

## PREHOSPITAL CARE

# Do ambulance crews with one advanced paramedic skills officer have longer scene times than crews with two?

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**Objective:** In 1999, the Metropolitan Ambulance Service (MAS), Melbourne, Australia began implementing The Emergency Operations Plan (1998). One of the initiatives of the plan was the addition of crews with one advanced paramedic skills (APS) officer and one non-APS officer (mixed crews). All previous APS crews contained two APS officers working together. There was concern that mixed crews would have longer scene times than all-APS crews. This study aims to compare scene times at time critical cases for mixed crews and all-APS crews.

**Method:** Prospective, non-randomised comparison of scene times for time critical cases for three mixed crew units and three all-APS units for the months of August to October 1999. The crew types were also compared by explicit retrospective audit for rates of APS procedures attempted and APS procedure failure rates. Data were analysed using SPSS, *t* test, and  $\chi^2$  test where appropriate.

**Results:** There were 1700 time critical cases in the study period of which 1537 had valid data for the calculation of scene times. A total of 714 cases were attended by mixed crews and 823 cases by all-APS crews. The mean scene time for mixed crews was 15.54 minutes compared with 16.92 minutes for all-APS crews. This difference is statistically significant ( $p=0.002$ ). All-APS crews performed a slightly higher number of APS procedures (0.90/time critical case versus 0.76/time critical case;  $p=0.001$ ). There was no significant difference in procedure failure rates.

**Conclusion:** Mixed crews demonstrated shorter scene times than all-APS crews, although this is unlikely to be clinically significant. The concern that mixed crews would have longer scene time was not substantiated and should not be considered as a barrier to the development of mixed crew staffing models.

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The prompt deployment of ambulance personnel with advanced paramedic skills (APS) to cases that might need them is a challenge for ambulance services, particularly in environments where demand for their services is increasing. In response to this problem, the Metropolitan Ambulance Service (MAS), Melbourne, Australia, in its Emergency Operations Plan (1998), introduced a new type of APS crew made up of one APS officer and one non-APS officer (mixed crew). All previous APS crews contained two APS officers (all-APS unit). The system also has crews that do not perform intravenous therapies or endotracheal intubation but may defibrillate and administer a small range of drugs by intramuscular, oral, buccal, rectal or inhaled routes (EMT-D).

The potential advantage of APS officers in ambulances is a balance between the benefit derived from interventions they can perform and the impact on outcomes of any delay to definitive care that results from the performance of these interventions. This balance is likely to be most sensitive for patients with time critical illness or injury.

The presence of APS capable officers has been shown to increase scene times<sup>1</sup> and there is evidence suggesting that this is largely attributable to the performance of APS interventions.<sup>2</sup> In addition, there are data suggesting that a reduction in the number of skilled officers in crews might also increase scene times.<sup>3</sup> For these reasons, MAS was concerned that mixed crews might have longer scene times than all-APS crews, with the potential for adverse impact on outcome for patients.

This study aims to compare scene times at defined time critical cases for mixed crews and all-APS crews.

## METHODS

### Design

Prospective, non-randomised comparison study for the months of August to October 1999.

### Setting

Melbourne, Australia. MAS is responsible for an area of approximately 9000 square kilometres with a population of 3.4 million.

### Study participants

Three mixed crew units and three all-APS units.

### Study process

Scene time for cases independently classified (according to the Ambulance Victoria *Clinical practice guidelines*) as time-critical were determined from patient care records completed by crews. Scene time was defined as time from arrival of the ambulance at the scene to the time of departure from the scene. It was calculated from data recorded by officers on patient care records.

The crew types were also compared for rates of APS procedures attempted and APS procedure failure rates. These data were drawn from a detailed audit of patient care records carried out by a group of three senior APS officers who had completed a pilot audit process to ensure consistency in the audit process.

### Data analysis

Data were analysed using SPSS, *t*, and  $\chi^2$  tests as appropriate.

