Prehospital Interventions: On-scene-Time and Ambulance-Technicians' Experience

Hans O. Birk, MS;[1] Lars O. Henriksen, MD[2]

1. Rosskilde County Department of Health and University of Copenhagen, Faculty of Health Sciences, Institute of Public health, Department of health Services Research, Copenhagen Denmark.
2. Deputy Director, Roskilde County, Department of Public Health. Denmark.

Correspondence:
Hans Okkels Birk
Roskilde County
Department of Health
PO Box 170
DK-4000 Roskilde
E-mail: SYHOB@RA.DK

Keywords: ambulance technicians; basic life support; emergency medical services; experience; prehospital

Abbreviations:
ECG = electrocardiograms

Received: 27 March 2001
Revised: 16 April 2002
Web Publication: 22 January 2003

Abstract
Introduction: Very little evidence is available on the experience of ambulance-personnels or on the impact of prehospital interventions on total prehospital time.
Hypothesis: On-scene-time increases with the number of prehospital techniques used, and ambulance-technicians achieve only limited clinical experience in prehospital techniques.
Methods: Prospective, observational registry study including 56 ambulance technicians from two ambulance stations in the mixed urban/rural county and 5,557 patients who were brought to a hospital in 1998. The number of cases in which each ambulance-technician performed various kinds of prehospital techniques, and the average on-scene time for each prehospital technique and several combinations of prehospital techniques were calculated.
Results: There were large differences between the number of times each technique was used. On-scene time was smallest when no techniques were used and tended to increase with the number of interventions used. On-scene-time was relatively low for patients with cardiac arrest.
Conclusion: The Danish ambulance-technicians' curriculum includes interventions for which the technicians only achieve limited practical experience. Prehospital interventions are associated with an increase of on-scene time.

Birk HO, Henricksen LO: Prehospital interventions: On-scene time and ambulance technicians' experience. *Prehosp Disast Med* 2002:17(3):167-169.

Introduction

An international tendency to extend training of ambulance technicians means that more prehospital interventions take place though few studies provide evidence for a positive effect on outcome.[1,2] Limited evidence is available on ambulance personnel's experience and skills or on the impact of prehospital interventions on the total prehospital time.[3]

Methods

The practical experience gained in 1998 by ambulance technicians from two Danish ambulance stations and the association of the use of prehospital techniques with on-scene-time was investigated. The study included all acute, ambulance turnouts from two ambulance stations serving a mixed urban/rural area with approximately 160,000 inhabitants in 1998, in which ambulance personnel brought a patient to a hospital. No selection of patients took place; the study included patients with medical conditions and patients with injuries from physical trauma. There were no competing ambulance companies in the area. At least one of the two ambulance technicians in each ambulance had been trained in the use of the techniques evaluated in this study. On-scene times and performance of prehospital techniques were recorded prospectively and manually by the ambulance-technicians who performed the interventions, using a

Technique	n	(%)
No techniques	1,238	(22.4)
Pulse	3,874	(70.2)
Blood pressure	3,565	(64.6)
Oxygen therapy	2,607	(47.3)
ECG	1,219	(22.1)
Wound dressing	296	(5.4)
Nitrolingual spray	214	(3.9)
Salbutamol	151	(2.7)
Ventilation	141	(2.6)
Cardiac massage	123	(2.2)
Nitrous oxide/oxygen (50%/50%)	113	(2.0)
Defibrillation	110	(2.0)
Diazepam	16	(0.3)

Prehospital and Disaster Medicine © 2002 Birk

Table 1—Ambulance technicians' use of prehospital interventions on 5,516 patients conveyed to hospital in 1998. (n = number of patients; ECG = electrocardiogram)

standardized patient report form. The form included information on measurement of pulse or blood pressure; administration of oxygen therapy; receiving of an electrocardiogram (ECG); wound dressing; nitrolingual spray (anti-angina); salbutamol (anti-asthmatic); ventilation; external chest compression; defibrillation; nitrous oxide/oxygen (50%/50% administration for pain relief); diazepam (anti-seizures); the ambulance technicians' service numbers; the service number of the technician who performed each intervention; the time of dispatch of the ambulance; the times of arrival at and departure from the scene; and the time of arrival at hospital. The patients' diagnosis was not recorded systematically in the report form.

The source of all of the data was kept anonymous. This registry study presented no ethical problems.

Data were entered into a database (EPIINFO), and 95%-confidence intervals were estimated by using Mann-Whitney *U*-test.

