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RIGSPOLITIET

**RAPPORT OM FØRSTE-  
HJÆLP I FORBINDELSE  
MED ERHVERVELSE AF  
KØREKORT**

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**ARBEJDSGRUPPEN OM FØRSTEHJÆLP I  
FORBINDELSE MED KØREUDDANNELSEN**



## Indholdsfortegnelse

1.	INDLEDNING .....	5
2.	FØRSTEHJÆLSARBEJDSGRUPPENS KOMMISSORIUM OG MEDLEMMER.....	6
3.	SAMMENFATNING AF ARBEJDSGRUPPENS ANBEFALINGER.....	8
4.	DEN DANSKE KØREUDDANNELSE .....	9
5.	TRAFIK OG ULYKKER PÅ DANSKE VEJE .....	10
5.1	ANTAL NYE KØREKORT TIL LASTBIL, BUS, STORT PÅLÆNGSKØRETØJ OG ERHVERVSMÆSSIG PERSONBEFORDRING .....	10
5.2	TRAFIKKEN PÅ DANSKE VEJE .....	10
5.3	ULYKKER PÅ DANSKE VEJE.....	12
6.	STATUS OVER FØRSTEHJÆLSKURSER I DANMARK.....	14
6.1	UDBYDERE AF FØRSTEHJÆLSKURSUS.....	14
6.2	INDHOLD AF FØRSTEHJÆLSKURSUS.....	15
6.2.1	<i>Betaling for førstehjælpkursus</i> .....	17
6.2.2	<i>Førstehjælpkursets omfang</i> .....	17
6.3	KRAV OM FØRSTEHJÆLP I FORBINDELSE MED ERHVERVSUDDANNELSE .....	18
6.3.1	<i>Forsvaret og redningsberedskabet</i> .....	18
6.3.2	<i>Politiet</i> .....	18
6.3.3	<i>AMU (Arbejdsmarkedsuddannelse)</i> .....	19
6.3.4	<i>ADR-Uddannelse (Transport af farligt gods ad vej)</i> .....	19
6.3.5	<i>Hvidt og blåt kvalifikationsbevis</i> .....	19
6.3.6	<i>Taxi, limousine eller sygetransportkøretøj</i> .....	20
7.	STATUS OVER FØRSTEHJÆLP I UDVALGTE LANDE I FORBINDELSE MED KØREUDDANNELSE.....	21
7.1	NORGE.....	21
7.2	SVERIGE .....	21
7.3	FINLAND.....	21
7.4	TYSKLAND.....	21
7.5	HOLLAND .....	21
7.6	SCHWEIZ.....	22
7.7	ØSTRIG .....	22
7.8	ENGLAND .....	22



<b>8. ARBEJDSGRUPPENS OVERVEJELSER OG KONKLUSIONER OM BRUGEN AF FØRSTEHJÆLP</b> .....	23
8.1 DEFINITION AF BEGREBET FØRSTEHJÆLP .....	23
8.2 FØRSTEHJÆLPENS BETYDNING FOR TRAFIKOFRE .....	23
8.2.1 <i>Velviljen til at udøve førstehjælp</i> .....	23
8.2.2 <i>Velviljen til at udøve førstehjælp og betydningen af varigheden af førstehjælpskurset</i> .....	24
8.2.3 <i>Overlevelseraten efter hjertestop</i> .....	25
8.2.4 <i>Danmarks befolknings syn på førstehjælp</i> .....	25
8.3 UNDERSØGELSE AF LÆGPERSONERS INDSATS PÅ SKADESTEDER.....	25
8.3.1 <i>Undersøgelse af lægpersoners indsats på skadesteder i Frederiksborg Amt</i> .....	26
8.3.2 <i>Omfanget af førstehjælp udøvet af lægmand samt effekten heraf</i> .....	27
8.3.3 <i>Undersøgelse foretaget af TrygFonden</i> .....	27
8.4 ARBEJDSGRUPPENS KONKLUSIONER .....	27
<b>9. FORSLAG TIL KRAV OM FÆRDSRELSRELATERET FØRSTEHJÆLPKURSUS FOR KØREKORTERHVERVERE</b> .....	29
9.1 FORMULERING AF KRAV .....	29
9.1.1 <i>Aldersmæssige betingelser og gyldighed af færdselsrelateret førstehjælpsbevis</i> .....	29
9.1.2 <i>Vedligeholdelse af færdselsrelateret førstehjælpskursus</i> .....	30
9.2 HJEMMEL FOR INDFØRELSE AF KRAV .....	30
9.3 ANTALLET AF PERSONER OMFATTET AF DE FORESLÅEDE KRAV.....	30
9.3.1 <i>Eksisterende krav i erhvervsuddannelser</i> .....	31
9.3.2 <i>Ny uddannelse af erhvervschauffører</i> .....	31
9.3.3 <i>Sammenfatning</i> .....	32
9.3.4 <i>Meritordninger</i> .....	32
9.3.5 <i>Kapacitet</i> .....	33
9.3.6 <i>Betaling for kursus</i> .....	33
<b>10. FORSLAG TIL INDHOLD AF FÆRDSRELSRELATERET FØRSTEHJÆLPKURSUS</b> .....	34
10.1 OMFANG .....	34
10.2 INDHOLD OG NIVEAU .....	34
<b>11. VEDLIGEHOLDELSE AF FÆRDSRELSRELATERET FØRSTEHJÆLPKURSUS</b> .....	38
11.1 VEDLIGEHOLDELSE AF FÆRDSRELSRELATERET FØRSTEHJÆLPKURSUS.....	38
11.2 INDHOLD AF VEDLIGEHOLDELSESKURSUS I FÆRDSRELSRELATERET FØRSTEHJÆLPKURSUS.....	38
<b>12. KONKLUSIONER</b> .....	39
<b>13. ADMINISTRATIVE OG ØKONOMISKE KONSEKVENSER</b> .....	42



13.1	ADMINISTRATIVE KONSEKvensER.....	42
13.2	ØKONOMISKE KONSEKvensER.....	42
14.	BILAGSOVERSIGT.....	43
15.	KILDEHENvisNINGER.....	44
16.	NOTER.....	45



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## 1. INDLEDNING

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I 1995 anbefalede en arbejdsgruppe nedsat af Færdselssikkerhedskommissionen, at der bør stilles krav om obligatorisk undervisning i færdselsrelevant førstehjælp som betingelse for at opnå kørekort til lastbil og bus (kategori C og D).

Imidlertid bemærkede arbejdsgruppen også, at der ikke kunne henvises til dokumentation for den færdselssikkerhedsmæssige effekt af obligatorisk førstehjælpsundervisning som led i erhvervelsen af kørekort.

På baggrund af blandt andet ovennævnte beretning er der igennem de senere år flere gange fremsat forslag om gennemførelse af en række initiativer for at indføre obligatorisk førstehjælpsundervisning i forbindelse med erhvervelse af kørekort.

Mere end 50.000 personer kommer hvert år til skade i trafikken i Danmark. Ca. 400 af dem mister livet, og mange får varige men. Det antages, at udøvelse af førstehjælp ved ulykker kan redde et antal af disse personer.

Der har i de senere år været sat større og større fokus på færdselssikkerhed.

Det blev derfor besluttet at nedsætte en arbejdsgruppe, som skal vurdere, om indførelse af et obligatorisk krav om førstehjælp i forbindelse med erhvervelse af kørekort til lastbil, bus, stort påhængskøretøj samt erhvervsmæssig personbefordring kan tænkes at have en positiv effekt på færdselsulykkernes omfang.

I denne rapport overvejes, om der nu er behov for indførelse af obligatorisk førstehjælpsundervisning i forbindelse med erhvervelse af kørekort til kategori C (lastbil), kategori D (stor personbil), C/E (stort påhængskøretøj til lastbil) eller D/E (stort påhængskøretøj til stor personbil) samt erhvervsmæssig personbefordring til kategori B (almindelig bil) eller erhvervsmæssig personbefordring til kategori D (stor personbil). I denne rapport er disse kørekortkategorier under ét benævnt "stortvognskategorier".



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## 2. FØRSTEHJÆLPSARBEJDSGRUPPENS KOMMISSORIUM OG MEDLEMMER

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Kommissoriet for arbejdsgruppen er:

*"En arbejdsgruppe nedsat af Færdselssikkerhedskommissionen afgav i 1995 en beretning vedrørende et forslag om at indføre obligatorisk førstehjælp som led i køreuddannelsen. Beretningen vedlægges til orientering.*

*Arbejdsgruppens medlemmer fandt, at det vil være hensigtsmæssigt, at der stilles krav om, at personer med kørekort til erhvervsmæssig personbefordring eller med kørekort til lastbil, stor personbil og stort påhængskøretøj gennemgår obligatorisk undervisning i førstehjælp, i det omfang der ikke i forvejen stilles et sådant krav i forbindelse med erhvervelse af kørekortet eller som led i en erhvervskvalificerende uddannelse.*

*På baggrund af Færdselssikkerhedskommissionens anbefalinger er det besluttet at nedsætte en arbejdsgruppe, som skal vurdere behovet for og omfanget af indførelse af eventuelt yderligere krav om førstehjælp.*

*Arbejdsgruppen består af repræsentanter fra:*

- *Dansk Røde Kors.*
- *Dansk Førstehjælpsråd.*
- *Sundhedsstyrelsen.*
- *Transporterhvervets Uddannelsesråd.*
- *FDM.*
- *Rigspolitiet.*

*Arbejdsgruppens formandskab og sekretariatsfunktion varetages af Rigspolitiet.*

*Arbejdsgruppens overordnede opgave er at undersøge behovet for og omfanget af indførelse af eventuelt yderligere krav om førstehjælp til personer med kørekort til erhvervsmæssig personbefordring til kategori B (almindelig bil) eller D (stor personbil) og med kørekort til kategori C (lastbil), kategori D (stor personbil), C/E (stort påhængskøretøj til lastbil) eller D/E (stort påhængskøretøj til stor personbil).*



*Arbejdsgruppen skal endvidere beskrive de administrative og økonomiske konsekvenser af de forslag til ændringer i gældende bestemmelser, som arbejdsgruppen måtte anbefale.*

*Arbejdsgruppen skal inden udgangen af april 2004 afgive en rapport med anbefalinger til Rigspolitichefen.”*

Følgende repræsentanter har deltaget i arbejdsgruppen:

- Sven Hedegaard, Dansk Røde Kors.
- Torben E. Frederiksen, Dansk Førstehjælpråd.
- Jens Roland, Dansk Førstehjælpråd (har deltaget siden 10. juni 2003 i stedet for Torben E. Frederiksen).
- Dorrit Müller, Sundhedsstyrelsen.
- Hans Christiansen, Transporterhvervets Uddannelsesråd.
- Svend Erik Pedersen, Transporterhvervets Uddannelsesråd (har deltaget i arbejdsgruppens 7. møde i stedet for Hans Christiansen).
- Helle Brasch, Forenede Danske Motorejere.
- Mads Mazanti Hansen, Rigspolitiets Færdselsafdeling (formand).
- Sussi Kronborg Rasmussen, Rigspolitiets Færdselsafdeling (sekretær).

Arbejdsgruppen afholdt sit første møde den 4. november 2002 og har i alt afholdt 7 møder.



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### 3. SAMMENFATNING AF ARBEJDSGRUPPENS ANBEFALINGER

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Arbejdsgruppen anbefaler følgende:

- At der indføres krav om obligatorisk færdselsrelateret førstehjælp i forbindelse med køreuddannelsen til storvognskategorierne (afsnit 8.4).
- Et færdselsrelateret førstehjælpskursus bør efter arbejdsgruppens opfattelse gennemføres før erhvervelse af kørekort til storvognskategorierne, og dokumentation for gennemført eller vedligeholdt færdselsrelateret førstehjælpskursus bør derfor foreligge i forbindelse med indlevering af ansøgning om kørekort (afsnit 9.1).
- Ved indlevering af ansøgning om kørekort må bevis for gennemført kursus ikke være mere end 3 år gammelt (afsnit 9.1.1).
- Indhavere af ikke færdselsrelaterede førstehjælpskurser kan opnå merit ved at gennemføre et vedligeholdelseskursus i færdselsrelateret førstehjælp (afsnit 9.3.4).
- Kursus i færdselsrelateret førstehjælp bør løbende vedligeholdes (afsnit 11.1).
- Kursus samt vedligeholdelseskursus i færdselsrelateret førstehjælp bør afsluttes ved udstedelse af et kursusbevis (afsnit 9.1).

For så vidt angår selve undervisningen (første kursus) anbefaler arbejdsgruppen, at:

- Undervisningen skal forestås af instruktører, som er godkendt af Dansk Førstehjælpsråd (afsnit 9.1).
- Undervisningen gennemføres i hold af maksimalt 12 kursister (afsnit 9.3.6).
- Undervisningen skal strække sig over 7,5 timer indeholdende førstehjælp i basal genoplivning (3 timer) samt færdselsrelateret førstehjælp og ulykkesforebyggelse målrettet mod førere af storvognskategorier (4,5 timer) (afsnit 10.1).
- Undervisningen gives en handlingsorienteret, praktisk tilgangsvinkel med case- og færdighedsundervisning, som er opbygget omkring typiske ulykke- og skadetyper på et skadested i trafikken (afsnit 10.1).
- Det færdselsrelaterede førstehjælpskursus indeholder elementer af forebyggende karakter, for at give deltageren viden om de ulykkesforebyggende tiltag, der kan indarbejdes i kørekortindehavernes anvendelse af køretøjet (afsnit 10.1).





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#### 4. DEN DANSKE KØREUDDANNELSE

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Køreuddannelsen har som sit overordnede formål at sikre, at de nye førere, som kommer ud i trafikken, kan køre trafiksikkert og hensigtsmæssigt. Dette er ikke kun vigtigt af hensyn til den enkelte, men også af hensyn til det øvrige samfund, og betydningen heraf skal ses ikke mindst i lyset af, at langt de fleste ulykker skyldes den menneskelige faktor, samt at de unge har en overrepræsentation i ulykkestallet.

Formålet med den almindelige køreuddannelse er derfor:

- At give eleverne indsigt i og forståelse for de farer og vanskeligheder, de møder i trafikken, samt viden om de færdselsregler og andre lovbestemmelser, der har betydning.
- At give eleverne et sådant kendskab til køretøjet og dets betjening, at de kan konstatere opståede mangler af betydning for sikkerheden.
- At give eleverne forståelse for de grundlæggende menneskelige forhold, der har indflydelse på kørefærdigheden, således at de fuldt ud kan udnytte deres evner og i fornødent omfang modvirke almindelige menneskelige begrænsninger.
- At give eleverne færdighed i at bedømme færdslen kritisk og føre køretøjet uden fare for sig selv og andre.
- At bidrage til, at eleverne bliver hensynsfulde og ansvarsbevidste motorførere.
- At give eleverne viden om og forståelse for de svage trafikanters situation, særlig i forhold til den motoriserede færdsel.

Køreuddannelsen indebærer i hovedtræk, at den praktiske undervisning skal indledes på en lukket øvelsesplads, at selve uddannelsen skal følge undervisningsplaner for de forskellige kategorier med integreret teoretisk og praktisk undervisning, samt at uddannelsen skal afsluttes med et kursus på et køreteknisk anlæg.

Uddannelsen skal tilrettelægges således, at eleverne lærer at forudse farlige situationer og lærer at reagere hensigtsmæssigt. Da det at køre bil eller motorcykel er en praktisk handling, har køreuddannelsen også sit tyngdepunkt i indøvelsen af praktiske færdigheder.

Ved førstegangserhvervelse af kørekort skal ansøgeren som et minimum gennemgå et obligatorisk antal lektioner i teorilokale (teoriundervisning) og i praktisk køreundervisning (øvelseskørsel). Der er endvidere fastsat et minimum for den periode, i hvilken køreundervisningen skal gives.



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## 5. TRAFIK OG ULYKKER PÅ DANSKE VEJE

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Arbejdsgruppen har til brug for sine overvejelser tilvejebragt oplysninger om omfanget af trafikken på danske veje.

### 5.1 Antal nye kørekort til lastbil, bus, stort påhængskøretøj og erhvervsmæssig personbefordring

Der blev i 2004 udstedt nye kørekort til storvognskategorier således:

Kategori C	Kategori D	Kategori E	I alt
4.250	1.768	2.302	8.320

Herudover er der udstedt 1.657 kørekort til erhvervsmæssig personbefordring til kategori B og 1.628 kørekort til erhvervsmæssig personbefordring til kategori D.

### 5.2 Trafikken på danske veje

Antal kørte kilometer i 2002 for de enkelte trafikarter fremgår af denne tabel:

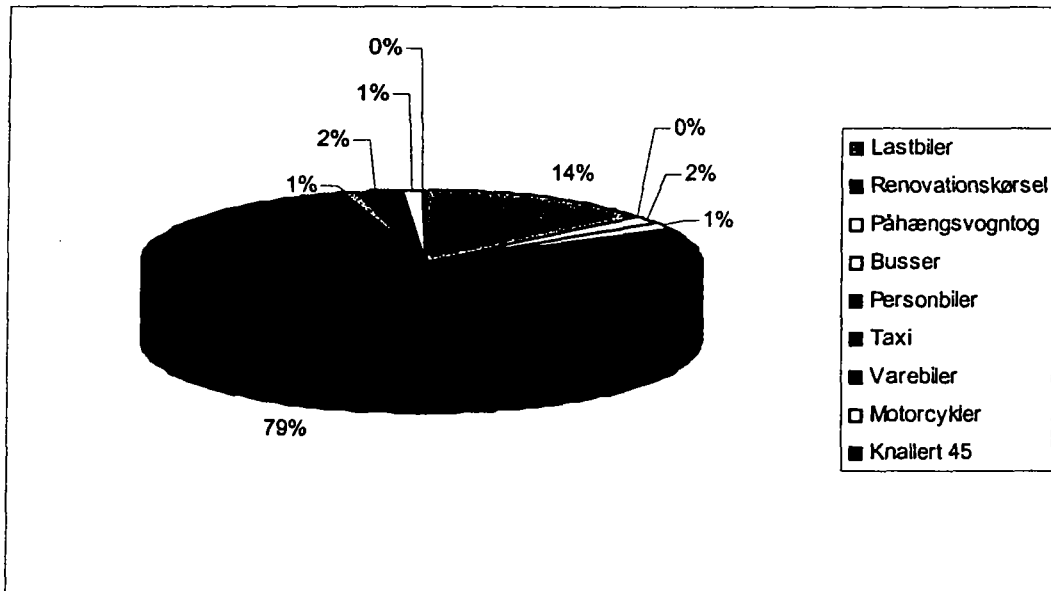
Trafikart	Antal mio. kørte km i 2002
Lastbiler	6.625,5
Renovationskørsel	28,6
Påhængsvogntog	893,1
Busser	625,5
Personbiler	37.212,7
Taxi	460,6
Varebiler	1.180,3



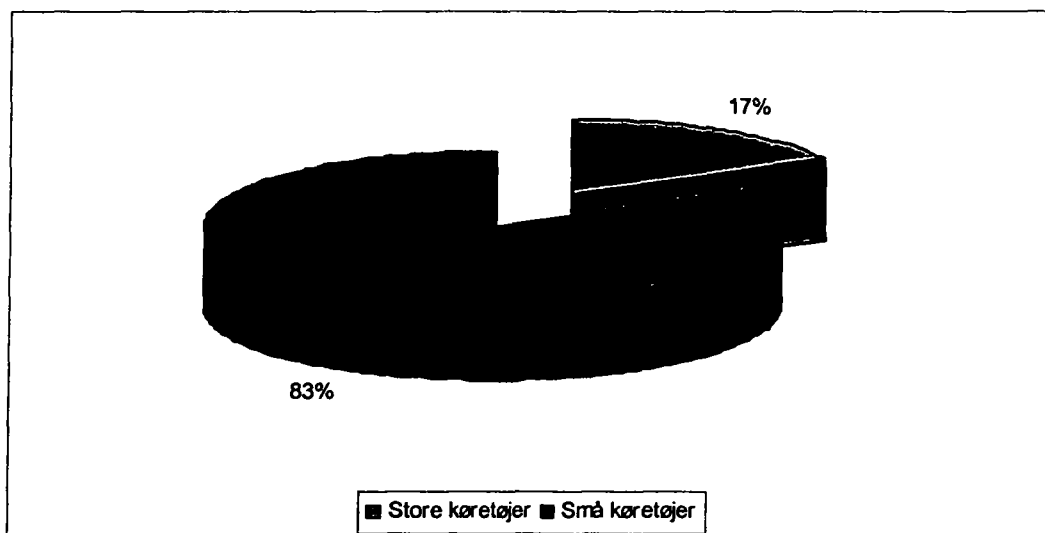
Motorcykler	550,5
Knallert 45	95,2

Kilde: Tal for kørsel med vare- og lastbil er fra Danmarks Statistiks "Kørebogsundersøgelse".  
Tal for øvrige transportformer er beregnet af Vejdirektoratet.

