only involved metropolitan-based team leaders from the SAAS where their team members were involved in a previous study (where the focus was at the paramedic level). While providing a good insight into the metropolitan-based team leaders and paramedics, this has resulted in other organisational groups being excluded such as non-emergency, volunteer and career country ambulance officers, paramedics and team leaders.

Also, using field triage accuracy rates as a representation of MCI triage accuracy rates may be inappropriate (as highlighted in the discussion).

This study required participants to complete a paper-based exercise. This exercise was completed in a controlled environment without the distractions that would be present in an uncontrolled operational environment while undertaking a triage sieve. Although a time limit was placed on the participants, this time limit was taken from a previous study and does not appear to have any theoretical validation.



* Indicates a p value of <0.05

Figure 3a. Control group comparison between team leaders and paramedics

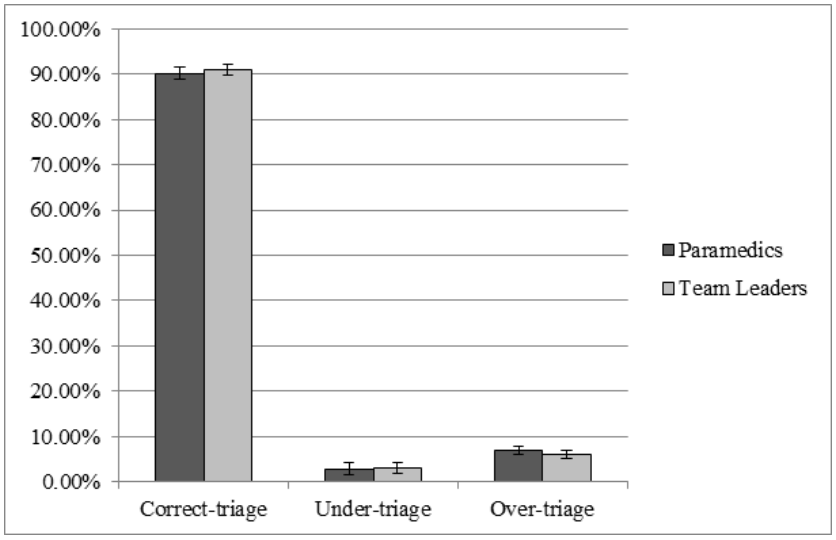


Figure 3b. Intervention group comparison between team leaders and paramedics

This study excluded paediatric casualties therefore it may not provide a true presentation of a casualty cohort involved in an MCI.

Conclusion

It has been shown that metropolitan-based team leaders from the SAAS achieved a higher triage sieve accuracy than their team members when no supporting documentation was provided (ie. control group not using an aide-memoir), while completing a paper-based exercise. Conversely, there was no difference between metropolitan-based team leaders from SAAS and their team members in triage sieve accuracy when completing a paper-based exercise using supporting documentation (intervention group) in the form of an aide-memoir, which is considered the current SAAS standard when carrying out a triage sieve. Furthermore, this study reinforces the results from a previous triage sieve accuracy study among paramedics that the use of supporting documentation (aide-memoir) is critical in achieving low under- and over-triage rates.

Conflict of interest

The authors declare they have no competing interests. Each author of this paper has completed the ICMJE conflict of interest statement.

References

1. Australian Government. Australian Emergency Management Glossary. Attorney Generals Department, Canberra: Commonwealth of Australia; 1998.
2. Arshad FH, Williams A, Asaeda G, et al. A modified simple triage and rapid treatment algorithm from the New York City (USA) Fire Department. Prehosp Disaster Med 2015;30:199-204.
3. Cross KP, Petry MJ, Cicero MX. A better START for low-acuity victims: data-driven refinement of mass casualty triage. Prehosp Emerg Care 2015;19:272-8.
4. Benson M, Koenig KL, Schultz CH. Disaster triage: START, then SAVE-a new method of dynamic triage for victims of a catastrophic earthquake. Prehosp Disaster Med 1996;11:117-24.
5. Jenkins JL, McCarthy ML, Sauer LM, et al. Mass-casualty triage: time for an evidence-based approach. ibid. 2008;23:3-8.
6. New South Wales Emergency Management Unit. Mass Casualty Triage - Smart Triage Packs. Sydney: NSW Government; 2017. Available at: www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2017_037.pdf
7. Advanced Life Support Group. Major Incident Medical Management and Support: The Practical Approach in the Hospital. Hoboken: Wiley; 2008. Available at: http://flinders.eblib.com/patron/FullRecord.aspx?p=351256.
8. Lee CW, McLeod SL, Peddle MB. First responder accuracy using SALT after brief initial training. Prehosp Disaster Med 2015;1-5.
9. Lerner EB, Schwartz RB, Coule PL, et al. Mass casualty triage: an evaluation of the data and development of a proposed national guideline. Disaster Med Public Health Prep 2008;2(Suppl 1):S25-34.
10. Armstrong JH, Frykberg ER, Burris DG. Toward a national standard in primary mass casualty triage. ibid. 2008;2(Suppl 1):S8-10.
11. Field K, Norton I. Australian triage tags: a prospective, randomised cross-over trial and evaluation of user preference. Emerg Med Australas 2012;24:321-8.
12. Aitken P, FitzGerald G. Disaster triage: evidence, consistency and standard practice. ibid. 2012;24:222-4.
13. Nocera A, Garner A. An Australian mass casualty incident triage system for the future based upon triage mistakes of the past: the Homebush Triage Standard. Aust N Z J Surg 1999;69:603-8.
14. Garner A, Nocera A. 'Sieve', 'sort' or START. Emerg Med 2001;13:477.
15. Cuttance G, Dansie K, Rayner T. Paramedic application of a triage sieve: a paper-based exercise. Prehosp Disaster Med 2017;1-11.
16. Kilner T. Triage decisions of prehospital emergency health care providers, using a multiple casualty scenario paper exercise. Emerg Med J 2002;19:348-53.
17. Kilner T, Hall FJ. Triage decisions of United Kingdom police firearms officers using a multiple-casualty scenario paper exercise. Prehosp Disaster Med 2005;20:40-6.
18. Aylwin CJ, Konig TC, Brennan NW, et al. Reduction in critical mortality in urban mass casualty incidents: analysis of triage, surge, and resource use after the London bombings on July 7, 2005. Lancet 2006;368:2219-25.
19. Challen K, Walter D. Major incident triage: comparative validation using data from 7th July bombings. Injury 2013;44:629-33.
20. Sasser SM, Hunt RC, Faul M, et al. Guidelines for field triage of injured patients: recommendations of the National Expert Panel on Field Triage, 2011. MMWR 2012;61:1-20.
21. Lee AC, Phillips W, Challen K, Goodacre S. Emergency management in health: key issues and challenges in the UK. BMC Public Health 2012;12:884.
22. Government of South Australia. State Emergency Management Plan. South Australia: SA Police; 2015.
23. Alenyo AN, Smith WP, McCaul M, Van Hoving DJ. A comparison between differently skilled prehospital emergency care providers in major-incident triage in South Africa. Prehosp Disaster Med 2018;1-6.