This study was part of the Emergency Operations Plan Evaluation Program conducted by MAS. As per local ethics

**Table 1** Comparison of scene times for mixed and all-APS crews

	Mixed crews	All-APS crews	Difference	
Cases	714	823		
Scene times (min) mean (SD)	15.54 (7.80)	16.92 (9.45)	-1.38	p=0.002

**Table 2** ALS procedures and procedure failure rates in time critical cases for each crew type

	Mixed crew	All-APS crew	Difference*
ALS procedures attempted	500 (0.76/case)	658 (0.90/case)	p=0.001
Procedures failures	17 (3% of procedures)	34 (5% of procedures)	NS

\* $\chi^2$  test; NS=not significant.

guidelines, formal ethical approval of this study was not required as it uses pooled, de-identified audit data.

## RESULTS

There were 1700 time critical cases in the study period of which 1537 had valid data for the calculation of scene times. Altogether 714 were attended by mixed crew units and 823 by all-APS units. Average scene times for the crew types are shown in table 1. There is a statistically significant difference between these (with the average scene time for the mixed crew being shorter,  $p=0.002$ ).

All-APS crews performed a slightly number of APS procedures but there was no significant difference in procedure failure rates. This is summarised in table 2.

## DISCUSSION

One way of being able to have APS trained officers available for cases for which they might be required is by spreading them throughout an ambulance system. In many ambulance systems, APS officers work together in pairs while EMT-D also work in pairs. Thus the number of crews with APS capability is half the number of available APS-capable officers. Spreading APS-capable officers throughout the system in teams with EMT-D officers (mixed crews) greatly enhances the capacity of a system to deliver these skills when required. But mixed crews also have potential down sides. There is only one APS-capable officer per crew to perform assessment and interventions. This has the potential to prolong scene times and have adverse impact on outcomes, particularly for patients with time critical illness or injury. Also, as mixed crews respond to a broader range of case types than all-APS crews, skills maintenance might be at issue.

The finding that scene times were in fact significantly shorter for mixed crews is somewhat surprising. APS crews undertook a slightly higher rate of APS procedures than the mixed crews, which may explain some of the difference in scene times. The reason for the difference in the number of APS procedures is not apparent from the study. Other factors contributing to the shorter scene times by mixed crews could include clearer role definition in teams resulting in more efficient work practices and faster decision making as the opportunity for consultation with another APS officer is not available. That said, whether a difference of 1.4 minutes in scene times of the order of 15 minutes is clinically significant is open to debate. However, even if this difference is not clinically significant, it is clear from the data that the theoretically based concern that mixed crews would have longer scene times than all-APS crews is not substantiated.

The findings of this study are somewhat at odds with previous data. Brown *et al.*,<sup>3</sup> in a study of emergency medical services in North Carolina, compared scene times for two member APS

crews with that for three member APS crews in a before and after study. The study was confined to patients with either chest pain or seizures and to two one-month periods in 1993. That study found significantly longer scene times for the two member crew treating the seizure group. The sample size for the study is however quite small (126). Also the before and after methodology raises the possibility that the results are contributed to by the process of settling in to new work practices. The much larger sample size of the current study and its parallel design should result in more robust data.

That the mixed crew did not have higher rates of failed procedures is reassuring. It supports the concept that APS trained officers are capable of safe, independent practice. This is particularly important, as the study ambulance system does not have online medical control.

The study has some limitations that should be considered when interpreting the results. Times are drawn from patient care record forms completed by paramedics and thus are open to inaccuracy of documentation. Valid scene time data were not available for a proportion of time critical cases. It is possible that scene times in the missing data group could be different from those where they were recorded, however the sample size is such that any effect is likely to be minimal. There was a somewhat higher proportion of missing data for the calculation of APS procedure rates and failed procedures. This should not however have introduced a systematic bias in favour of one group. The clinical evaluation was performed using an explicit retrospective audit thus is reliant of the quality of documentation. The data in this study most susceptible to failure to document are failed attempts at procedures. It is suspected that the true rate is higher than that reported here. However, as this omission is likely to apply to both study groups similarly, the finding that the rates of failed procedures is similar is probably justified.

In conclusion, mixed crews demonstrated shorter scene times than all-APS crews, although this is unlikely to be clinically significant. The concern that mixed crews would have longer scene time was not substantiated and should not be considered as a barrier to the development of mixed crew staffing models.

## Contributors

Anne-Maree Kelly and Alex Currell jointly initiated the study, designed the methodology and interpreted the results. Anne-Maree Kelly was responsible for writing the paper. Alex Currell was responsible for data analysis and contributed to the paper. The guarantor of this paper is Anne-Maree Kelly.

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