På nedenstående graf kan forskellen i antal kørte kilometer ses:



Differentieres antal kørte kilometer på trafikarter, der forudsætter erhvervelse af et kørekort til de små kategorier (bil og motorcykel) og til storkøretøjskategorier (lastbil, bus og påhængskøretøjer), kan forskellen i antal kørte kilometer i mio. km anskueliggøres således:





Det må dog formodes, at uanset den store forskel i antal kørte kilometer mellem små og store køretøjer, befinder de store køretøjer sig relativt længere tid på vejene, når henses til disse føreres erhvervsarbejde.

### 5.3 Ulykker på danske veje

Det fremgår af denne tabel, at færdselsulykker i 2004 har medført følgende personskade og materielskader:

Året	2004
Ulykker	
Med personskade	6.209
Alene materiel skade	9.451
I alt	15.660
Personskader	
Dræbte	369
Alvorligt tilskadekomne	3.561
Lettere tilskadekomne	3.985
I alt	7.915

Kilde: Vejsektoren

Generelt er der en positiv udvikling i 2004 i forhold til 2003. Især er der en meget positiv udvikling for antallet af dræbte, som er faldet til 369 dræbte i 2004, hvilket er det laveste tal siden 1950. Antallet af personskader i alt er med 7.915 dræbte og tilskadekomne i 2004 det laveste siden 1947. Antallet af ulykker alene med materiel skade er dog steget med 1 %.



	Biler	To-hjulede med motor	Cykel	Fodgænger
Personskader i alt	4.266	1.473	1.429	718
Dræbte	203	69	53	43
Alvorligt tilskade	1.591	829	726	404
Lettere tilskade	2.472	575	650	271

Nedgangen i antallet af dræbte gælder især personer i biler (person-, vare- og lastbil samt bus), hvor også nedgangen i antallet af alvorligt og lettere tilskadede er markant. For to-hjulede med motor (mc, knallert 45 og knallert 30) er der en markant nedgang for alvorligt og lettere tilskadede. For cyklister og fodgængere er det alene for lettere tilskadede, at der er en markant nedgang. For cyklister er der endda en stigning i antallet af dræbte.



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## 6. STATUS OVER FØRSTEHJÆLPSKURSER I DANMARK

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Arbejdsgruppen har undersøgt gennemførelsen af førstehjælpskurser i Danmark i 2005.

### 6.1 Udbydere af førstehjælpskursus

Førstehjælpskurser udbydes i dag af medlemsorganisationer i og samarbejdspartnere til Dansk Førstehjælpsråd, som er en paraplyorganisation etableret i 1999 for førstehjælpsområdet i Danmark.

Dansk Førstehjælpsråds formål er at virke som samarbejdsorgan for organisationer m.fl., der har opgaver inden for uddannelse i førstehjælp. Rådet skal arbejde for at øge kendskabet til og færdighederne i førstehjælp og varetager koordineringen og planlægningen af førstehjælpsuddannelsen, der er kompetencegivende inden for al uddannelse i forsvaret og redningsberedskabet. Rådets hovedopgaver omfatter blandt andet at arbejde for en ensartet førstehjælpsundervisning i Danmark, baseret på de nyeste lægefaglige anvisninger samt at anbefale standarder for og godkendelse af førstehjælpsuddannelse og instruktøruddannelse inden for førstehjælp.

Medlemsorganisationer i Dansk Førstehjælpsråd:

- ASF-Dansk Folkehjælp.
- Beredskabs-Forbundet.
- Beredskabsstyrelsen.
- Dansk Røde Kors.
- Falck.
- Foreningen af Kommunale Beredskabschefer i Danmark.
- Forsvarets Sundhedstjeneste.

Samarbejdspartnere til Dansk Førstehjælpsråd:

- Epilepsiforeningen.
- Bedriftssundhedstjenesten.



- Søfartsstyrelsens Center for Maritime Sundhedsuddannelser.
- Foreningen af Selvstændige Førstehjælpsinstruktører i Danmark.
- Danske Gymnastik- og Idrætsforeninger.
- Dansk Brand- og sikringsteknisk Institut.

Alle ovennævnte medlemsorganisationer og samarbejdspartnere udbyder i dag førstehjælpskurser i overensstemmelse med Dansk Førstehjælpsråds anbefalinger.

## **6.2 Indhold af førstehjælpskursus**

Dansk Førstehjælpsråd har udarbejdet retningslinier for et 12-timers grundkursus i førstehjælp og 30-timers udvidet kursus i førstehjælp. Dansk Førstehjælpsråds instruktører har gennemgået en uddannelse, der sætter dem i stand til at udarbejde målrettede kurser i førstehjælp for specielle områder.

Dansk Førstehjælpsråds 12-timers grundkursus i førstehjælp omfatter:

- Førstehjælpens 4 hovedpunkter.
- Trinvis førstehjælp til bevidstløse.
- Den livsvigtige iltransport.
- Nedsat eller standset vejtrækning.
- Udvendig hjertemassage.
- Årsager til shock.
- Shockforebyggelse.
- Trykforbinding.
- Alarmeringsprocedurer.
- El-ulykker.
- Temperaturpåvirkninger.
- Pludselige sygdomme.



- Psykisk førstehjælp.
- Situationsøvelser.
- Praktiske øvelser.
- Skriftlig opgave.

Dansk Førstehjælpsråds 30-timers udvidet kursus i førstehjælp omfatter:

- Førstehjælpens 4 hovedpunkter.
- Psykisk førstehjælp.
- Bevidsthedstilstande.
- Trinvis førstehjælp til bevidstløse.
- Den livsvigtige iltransport.
- Førstehjælpen ved fremmedlegeme i luftvejene.
- Blodkredsløbet.
- Teknikken i udvendig hjertemassage.
- Årsager til shock.
- Shockforebyggelse.
- Førstehjælpen ved ulykker, der kan medføre bevidstløshed og/eller shock.
- Bevægeapparatet.
- Hudens opbygning.
- Særlige skader.
- Kroppens temperatur regulering.
- Bughulens organer.
- Førstehjælpen ved pludselig sygdom, der kan medføre bevidstløshed og/eller shock.
- Småskader.





- Støtteforbinding.
- Færdselsulykker og andre større ulykker.
- Katastrofer.
- Prioritering ved flere tilskadekomne.
- Handleprøve.
- Skriftlig prøve.
- Forebyggelse.
- Ulykker i hjemmet/arbejdet.

Dansk Førstehjælpsråd er i øjeblikket i færd med at udarbejde en ny uddannelsesstruktur til implementering i sommeren 2006.

Den nye uddannelsesstruktur vil være opbygget af 3-timers moduler, som indeholder specifikke førstehjælpsfaglige emner. Modulerne vil blive sammensat i 6, 12 eller 24-timers vejledende kurser. Det vil endvidere være muligt at sammensætte modulerne efter eget valg. Formålet med den nye uddannelsesstruktur er en mere hensigtsmæssig tilpasning af det førstehjælpsfaglige indhold til forskellige målgrupper, f.eks. kørekortaspiranter, idrætsforeninger, institutioner mv.

#### 6.2.1 BETALING FOR FØRSTEHJÆLPSKURSUS

Den sædvanlige pris, der opkræves af en kursist for gennemførelsen af et 12-timers grundkursus i førstehjælp, er fra ca. 500 kroner og opefter.

Befolkningsuddannelsen<sup>1</sup>, der består af et 12-timers grundkursus i førstehjælp og/eller et 3-timers kursus i elementær brandbekæmpelse, gennemføres årligt af ca. 11.000 personer. Et 12-timers grundkursus i førstehjælp i befolkningsuddannelsen koster den enkelte 125 kr., idet den resterende omkostning dækkes af tilskud fra staten.

#### 6.2.2 FØRSTEHJÆLPSKURSETS OMFANG

Dansk Førstehjælpsråd har primo 2004 indhentet oplysninger fra rådets medlemsorganisationer og fra rådets samarbejdspartnere vedrørende uddannelse i førstehjælp.



Det fremgår af disse oplysninger, at ca. 136.000 personer i 2003 gennemførte en førstehjælpsuddannelse gennem en af Dansk Førstehjælpsråds medlemsorganisationer eller samarbejdspartnere.

Herudover gennemføres førstehjælpsuddannelse i en række andre uddannelsessystemer.

### **6.3 Krav om førstehjælp i forbindelse med erhvervsuddannelse**

Førstehjælpsuddannelse indgår allerede i dag som led i en række erhvervsuddannelser. Arbejdsgruppen har nærmere undersøgt omfanget og arten af førstehjælp i de erhvervsuddannelser, der gennemføres af personer, som erfaringsmæssigt tilbringer meget tid på vejen.

#### **6.3.1 FORSVARET OG REDNINGSBEREDSKABET**

I forsvarets 4-måneders værnepligtsuddannelse og i det statslige redningsberedskabs 6 måneders værnepligtsuddannelse indgår et 30-timers udvidet førstehjælpskursus, der følger Dansk Førstehjælpsråds anbefalinger for indhold mv. Herudover modtager de værnepligtige videregående fagspecifik førstehjælp målrettet mod henholdsvis forsvarets og redningsberedskabets særlige brug.

Endvidere har hovedparten af det fastansatte uniformerede personel gennemført førnævnte førstehjælpskursus, ligesom en del af det fastansatte civile personel har gennemført en 12-timers grundlæggende uddannelse i førstehjælp. Alt fastansat personel gennemfører vedligeholdelsesuddannelse minimum hvert tredje år og minimum ved gennemførelse af et 3-timers repetitionskursus i overensstemmelse med Dansk Førstehjælpsråds anbefalinger.

Ved gennemførelsen af førstehjælpsuddannelserne anvendes egne førstehjælpsinstruktører, der er certificeret af Dansk Førstehjælpsråd.

Der uddannes årligt ca. 5.300 værnepligtige i forsvaret og redningsberedskabet.

#### **6.3.2 POLITIET**

I politiets grunduddannelse PG1 indgår et førstehjælpskursus med instruktører fra Dansk Røde Kors. Kurset omfatter 11 lektioner á 45 minutter og afsluttes med en eksamen. I beredskabsuddannelsen indgår ligeledes et element fra førstehjælpsuddannelsen.

På PGIII indgår førstehjælp med 4 lektioner i beredskabsuddannelsen som opfølgning på det på PGI indlærte.



Der uddannes årligt omkring 380 polititjenestemænd. I 2005 forventes dog et antal på ca. 560.

### 6.3.3 AMU (ARBEJDSMARKEDSUDDANNELSE)

Der indgår førstehjælpsuddannelse i alle AMU-systemets grundkurser inden for chaufførområdet. Det er dog kun muligt at erhverve et bevis for gennemført kursus i førstehjælp, såfremt kursisten mod betaling efter grundkursets gennemførelse aflægger prøve for en førstehjælpsinstruktør.

Det skønnes, at der i 2004 blev udstedt ca. 4.000 kursusbeviser.

### 6.3.4 ADR-UDDANNELSE (TRANSPORT AF FARLIGT GODS AD VEJ)

Det fremgår af § 30 i bekendtgørelse nr. 437 af 6. juni 2005 om vejtransport af farligt gods, at førere af køretøjer til vejtransport af farligt gods samt andet personale, som er involveret i vejtransport af farligt gods, skal opfylde de uddannelseskrav, som følger af ADR.

I det grundlæggende uddannelsesprogram for ADR-uddannelsen indgår undervisning i førstehjælp som en del af de individuelle praktiske øvelser.

Det skønnes, at der i 2004 blev udstedt ca. 6.000 ADR-beviser, hvoraf ca. 2.500 blev udstedt efter repetitionskursus.

### 6.3.5 HVIDT OG BLÅT KVALIFIKATIONSBEVIS

Personer, der er fyldt 21 år, som ønsker at føre et dansk registreret køretøj i indenlandsk personbefordring på strækninger, hvis radius er over 50 km fra køretøjets garageanlæg, skal være i besiddelse af både et hvidt og blåt kvalifikationsbevis.

Personer, der ønsker at føre et dansk indregistreret køretøj i international personbefordring, skal være fyldt 23 år og være i besiddelse af både hvidt og blåt kvalifikationsbevis samt kunne godtgøre, at man i mindst to år sammenlagt har virket som fører af køretøjer i godstransport, hvis største tilladte totalvægt er over 3,5 tons, eller som fører af køretøjer i personbefordring.

Ved erhvervelse af hvidt kvalifikationsbevis indgår i undervisningen kendskab til de foranstaltninger, der skal træffes ved færdselsuheld eller andre uheld (f.eks. brand), for så vidt angår køretøjers forsikringsforhold. Ved erhvervelse af blåt kvalifikationsbevis indgår egentlig førstehjælp i undervisningen.



Førere af dansk registrerede køretøjer i godstransport, der ikke er fyldt 21 år, og som fører motorkøretøj, hvis størst tilladte totalvægt inklusiv påhængsvogn eller sættevogn overstiger 7,5 tons, skal være i besiddelse af et kvalifikationsbevis for en tilfredsstillende afslutning af nævnte uddannelse. I denne undervisning indgår blandt andet kendskab til de foranstaltninger, der skal træffes ved færdselsuheld eller andre uheld (f.eks. brand), for så vidt angår køretøjers forsikringsforhold.

Der udstedes årligt ca. 4-5.000 blå kvalifikationsbeviser.

### 6.3.6 TAXI, LIMOUSINE ELLER SYGETRANSPORTKØRETØJ

Personer, der vil føre taxi, limousine eller sygetransportkøretøj, skal have et kørekort til erhvervsmæssig personbefordring til kategori B samt et førerkort. Førerkort udstedes af kommunalbestyrelsen i den kommune, hvor ansøgeren ønsker at arbejde som chauffør.

Et førerkort udstedes for højst 5 år ad gangen. For at få et førerkort, skal ansøgeren blandt andet have gennemgået et chaufførkursus, som også omfatter førstehjælp.

Færdselsstyrelsen har oplyst, at der i 2004 blev udsendt 2.446 opgavesæt til brug på chaufførkursus. Det må formodes, at hovedparten af disse aspiranter har bestået prøven og dermed gennemgået et førstehjælpskursus.



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## **7. STATUS OVER FØRSTEHJÆLP I UDVALGTE LANDE I FORBINDELSE MED KØREUDDANNELSE**

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Arbejdsgruppen har undersøgt status over førstehjælp i forbindelse med køreuddannelsen i de lande, som Danmark sædvanligvis sammenligner sig med. Oplysningerne er indhentet i 2003.

### **7.1 Norge**

I Norge indgik undervisning i førstehjælp i køreuddannelsen indtil 1995, og er igen i 2005 indført som en obligatorisk del af et trafikalt grundkursus i forbindelse med erhvervelse af kørekort til kategori B.

Førstehjælpskurset har en varighed på 4 timer.

### **7.2 Sverige**

Der er i Sverige ikke krav om obligatorisk førstehjælp ved erhvervelse af kørekort.

### **7.3 Finland**

I Finland indgår der ikke egentlig undervisning i førstehjælp i køreuddannelsen, men alene en lektion i hvorledes man skal forholde sig på et ulykkessted.

### **7.4 Tyskland**

I Tyskland skal en køreelev, der ønsker kørekort til kategori A eller B gennemføre træning i livreddende foranstaltninger. Træningen omfatter teori og praktik, som giver eleven tilfredsstillende kendskab til grundlæggende, primær varetagelse af tilskadekomne ved trafikulykker.

For elever, der ønsker kørekort til kategori C og kategori D, skal et egentligt førstehjælpskursus gennemføres.

### **7.5 Holland**

Der er i Holland ikke krav om obligatorisk førstehjælp ved erhvervelse af kørekort.



## **7.6 Schweiz**

I Schweiz er det et krav, at alle, der erhverver kørekort, skal kunne forevise et førstehjælpsbevis, der højst er 6 år gammelt. Kurset, der som et minimum skal omfatte 10 timers uddannelse med 30 % teori og 70 % praktiske øvelser, skal være godkendt af Bundesamt für Strassen.

Målene med førstehjælpsuddannelsen er, at:

- Kunne sørge for sikkerhed på ulykkesstedet.
- Kunne tilkalde hjælp.
- Kunne give livreddende førstehjælp.
- Kende sine egne grænser i en kritisk situation.

## **7.7 Østrig**

I Østrig er et førstehjælpskursus en obligatorisk del af køreuddannelsen. Kurset gennemføres af førstehjælpsinstruktører og har et omfang af 6 timer. Kurset afsluttes ikke med en prøve, men der kræves aktiv deltagelse af køreeleven.

De østrigske myndigheder ønsker, at spørgsmål om førstehjælp skal indgå i køreprøven.

## **7.8 England**

Der er i England ikke krav om obligatorisk førstehjælp ved erhvervelse af kørekort.



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## 8. ARBEJDSGRUPPENS OVERVEJELSER OG KONKLUSIONER OM BRUGEN AF FØRSTEHJÆLP

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Arbejdsgruppen har til brug for sine overvejelser søgt at tilvejebringe nærmere oplysninger om brugen af førstehjælp.

### 8.1 Definition af begrebet førstehjælp

Arbejdsgruppen har drøftet forskellige definitioner på begrebet førstehjælp fra forskellige aktører med berøring til førstehjælpsområdet og er enige om at anvende følgende definition:

”Førstehjælp er det, som en person kan gøre for at hjælpe et menneske, der er kommet til skade eller er blevet akut syg, indtil vedkommende kommer under professionel behandling.”

### 8.2 Førstehjælpens betydning for trafikofre

Arbejdsgruppen har ikke kunnet finde materiale, der specifikt belyser betydningen af førstehjælp i forbindelse med trafikulykker. Arbejdsgruppen har dog fundet artikler, der beskriver nyere undersøgelser (2000 og fremefter) fra det lægefaglige forskningsmiljø, omhandlende genoplivning i forbindelse med ulykker generelt. Artiklerne stammer primært fra Europæisk Råd for Genoplivnings tidsskrift ”Resuscitation”.

Nedenstående artikler omhandler for størstepartens vedkommende kun genoplivning forstået som kunstigt åndedræt og hjertemassage. Det er dog arbejdsgruppens opfattelse, at data og konklusioner fra artiklerne med høj validitet kan overføres til førstehjælpsområdet generelt.

#### 8.2.1 VELVILJEN TIL AT UDØVE FØRSTEHJÆLP

Der er i Sverige gennemført en landsdækkende undersøgelse med 5.000 tilfældigt udvalgte voksne i alderen 18-79 år. Formålet var at undersøge lægmænds velvilje til at udøve førstehjælp (genoplivning). Undersøgelsen viser, at personer, som har gennemgået kursus i førstehjælp, er mere villige til at udøve førstehjælp (genoplivning). Undersøgelsen viser endvidere, at personer, som har vedligeholdt førstehjælpsuddannelsen, er mere villige til at udøve førstehjælp end personer, som ikke har vedligeholdt uddannelsen.

Undersøgelsen er nærmere beskrevet i artiklen ”Willingness of lay person to perform CPR in an emergency. A nationwide survey of lay people trained in CPR or willing to learn”, som er indsat som bilag 1.



## 8.2.2 VELVILJEN TIL AT UDØVE FØRSTEHJÆLP OG BETYDNINGEN AF VARIGHEDEN AF FØRSTEHJÆLPSPKURSET

### Undersøgelse 1

En østrigsk undersøgelse viser, at gennemførelse af en førstehjælpsuddannelse øger velviljen til at udøve førstehjælp. Undersøgelsen viser endvidere, at effekten af den førstehjælp, der ydes, er bedre jo længere tid førstehjælperen har været på kursus.

Undersøgelsen er nærmere beskrevet i artiklen "First aid training increases the consent of lay helpers to start cardio pulmonary resuscitation", som er indsat som bilag 2.

### Undersøgelse 2

Af en østrigsk og tysk undersøgelse af effekten af førstehjælpsuddannelse på den hjælp, der gives, inden professionel hjælp kommer frem, fremgår det, at velviljen til at udøve førstehjælp stiger i sammenhæng med omfanget af den førstehjælpsuddannelse, de pågældende personer har modtaget. Det fremgår endvidere, at effekten af den givne førstehjælp er bedre, når den ydes af personer, som har været på kursus, og at kvaliteten af den givne førstehjælp stiger i sammenhæng med kursets niveau.

Undersøgelsen er nærmere beskrevet i artiklen "Bystander trauma care – effect of level of training", som er indsat som bilag 3.

### Undersøgelse 3

En østrigsk undersøgelse om frekvens og kvalitet af den førstehjælp, der gives, inden professionel hjælp kommer frem til moderat henholdsvis svært tilskadekomne personer, viser, at førstehjælp ofte først ydes til de personer på et skadested, der gør mest opmærksom på sig selv og ikke til dem, der har mest brug for det. Undersøgelsen tyder på, at der bør gives et mere dybdegående kursus og af længere varighed, end det kursus, som personerne i undersøgelsen har modtaget. Ved et mere dybdegående og længerevarende kursus kan deltagernes opfattelse af tilstrækkelig egenkompetence i det at yde førstehjælp etableres – et forhold der mangler ved de korterevarende førstehjælpskurser.