The average number of cases in which each ambulance-technician performed each kind of technique was calculated, and the number of technicians who used each technique on patients in 1998 was counted. The average on-scene time with and without each kind of technique, and for various numbers and combinations of prehospital techniques, was calculated.

Results

A total of 56 ambulance-technicians completed 5,980 patient report forms in 1998. In 5,557 cases, a patient was conveyed to a hospital via an ambulance from one of the two ambulance stations. Forty-one report forms were excluded from the study because the times of dispatch, arrival, departure and/or arrival at hospital were not recorded. Thus, 5,516 report forms made up the study group.

One or more techniques were used on 77.6% of the 5,516 patients included in the study (Table 1). The techniques used most often were measurement of pulse and of blood pressure; 47.3% of the patients received oxygen therapy, and an. ECG was performed on 22.1% of the patients.

On average, each of the 56 technicians conveyed 107 patients to a hospital in 1998 (range: 1–228). There were large differences between the number of patients the various technicians conveyed to a hospital and the number of times the technicians used each technique. Every technician measured pulse and blood pressure at least once, while 16% did not perform external chest compressions and 71% did not administer drugs to terminate seizures (Table 2).

The average on-scene time was 8.6 minutes. The average time from scene-to-hospital was 12.7 minutes. On-scene time was shortest when no techniques were used. The prolongation of on-scene time was shortest for patients whose pulse and/or blood pressure were measured or whose wounds were dressed. The on-scene time was longer for patients with cardiac arrest and even longer for patients treated for symptoms of asthma or chest pain. The on-scene times were longest for patients who received nitrous oxide/oxygen inhalation. The report forms indicated that entrapped patients and patients with broken limbs were most likely to be offered this analgesic, which might explain why the on-scene time was prolonged (Table 3).

On-scene times tended to be correlated positively to the number of prehospital techniques used, but remained relatively low when the technicians performed defibrillation on patients suffering from cardiac arrest despite the number of techniques involved (Table 4).

Discussion

This study demonstrates that the Danish ambulance technicians' curriculum includes techniques for which the ambulance-technicians achieve little experience on-scene. This observation is important, because retention of knowledge and skill in prehospital techniques appears to be related directly to frequency of use.[4]

The use of prehospital techniques is associated with a prolonged on-scene time, and on-scene time increases with the number of prehospital interventions used. Several studies concerning patients with trauma or medical conditions indicate that ambulance personnel with an extended curriculum spend more time on-scene than do ambulance technicians with a basic curriculum,[5–8] though they do not achieve better outcomes as measured by mortality,[5,7,9–11] return of spontaneous circulation in patients with cardiac arrest,[5] time-to-medication,[8] admission rate,[9] or length of stay in intensive care.[7]

For most prehospital interventions, there is no or only scanty evidence of a positive effect on outcome,[1,2] while shorter prehospital times may represent an important factor in survival for trauma patients.[12–14]

When the scope of the ambulance technicians' curriculum is considered, the limited experience, the lack of evidence of a positive effect on outcome for most prehospital interventions, and the delay of hospital admission, should be borne in mind. This is important because the skills that require the most technical knowledge deteriorate the fastest,[15] and because new interventions presumably will be more demanding technically, and their use rarely indicated.

Conclusion

On-scene time increases with the number of prehospital interventions used. Ambulance technicians achieve only limited experience in the use of prehospital techniques through their practical work.

Intervention	Interventions/technician (mean)	Range	Used Technique n	(%)
Pulse	69.2	1-172	56	(100)
Blood pressure	63.7	1-165	56	(100)
Oxygen therapy	46.6	0-109	55	(98.2)
ECG	21.8	0-67	55	(98.2)
Wound dressing	5.3	0-24	51	(91.1)
Nitrolingual spray	3.8	0-12	50	(89.3)
Salbutamol	2.7	0-14	46	(82.1)
Ventilation	2.5	0-9	46	(82.1)
External cardiac compression	2.2	0-8	47	(83.9)
Defibrillation	2.0	0-7	46	(78.6)
Nitrous oxide/oxygen	2.0	0-9	44	(78.6)
Diazepam	0.3	0-3	16	(28.6)