Undersøgelsen er nærmere beskrevet i artiklen "Comparison of bystander trauma care for moderate versus severe injury", som er indsat som bilag 4.





#### **Undersøgelse 4**

En engelsk undersøgelse af glemselskurven efter gennemførelse af førstehjælpskursus viser, at undersøgelsespersonerne allerede 6 måneder efter gennemført førstehjælpskursus har glemt en del af deres førstehjælpsfærdigheder. Undersøgelsen viser endvidere, at færdighedsniveauet igen kan hæves til det oprindelige niveau eller til et højere niveau ved gennemførelse af et 4-timers genopfriskningskursus 6 måneder efter gennemførelse af det første førstehjælpskursus.

Undersøgelsen er nærmere beskrevet i artiklen "Skill acquisition and retention in automated external defibrillator (AED) use and CPR by lay responders: a prospective study", som er indsat som bilag 5.

#### **8.2.3 OVERLEVELSERATEN EFTER HJERTESTOP**

En undersøgelse af overlevelsesraten i fire europæiske regioner viser, at i tilfælde, hvor forbipasserende har udøvet førstehjælp, forhøjes genoplivningsprocenten for tilskadekomne, som senere bliver bragt til et hospital. Undersøgelsen viser endvidere, at sandsynligheden for, at en af de forbipasserende kan yde førstehjælp, stiger i takt med antallet af personer, der har gennemført et førstehjælpskursus.

Undersøgelsen er nærmere beskrevet i artiklen "Resuscitation in Europe: a tale of five European regions", som er indsat som bilag 6.

#### **8.2.4 DANMARKS BEFOLKNINGS SYN PÅ FØRSTEHJÆLP**

Gallup har gennemført en undersøgelse for Tryg i Danmark (nu TrygFonden), som viser, at en stor del af de adspurgte personer, ville føle sig mere trygge i hverdagen, hvis flere kunne førstehjælp, og at næsten alle de adspurgte fandt, at det er vigtigt, at folk kan yde førstehjælp. Undersøgelsen viser endvidere, at en stor del af de adspurgte personer, som ikke kan førstehjælp, er motiverede for at lære det.

Undersøgelsen er nærmere beskrevet i artiklen "Førstehjælp i Danmark", som er indsat som bilag 7.

#### **8.3 Undersøgelse af lægpersoners indsats på skadesteder**

Til brug for arbejdsgruppens vurdering af omfanget af lægpersoners førstehjælpsindsats i forbindelse med færdselsulykker har arbejdsgruppen taget udgangspunkt i nedenstående undersøgelser.



### 8.3.1 UNDERSØGELSE AF LÆGPERSONERS INDSATS PÅ SKADESTEDER I FREDERIKSBORG AMT

Til brug for arbejdsgruppens overvejelser anmodede arbejdsgruppen Falck A/S om en uddybning af de ambulancejournaler, som udfyldes i forbindelse med tilskadekomst, med henblik på at belyse lægpersoners indsats på et skadested. Arbejdsgruppen anmodede om, at der blev foretaget en undersøgelse i to amter, der udviser repræsentative data på landsplan.

Arbejdsgruppen anmodede endvidere om oplysning om:

- Det totale antal tilskadekomster i forbindelse med færdselsuheld indenfor de to amter.
- Hvordan lokaliseringen af skaderne ved tilskadekomst i forbindelse med færdselsuheld fordeler sig.
- I hvor mange tilfælde der er givet behandling før ankomst af ambulance, samt hvordan de forskellige typer af mulige behandlinger fordeler sig på lokaliseringen af tilskadekomsten.
- Hvilken personkategori der har givet behandlingen, herunder oplysning om køn, alder samt, såfremt behandling er ydet af lægmænd, hvorvidt disse har gennemgået kursus i førstehjælp.

Falck oplyste, at det af tekniske grunde ikke var muligt at levere brugbare data, der kunne besvare de af arbejdsgruppen stillede spørgsmål. Falck fremsendte i stedet "Rapport vedrørende førstehjælp udført af lægpersoner i forbindelse med tilskadekomst" udarbejdet i 2004 af Rikke Vita Borre Jakobsen. Rapporten er skrevet på baggrund ambulancepersonales iagttagelser, vurderinger og behandlinger af patienter på skadesteder og under transport til sygehuse i Frederiksborg Amt i perioden 1999-2000.

Det fremgår af rapporten, at formålet med undersøgelsen var at belyse antallet af patienter involveret i færdselsuheld i Frederiksborg Amt og i hvilket omfang, der blev givet førstehjælp af lægpersoner før ankomst af ambulance. Formålet var desuden at belyse hvilken førstehjælp, der blev ydet.

I rapporten konkluderes det, at der sjældent ydes førstehjælp af lægpersoner ved trafikulykker. Af rapporten fremgår det, at dette muligvis skyldes, at det er svært at få overblik på et skadested, og at yde hjælp til den tilskadekomne, som har mest brug herfor. Det fremgår dog, at forklaringen nok i højere grad skal findes i manglende uddannelse og træning i at kunne udøve førstehjælp.

"Rapport vedrørende førstehjælp udført af lægpersoner i forbindelse med tilskadekomst" er indsat som bilag 8.



### 8.3.2 OMFANGET AF FØRSTEHJÆLP UDØVET AF LÆGMAND SAMT EFFEKTEN HERAF

I perioden 1. januar 1998 til 31. december 1998 blev der i Århus gennemført en undersøgelse om omfanget af førstehjælp udøvet af lægmand samt effekten heraf. Undersøgelsen baserer sig på data fra ambulancelægernes journaler udfyldt ved hver udrykning. Undersøgelsen viser bl.a., at der i ca. 12 % af tilfældene (9 ud af 72 patienter) var ydet førstehjælp af lægmand. Det fremgår endvidere af undersøgelsen, at denne procentdel harmonerer med tidligere undersøgelser foretaget i England, København og Odense.

Undersøgelsen er nærmere beskrevet i artiklen "1 års overlevelsen efter avanceret hjertestopbehandling udenfor hospital udført af lægeambulancen i Århus", som er indsat som bilag 9.

### 8.3.3 UNDERSØGELSE FORETAGET AF TRYGFONDEN

TrygFonden har gennemført en undersøgelse af omfanget af lægpersoners førstehjælpsindsats ved ulykker. På baggrund af oplysninger fra Dansk Hjertestopregister, Københavns Brandvæsen og Roskilde Brandvæsen dækkende perioden medio juni til medio august 2004 konkluderes det, at der i dag ydes førstehjælp af lægmand til 16,8% af de tilskadekomne.

## 8.4 Arbejdsgruppens konklusioner

På baggrund af ovenstående undersøgelser kan arbejdsgruppen konkludere, at:

- Sandsynligheden for, at en af de forbipasserende kan yde førstehjælp, stiger i takt med antallet af personer, der har gennemført et førstehjælpskursus.
- Personer, som har gennemgået kursus i førstehjælp er mere villige til at udøve førstehjælp på et skadested end personer, som ikke har gennemgået et førstehjælpskursus.
- Effekten af den førstehjælp, der ydes, er bedre, når man har været på førstehjælpskursus, og stiger med kursets niveau.
- Førstehjælpskursets varighed og niveau skal være tilstrækkelig til, at personerne føler sig kompetente til at yde den nødvendige førstehjælp i en given situation.
- I tilfælde, hvor forbipasserende har udøvet førstehjælp, forhøjes genoplivningsprocenten for tilskadekomne, som senere bliver bragt til et hospital.
- Regelmæssig vedligeholdelse af førstehjælpsuddannelse, er nødvendig for at bibeholde et nødvendigt færdighedsniveau og velvilje til at yde førstehjælp.



- Personer, som har vedligeholdt førstehjælpsuddannelsen er mere villige til at udøve førstehjælp end personer, som ikke har vedligeholdt uddannelsen.

Det er derfor arbejdsgruppens vurdering, at indførelse af krav om obligatorisk førstehjælp i forbindelse med erhvervelse af kørekort til storvognskategorierne først og fremmest vil have en to-sidet effekt:

- Antallet af kompetente førstehjælpere øges.
- Effekten af den ydede førstehjælp øges.

På baggrund af ovenstående er det arbejdsgruppens vurdering, at overlevelseshraten efter trafikulykker må formodes at stige, og at ménvirkningen tilsvarende vil falde. Endvidere må det formodes, at den tid, tilskadekomne tilbringer på sygehuset, vil falde.

Arbejdsgruppen finder således, at der er tilstrækkeligt grundlag for at anbefale, at der indføres krav om obligatorisk færdselsrelateret førstehjælp i forbindelse med køreuddannelsen

Det er herudover arbejdsgruppens opfattelse, at indførelse af krav om obligatorisk færdselsrelateret førstehjælp i forbindelse med erhvervelse af kørekort til storvognskategorierne også vil have en gavnlig effekt på kørekortindehaveres trafikadfærd generelt og dermed højne trafiksikkerheden.



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## 9. FORSLAG TIL KRAV OM FÆRDSRELSRELATERET FØRSTEHJÆLPKURSUS FOR KØREKORTERHVERVERE

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Som nævnt i afsnit 8.4 kan arbejdsgruppen anbefale, at der indføres krav om obligatorisk førstehjælp i forbindelse med erhvervelse af kørekort til storvognskategoriene.

### 9.1 Formulering af krav

Arbejdsgruppen anbefaler, at der udarbejdes et målrettet, færdselsrelateret førstehjælpkursus af så kort varighed, som det vurderes forsvarligt, af hensyn til økonomiske omkostninger samt af hensyn til den enkeltes tidsforbrug

For at optimere førstehjælpen særligt ved trafikulykker finder arbejdsgruppen det vigtigt, at førstehjælpsuddannelsen opbygges omkring færdselsrelaterede emner.

Det er arbejdsgruppens opfattelse, at undervisningen bør forestås af instruktører, som er godkendt af Dansk Førstehjælpsråd.

Arbejdsgruppen finder, at første kursus i færdselsrelateret førstehjælp bør afsluttes ved udstedelse af et kursusbevis, såfremt kursisten af instruktøren vurderes af have tilegnet sig tilstrækkelig viden og færdigheder i henhold til kursets mål.

Et færdselsrelateret førstehjælpkursus bør efter arbejdsgruppens opfattelse gennemføres før erhvervelse af kørekort til storvognskategoriene, og dokumentation for gennemført eller vedligeholdt færdselsrelateret førstehjælpkursus bør derfor foreligge i forbindelse med indlevering af ansøgning om kørekort<sup>ii</sup>.

#### 9.1.1 ALDERSMÆSSIGE BETINGELSER OG GYLDIGHED AF FÆRDSRELSRELATERET FØRSTEHJÆLPSBEVIS

For så vidt angår aldersmæssige betingelser for gennemførelse af færdselsrelateret førstehjælpkursus samt gyldighed af tidligere udstedt bevis finder arbejdsgruppen, at de generelle anbefalinger fra Dansk Førstehjælpsråd i videst muligt omfang bør følges.

Dansk Førstehjælpsråd anbefaler følgende:

- Deltagere på et førstehjælpkursus skal være fyldt 14 år.
- Et førstehjælpkursus skal vedligeholdes minimum hvert 3. år med minimum 3 timer.



Efter Dansk Førstehjælpsråds anbefalinger vil det således være muligt allerede som 14-årig at gennemføre et førstehjælpskursus. Et sådant kursus vil imidlertid ikke opfylde de fulde krav til et færdselsrelateret førstehjælpskursus. Arbejdsgruppen finder, at personer, der har gennemført eller vedligeholdt et førstehjælpskursus, vil opfylde kravet om obligatorisk færdselsrelateret førstehjælpskursus, såfremt de har gennemgået et vedligeholdelseskursus i færdselsrelateret førstehjælp. Ved indlevering af ansøgning om kørekort må bevis for gennemført færdselsrelateret førstehjælpskursus eller færdselsrelateret vedligeholdelseskursus således ikke være mere end 3 år gammelt.

#### **9.1.2 VEDLIGEHOLDELSE AF FÆRDSLSRELATERET FØRSTEHJÆLPSKURSUS**

Arbejdsgruppen finder, at kursus i færdselsrelateret førstehjælp bør vedligeholdes, jf. afsnit 9.1.2 og 11.1.

Arbejdsgruppen finder, at vedligeholdelseskursus i færdselsrelateret førstehjælp bør afsluttes ved udstedelse af et kursusbevis, såfremt kursisten af instruktøren vurderes af have tilegnet sig tilstrækkelig viden og færdigheder i henhold til kursets mål.

#### **9.2 Hjemmel for indførelse af krav**

I henhold til færdselslovens § 57, stk. 2, kan Trafikministeren (nu Justitsministeren) fastsætte yderligere betingelser for erhvervelse af kørekort til motorkøretøj, der benyttes erhvervsmæssigt til befordring af personer, og til visse motorcykler. Trafikministeren (nu Justitsministeren) kan endvidere fastsætte særlige bestemmelser om erhvervelse af kørekort til motorkøretøj, der benyttes til buskørsel, godstransport, transport af farligt gods eller til kørsel med personer eller gods i international trafik.

I medfør af denne bestemmelse kan Justitsministeren administrativt gennem udstedelse af en bekendtgørelse indføre krav om obligatorisk førstehjælp som betingelse for erhvervelse af kørekort til de i § 57, stk. 2, nævnte kategorier samt erhvervsmæssig personbefordring.

#### **9.3 Antallet af personer omfattet af de foreslåede krav**

Det fremgår af afsnit 5.1, at der i 2004 er udstedt ca. 8.000 nye kørekort til lastbil, bus samt stort påhængskøretøj. Herudover er der udstedt ca. 3.300 kørekort til erhvervsmæssig personbefordring til kategori B og D.



Det bemærkes, at det ikke er muligt at vurdere, hvor mange af ovenstående kørekortindehavere der er i besiddelse af kørekort til flere af de nævnte kategorier. Det kan således ikke præcist fastslås, hvor mange nye køreelever, der skal have gennemført et færdselsrelateret førstehjælpskursus, såfremt der indføres krav herom.

### 9.3.1 EKSISTERENDE KRAV I ERHVERVSUDDANNELSER

Der indgår imidlertid allerede i dag førstehjælpsundervisning i forskellige sammenhænge. Ved erhvervelse af førerkort, ADR-bevis og blåt kvalifikationsbevis indgår førstehjælpsundervisning, jf. afsnit 6.3.

### 9.3.2 NY UDDANNELSE AF ERHVERVSCHAUFFØRER

Den 15. juli 2003 udstedte EU et nyt direktiv<sup>iii</sup> om uddannelse af erhvervschauffører i EU.

Direktivet gælder for alle chauffører, der er statsborgere i EU, og omfatter alle chauffører, selvstændige som lønmodtagere, der udfører deres erhverv for egen eller fremmed regning. Undtaget fra direktivet er blandt andet transport med:

- Køretøjer, der ikke kan køre mere end 45 km/t.
- Forsvarets, redningskorpsenes og brandvæsenets køretøjer.
- Køretøjer under reparation.
- Skolevogne.
- Køretøjer, der føres af lærlinge under en erhvervsuddannelse.
- Køretøjer, der benyttes til ikke-erhvervsmæssig personbefordring og varetransport i privat øjemed.
- Køretøjer, der benyttes til at transportere materiel og udstyr, som føreren skal benytte til udøve sit egentlige erhverv, som således ikke er chauffør.

Nuværende chauffører er ikke forpligtet til at gennemføre det omtalte uddannelsesforløb. Reglerne gælder for godschauffører, hvis kørekort udstedes senest den 10. september 2009 og tilsvarende for buschauffører, hvis kørekort udstedes senest den 10. september 2008.

I korte træk indeholder EU-direktivet bestemmelser om grunduddannelse for alle nye chauffører og efteruddannelse for alle chauffører.



Grunduddannelsen omfatter "Videreuddannelse i rationel kørsel med hovedvægt på sikkerhed", "Anvendelse af reglerne" og "Sundhed, færdselssikkerhed og miljøssikkerhed, service og logistik". EU-direktivet nævner i stikords-form hvilke emneområder, grunduddannelsen som et minimum skal omfatte. Heri indgår blandt andet den målsætning at kunne vurdere nødsituationer, herunder førstehjælp.

De obligatoriske efteruddannelseskurser skal have en varighed på 35 timer hvert femte år og afholdes over perioder på mindst 7 timer. Efteruddannelsen tager sigte på at give deltagerne mulighed for at ajourføre kundskaber, som er væsentlige for deres arbejde, idet der lægges særlig vægt på færdselssikkerhed og rationelt brændstofforbrug. Det fremgår ikke af direktivet, hvilket indhold eller varighed "førstehjælpsdelen" har.

Grundkursets varighed skal enten gennemføres som et intensivt grundlæggende kvalifikationskursus (kort kursus) på mindst 140 timer (4 uger á 35 timer) og med mindst 10 individuelle køretimer eller et fuldstændigt kvalifikationskursus (langt kursus) på mindst 280 timer (8 uger á 35 timer), som skal omfatte mindst 20 individuelle køretimer.

Efteruddannelsen har til formål at uddybe og repetere nogle af de emner, der er nævnt nedenfor vedrørende grunduddannelsen. Kravet om en uges (37 timers) efteruddannelse pr. 5 år træder i kraft pr. 10. september 2008 for buschaufførernes vedkommende. For godschaufførernes vedkommende træder kravet i kraft pr. 10. september 2009.

Arbejdsgruppen kan på baggrund af bestemmelserne i direktivet om grunduddannelsens indhold og varighed konkludere, at førstehjælpsdelen udgør en mindre del af grunduddannelsen.

### 9.3.3 SAMMENFATNING

Det er arbejdsgruppens opfattelse, at færdselsrelaterede førstehjælpskurser er så væsentlige, at der udover de eksisterende krav om førstehjælp med fordel kan stilles krav herom i forbindelse med erhvervelse af kørekort til storvognskategoriene.

### 9.3.4 MERITORDNINGER

Arbejdsgruppen finder, at personer, der tidligere har gennemført et førstehjælpskursus, vil kunne opnå merit for dele af kurset, såfremt de i forbindelse med erhvervelse af kørekort har gennemgået et vedligeholdelseskursus i færdselsrelateret førstehjælp, jf. afsnit 9.3.4.





### 9.3.5 KAPACITET

Arbejdsgruppen vurderer på baggrund af oplysninger fra Dansk Førstehjælpsråd, at den nuværende uddannelseskapacitet på ca. 140.000 kursister årligt kan udvides med op til 50 %, uden der opstår behov for udvidelse af antallet af instruktører.

### 9.3.6 BETALING FOR KURSUS

Arbejdsgruppen anbefaler, at undervisning i færdselsrelateret førstehjælp af pædagogiske grunde gennemføres i hold af maksimalt 12 kursister, idet undervisningen fortrinsvis struktureres og gennemføres som praktisk case- og færdighedsundervisning.

Det anslås, at kursusafgiften for den enkelte ved hold af maksimalt 12 personer vil beløbe sig til ca. 385 kr., idet der er taget udgangspunkt i nedenstående beløb, som er oplyst af Dansk Førstehjælpsråd:

- Undervisningsbog: Ca. 35 kr.
- Instruktørhonorar:  $(7,5 \times 300 \text{ kr.}) : 12 = 187,50 \text{ kr.}$
- Kursusmaterialer mv.<sup>iv</sup>: 100 kr.
- Administrationsomkostninger: 15 kr.
- Fortjeneste: 17%<sup>v</sup>.

På baggrund af ovennævnte beløb anslås det endvidere, at kursusafgiften for et 3-timers vedligeholdelseskursus i færdselsrelateret førstehjælp vil beløbe sig til ca. 215 kr., idet der ved beregningen ikke er medtaget udgift til undervisningsbog.



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## 10. FORSLAG TIL INDHOLD AF FÆRDSLSRELATERET FØRSTEHJÆLPKURSUS

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Arbejdsgruppen har til brug for overvejelserne om indholdet af et færdselsrelateret førstehjælpkursus modtaget forslag til indhold fra Dansk Førstehjælpsråd. Forslaget er indsat som bilag 10.

### 10.1 Omfang

Arbejdsgruppen anbefaler, at det færdselsrelaterede førstehjælpkursus skal omfatte 7,5 timers undervisning indeholdende:

- Førstehjælp i basal genoplivning (3 timer).
- Færdselsrelateret førstehjælp og ulykkesforebyggelse målrettet førere af storvognskategorier (4,5 timer).

Det anbefales endvidere, at undervisningen gives en handlingsorienteret, praktisk tilgangsvinkel, hvilket medfører, at undervisningen struktureres og gennemføres som case- og færdighedsundervisning, dog med mindre seancer indlagt, hvor den nødvendige teoretiske baggrundsforståelse gives.

Case- og færdighedsundervisningen opbygges omkring typiske ulykkes- og skadetyper på et skadested i trafikken.

Endelig anbefales det, at det færdselsrelaterede førstehjælpkursus indeholder elementer af forebyggende karakter, for at give deltageren viden om de ulykkesforebyggende tiltag, der kan indarbejdes i førerens anvendelse af køretøjet.

### 10.2 Indhold og niveau

Arbejdsgruppen anbefaler, at færdselsrelateret førstehjælpkursus skal have følgende indhold og niveau:

#### Genoplivning

Ved uddannelsens afslutning skal deltageren kunne anvende basal genoplivning (BLS) til en bevidstløs med vejrtrækning og til en bevidstløs uden livstegn.

Resultatet er tilfredsstillende, såfremt deltageren:



- Sikrer sig, at ulykken er standset.
- Undersøger bevidsthedsniveau ved at tale, ruske og eventuelt smertepåvirke.
- Bruger "hoved-bøj/kæbe-skub" ("head-tilt/chin-lift manoeuvre") til at skabe frie luftveje.
- Undersøger vejrtrækning ved at se, føle og lytte.
- Opretholder frie luftveje under kunstigt åndedræt.
- Benytter mund-til-mund-metode som førstevalg og mund-til-næse-metode som andet valg ved kunstigt åndedræt.
- Ved kunstigt åndedræt blæser, til brystkassen synligt hæver sig.
- Ved konstatering af livstegn observerer for:
  - vejrtrækningsforsøg.
  - Bevægelse/trækninger.
  - Hoste.
- Udpeger trykstedet til nederste halvdel af brystbenet uanset aldersgruppe.
- Giver hjertemassage med frekvensen minimum 100 tryk min-1 uanset aldersgruppe.
- Anvender forholdet 15:2 (tryk/kunstigt åndedræt) ved voksne og 5:1 (tryk/kunstigt åndedræt) ved spædbørn og småbørn.
- Initialt giver kunstigt åndedræt i 1 minut til spædbørn.
- Kan lejre den tilskadekomne i aflåst sideleje.

#### **Færdselsrelateret førstehjælp og ulykkesforebyggelse**

Ved uddannelsens afslutning skal deltageren kunne agere initiativrigt og hensigtsmæssigt på et skadested relateret til transportområdet, herunder kunne yde den nødvendige førstehjælp til områdets typiske og alvorligere skadestyper. Endvidere skal deltageren være vidende om de ulykkesforebyggende tiltag, der kan indarbejdes i det daglige arbejde.

Arbejdsgruppen finder, at resultatet er tilfredsstillende, såfremt deltageren:

- Forhold ved større ulykker relateret til trafikområdet.
  - Skaber overblik over skaden og de tilskadekomne.
  - Sikrer skadestedet, så det er sikkert at færdes på – herunder tager de nødvendige forholdsregler for ikke selv at udsætte sig for fare.



- Vurderer de enkelte tilskadekomnes skader.
- Prioriterer, hvem der skal have hvilken førstehjælp i hvilken rækkefølge samt behov for eventuelt nødflytning.
- Anvender eventuelt hjælpere ud fra deres førstehjælpskundskaber og de tilskadekomnes skader og tilstand.
- Alarmerer hensigtsmæssigt i forløbet.
- **ABC-systemet, den livsvigtige ilttransport.**
  - Gengiver den livsvigtige ilttransport.
  - Undersøger den livsvigtige ilttransport i rækkefølgen ABC.
  - Giver førstehjælp ved ulykker, der omhandler luftvejene.
    - Skaber frie luftveje.
  - Giver førstehjælp ved ulykker, der medfører nedsat eller standset vejtrækning.
    - Giver kunstigt åndedræt.
  - Giver førstehjælp ved ulykker, der medfører nedsat eller standset cirkulation.
    - Anlægger forbindinger ved store blødninger.
    - Giver kunstigt åndedræt og hjertemassage.
  - Lægger den tilskadekomne i aflåst sideleje for at sikre frie luftveje eller observerer denne, indtil redningsmandskab tager over.
- **Hovedlæsioner, brud på nakke, rygsøjle og bækken.**
  - Gengiver virkning og symptomer ved læsioner på/i kraniet.
  - Demonstrerer førstehjælp ved ulykker med læsioner på/i kraniet.
  - Gengiver virkning og symptomer ved læsioner på rygsøjlen og bækkenet.
  - Gengiver mulige komplikationer i forhold til læsioner på rygsøjlen og bækkenet samt forholdsregler.
  - Demonstrerer førstehjælpen ved ulykker med læsioner på rygsøjlen og bækkenet.



- **Knoglebrud.**
  - Gengiver virkning og symptomer for knoglebrud på fingre, tæer, hånd- og fodrod samt brud på ekstremiteterne.
  - Afgør, om et brud er åbent eller lukket.
  - Støtter bruddet i findestillingen.
  - Forbinder om muligt åbne brud samt minimerer forureningsrisiko.
- **Shock.**
  - Gengiver virkning og symptomer ved Shock.
  - Giver eksempler på de typer af Shock, der omtales i forbindelse med førstehjælp.
  - Demonstrerer forebyggelse af shock i forbindelse med ulykker (og livstruende sygdom).
- **Forbrændinger.**
  - Gengiver forbrændingers virkning og symptomer.
  - Demonstrerer førstehjælp ved større forbrændinger.
- **Psykisk førstehjælp.**
  - Skaber ro og fremtræder roligt og kompetent.
  - Optræder bestemt over for øvrige hjælpere.
  - Viser omsorg og sætter sig i den tilskadekomnes situation.
  - Lytter til den tilskadekomne og bruger den nødvendige tid til og nærvær i samtalen.
- **Revurderer sin undersøgelse af ABC og tager resultatet med i den videre ydelse af førstehjælpen.**
- **Foretager top til tå undersøgelse.**
- **Overleverer den tilskadekomne til redningsmandskabet.**
- **Forebygger ulykker inden for transportområdet.**



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## **11. VEDLIGEHODELSE AF FÆRDSLSRELATERET FØRSTEHJÆLSKURSUS**

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I overensstemmelse med anbefalingerne fra Dansk Førstehjælpsråd finder arbejdsgruppen det hensigtsmæssigt, at det gennemførte færdselsrelaterede førstehjælpskursus bør vedligeholdes.

Arbejdsgruppen finder, at det er nødvendigt, at den erhvervede viden om og færdigheder i færdselsrelateret førstehjælp jævnligt vedligeholdes for at bevare et virksomt førstehjælpsredskab hos den enkelte.

### **11.1 Vedligeholdelse af færdselsrelateret førstehjælpskursus**

Dansk Førstehjælpsråd anbefaler generelt, at førstehjælpskurser vedligeholdes hvert 3. år. Arbejdsgruppen finder, at denne anbefaling i videst muligt omfang også bør omfatte vedligeholdelse af den færdselsrelaterede førstehjælp.

### **11.2 Indhold af vedligeholdelseskursus i færdselsrelateret førstehjælpskursus**

Indholdet af vedligeholdelseskursus i færdselsrelateret førstehjælp bør omfatte repetition af den oprindeligt erhvervede viden om og færdigheder i færdselsrelateret førstehjælp og ulykkesforebyggelse, jf. afsnit 10. Det anslås, at dette mål kan opnås ved gennemførelse af et 3-timers vedligeholdelseskursus.



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## 12. KONKLUSIONER

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Arbejdsgruppens anbefalinger er sammenfattet i afsnit 3.

Arbejdsgruppen har drøftet forskellige definitioner på begrebet førstehjælp fra forskellige aktører med berøring til førstehjælpsområdet og konkluderet, at følgende definition kan lægges til grund for arbejdsgruppens rapport: "Førstehjælp er det, som en person kan gøre for at hjælpe et menneske, der er kommet til skade eller er blevet akut syg, indtil vedkommende kommer under professionel behandling."

På baggrund af tidligere nævnte undersøgelser har arbejdsgruppen konkluderet, at:

- Sandsynligheden for, at en forbipasserende kan yde førstehjælp, stiger i takt med antallet af personer, der har gennemført et førstehjælpskursus.
- Personer, som har gennemgået kursus i førstehjælp, er mere villige til at udøve førstehjælp på et skadested end personer, som ikke har gennemgået et førstehjælpskursus.
- Effekten af den førstehjælp, der ydes, er bedre, når man har været på førstehjælpskursus og stiger med kursets niveau.
- Førstehjælpskursets varighed og niveau skal være tilstrækkelig til, at deltagerne efterfølgende føler sig kompetente til at yde den nødvendige førstehjælp i en given situation.
- I tilfælde, hvor forbipasserende har udøvet førstehjælp, forhøjes genoplivningsprocenten for tilskadekomne, som senere bliver bragt til et hospital.
- Regelmæssig vedligeholdelse af førstehjælpsuddannelse er nødvendig for at bibeholde et nødvendigt færdighedsniveau og velvilje til at yde førstehjælp.
- Personer, som har vedligeholdt førstehjælpsuddannelsen, er mere villige til at udøve førstehjælp end personer, som ikke har vedligeholdt uddannelsen.

Arbejdsgruppen har endvidere konkluderet, at indførelse af krav om obligatorisk førstehjælp i forbindelse med erhvervelse af kørekort til storvognskategorierne først og fremmest vil have en to-sidet effekt:

- Antallet af kompetente førstehjælpere øges.
- Effekten af den ydede førstehjælp øges.



På baggrund af ovenstående er det arbejdsgruppens vurdering, at overlevelsesraten efter trafikulykker må formodes at stige, og at ménvirkningen tilsvarende vil falde hos den enkelte. Endvidere må det formodes, at den tid, tilskadekomne tilbringer på sygehuset, vil falde.

Arbejdsgruppen har endvidere konkluderet, at indførelse af krav om obligatorisk førstehjælp i forbindelse med erhvervelse af kørekort må formodes også at have en gavnlig effekt på kørekortindehaveres trafikadfærd generelt og dermed højne trafiksikkerheden. Arbejdsgruppen finder således, at de økonomiske omkostninger og elevernes tidsforbrug må antages at stå mål med den færdselssikkerhedsmæssige gevinst.

Arbejdsgruppen har på denne baggrund konkluderet, at der er tilstrækkeligt grundlag for at anbefale, at der indføres krav om obligatorisk færdselsrelateret førstehjælp i forbindelse med erhvervelse af kørekort til storvognskategorierne.

Arbejdsgruppen har endvidere konkluderet, at det er betænkeligt at lade den færdselsrelaterede førstehjælp indgå i selve køreuddannelsen, hvorfor kursus eller vedligeholdelseskursus i færdselsrelateret førstehjælp skal være gennemført før erhvervelse af kørekort til storvognskategorierne, således at dokumentation for gennemført kursus foreligger i forbindelse med indlevering af ansøgning om kørekort.

Indholdet af et relevant førstehjælpskursus har været drøftet, og arbejdsgruppen har konkluderet, at såfremt kendskab til førstehjælp skal have en gunstig effekt, forudsætter dette, at uddannelsen er målrettet på færdslen og orienteres mod praktiske situationer.

Arbejdsgruppen finder endvidere, at det er nødvendigt, at den erhvervede viden om og færdigheder i færdselsrelateret førstehjælp jævnligt vedligeholdes for at bevare et virksomt førstehjælpsberedskab hos den enkelte.

For så vidt angår selve undervisningen har arbejdsgruppen konkluderet, at undervisningen bør forestås af instruktører, som er godkendt af Dansk Førstehjælpsråd, at undervisningen gennemføres i hold af maksimalt 12 kursister, samt at undervisningen skal strække sig over 7,5 timer indeholdende førstehjælp i basal genoplivning (3 timer) samt færdselsrelateret førstehjælp og ulykkesforebyggelse målrettet mod førere af storvognskategorier (4,5 timer). Arbejdsgruppen har endvidere konkluderet, at undervisningen skal have en handlingsorienteret, praktisk tilgangsvinkel, og at case- og færdighedsundervisningen bør opbygges omkring typiske ulykkes- og skadestyper på et skadested relateret til transportområdet, samt at det færdselsrelaterede førstehjælpskursus bør indeholde elementer af forebyggende karakter for at give deltageren viden om de ulykkesforebyggende tiltag, der kan indarbejdes i kørekortindehavernes anvendelse af køretøjet.





På baggrund af oplysninger fra Dansk Førstehjælpsråd har arbejdsgruppen konkluderet, at den nuværende uddannelseskapacitet på ca. 140.000 kursister årligt kan udvides med op til 50 %, uden der opstår behov for en udvidelse af antallet af instruktører.

Arbejdsgruppen har endelig konkluderet, at indførelse af krav om obligatorisk førstehjælp i forbindelse med erhvervelse af kørekort ikke kræver en lovændring, idet Justitsministeren i medfør af færdselslovens § 57, stk. 2, administrativt gennem udstedelse af en bekendtgørelse kan indføre krav om obligatorisk førstehjælp som betingelse for erhvervelse af kørekort til de i § 57, stk. 2, nævnte kategorier samt erhvervsmæssig personbefordring.

Arbejdsgruppen har drøftet hvorvidt kravet om færdselsrelateret førstehjælp bør omfatte samtlige kørekortkategorier, men har ikke taget stilling hertil, da dette falder udenfor arbejdsgruppens kommissorium.



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## 13. ADMINISTRATIVE OG ØKONOMISKE KONSEKVENSER

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Gennemførelse af arbejdsgruppens anbefalinger forventes af få administrative og økonomiske konsekvenser.

### 13.1 Administrative konsekvenser.

Indførelsen af obligatorisk førstehjælp i forbindelse med erhvervelse af kørekort til storvognskategorierne vil medføre, at det ved indlevering af ansøgning om kørekort hertil skal undersøges, hvorvidt der er vedlagt gyldigt bevis for gennemført kursus (eller vedligeholdelseskursus) i færdselsrelateret førstehjælp.

### 13.2 Økonomiske konsekvenser

Indførelsen af obligatorisk førstehjælp forud for erhvervelse af kørekort vil medføre en udgift for hver enkelt køreelev svarende til afgiften for deltagelse i kursus (eller vedligeholdelseskursus) i færdselsrelateret førstehjælp.



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## 14. BILAGSOVERSIGT

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- Bilag 1: "Willingness of lay person to perform CPR in an emergency. A nationwide survey of lay people trained in CPR or willing to learn".
- Bilag 2: "First aid training increases the consent of lay helpers to start cardio pulmonary resuscitation".
- Bilag 3: "Bystander trauma care – effect of level of training".
- Bilag 4: "Comparison of bystander trauma care for moderate versus severe injury".
- Bilag 5: "Skill acquisition and retention in automated external defibrillator (AED) use and CPR by lay responders: a prospective study".
- Bilag 6: "Resuscitation in Europe: a tale of five European regions".
- Bilag 7: "Førstehjælp i Danmark".
- Bilag 8: "Rapport vedrørende førstehjælp udført af lægpersoner i forbindelse med tilskadekomst".
- Bilag 9: "1 års overlevelsen efter avanceret hjertestopbehandling udenfor hospital udført af lægeambulancen i Århus".
- Bilag 10: Forslag til indhold af et færdselsrelateret førstehjælpskursus modtaget fra Dansk Førstehjælpsråd.



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## 15. KILDEHENVISNINGER

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- Europæisk Råd for Genoplivnings tidsskrift "Resuscitation".
- Beretning fra 1995 fra Færdselssikkerhedskommissionens arbejdsgruppe vedrørende Færdsel og Førstehjælp.
- Statistik fra Vejsektoren.
- Rigspolitiets statistik over køreprøver.
- "Rapport vedrørende førstehjælp udført af lægpersoner i forbindelse med tilskadekomst" udarbejdet i 2004 af Rikke Vita Borre Jakobsen.
- TrygFondens undersøgelse af omfanget af lægpersoners førstehjælpsindsats ved ulykker.



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## 16. NOTER

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<sup>i</sup> Beredskabsforbundet administrerer de statslige tilskudsmidler til befolkningsuddannelsen i elementær førstehjælp (12-timers grundkursus i førstehjælp) og elementær brandbekæmpelse (3-timers kursus i elementær brandbekæmpelse). Beredskabsforbundet gennemfører kurserne i befolkningsuddannelsen sammen med ASF-Dansk Folkehjælp og Dansk Røde Kors. Deltagerne på førstehjælpskurserne betaler et administrationsgebyr på 125 kr. for at deltage på kurset. Resten af omkostningerne betales af de statslige midler, hvortil der er afsat 4 mio. kr.

<sup>ii</sup> Det kan oplyses, at bevis for gennemført kursus i alkohol og trafik (A/T-kursus) på tilsvarende måde skal vedlægges ansøgning om kørekort i forbindelse med generhvervelse af førerretten efter ubetinget frakendelse som følge af spirituskørsel.

<sup>iii</sup> Europa-Parlamentets og Rådets "Direktiv om grundlæggende kvalifikationskrav og efteruddannelseskrav for førere af visse køretøjer, der benyttes til godstransport og personbefordring ad vej".

<sup>iv</sup> Bandage, dukker, lokaleleje mv.

<sup>v</sup> Ved ydelser, som har karakter af indkomstdækket virksomhed, må statslige virksomheder maksimalt indberegne en fortjeneste på 17 %.

# **Bilag 1**

WILLINGNESS OF LAY PEOPLE TO PERFORM CPR IN AN EMERGENCY. A NATIONWIDE SURVEY OF LAY PEOPLE TRAINED IN CPR OR WILLING TO LEARN

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*Aim:* To analyse the willingness of lay people to perform CPR in an emergency, and to investigate differences with regard to gender, age, number of courses and recentness of CPR training. *Methods:* In a nation wide survey, 5000 randomly selected adults, aged >18 to <79 years, were approached with a postal questionnaire, resulting in 3167 responders. This study deals with the 2153 respondents reported to have trained CPR (1345) or willing to learn (808). *Results:* The mean age was 42 (+15) years and 56% were women; 21% had been trained within the last 2.5 years (1998–2000), 41% had been trained before 1998 and 38% were not yet trained but willing to learn CPR; 34% had attended one CPR course and 29% more than one; 78% of the respondents stated that they would be willing to start CPR if a close friend or relative collapsed in their presence. Men ( $P < 0.0001$ ), younger respondents ( $P = 0.04$ ), those trained more than once ( $P < 0.0001$ ) and those trained within the last 2.5 years ( $P = 0.0006$ ) stated more frequently that they would be willing to start CPR. Women ( $P = 0.0008$ ) and untrained respondents ( $P < 0.0001$ ) stated that CPR instructions from medical dispatchers could be helpful. When predicting their willingness to perform CPR in two scenarios, 82% stated willingness to start CPR on a known neighbour and 64% on an unknown person. Men ( $P = 0.04$ ), younger respondents ( $P = 0.002$ ) and those trained more than once ( $P < 0.0001$ ) stated more frequently willingness to start CPR on a known neighbour. Men ( $P = 0.0002$ ) and respondents trained more than once ( $P = 0.004$ ) stated more frequently willingness to start CPR on an unknown person. *Conclusion:* Willingness to perform CPR on a known person was high among lay rescuers in Sweden. Gender and number of CPR courses were recurrent factors having a significant impact on readiness to intervene in a cardiac arrest situation.

## **Bilag 2**



## FIRST AID TRAINING INCREASES THE CONSENT OF LAY HELPERS TO START CARDIO PULMONARY RESUSCITATION

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*Purpose:* Only 30% of people trained in first aid use their knowledge in an emergency. Many potential helpers may hesitate to provide help because of worries that they could harm the patient. Although it is believed that first aid training increases "the willingness to help" no prospective data was available. Therefore our study was carried out to determine if first aid training is able to increase the number of people who are willing to provide Cardio-Pulmonary-Resuscitation (CPR). *Methods:* From September 2002 until January 2003 we asked participants of first aid courses to complete a questionnaire to assess their willingness to start CPR before (t1) and after their 16 h training (t2) with a 4 point scale (1 = no, 2 = rather no, 3 = rather yes, 4 = yes). Measures were compared by ANOVA. A *P*-value <0.05 was considered statistically significant. *Results:* The results are given in mean  $\pm$  S.D. The willingness to start CPR was improved from: rather "no" (t1:  $2.39 \pm 0.91$ ) to "yes" (t2:  $3.73 \pm 0.47$ ; *P* < 0.001). The willingness to call the emergency medical service was not affected significantly (t1: "yes"  $3.98 \pm 0.19$  t2:  $3.94 \pm 0.32$ ; *P* = 0.075). The willingness of course participants to recruit other persons to start CPR efforts decreased significantly from "yes" (t1:  $3.12 \pm 0.89$ ) to "rather yes" (t2:  $2.45 \pm 1.01$ ; *P* < 0.001). Before the course willingness to start CPR was given for family members ( $3.71 \pm 0.62$ ) or friends ( $3.68 \pm 0.64$ ) more easily than for co-workers ( $3.51 \pm 0.78$ ), neighbours ( $3.45 \pm 0.81$ ) or unknown persons ( $3.16 \pm 0.95$ ). Nevertheless these levels were raised significantly (*P* < 0.001) in all groups. *Conclusions:* We concluded that first aid training is appropriate to increase the sense of competence in lay rescuers.