Prehospital and Disaster Medicine © 2002 Birk

Table 2—Ambulance technicians' experience with prehospital interventions in 1998

Technique	On-scene-time (minutes) With	Without	Difference	95%-Confidence-Interval
Pulse	9.2	7.1	2.1	1.8–2.4
Blood pressure	9.3	7.3	2.0	1.7–2.3
Oxygen therapy	9.6	7.6	2.0	1.7–2.3
ECG	10.3	8.1	2.2	1.9–2.6
Wound dressing	9.3	8.5	0.7	0.04–1.4
Nitrolingual spray	10.7	8.5	2.2	1.6–2.8
Salbutamol	11.8	8.5	3.4	2.2–4.5
Ventilation	9.8	8.5	1.3	0.3–2.3
External cardiac compression	9.6	8.5	1.1	0.1–2.0
Defibrillation	9.6	8.6	1.1	0.2–2.0
Nitrous oxide/oxygen	14.1	8.5	5.6	4.4–6.8
Diazepam	9.7	8.6	1.1	-0.8–3.0

Prehospital and Disaster Medicine © 2002 Birk

Table 3—Average on-scene time with and without use of various prehospital techniques

Combination of techniques	n	On-scene time (minutes)
No interventions	1,238	6.6
Pulse and/or blood pressure, ECG, oxygen therapy:		
1 of the 4 interventions	437	8.6
2 of the 4 interventions	1,355	8.3
3 of the 4 interventions	1,410	9.4
All of the 4 interventions	972	10.6
All of the 4 interventions plus nitrolingual spray	164	10.8
All of the 4 interventions plus salbutamol	69	13.8
External chest compression, ventilation and defibrillation	96	9.7

Prehospital and Disaster Medicine © 2002 Birk

Table 4—Average on-scene time for various combinations of prehospital techniques

References

1. Callaham M: Quantifying the scanty evidence of prehospital emergency care. *Ann Emerg Med* 1997;30:785–790.
2. Pepe PE, Eckstein M: Reappraising the prehospital care of the patient with major trauma. *Emerg Med Clin North Am* 1998;16:1–15.
3. Schou J: Duration and type of prehospital emergency therapy. *Eur J Emerg Med* 1999;6:185–192.
4. Latman NS, Wooley K: Knowledge and skill retention of emergency care attendants, EMT-As and EMT-Ps. *Ann Emerg Med* 1980;9:183–189.
5. Guly UM, Mitchell RG, Cook R, Steedman DJ, Robertson CE: Paramedics and technicians are equally succesful at managing cardiac arrest outside hospital. *BMJ* 1995;310:1091–1094.
6. Weston CF, McCabe MJ: Audit of an emergency ambulance service: Impact of a paramedic system. *J R Coll Physicians Lond* 1992;26:86–89.
7. Rainer TH, Houlihan KP, Robertson CE, Beard D, Henry JM, Gordon MW: An evaluation of paramedic activities in prehospital trauma care. *Injury* 1997;28:623–627.
8. Donovan PJ, Cline DM, Whitley TW, Foster C, Outlaw M: Prehospital care by EMTs and EMT-Is in a rural setting: Prolongation of scene times by ALS procedures. *Ann Emerg Med* 1989;18:495–500.
9. Adams J, Aldag G, Wolford R: Does the level of prehospital care influence the outcome of patients with altered levels of consciousness? *Prehosp Disast Med* 1996;11:101–104.
10. Mitchell RG, Guly UM, Rainer TH, Robertson CE: Can the full range of paramedic skills improve survival from out of hospital cardiac arrests? *J Accid Emerg Med* 1997;14:274–277.
11. Gardtman M, Waagstein L, Karlsson T, Herlitz J: Has an intensified treatment in the ambulance of patients with acute severe left heart failure improved the outcome? *Eur J Emerg Med* 2000;7:15–24.
12. Feero S, Hedges JR, Simmons E, Irwin L: Does out-of-hospital EMS time affect trauma survival? *Am J Emerg Med* 1995;13:133–135.
13. Sampalis JS, Lavoie A, Williams JI, Mulder DS, Kalina M: Impact of on-site care, prehospital time, and the level of in-hospital care on survival in severely injured patients. *J Trauma* 1993;34:252–261.
14. Demetriades D, Chan L, Cornwell E, Belzberg H, Berne TV, Asensio J, *et al*: Paramedic vs. private transportation of trauma patients. Effect on outcome. *Arch Surg* 1996;131:133–138.
15. Skelton MB, McSwain NE: A study of cognitive and technical skill deterioration among trained paramedics. *JACEP* 1977;6:436–438.