### Reference

- [1] Johnston TC, et al. Factors influencing Queenslanders' willingness to perform bystander cardiopulmonary resuscitation. *Resuscitation* 2003;56(1):67-75.

## **Bilag 3**



## Bystander trauma care—effect of the level of training

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### Abstract

**Background:** The bystander is often the first person present at the scene of an accident. Our aim was to determine how often and how well bystanders perform trauma care and whether trauma care is affected by the bystander's level of training, relationship to the patient and numbers of bystanders present. **Patients and methods:** In a prospective 1-year study, the emergency medical service in two European cities collected data on trauma calls. Questionnaires were used to document the bystanders' level of training (none, basic, advanced, professional), the bystander's relationship to the patient, and the number of bystanders present, and to assess whether five separate measures of trauma care (ensuring scene safety, extrication of the patient, positioning, control of haemorrhage, prevention of hypothermia) were performed correctly, incorrectly, or not at all. **Results:** Two thousand nine hundred and thirty-two trauma calls were documented and bystanders were present in 1720 (58.7%). All measures except ensuring scene safety and prevention of hypothermia were affected by the bystander's level of training. Correct extrication, positioning, and control of haemorrhage increased with the level of bystander training while the number of patients who were not attended decreased ( $P < 0.05$ ,  $P < 0.005$ ,  $P < 0.005$ ), respectively. The relationship to the patient did not affect whether, or how well, any measure was performed. The number of bystanders present only affected prevention of hypothermia, which was performed most often when only one bystander was present. **Conclusion:** Improved, more widespread training could increase the frequency and quality of bystander trauma care further.

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**Keywords:** Basic life support (BLS); Bystander; Emergency treatment; Training; Trauma

### Resumo

**Contexto:** As testemunhas são frequentemente a primeira pessoa presente no local do acidente. O nosso objectivo é determinar qual é a frequência e como são desempenhados os cuidados de trauma, e em que medida é que os cuidados de trauma são afectados pelo nível de treino das testemunhas, seu relacionamento com o doente e número presente. **Doentes e métodos:** Num estudo prospectivo de um ano, os serviços de Emergência Médica em duas cidades Europeias recolheram dados sobre as chamadas por trauma. Foram utilizados questionários para documentar o nível de treino das testemunhas (nenhum, básico, avançado, profissional), o relacionamento das testemunhas com o doente, e o número de testemunhas presentes, e para avaliar se estas 5 medidas (assegurar a segurança no local, extracção das vítimas, posicionamento, controlo da hemorragia, prevenção da hipotermia) separadas dos cuidados de trauma foram realizadas de forma correcta ou não. **Resultados:** Foram documentadas duas mil novecentas e trinta e duas chamadas por trauma e as testemunhas estiveram presentes em 1720 (58.7%). Todas as medidas, com a excepção da segurança no local e da prevenção da hipotermia, foram afectadas pelo nível de treino das testemunhas. A extracção correcta, o posicionamento e o controlo da hemorragia aumentaram com o nível de treino das testemunhas enquanto que o número de doentes que não foram socorridos diminuiu ( $P < 0.05$ ,  $P < 0.005$ ,  $P < 0.005$ ), respectivamente. O relacionamento com o doente não afectou quando, ou de que forma, qualquer das medidas foi realizada. O número de testemunhas presentes apenas afectou a prevenção da hipotermia, a qual foi desempenhada pior quando estava presente apenas uma testemunha. **Conclusão:** A melhoria do treino e o treino mais alargado pode aumentar a frequência e a qualidade dos cuidados de trauma prestados pelas testemunhas.

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**Palavras chave:** Suporte Básico de Vida (SBV); Testemunha; Tratamento Emergente; Treino; Trauma

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## Resumen

**Antecedentes:** El testigo reanimador es frecuentemente la primera persona que se presenta en la escena de un accidente. Nuestro objetivo fue determinar que tan frecuentemente y que tan bien realizan los cuidados de trauma estos testigos reanimadores, y analizar si los cuidados de trauma son afectados por el nivel de entrenamiento de esta persona, su relación con el paciente y el número de ellos presentes. **Pacientes y Métodos:** Los servicios de emergencias médicas en dos ciudades europeas recolectaron los datos de llamadas de trauma en un estudio prospectivo de un año. Se usaron cuestionarios para documentar el nivel de entrenamiento de los testigos reanimadores (ninguno, básico, avanzado, profesional), la relación entre el testigo reanimador y el paciente, y el número de testigos presentes en el evento y para evaluar si 5 medidas separadas de cuidados de trauma (garantizar seguridad de la escena, extracción del paciente, posicionamiento, control de la hemorragia, prevención de la hipotermia) fueron realizadas correctamente, incorrectamente o no fueron realizadas en absoluto. **Resultados:** Se documentaron 2932 llamadas de trauma, y hubo testigos reanimadores presentes en 1720 (58.7%) de ellas. Todas las medidas salvo garantizar seguridad y prevenir hipotermia fueron afectadas por el nivel de entrenamiento. La correcta extracción, posicionamiento y control de hemorragia aumentó con el nivel de entrenamiento del testigo reanimador, al tiempo que el número de pacientes sin atención disminuyó ( $P < 0.05$ ,  $P < 0.005$ ,  $P < 0.005$ ), respectivamente. La relación con el paciente no afectó si acaso realizó o que tan bien realizó cualquier medida. El número de testigos reanimadores presentes afectaron la prevención de la hipotermia, la que fue realizada con más frecuencia cuando había presente solo un testigo reanimador. **Conclusión:** Entrenamiento mejorado y ampliamente difundido mejoraría la frecuencia y calidad de la atención de trauma por testigos reanimadores.

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**Palabras clave:** Soporte vital básico (SVB); Testigo reanimador; Tratamiento de emergencia; Entrenamiento; Trauma

## 1. Introduction

The chain of survival following trauma begins at the scene of the accident. Prehospital care by the emergency medical services (EMS) has been investigated more closely in recent years [1] and efforts at improvement are being made continuously [2–5]. However, since the bystander rather than the EMS is often first to be present at the scene of an accident, the trauma patient is often dependent upon the bystander's response—upon his or her capability to provide basic life support [6]. Though important and sometimes crucial, the bystander's response is still a neglected link in the chain of survival following trauma [7–9].

In contrast, the bystander's response and capability to provide cardiopulmonary resuscitation in non-trauma-related incidents has been investigated extensively [10–17] and some studies have surveyed large numbers of patients [18–24]. Two major studies which investigated the bystander's qualifications to provide basic life support, found considerable shortcomings [8,10]. Both studies investigated all calls associated with prehospital care in rural areas, regardless of whether they were related to trauma or not. Our study was designed to investigate only trauma-related calls associated with prehospital care in urban areas. The primary aim of our study was to determine how often, and how well, bystanders perform necessary measures of trauma care before the EMS arrives at the scene of an accident. The second aim of our study was to determine whether bystander trauma care is affected by the bystander's level of training, the bystander's relationship to the trauma patient and by the number of bystanders present at the scene of an accident.

## 2. Patients and methods

### 2.1. Setting

This prospective study focused upon trauma calls in urban settings. It was conducted in two German-speaking Central European cities, Vienna and Mainz. In both Vienna and Mainz, the EMS is organised and operated in a similar way and employs both physicians certified in emergency medicine and paramedics. The EMS operates helicopter-staffed with a physician, mobile intensive care units and rapid response units staffed with one physician and one paramedic.

### 2.2. Collection of data

According to Austrian and German law, Ethics Committee approval would not have been required since data were merely collected and evaluated but no clinical decisions were based upon the results. Nevertheless, in both Vienna and Mainz, the protocol of the study was submitted to the local Ethics Committees, which waived the need for informed consent.

The study was designed and surveyed by physicians certified in anaesthesia and intensive care and in emergency medicine at the Lorenz Boehler Trauma Centre in Vienna or at the Johannes Gutenberg-University of Mainz. The participating physicians specified the data to be collected in co-operation with the EMS in Vienna and Mainz. They developed a structured questionnaire, which was subsequently pre-tested, and discussed with, the EMS personnel. The questionnaire was tested in the field and final improvements were made in co-operation with the EMS personnel prior to beginning the study. The EMS personnel called to the

of an accident filled out the questionnaire immediately after finishing the call. In Vienna, the study was conducted for 4 months (March–June 2000) and the questionnaire was completed for every trauma patient attended by the Vienna EMS. In Mainz, the study was conducted for 12 months (July 2000–June 2001) and the questionnaire was completed mainly for severely traumatised patients attended by the Mainz EMS. The structured questionnaire gathered information on:

- **Patients:** Age, gender, cause of trauma, pattern of trauma, trauma score according to the classification of the National Advisory Committee of Aeronautics (NACA) Score [25], Glasgow Coma Score, outcome up to admittance to hospital.
- **Bystanders:** Bystanders were included in the study only if they had been present at the scene of the accident before the EMS arrived. Documentation included bystander age, gender, training in trauma care (no training, basic training, advanced training, professional training), relationship to the trauma patient (relationship or not) and number of bystanders present. Bystanders with a relationship to the trauma patient included all bystanders who knew the trauma patient personally, i.e. direct relatives as well as friends, neighbours and colleagues.

According to their level of training in trauma care, bystanders were classified into four separate categories:

- **No training:** Since basic training is mandatory for acquiring a driving licence in Austria and Germany, bystanders with no training included all individuals without a driving licence who had not received any other training.
- **Basic:** Basic training included all bystanders who had taken the basic 8 h course required for the driving licence. They had been trained how to ensure scene safety, how to extricate a trauma patient from a vehicle or remove a trauma patient from a danger zone. Bystanders with basic training had also been taught when and how to position trauma patients to keep the airway clear, how to control haemorrhage and which precautions to take against hypothermia.
- **Advanced:** Advanced training included all individuals who had taken an advanced 16 h course. This advanced course is basically a repetition of the measures taught and discussed in the basic course but provides additional instruction on cardiopulmonary resuscitation.
- **Professional:** Professional training included paramedics, nurses and physicians, regardless of whether they had taken additional training or not.

Five pre-specified measures of bystander trauma care were assessed by the EMS according to the guidelines which form the basis of EMS training. The EMS documented whether or not each of the following measures performed had been necessary and, if necessary, had been performed correctly, incorrectly or not at all:

- ensuring scene safety (to prevent further trauma);
- extrication of the trauma patient (from a vehicle or from a danger zone);
- positioning of the trauma patient (to keep the airway clear);
- control of haemorrhage;
- prevention of hypothermia.

### 2.3. Statistics

The questionnaires were collected together with a copy of the EMS protocol and entered into a data bank (MS Access™) for evaluation. All numerical analyses were drawn using SPSS® (release 10.0 for Windows). The chi-square test was applied and the Fisher's two-tailed exact test was applied for numbers smaller than five. Due to the observational character of the study, *P*-values were not adjusted for multiplicity. *P* < 0.05 was considered statistically significant.

## 3. Results

### 3.1. Patients

In this survey, we collected questionnaires on 2932 trauma patients. Gender (55% males, 45% females) and age (mean age 46 years, range 10–93 years) were documented for 2902 and 2915 trauma patients, respectively.

The cause of trauma, pattern of trauma, trauma score according to the classification of the NACA Score [25] and Glasgow Coma Score have been documented in detail in a parallel paper dealing with bystander trauma care in severely versus moderately injured patients.

With the exception of eight trauma patients who died of severe haemorrhage at the scene of the accident or in the ambulance, all trauma patients attended by the EMS arrived at the hospital alive.

### 3.2. Bystanders

Bystanders were present on-scene in 1720 of the 2932 trauma calls (58.7%). Gender and age were listed for 1675 (60% males, 40% females) and 1626 patients (mean age 40 years, range 13–96 years), respectively.

Ensuring scene safety (Fig. 1), was done correctly somewhat more often, was rarely done incorrectly and was not done less often with higher levels of bystanders training, but the difference between bystanders with different levels of training was not significant. Interestingly, bystanders with no training either ensured scene safety correctly or not at all, but none did so incorrectly.

Extrication of the trauma patient (Fig. 2) was done correctly more often, was rarely done incorrectly and was not done less often with higher levels of bystander training (*P* <

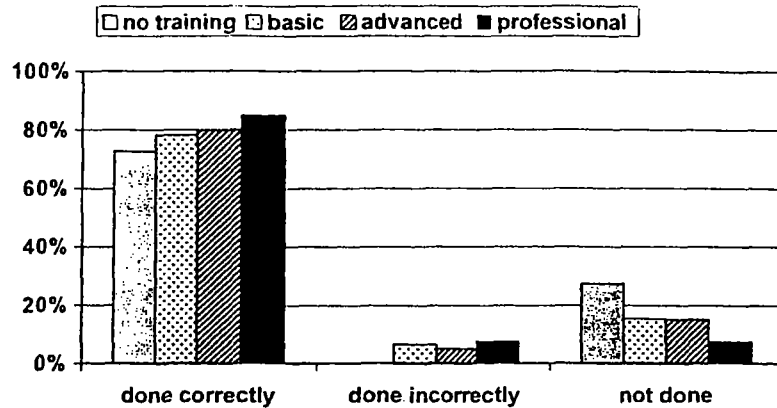


Fig. 1. Ensuring scene safety done correctly, done incorrectly or not done by bystanders with no training, basic training (8 h course), advanced training (16 h course) and professionals (paramedics, nurses, physicians). Data presented as percent values. Ensuring scene safety did not differ significantly between bystanders with different levels of training.

0.05). Professionals were the only bystanders who never failed to extricate a patient.

Positioning of the trauma patient (Fig. 3) was done correctly more often, was rarely done incorrectly and was not done less often with higher levels of bystander training ( $P < 0.005$ ). However, incorrect positioning was also done more often by bystanders with advanced training and by professionals than by bystanders with basic or no training. Similarly when ensuring scene safety, most bystanders with no training either positioned patients correctly or not at all.

Control of haemorrhage (Fig. 4) was done correctly more often and was not done less often with higher levels of bystander training ( $P < 0.005$ ). Control of haemorrhage was also done incorrectly most often by bystanders with advanced training. Surprisingly, professionals controlled haemorrhage incorrectly as often as bystanders with no training at all.

Prevention of hypothermia (Fig. 5) was done correctly more often and not done less often with higher levels of bystander training, but this difference was not significant. Prevention of hypothermia was done incorrectly only by

bystanders with advanced training and rarely by bystanders with basic training, but not by those with no training or professionals. A striking finding was that many bystanders failed to provide prevention of hypothermia at all.

Whether or not bystanders had a relationship to the trauma patient did not affect whether they performed any of the necessary measures of trauma care or whether they performed these measures correctly. We also compared the frequency and quality of individual emergency measures performed by bystanders who knew the trauma patient and had different levels of training to measures performed by bystanders who did not know the trauma patient and had different levels of training. Since the number of bystanders who matched these criteria was comparatively small for some measures (ensuring scene safety, extrication and precautions against hypothermia), we selected only two measures, positioning and control of haemorrhage for this comparison. We found that there was no difference in the frequency and quality of each measure of bystander trauma care between bystanders with and without a relationship to the patient, even when level of bystander training was taken into account.

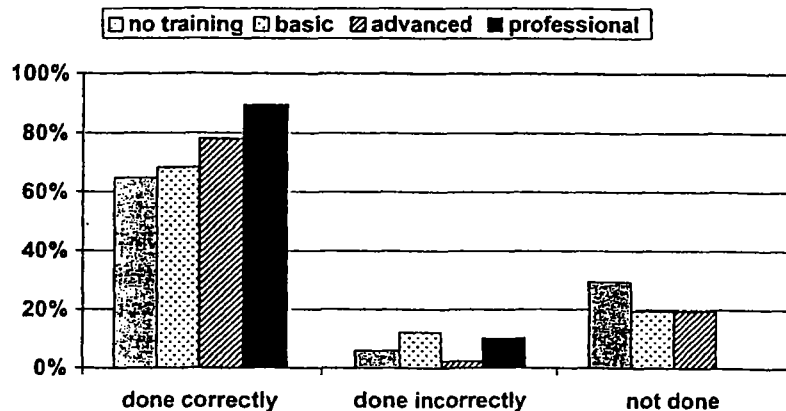


Fig. 2. Extrication of the trauma patient done correctly, done incorrectly or not done by bystanders with no training, basic training (8 h course), advanced training (16 h course) and professionals (paramedics, nurses, physicians). Data presented as percent values. Significant at  $P < 0.05$ . Extrication of trauma patient differed significantly between bystanders with different levels of training ( $P < 0.05$ ).

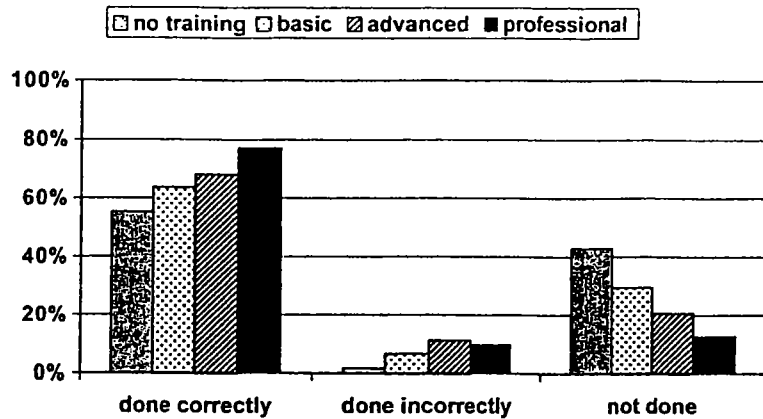


Fig. 3. Positioning of the trauma patient done correctly, done incorrectly or not done by bystanders with no training, basic training (8 h course), advanced training (16 h course) and professionals (paramedics, nurses, physicians). Data presented as percent values. Significant at  $P < 0.05$ . Positioning of the trauma patient differed significantly between bystanders with different levels of training ( $P < 0.005$ ).

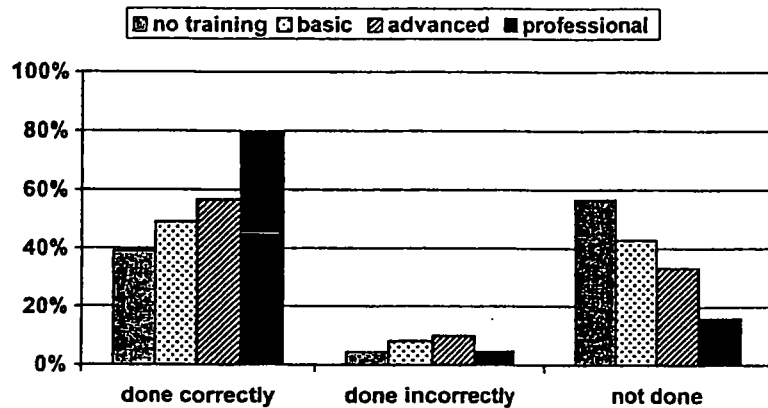


Fig. 4. Control of haemorrhage done correctly, done incorrectly or not done by bystanders with no training, basic training (8 h course), advanced training (16 h course) and professionals (paramedics, nurses, physicians). Data presented as percent values. Significant at  $P < 0.05$ . Control of haemorrhage differed significantly between bystanders with different levels of training ( $P < 0.005$ ).

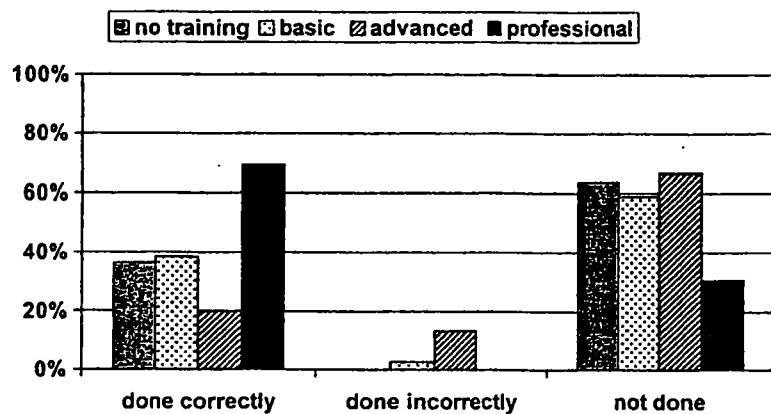


Fig. 5. Prevention of hypothermia done correctly, incorrectly or not done by bystanders with no training, basic training (8 h course), advanced training (16 h course) and professionals (paramedics, nurses, physicians). Data presented as percent values. Ensuring scene safety did not differ significantly between bystanders with different levels of training.

The number of bystanders present had no effect upon most of the measures done. Interestingly, though measures of trauma care were usually performed correctly (if they were performed at all), these measures were performed more often when there was only one bystander present.

#### 4. Discussion

The aim of our study was to determine how often and how well bystanders perform necessary measures of trauma care and to determine whether these measures are affected by the

bystander's level of training, their relationship to the trauma patient and by the number of bystanders present. We found that bystanders performed most necessary emergency measures more often and correctly, the better their training was. The better that training was, the less often bystanders failed to perform trauma care on-scene. Of the five emergency measures of trauma care investigated (ensuring scene safety, extrication of the trauma patient, positioning of the trauma patient, control of haemorrhage and prevention of hypothermia), some were done incorrectly most often by bystanders with basic training (extrication, control of haemorrhage), while other emergency measures were done incorrectly most often by bystanders with advanced training (positioning, control of haemorrhage, prevention of hypothermia). Neither the relationship of both trained and untrained bystanders to the trauma patient nor the number of bystanders present enhanced the frequency or quality of any measure of bystander trauma care.

Like all studies of this kind, our study faced several difficulties. One difficulty was that it was limited to trauma cases attended by the EMS. Furthermore, only bystander trauma care in the greater urban area was assessed. It should be kept in mind that the EMS usually arrives sooner in the urban than in the rural area and that urban bystanders therefore usually have less time to accomplish the necessary measures of trauma care than rural bystanders. Another difficulty is the lack of guidelines and standards according to which EMS personnel can assess how well measures were performed. Moreover, it is difficult, if not impossible, to demonstrate the validity and reliability of the individual measures of trauma care [8]. We attempted to avoid this problem as far as possible by testing and improving the details of the questionnaire in co-operation with the EMS personnel before beginning the study. One point of criticism could be that data were collected prospectively, but it was quite impossible to complete the questionnaire immediately on-scene. Thus, the questionnaire was actually completed retrospectively, i.e. immediately after the patient had been admitted to hospital and the trauma call had been completed. This difficulty has been addressed by other authors [8] who have also pointed out that the study design does not offer a realistic alternative. Another point of criticism could be that the bystanders defined as professionals included paramedics as well as nurses and physicians, regardless of their speciality and of whether they had taken additional training in emergency medicine or not. One might argue that professional medical training is not necessarily synonymous with professional training, not to mention experience in the field of emergency medicine. However, splitting the group of professionals accordingly, would have further reduced the number of bystanders in each group and the information gained would thus have been of limited use. We were faced with a similar problem regarding the evaluation of necessary measures of trauma care. We are aware of the fact that it would have been interesting to evaluate more than the five

measures selected for our study and to subsequently compare the findings to those published by Donner-Banzhoff et al. [8]. Actually, we collected data on more than five measures, including clearing the airway, mouth-to-mouth rescue breathing and thoracic compressions. However, we found that these additional measures were only necessary in a limited number of cases and that bystanders were not always present, leaving us with a final number of cases for assessment which would have been very small indeed.

To our knowledge, our study is the first to focus upon individual necessary emergency measures performed by bystanders of trauma-related emergencies and to evaluate the emergency measures with regard to the level of bystander training. Bystander trauma care is a subject which has been dealt with in only a few studies, and these studies investigated trauma- and non-trauma-related calls together [8,11]. Bartsch et al. studied 500 patients with 16% trauma-related calls but neither specified how often bystanders were involved nor the type of care they provided. Donner-Banzhoff et al. investigated individual measures of care in a very detailed study on 1150 cases with bystanders present in 97% but did not specify the percentage of trauma-related calls. In our opinion, it is more objective to compare individual measures of bystander trauma care than to assess bystander trauma care globally. Moreover, the findings differ considerably among the individual measures. In this context, it is particularly interesting to take into account which necessary measures were not performed by bystanders. Each measure of bystander trauma care was carried out correctly more often, and not carried out less often, the better the bystander training. However, while bystanders rarely failed to ensure scene safety and extricate patients (in comparison to the other measures), they often failed to position patients correctly. Control of haemorrhage was performed even less often than correct positioning. Prevention of hypothermia was the measure which bystanders failed to perform most often. Only professionals rarely failed to prevent hypothermia, probably because professionals realised that preventing hypothermia is important while other bystanders did not. In our opinion, most courses on bystander trauma care fail to emphasise the danger associated with hypothermia sufficiently.

Did bystanders fail to help because they failed to recognise the necessity to do so? Did bystanders feel insufficiently trained to help? Did bystanders fail to help because they feared to do more harm than good? Obviously, these reasons for failing to help are linked to one another, since a bystander who feels insufficiently trained will be unable to recognise the necessity to do so. In our opinion, simple measures (such as prevention of hypothermia) are more likely to be overlooked by bystanders who have not been trained that these measures are important. On the other hand, seemingly complicated measures (such as extrication, positioning and control of haemorrhage) might not be performed because bystanders feel insufficiently trained. Interestingly,



he percentage of incorrectly performed measures was low for all measures of bystander trauma care and at all levels of training. A direct comparison with other studies is not possible, however, because no comparable data have been published.

Surprisingly, the bystander's relationship to the patient did not affect his or her willingness or capability to provide trauma care, even when the level of bystander training was taken into account. For us, this was unexpected, particularly in the urban setting. It would be interesting to see whether the findings are the same in other urban centres and in rural centres. Another unexpected finding was that the number of bystanders had no effect upon most individual measures. This might indicate that the more bystanders there are, the more they tend to rely upon one another to take action, i.e. less is accomplished ultimately. In contrast, a single bystander has no one else to rely upon and cannot assume that anyone else will take action.

Trauma training in general has been focussed upon more in recent years [26–28]. Several studies have also addressed the issue of training for bystanders both for non-trauma-related [29–31] and for trauma-related calls [32–34]. In accordance with Steele [32], we feel that training improves public awareness, appreciation and performance of bystander trauma care. Trained bystanders retain their knowledge well [34] and are probably more willing to help since they understand that minutes count and that simple interventions can make a difference [35]. If performed soon enough and performed correctly, bystander trauma care can mean the difference between life and death.

## 5. Conclusions

Our study shows that bystanders perform trauma care more often and fail to provide trauma care less often with higher levels of training. Neither the relationship of the bystander to the trauma patient nor the number of bystanders present enhances the frequency or quality of measures. Improved, more widespread training for bystanders could increase the frequency and quality of bystander trauma care further.

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## **Bilag 4**



## Comparison of bystander trauma care for moderate versus severe injury<sup>☆</sup>

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### Abstract

At the scene of an accident, the most severely injured patients need trauma care urgently. Bystanders are often present before the emergency medical service arrives and may be able to limit trauma-related damage by providing trauma care at the scene. The aim of this prospective study conducted in Mainz, Germany, and Vienna, Austria, was to compare the frequency and quality of bystander trauma care in moderately versus severely injured patients. Five specific measures (making the scene readily visible for oncoming traffic, extrication and positioning of the trauma patient, control of haemorrhage, and hypothermia protection) were assessed in a questionnaire and evaluated statistically. Bystanders were present at the scene in 58.7% of all accidents. Making the scene readily visible for oncoming traffic, patient extrication and patient positioning were initiated significantly more often than haemorrhage control and hypothermia protection. Extrication, patient positioning and hypothermia protection were initiated significantly more often in moderately (NACA I-II) compared to severely (NACA III-VII) injured patients. In severely injured patients, bystanders attempted measures less frequently and the measures performed were more often incorrect compared to those in moderately injured patients. Our findings show that severely injured patients received less and less appropriate bystander trauma care than moderately injured patients. In an effort to correct this serious problem and to improve trauma care on-scene, we advocate offering lay persons more extensive training in bystander trauma care.

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**Keywords:** Basic life support (BLS); Bystander; Prehospital trauma care; First aid; Training; Trauma

### Resumo

No local de um acidente, os doentes com lesões graves necessitam de cuidados urgentes. Há frequentemente testemunhas presentes antes da chegada dos serviços médicos de emergência e podem ser capazes de limitar a lesão relacionada com o trauma proporcionando cuidados no local. O objectivo deste estudo prospectivo conduzido em Mainz, Alemanha, e Viena, Austria, foi comparar a frequência e qualidade dos cuidados de trauma proporcionados por testemunhas a doentes com lesões de trauma severas versus moderadas. Foram avaliadas num questionário, e comparadas estatisticamente, cinco medidas específicas (tornar a cena facilmente visível para o tráfego, retirar e posicionar o doente traumatizado, controlo da hemorragia e protecção da hipotermia). Estavam presentes testemunhas no local em 58,7% dos acidentes. Tornar a cena facilmente visível para o tráfego, retirar e posicionar o doente foram feitas significativamente mais vezes do que o controlo da hemorragia e a protecção da hipotermia. Retirar, posicionar e proteger da hipotermia foram iniciados com frequência significativamente maior nos doentes com lesões moderadas (NACA I-II) do que nos doentes com lesões severas (NACA III-VII). Nos doentes com lesões graves, as testemunhas actuaram menos vezes e mais frequentemente de forma incorrecta quando comparadas com as realizadas nos doentes com lesões moderadas. Os nossos achados demonstram que os doentes com lesões graves receberam cuidados pelas testemunhas menos vezes e menos apropriadas do que os doentes com lesões moderadas. Num esforço para corrigir este problema sério e melhorar os cuidados do trauma no local do acidente, propomos que seja oferecido aos leigos mais treino de cuidados de trauma por testemunhas do acidente.

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**Palavras chave:** Suporte básico de vida (BLS); Testemunha; Cuidados de trauma pré-hospitalar; Primeira ajuda; Treino; Trauma

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## Resumen

En la escena de un accidente, los pacientes mas severamente lesionados necesitan cuidados de trauma urgentemente. Los transeúntes frecuentemente están presentes antes de la llegada de los servicios de emergencias médicas y pueden limitar el daño relacionado con el trauma al proporcionar cuidados de trauma en el lugar. El objetivo de este estudio prospectivo conducido en Mainz, Alemania y Viena, Austria, comparar la frecuencia y calidad de los cuidados de trauma entregados por transeúntes en pacientes de trauma moderado versus pacientes de trauma severo. Se investigaron y evaluaron estadísticamente 5 medidas específicas mediante un cuestionario (Hacer la escena visible para el tráfico que se acerca, extricación y posicionamiento del paciente de trauma, control de hemorragia, y protección de la hipotermia). Habían transeúntes en la escena en 58.7% de todos los accidentes. El hacer la escena visible para el tráfico que llega, la extricación y el posicionamiento del paciente fueron iniciados en forma significativamente mas frecuente que el control de la hemorragia y la protección de la hipotermia. La extricación, posicionamiento del paciente y protección de la hipotermia fueron iniciados en forma significativamente mas frecuente en pacientes moderadamente lesionados (MACA I-II) que en los severamente lesionados (NACA III-IV). En pacientes severamente lesionados los transeúntes intentaron medidas con menos frecuencia y las medidas realizadas fueron mas frecuentemente incorrectas comparadas aquellas en pacientes moderadamente lesionados. Nuestros hallazgos muestran que los pacientes severamente lesionados recibieron cuidados de trauma de transeúntes con menor frecuencia y cuidados menos apropiados que pacientes moderadamente lesionados. En un esfuerzo corregir este serio problema y mejorar los cuidados de trauma en la escena, proponemos ofrecer a los legos entrenamiento extensivo en cuidados de trauma por transeúntes legos.

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*Palabras clave:* Soporte vital básico (SVB); Transeúntes; Cuidados prehospitalarios de trauma; Primeros auxilios; Entrenamiento; Trauma

## 1. Introduction

First aid for trauma patients in the field is based on the consensus opinion of experts to avoid further harm and to provide optimal basic care under the circumstances.

Following severe and multiple trauma, the occurrence of death follows a three-peak pattern [1]. The first peak is immediately after trauma and is due to non-survivable injuries and uncontrollable haemorrhage or due to lack of opportune simple life-saving measures from bystanders. The second peak follows within the first hours or days after trauma and is usually caused by severe cardiopulmonary insufficiency [2] or brain injury. The third peak can be delayed, following within weeks after trauma, and is due to sepsis and/or multiple organ failure. While death during the first peak is almost impossible to prevent, the prognosis of patients during the second peak can be improved considerably by rapid and appropriate trauma care at the scene. According to the chain of survival, the bystander is a key link to prevent further harm to the patient and initiate life-saving measures [3,4].

In recent years, a number of studies have been published on the quality of emergency measures for acute cardio-respiratory conditions, particularly, resuscitation of adult [5–9] or paediatric patients [10–12]. These studies also assessed the emergency measures performed by lay persons [7,13,14]. Very few studies have addressed the problems of trauma care rendered by laypersons [13,15].

Our study was focused upon emergency measures performed by bystanders in the trauma setting [16]. Our aim was to compare the frequency and quality of bystander trauma care in moderately and severely injured patients.

## 2. Patients and methods

### 2.1. Setting

This prospective study was conducted in Mainz, Germany and Vienna, Austria. Both of these European cities run very similar emergency medical systems (EMS), responding to trauma calls with mobile intensive care units (MICU) on a 24 h basis. Certified paramedics and physicians certified in emergency medicine are dispatched by the emergency medical system to provide trauma care in the field.

In this study, bystanders were defined as persons who happened to be present or who arrived at the scene of the accident and provided trauma care before professional help arrived.

EMS personnel (including emergency physicians) arriving at the scene of the accident assessed retrospectively whether bystanders had performed necessary measures "correctly", "incorrectly" or "not at all".

The measures assessed were: making the scene readily visible for oncoming traffic, extrication of the trauma patient from hazardous surroundings (taking into account the pattern of trauma), positioning of the trauma patient (taking into account the pattern of trauma), control of haemorrhage (application of a dressing, a compression dressing or tourniquet when required) and hypothermia protection (covering the patient with a blanket, clothing or other available articles).

### 2.2. Data collection

A structured questionnaire was developed for data collection. For practical reasons and to facilitate acceptance by EMS personnel, we divided our questionnaire into a section

<p>NACA I =slight impairment:</p> <p>Patients with minor injuries or diseases who do not require immediate examination or treatment.</p> <p>NACA II = out-patient treatment:</p> <p>Patients with injuries or diseases who do require further examination or treatment, but who do not require emergency measures.</p> <p>NACA III = in-patient treatment:</p> <p>Patients whose injuries or diseases require admission to hospital for examination or treatment but are not acutely life-threatening. Emergency measures are usually not required.</p> <p>NACA IV = acutely life-threatening situation cannot be ruled out:</p> <p>Patients with injuries or diseases which are not acutely life-threatening, but could become life-threatening in the near future.</p> <p>NACA V = acutely life-threatening situation:</p> <p>Patients with injuries or diseases which are acutely life-threatening and which will be fatal if not treated immediately.</p> <p>NACA VI = Resuscitation:</p> <p>Patients with injuries or diseases which require immediate on-scene resuscitation and subsequent admission to hospital.</p>
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Fig. 1. The American National Advisory Committee of Aeronautics Score (NACA).

levoted to the patient and a section devoted to the bystander, attempting to keep the questionnaire as brief and simple as possible.

Before launching the study, we discussed our questionnaire extensively with EMS personnel, focusing particularly, upon rating how items of care were performed.

The questionnaire included the following patient data: age, gender, cause of trauma, pattern of injury, severity of injury according to the National Advisory Committee of Aeronautics (NACA) score as specified in Fig. 1, Glasgow Coma Scale (GCS) [17,18] and outcome (admittance to hospital or death). The items in the questionnaire may be added to local EMS patient reports to enable nation-wide data collection.

The NACA-score is a validated score ranging from I to VII. It was defined as a severity score in the late 1960s by the American National Advisory Committee of Aeronautics [19,20]. The NACA-score is applied to classify the severity of injury or illness, both in trauma and in non-trauma patients [21].

Depending upon the severity of injury according to the NACA-score, trauma patients were classified as moderately injured (NACA 1–2) or severely injured (NACA 3–7). Sub-

sequently, moderately injured patients were compared to severely injured patients regarding demographic data, causes and pattern of injury and the frequency and quality of the five pre-specified items of bystander trauma care.

The Glasgow Coma Scale defines the level of responsiveness according to “eye opening”, “best verbal response” and “best motor response”.

The questionnaire included the following data on the bystander: presence, age, gender, level of training in emergency measures (no emergency training, basic emergency training mandatory to acquire a driver’s licence, advanced emergency and/or medical training), and the emergency measures performed.

For each emergency measure, the EMS personnel recorded on the questionnaire whether or not the measure had been necessary and (provided the measure had been necessary) whether it had been performed “correctly”, “incorrectly” or “not at all”.

For the duration of the study, all questionnaires were completed by the EMS personnel involved immediately after having completed their respective trauma call and patient treatment.

### 2.3. Statistics

The questionnaires were collected together with a copy of the EMS protocol and entered into a data bank (Microsoft Access™) for evaluation. All numerical analyses were drawn using SPSS® (release 10.0 for Windows). Fisher's two-tailed exact test for numbers smaller than five and chi-square test were applied. Due to the observational character of the study, the *P*-values of the above tests were not adjusted for multiplicity; a *P*-value of <0.05 indicates local statistical significance.

## 3. Results

### 3.1. Patients

We collected data from 2932 trauma patients over 12 months in Mainz and 4 months in Vienna. An overview of the patients finally included in the study and the bystanders involved is shown in Fig. 2. Incomplete questionnaires lacking NACA-scores were excluded (*n* = 730).

Both groups were statistically comparable with regard to age and gender. The patient characteristics are presented in Table 1.

The most common major causes of injury were falls from a height <1 m (48.5%) and traffic accidents (18%). Less commonly, we registered falls from heights >1 m (9.7%) and

blows from blunt articles (7.3%). Penetrating injuries (stab or gunshot wounds), and burn injuries were rare (0.4% and 0.5%, respectively). 14.8% of injuries were due to other causes.

Almost all patients reached the hospital alive (99.6% (2194)). The remaining patients (0.4%, *n* = 8) died at the scene or in the ambulance.

The most frequently injured parts of the body were the extremities (59.4%), the brain (41.9%), followed by the thorax (8.4%) and pelvis (7%). The neck and the abdomen were rarely injured (3.9 and 1.5%, respectively).

Fig. 2 specifies the distribution of bystanders between moderately and severely injured patients in relation to the NACA-score of the individual patient.

### 3.2. Bystanders and measures performed

Bystanders were present at the scene on arrival of the first EMS unit in 58.7% (*n* = 1720) of all accidents (2932). In the remaining cases, bystanders were not present (*n* = 1208) or no information on bystanders was available (*n* = 4).

Information on bystander age and gender was documented in 1,675 questionnaires (57.1%): bystander age ranged from 6 to 96 years of age (median 37) and 60% of bystanders were males.

Seven hundred and thirty cases had to be excluded because they lacked a record of the NACA-score (Fig. 2).

#### 3.2.1. Frequency of measures

Bystanders clearly performed some measures significantly more often than others. Making the scene reachable for oncoming traffic was performed in 87% of cases, extrication in 83%, positioning in 73%, controlling haemorrhage in 60%, and hypothermia protection in 42% of all cases (Fig. 3).

Table 1  
Patient characteristics of groups 1 and 2

Groups	Males		Females		Age (median)
	Number	Percentage	Number	Percentage	
NACA 1-2	784	53.7	677	46.3	41
NACA 3-7	394	55.0	623	45.0	45

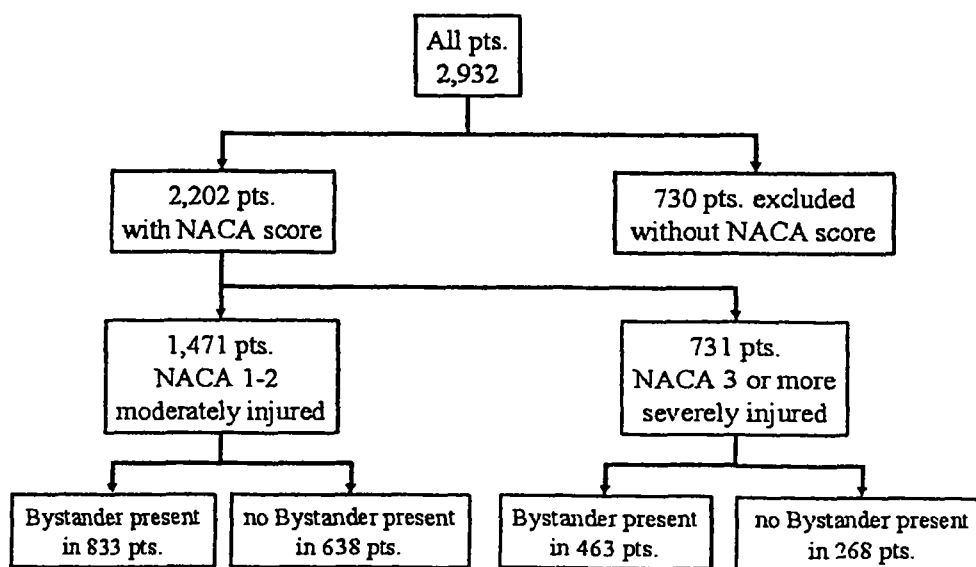


Fig. 2. Overview of the patients included in the study and the bystanders involved.

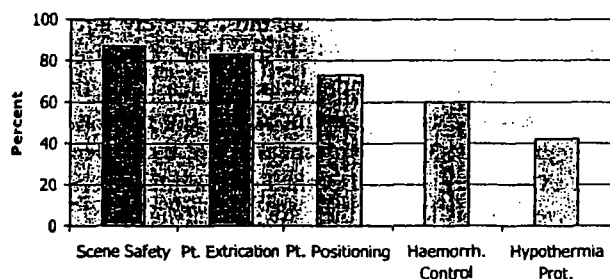


Fig. 3. Percentage of all indicated and performed measures.

### 3.2.2. Performance of measures in relation to patient groups

Extrication, patient positioning and hypothermia protection were initiated significantly more often in moderately (NACA I–II) compared to severely (NACA III–VII) injured patients (Fig. 4).

Regardless of the level of bystander training, we found that bystanders performed fewer measures correctly in severely injured patients.

Extrication was performed correctly in 92.9% of moderately injured patients, while it was only performed correctly in 72.1% of severely injured patients ( $P < 0.01$ ). Positioning of patients was performed correctly in 76.9% of moderately injured patients compared to only 65.9% of severely injured patients ( $P < 0.05$ ). Hypothermia protection was performed correctly in 66.7% of moderately injured patients, but in only 34.8% of severely injured patients ( $P < 0.05$ ).

There was no significant difference with haemorrhage control among both groups.

## 4. Discussion

The aim of our study was to compare the frequency and quality of bystander trauma care in moderately and severely

injured patients. We found that in almost 59% of cases bystanders were present on-scene before the EMS arrived, which is in accordance with the number (54%) published by Donner-Banzhoff [14].

We also found that bystander trauma care varied in moderately and severely injured patients, depending upon the individual measure performed and ranged from 42% (hypothermia protection) to 87% (making the scene readily visible for oncoming traffic).

Most strikingly, however, we found that severely injured patients received trauma care from bystanders less frequently than moderately injured patients, i.e. those patients who needed the most care were the ones who actually received the least care. Our findings are in accordance with those of Bartsch [13], who reported that 63% of trauma patients received some form of first aid from relatives or other bystanders. Whether or not a bystander provides care to a patient depends upon several different factors.

Bierhoff [22] has described certain factors which may affect a bystander's decision to provide care positively or negatively, including bystander realization that a patient needs help desperately [23] and that, faced with an emergency, has a sense of responsibility to provide bystander trauma care [24], feels competent to provide trauma care [15] and has the time to provide trauma care when and where it is required as well. According to Bartsch [13], such factors as the patient probably is "attractive" with regard to age, gender and attire also influence the quality of bystander trauma care.

In order to increase bystanders' willingness to provide trauma care, they should be offered better training, as has been proved to be effective in cardiopulmonary resuscitation [25]. In our opinion, this could improve the bystander's feeling of competence, which is essential for providing trauma care.

The subjective feeling of competence in correlates directly with their training in first aid and affects the bystander's decision to take action. Steele and Schäfer have pointed out

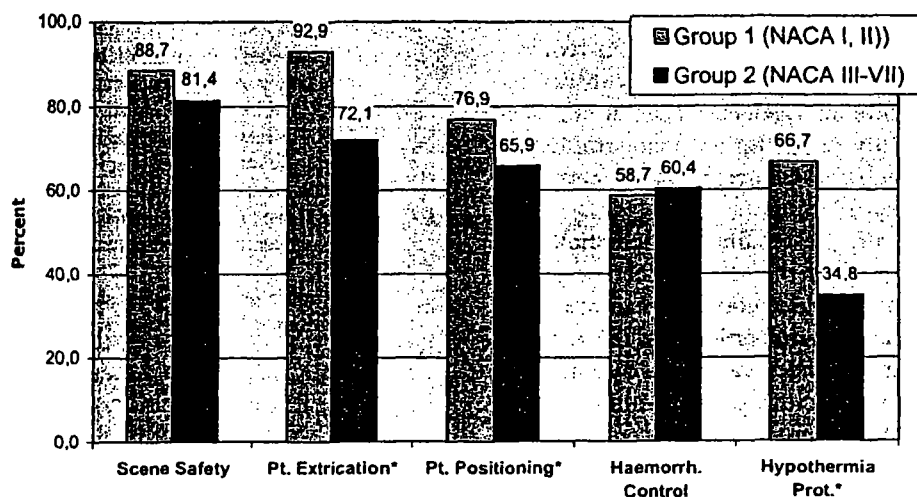


Fig. 4. All measures performed compared in moderately (NACA I–II) compared to severely (NACA III–VII) injured patients (\*indicates local significance ( $P < 0.05$ )).

that extensive training in first aid increases the number of potential bystanders who feel competent in an emergency situation and would be willing to provide first aid [26,27].

However, we can draw only limited conclusions on how the bystanders interviewed by Bierhoff and Schäfer would react in an actual rather than in a fictitious emergency.

Apart from training in first aid, there are other factors which influence the decision to provide bystander trauma care, such as a personal relationship between the bystander and the patient, the number of bystanders present, the bystander's age, the patient's age, the time and place of the accident and knowledge of how to activate the EMS [28].

In contrast to Bierhoff, we did not find that bystanders were more motivated to provide trauma care to patients who were in greater need of care or even dying. Surprisingly, we found that bystanders did not provide trauma care to the severely injured more frequently than to moderately injured patients. On the contrary, we even found a tendency towards less bystander trauma care for severely injured patients, particularly regarding extrication and positioning of the severely injured patient.

Nevertheless, in contrast to Bartsch, who observed that bystanders do not provide trauma care to over 80% of severely injured patients, we found that bystanders provided trauma care to at least 50% of severely injured patients. It is conceivable that moderately injured, conscious patients can and do call out for help, thereby encouraging the bystander to overcome his or her reluctance to act. Severely injured unconscious patients, however, are unable to draw attention to themselves. Although most bystanders are aware of the fact that severely injured patients require their help more than moderately injured patients, two bystanders in our study themselves said that they were reluctant to help because they feared doing something wrong thereby harming the patient. Some bystanders even fear catching contagious diseases such as AIDS [29].

Such fears may be the reason why bystanders attempt to avoid direct contact with patients. Bystander-performed measures, such as control of haemorrhage which requires close patient contact, significantly less frequently than measures which do not require any patient contact at all, such as making the scene readily visible for oncoming traffic. All bystanders performed such non-medical measures correctly, regardless of their level of training.

Bystanders are frequently present first and potentially are able to provide trauma care at the scene. Whether or not this care is provided, and provided correctly, can mean the difference between life and death, particularly, for severely injured patients. A manual manoeuvre from a bystander to open the airway in the unconscious patient within minutes or simple prevention of hypothermia in the severely injured may well save a life. As in patients suffering from out of hospital primary cardiac arrest [5,8], bystanders have to feel capable and confident to render primary measures in trauma patients.

It is worrying indeed that the most severely injured patients, who need trauma care on-scene the most, frequently are those who receive trauma care the least. On the basis of our findings, we are convinced that lay persons should be taught the most important measures of bystander trauma care more extensively, to help correct this serious shortcoming and save lives as long as they are still salvageable.

#### Acknowledgements

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## **Bilag 5**



## Skill acquisition and retention in automated external defibrillator (AED) use and CPR by lay responders: a prospective study

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### Abstract

This prospective study evaluated the acquisition and retention of skills in cardio-pulmonary resuscitation (CPR) and the use of the automated external defibrillator (AED) by lay volunteers involved in the Department of Health, England National Defibrillator Programme. One hundred and twelve trainees were tested immediately before and after an initial 4-h class; 76 were similarly reassessed at refresher training 6 months later. A standardised test scenario that required assessment of the casualty, CPR and the use of an AED was evaluated using recording manikin data and video recordings. Before training only 44% of subjects delivered a shock. Afterwards, all did so and the average delay to first shock was reduced by 57 s. All trainees placed the defibrillator electrodes in an 'acceptable' position after training, but very few did so in the recommended 'ideal' position. After refresher training 80% of subjects used the correct sequence for CPR and shock delivery, yet a third failed to perform adequate safety checks before all shocks. The trainees self-assessed AED competence score was 86 (scale 0–100) after the initial class and their confidence that they would act in a real emergency was rated at a similar level. Initial training improved performance of all CPR skills, although all except compression rate had deteriorated after 6 months. The proportion of subjects able to correctly perform most CPR skills was higher following refresher training than after the initial class. Although this course was judged to be effective in teaching delivery of counter-shocks, the need was identified for more emphasis on positioning of electrodes, pre-shock safety checks, airway opening, ventilation volume, checking for signs of a circulation, hand positioning, and depth and rate of chest compressions.

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**Keywords:** Automated external defibrillator (AED); Cardiac arrest; Education; Out-of-hospital CPR; Training; Ventricular fibrillation

### Resumo

Este estudo prospectivo avaliou a aquisição e retenção de capacidade em ressuscitação cardiopulmonar (CPR) e no uso de desfibrilador automático externo (AED) por reanimadores leigos envolvidos no Departamento de Saúde do England National Defibrillator Programme. Foram testados 112 candidatos imediatamente antes e após um aula inicial de 4 horas; 76 foram igualmente reavaliados em treino repetido 6 meses depois. Foi avaliado o desempenho num cenário de teste normalizado que requeria avaliação da vítima, CPR e utilização de um AED, através de informação gravada pelos manequins e gravação vídeo. Antes do treino apenas 44% dos candidatos efectuaram um choque. Após o treino todos o fizeram e o tempo médio para o 1º choque foi reduzido em 57 segundos. Todos os candidatos colocaram os electrodos do desfibrilador numa posição "aceitável" após o treino mas muito poucos o fizeram na posição "ideal" recomendada. Após treino repetido 80% dos candidatos usaram a sequência correcta para CPR e aplicação do choque, no entanto 1/3 falhou na verificação adequada da segurança antes de todos os choques. O score de competência em AED por auto-avaliação dos candidatos foi 86 (escala 0–100) após a aula inicial e a sua confiança de que actuarium numa emergência real foi avaliada num nível similar. O treino inicial melhorou a performance de todas as capacidades para CPR, embora todas tenham deteriorado após 6 meses, excepto a frequência das compressões. A avaliação da proporção de candidatos capazes de realizar correctamente a maioria das competências para CPR foi maior após o treino repetido do que após a aula inicial. Embora este curso tenha sido avaliado como eficaz no ensino da administração dos choques, foi identificada a necessidade de maior ênfase no posicionamento

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dos electrodos, nas avaliações de segurança pré-choque, na permeabilização da via aérea, no volume de ventilação, na avaliação dos sinais de circulação, no posicionamento das mãos, na profundidade e na frequência das compressões torácicas.

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**Palavras chave:** Ventricular; Desfibrilhador automático externo (AED); Paragem cardíaca; Educação; CPR pré-hospitalar; Treino; Fibrilhação

## Resumen

Este estudio prospectivo evaluó la adquisición y retención de destrezas en reanimación cardiopulmonar (CPR) y el uso de desfibriladores automáticos externos (AED) por voluntarios legos involucrados en el departamento de salud, en el Programa Nacional de Desfibrilación en Inglaterra. Ciento once alumnos fueron examinados inmediatamente antes y después de una clase inicial de 4 hrs; 76 fueron reevaluados de forma similar durante un curso de reentrenamiento seis meses después. Se evaluó un escenario estandarizado que requería evaluación de la víctima, CPR y el uso de un AED usando datos del registro de un maniquí y registros en cintas de video. Antes del entrenamiento solamente 44% de los sujetos entregaron una descarga. Después, todos lo hicieron y la demora promedio a la primera descarga fue reducida en 57 s. Todos los alumnos ubicaron los electrodos de desfibrilación en una posición 'aceptable' después del entrenamiento, pero muy pocos lo hicieron en la posición Palavrai 'ideal' recomendada. Después del reentrenamiento el 80% de los sujetos usaron la secuencia correcta de CPR y entrega de descarga eléctrica, pero aún un tercio fracasó en garantizar seguridad antes de todas las descargas entregadas. Los alumnos se evaluaron a sí mismos en competencia en uso del AED con un puntaje de 86 (escala de 0–100) después de la clase inicial y su confianza de que actuarían bien en una emergencia real fue evaluada en un nivel similar. El entrenamiento inicial mejoró el desempeño de todas las destrezas de CPR, aunque todas, salvo la frecuencia de compresiones, se deterioraron después de 6 meses. La proporción de sujetos capaces de realizar correctamente la mayoría de las destrezas de CPR evaluadas fue mayor después de el curso de reentrenamiento que después de la clase inicial. Aunque este curso fue juzgado como efectivo en la enseñanza de entrega de descargas eléctricas, se identificó la necesidad de mayor énfasis en el posicionamiento de los electrodos, las evaluaciones de seguridad antes de entregar las descargas, apertura de vía aérea, volumen ventilatorio, evaluación de signos de circulación, posición de las manos, y profundidad y frecuencia de las compresiones torácicas.

**Palabras clave:** Dautomático externo; Paro cardíaco; Educación; Reanimación cardiopulmonar extrahospitalaria (RCP); Entrenamiento; Fibrilación ventricular

## 1. Introduction

The use of automated external defibrillators (AEDs) in community programmes is becoming widespread [1–5]. However, few reports have been published on the effectiveness of training programmes for lay persons using AEDs, and no general agreement has been reached on the optimum intervals for refresher training. In accordance with government policy [6], the Department of Health in England has placed AEDs in busy public places such as airports and railway stations [7]. We were commissioned to assess the effectiveness of a 4-h training course in basic life support and AED use, the subsequent degree of skill decay after 6 months, and the value of refresher training at that time. Our findings have implications for all training programmes for responders who are not health care professionals but who may be deployed to a cardiac arrest to use an AED and provide cardio-pulmonary resuscitation (CPR).

## 2. Methods

### 2.1. Subjects

Airport employees aged 18 years or over who volunteered to take part in the Department of Health, England National Defibrillator Programme. Demographics are reported in Table 1.

### 2.2. Test scenario

Before initial training, participants were asked to manikins a standardised manikin simulation of a cardiac arrest. During the assessment, an AED was available but no prompt or encouragement to use it was given. The scenario used had previously been tested in a pilot study with three groups of five participants. Trainees were asked to read the following statement at the start of each assessment:

Table 1  
Basic demographic data for study participants

	Total	Male (n)	Female (n)	Mean age (range) (years)
Approached to participate in research	132	78	54	35 (19–65)
Refused	13	3	10	35 (21–60)
Completed pre-basic training assessment	119	75	44	36 (19–65)
Withdrew after basic training	7	5	2	40 (21–60)
Completing both pre-basic training and post-initial training assessments	112	70	42	35 (19–65)
Completing both pre- and post-refresher training assessments	76	47	29	35 (19–65)

You are called to help a person who has collapsed. An ambulance has already been called. You have an automatic machine with you. If you use this very quickly it can save someone's life.

When you go into the room alone you will see a training dummy that we want you to imagine is an adult about 50 years old.

When our testing starts, we want you to treat this person until we tell you to stop.

During the test I will answer any questions you have about the person's condition which you cannot work out for yourself, for example, "Is he breathing?" But I won't be able to tell you what to do.

The scenario will last approximately 10 min. This may seem like a long time but please continue to treat the person until we tell you to stop.

Please start treating the person as soon as I tell you to.

The trainees were presented with a manikin representing an unresponsive casualty with no signs of breathing or circulation. A training AED (Lifepak 500T, Medtronic Physio-Control, 11811 Willows Road, North East Redmond, WA, USA) was present on the floor beside the manikin. The AED was pre-programmed to a standard sequence that was used in all cases. On the first analysis a shockable rhythm was identified and the AED simulated being charged and prompted the operator to give a shock, which was unsuccessful in converting the rhythm. This sequence was repeated for two subsequent shocks, after which the AED advised a pulse check: none was present and the AED voice prompt advised CPR. After 1 min, the AED prompted a further re-analysis and advised a fourth shock. After a further period of analysis, a pulse check was advised. Subjects were told that signs of breathing and a circulation were now present and the assessment was concluded. Participants who failed to undertake all stages of the scenario were allowed to provide whatever interventions they deemed appropriate for up to 10 min.

### 2.3. Course description

Following the baseline test, all subjects took part in a training course lasting 4 h. Instruction was provided by St. John Ambulance, which was awarded a contract to provide the training for the site involved with the research. The syllabus covered key competencies in CPR and the use of an AED developed by the Department of Health for the National Defibrillator Programme and subsequently adopted and modified by the Resuscitation Council (UK) [8]. The course content is detailed in Appendix A. Each class was attended by no more than six students and taught by one instructor.

Skill acquisition was assessed immediately after the initial training course, using the same manikin simulation. Six months after initial training, subjects were tested immediately before and after a 2-h refresher course led by the same instructors. A scenario identical to that used for baseline testing was employed throughout.

### 2.4. Outcome measures

The following outcome measures were assessed:

1. changes in time to first shock;
2. baseline skills in CPR and use of an AED;
3. skill acquisition following a 4-h course in CPR and the use of an AED;
4. skill retention immediately before a 2-h refresher class 6 months after initial instruction;
5. performance immediately after the refresher class;
6. the number of trainees who failed to return for refresher training;
7. trainees' self-assessed rating of their competence and confidence following basic and refresher classes.

### 2.5. Evaluation of performance

Evaluation of performance was by analysis of data from a Laerdal Recording Anne Manikin (Laerdal UK Limited) connected to a laptop computer running the manufacturer's software (VAM version 1.12.11), and from a video tape recordings of each assessment. Performance was assessed using the Cardiff Test of CPR and AED version 3.1. This employs a checklist to evaluate CPR performance from a criterion-referenced analysis of video recordings and data recorded from a manikin. This test has been shown to have a high level of intra-observer reliability [9], and is a modified version of the previously validated Cardiff Assessment of Response and Evaluation (CARE) [10] and Video and Recording Anne Printout (VIDRAP) [11] protocols. Criteria to assess the use of the AED were developed from the algorithms recommended by the European Resuscitation Council [12] and were validated in a pilot study. For example, researchers compared the position of defibrillation electrodes recorded on videos of assessments with a photograph of a manikin previously marked with the ideal position (Fig. 1).

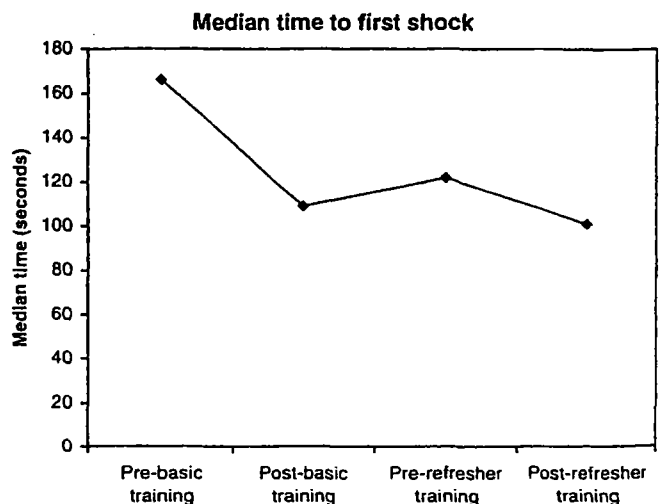


Fig. 1. Areas defined for ideal defibrillation pad placement.

Four researchers from the Pre-hospital Emergency Research Unit conducted the tests and were independent of the airport authority, the Department of Health, and the training organisation. To maximise reliability, one researcher marked all the tests. The instructors for the course were not informed of the assessment methods, and no researcher attended any class undertaken by study participants.

At the end of each class, the subjects were asked to rate their competence to use an AED on a 100 mm visual analogue scale. Using a similar method, they were also asked to indicate how confident they were that they would use the AED in a real emergency.

## 2.6. Statistics

### 2.6.1. Study numbers

The primary outcome measure for the study was the time between the start of the assessment and the administration of the first counter-shock. A paired analysis was performed to assess the difference in this variable between the assessment following the initial training class and the assessment at the start of the refresher class 6 months later. We selected a difference of 1 min as likely to be of clinical importance as it may represent as much as a 10% change in the probability of survival [13]. A standard deviation of 2.9 min (representing the degree to which the delay varied among the trainees) was used to perform this calculation. This was based on the reported experience of casino security officers [3]. We anticipated a similar value for the standard deviation of intra-trainee changes, on the grounds that a related study [14] yielded a pre-post correlation of approximately +0.5 for a 'time to care' measure in trainees.

Comparable training programmes have experienced a dropout rate of between 25 and 33% over a similar 6-month interval between the initial and refresher classes. It was anticipated that the number of trainees at the selected location would be in the region of 200, and consequently it seemed wise to include the whole group in the study at the outset to allow for the anticipated dropout of subjects. Provided useable data was available from at least 66 subjects, we anticipated a power of at least 80% to detect a 1 min change in mean delay, significant at the 5% level.

### 2.6.2. Analysis

Data were entered into the statistical software package SPSS (version 10.0, SPSS Inc., Chicago, IL, USA). The Wilcoxon test was used to compare mean time to first shock and self-assessed competence and confidence scores between assessments. *P*-values and 95% confidence intervals for the differences in the proportions of subjects performing skills correctly at the defined points during the training programme were calculated using Arcus QuickStat (biomedical version 1.0, build 88, Research Solutions). The Spearman rank correlation ( $r_s$ ) was used to assess the degree of association between self-assessed competence, confidence and time to first shock after basic training. Where possible, con-

fidence intervals are given in addition to *P*-values to indicate the precision of the point estimate and the range in which the results of a similar study in a similar population are likely to lie. A confidence interval with a range that crosses zero is indicative of a *P*-value of greater than 0.05.

## 2.7. Ethics approval and informed consent

Ethics approval was obtained from the Local Research Ethics Committee. A consent form was signed by all trainees agreeing to participate in the study following a full verbal and written explanation of the purpose of the trial.

## 3. Results

### 3.1. Demographics

Of the 132 subjects approached to participate in the research, 112 completed both pre- and post-initial training assessments. Seventy-six subsequently undertook refresher training and completed further assessments both before and after this class. Demographic data are reported in Table 1.

The dropout rate of subjects between the initial and refresher classes was considerable despite attempts to encourage all trainees to attend both sessions using letters and telephone contact. There were no significant differences in the mean ages (35.6 years versus 34.0 years, 95% CI 6.3–3.3 years,  $P = 0.507$ ) or proportions of male to females ( $P = 0.835$ , Fisher's exact test) of those who attended only an initial class compared with those who attended both initial and refresher classes.

None of the trainees in this study used an AED or performed CPR to manage a 'real' cardiac arrest between the initial and refresher classes.

### 3.2. Previous first aid or CPR training

Seventy-eight subjects had previously undertaken first aid or CPR training (Table 2). Thirty-four were fire-fighters who undertook first aid or CPR training regularly. The median time between first aid or CPR training and the study was 2.3 months (range 0–384 months). Two subjects could not remember when they had last undertaken training. Only one

Table 2  
Previous first aid or CPR training (all subjects taking pre-training test)

Previous first aid/CPR training ( $n = 119$ )	Number (%)
None	41 (34)
4 h or less	17 (14)
5–9 h	25 (21)
2–3 days	9 (8)
Four days or more	27 (23)
Paramedic training	1 (1)

Table 3  
Median time to first shock

Test (n)	Median time to first shock (range) (s)
Pre-basic training (52)	166 (81–528)
Post-basic training (112)	109 (71–208)
Pre-refresher training (78)	122 (84–248)
Post-refresher training (76)	101 (65–144)

subject (a retired ambulance paramedic) had previously received instruction in the use of a defibrillator.

The mean time between basic and refresher training was 180 days (S.D. = 18 days, range 144–232 days). Twenty-five subjects (32%) reported undertaking some form of first aid training between the basic and refresher course: all except one were fire-fighters.

### 3.3. AED skills

#### 3.3.1. Time to first shock

Before training, 52 of 119 subjects delivered at least one shock (44%, 95% CI 35–53%). All 112 tested after initial training delivered at least one shock (seven subjects did not return for testing).

Seventy-eight subjects completed the assessment immediately before the refresher course (66% of those who undertook basic training). Only one failed to administer a shock. Seventy-six were tested after refresher training and all successfully delivered a shock (two subjects did not return to take the post-refresher test).

Initial training reduced the delay to delivery of the first shock by a median of 57 s. When tested immediately before the refresher class this delay had increased by 13 s, but was reduced by 21 s after the refresher class. These differences are all highly significant ( $P < 0.001$ , Wilcoxon rank sum) (Table 3 and Fig. 2).

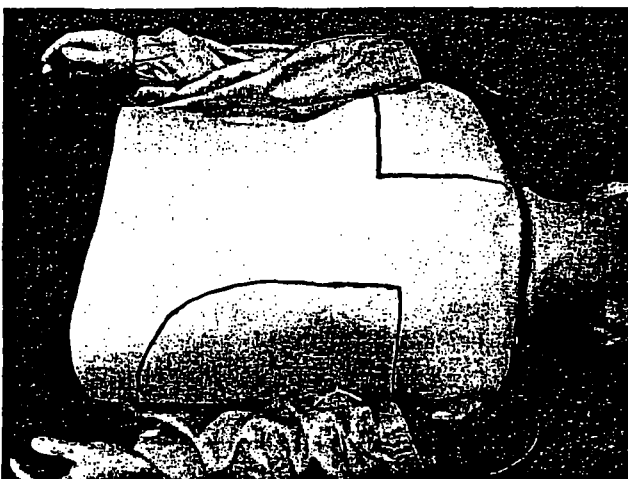


Fig. 2. Change in median time to first shock after basic and refresher training.

#### 3.3.2. Use of AED

Initial training increased the proportion of subjects placing the defibrillation pads in an acceptable position by 23–99%. There was evidence of skill decay at the end of 6 months but this was reversed by the refresher course. Using more stringent criteria, however, less than 10% of subjects placed both defibrillation electrodes in an 'ideal' position, and training did not result in a significant improvement.

Before initial training, only one subject performed an adequate 'hands-off' check before each of the four rhythm analyses, and no subject performed adequate safety checks before delivering each of the four shocks. Even after training, only 51% of the subjects performed each of these safety checks correctly. Although further improvement was seen after refresher training, over one-third of subjects still failed to make adequate safety checks before every shock. The safety check performed before the first shock was more likely to be performed rigorously than the checks made before subsequent shocks (Tables 4–6).

#### 3.3.3. Self-rated competence and confidence scores

The possible scores for trainees' self-assessed confidence and competence to use an AED ranged from zero (not at all competent/confident) to 100 (very competent/confident). Most trainees felt competent to use the AED following basic training and confident that they would do so in a real emergency. The score for competence increased very slightly (by a mean of 3.4,  $P = 0.004$ ) following refresher training. The more competent the trainees felt following training, the more confident they were that they would use the defibrillator in an emergency. This applied following both basic and refresher training ( $r_s + 0.727$  and  $r_s + 0.753$ , both  $P < 0.001$ ) (Table 7).

### 3.4. CPR skills

Initial training resulted in significant improvements in all variables (Table 4). There was evidence of skill decay after 6 months for all skills, but this was not significant for the delivery of rescue breaths or chest compression rate and depth (Table 5). With the exception of circulation checks, rescue breaths, and compression depth, performance of each variable improved after the 2-h refresher class and more subjects performed individual skills correctly than was the case after initial training (Table 6).

Even after the refresher class, however, a quarter of subjects did not open the airway correctly and 76% performed the circulation check incorrectly. Some rescuers also omitted the initial rescue breaths, possibly in an endeavour to administer the first shock quickly. Others checked for breathing and a pulse simultaneously and then went on to perform CPR. Two-thirds of subjects still failed to ventilate at the correct volume, with most over-inflating the lungs. One-third of subjects used incorrect hand positions for at least some chest compressions and only 11% gave these at the correct rate, with two-thirds delivering over 120 compressions per

Table 4  
Skill acquisition following initial training

AED/CPR skill	Proportion performing correctly			
	Before initial training	Immediately after initial training	Change (95% CI) (%)	P-value difference
Placement of defibrillation pads in an <i>acceptable</i> position (see Fig. 2)	44/58 (76)	111/112 (99)	+23 (+14 to +36)	<0.000
Placement of defibrillation pads in an <i>ideal</i> position (see Fig. 2)	2/58 (4)	7/112 (6)	+3 (–6 to +10)	0.50
Pre-rhythm analysis visual 'hands-off' check and verbal warning prior to <i>all four</i> analyses	1/45 (2)	59/112 (53)	+51 (+39 to +60)	<0.000
Safe shock delivery (visual check and verbal warning prior to <i>all four</i> shocks)	0/45 (0)	57/112 (51)	+51 (+42 to +60)	<0.000
Check for responsiveness (shake and shout)	37/117 (32)	94/112 (84)	+52 (+41 to +62)	<0.000
Airway opening	22/117 (19)	73/112 (65)	+46 (+34 to +57)	<0.000
Initial breathing check	36/117 (31)	80/112 (71)	+41 (+28 to +52)	<0.000
Initial circulation checks	7/117 (6)	32/112 (29)	+23 (+13 to +32)	<0.000
Initial rescue breaths (two breaths within five attempts, mean tidal volume 700–1000 ml)	11/116 (10)	25/112 (22)	+13 (+3 to +23)	0.007
Ventilation volume during 1 min of CPR between shocks 3 and 4 (range 700–1000 ml) <sup>a</sup>	23/118 (20)	44/112 (39)	+20 (+8 to +31)	0.000
Correct hand position for <i>all</i> compressions <sup>b</sup>	11/116 (10)	53/111 (48)	+38 (+27 to +49)	<0.000
Compression rate (range 90–110)	10/118 (9)	24/112 (21)	+13 (+3 to +23)	0.005
Compression depth (mean range = 40–50 mm)	21/118 (18)	38/112 (34)	+16 (+5 to +27)	0.004
Compression to breath ratio (15:2)	49/118 (42)	109/112 (97)	+56 (+46 to +65)	<0.000
Sequence of actions	10/118 (9)	70/112 (63)	+54 (+43 to +64)	<0.000

Values in parentheses are percentages.

<sup>a</sup> For subjects who did not use the defibrillator, ventilation volume was averaged for the entire period they performed CPR. Not all subjects attempted ventilation.

<sup>b</sup> Twenty-seven subjects did not attempt compressions at pre-basic training test.

Table 5  
Skill decay at 6 months after initial training

AED/CPR skill	Proportion performing correctly			
	Immediately after initial training	Six months after initial training	Change (95% CI)	P-value difference
Placement of defibrillation pads in an <i>acceptable</i> position (see Fig. 2)	111/112 (99)	68/78 (87)	–12 (–21 to –6)	0.0004
Placement of defibrillation pads in an <i>ideal</i> position (see Fig. 2)	7/112 (6)	5/78 (6)	–0.2 (–9 to +7)	1
Pre-rhythm analysis visual 'hands-off' check and verbal warning prior to <i>all four</i> analyses	59/112 (53)	39/76 (51)	–2 (–16 to +13)	0.77
Safe shock delivery (visual check and verbal warning prior to <i>all four</i> shocks)	57/112 (51)	22/76 (29)	–22 (–35 to –8)	0.0028
Check for responsiveness (shake and shout)	94/112 (84)	57/79 (72)	–12 (–24 to +0.0)	0.050
Airway opening	73/112 (65)	30/79 (38)	–27 (–40 to –13)	0.0002
Initial breathing check	80/112 (71)	39/79 (49)	–22 (–36 to –8)	0.002
Initial circulation checks	32/112 (29)	11/79 (14)	–15 (–26 to –3)	0.015
Initial rescue breaths (two breaths within five attempts, mean tidal volume 700–1000 ml)	25/112 (22)	11/77 (14)	–8 (–4 to +19)	0.14
Ventilation volume during 1 min of CPR between shocks 3 and 4 (range 700–1000 ml) <sup>a</sup>	44/112 (39)	23/78 (30)	–10 (–23 to +4)	0.17
Correct hand position for <i>all</i> compressions <sup>b</sup>	53/111 (48)	24/77 (31)	–17 (–30 to –2)	0.018
Compression rate (range 90–110)	24/112 (21)	19/78 (24)	+3 (–9 to +16)	0.60
Compression depth (mean range = 40–50 mm)	38/112 (34)	23/78 (30)	–4 (–9 to +18)	0.44
Compression to breath ratio (15:2)	109/112 (97)	64/78 (82)	–15 (–26 to –7)	0.0002
Sequence of actions	70/112 (63)	33/78 (42)	–20 (–34 to –6)	0.0053

Values in parentheses are percentages.

<sup>a</sup> For subjects who did not use the defibrillator, ventilation volume was averaged for the entire period they performed CPR. Not all subjects attempted ventilation.

<sup>b</sup> 27 subjects did not attempt compressions at pre-basic training test.

Table 6  
Re-skilling after refresher class

AED/CPR skill	Proportion performing correctly			
	Six months after initial training	Immediately after refresher training	Change (95% CI)	P-value for difference
Placement of defibrillation pads in an <i>acceptable</i> position (see Fig. 2)	68/78 (87)	76/76 (100)	+13 (+7 to +22)	0.0007
Placement of defibrillation pads in an <i>ideal</i> position (see Fig. 2)	5/78 (6)	2/76 (3)	-4 (-12 to +4)	0.28
Pre-rhythm analysis visual 'hands-off' check and verbal warning prior to <i>all four</i> analyses	39/76 (51)	51/76 (67)	+16 (+0.1 to +31)	0.05
Safe shock delivery (visual check and verbal warning prior to <i>all four</i> shocks)	22/76 (29)	46/76 (61)	+32 (+16 to +46)	<0.0001
Check for responsiveness (shake and shout)	57/79 (72)	66/76 (87)	+15 (+2 to +27)	0.019
Airway opening	30/79 (38)	56/76 (74)	+36 (+20 to +49)	<0.0001
Initial breathing check	39/79 (49)	60/76 (79)	+30 (+15 to +43)	0.0001
Initial circulation checks	11/79 (14)	18/76 (24)	+10 (-3 to +22)	0.11
Initial rescue breaths (two breaths within five attempts, mean tidal volume 700–1000 ml)	11/77 (14)	25/76 (33)	+19 (+5 to +32)	0.005
Ventilation volume during 1 min of CPR between shocks 3 and 4 (range 700–1000 ml) <sup>a</sup>	23/78 (30)	31/76 (41)	+11 (-4 to +26)	0.13
Correct hand position for <i>all</i> compressions <sup>b</sup>	24/77 (31)	46/76 (61)	+29 (+14 to +44)	0.0002
Compression rate (range 90–110)	19/78 (24)	8/76 (11)	-15 (-26 to -2)	0.021
Compression depth (mean range = 40–50 mm)	23/78 (30)	28/76 (37)	+7 (-8 to +22)	0.31
Compression to breath ratio (15:2)	64/78 (82)	76/76 (100)	+18 (+11 to +28)	<0.0001
Sequence of actions	33/78 (42)	60/76 (79)	+37 (+22 to +50)	<0.0002

Values in parentheses are percentages.

<sup>a</sup> For subjects who did not use the defibrillator, ventilation volume was averaged for the entire period they performed CPR. Not all subjects attempted ventilation.

<sup>b</sup> 27 subjects did not attempt compressions at pre-basic training test.

Table 7  
Trainees' self-assessed scores for competence and confidence in using the AED

Self-rated score (n)	Mean score (median)	Range
Self-assessed competence following basic training (112)	80.2 (81.0)	47–99
Self-assessed competence following refresher training (73 <sup>a</sup> )	85.7 (88.0)	48–100
Self-assessed confidence following basic training (112)	83.8 (86.0)	44–99
Self-assessed confidence following refresher training (73 <sup>a</sup> )	86.6 (90.0)	42–100

<sup>a</sup> Data was missing for three subjects post-refresher training.

minute. Thirty-eight percent compressed the chest to an inadequate depth (Table 6).

### 3.5. Other observations

Some of the subjects who did not administer a shock before training expressed a fear of doing harm while others refused to use a device without training. Others attempted to use the AED but were unsuccessful. This was either due to an inability to plug the electrodes into the AED or failure to stick them to the manikin's chest.

Delivery of the first shock in less than 80 s was often due to the omission of one or more initial assessment steps. Conversely, even after training, some subjects delayed using

the AED to give 15 compressions and two inflations. Before training, the difficulty some participants had in connecting the defibrillation electrodes may have contributed to delays. This problem was partially resolved by basic training but recurred to a lesser extent before the refresher course.

Voice prompts were occasionally misunderstood or misinterpreted before training. One subject asked what electrodes were when prompted to "connect electrodes" by the AED. The voice prompt "stand clear" resulted in one subject retreating so far from the manikin and AED that it was impossible to reach the shock button. The AED voice prompt "press to shock" was misunderstood by another trainee, who pressed the electrodes instead of the shock button. A number of subjects did not realise that the protective cover over the adhesive backing of the defibrillation electrodes had to be removed before placing these on the manikin. None of these errors recurred after training.

After training a small number of subjects covered the nostrils of the manikin using their index and middle fingers during rescue breathing, rather than using their thumb and index finger to pinch the nose closed. Use of this technique had not been evident during the pre-training assessment.

Before training, 92% of trainees performed a pulse check after delivering shocks rather than the recommended methods to check for signs of circulation. The AED used a voice prompt that instructed the rescuer to "check for pulse," which probably accounted for this error. Even after training, most subjects did not carry out the check for signs of circulation correctly, placing an inappropriate emphasis on 'patient' colour. Some trainees also checked for breathing



without opening the airway first, or looked for signs of life (coughing or moving) without checking for breathing at all. The approach to checking for signs of circulation did not change in a consistent manner following either of the training classes.

#### 4. Discussion

Automated external defibrillators have been available for over 20 years [15], but only recently has their true potential begun to be realised. AEDs have made early defibrillation more generally available within the community [16–18], and in England the Department of Health has placed nearly 700 in busy public places and arranged training for lay employees working at the site who are most likely to be in a position to use them. There have been few reports about the effectiveness of current training programmes and no firm recommendations have been made on the optimum intervals for refresher training. This study was designed to provide practical guidance on the training requirements of lay persons volunteering to use AEDs.

##### 4.1. Comparisons with previous research

This study has shown that both initial and refresher training improve skill in the use of an AED. Research describing the successful use of AEDs by lay persons suggests that training might increase the effectiveness of AEDs deployed in the public domain [4]. Previous studies have, however, reported that lay responders (including children) with minimal training are able to deliver at least one shock effectively in a simulated environment [19–21]. Similarly, clinical hospital staff with previous training limited to CPR have used an AED without further instruction [22]. In each of these studies all subjects were able to deliver a shock, in contrast to the pre-training figure of 44% recorded in our study. The average time to first shock was also shorter than reported here. None of the subjects in these studies was, however, required to make a safe approach or check for signs of responsiveness, breathing, or a circulation. Our research protocol employed a more realistic scenario, requiring subjects to evaluate the patient before using the AED. The failure of previous studies to test the ability of subjects to detect signs of a circulation may give a falsely high indication of the proportion who would deliver a shock without training.

The performance of pre-shock safety checks has not been evaluated in detail in other studies, which have limited their assessments to whether rescuers avoided touching patients. The relatively low level of safety checking reported in our study may have been related to the situation in which subjects were assessed. They were told that they were on their own, so verbal instructions to stand clear may have seemed inappropriate to some, and they were also aware that the training defibrillator did not actually deliver a shock. Modifications to the training programme may, however, be re-

quired to improve safety checks and the correct placement of defibrillation electrodes. Although the extent to which the precision of electrode placement affects shock effectiveness is unknown, contact with the patient may cause movement artefact with consequent failure of rhythm analysis, and bystanders might receive a shock if they make contact with the patient during shock delivery.

Some aspects of CPR performance also caused concern. Even after training, airway opening, ventilation, circulation checks, hand position, and rate and depth of chest compressions continued to be poorly performed by a significant portion of trainees. There is considerable evidence that CPR is taught alone (without AED use), initial acquisition and subsequent retention of skills are poor [23–27]. This is not surprising as trainees are expected to remember and perform up to 50 psychomotor skills [28]. These findings have led to the suggestion that too much is expected from courses that last only 2–3 h [29], yet many existing courses last for only 4 h inclusive of CPR training. Most of the previous AED studies have tested the performance of CPR, yet administration of a shock will not be indicated in many cases of out-of-hospital cardiac arrest. The presence of arrhythmia may be asystole or pulseless electrical activity in at least 30% of such incidents and CPR is the only intervention likely to help in these circumstances [30]. CPR training also be required between sequences of shocks. The primary importance of CPR is contentious, however, as lay responders using AEDs but without training in CPR have had low survival rates in one trial [31].

In the study reported here, the initial training class improved the performance of all CPR and AED skills compared to baseline tests. However, because the frequency with which cardiac arrest is encountered by any one individual is likely to be low in the 'public access' setting, it has been suggested that deterioration in skill might be a problem [32]. Previous studies have concentrated on health care professionals or providers of advanced first aid. In contrast to our findings, nurses demonstrated good performance of CPR skills but their knowledge of AED protocols declined when assessed 6 months after training [33]. In another study of nurses reported little loss of AED skill, but the quality of CPR performance was not reported [34]. Only 54% of voluntary aid society members were able to pass assessment 3 and 6 months after initial training; the majority of errors were associated with basic life support rather than with use of the AED [35]. A decline in the performance of both AED and CPR skills at 6 weeks and 3 months after training has also been reported in lay responders, despite 59% having had CPR training before the AED course [36]. The confusion engendered by switching between CPR and AED skills was sufficient for the authors of that study to propose that the start of CPR be delayed until after the administration of the first three shocks. Another study of lay trainees reported unsatisfactory performance, especially of CPR skills, after 3 months [37]. We found evidence of deterioration for all except one intervention (compressions).

rate) 6 months after initial training. Fortunately, the proportion of subjects able to correctly perform eight of the ten CPR skills assessed was higher following refresher training than immediately after the initial class. These findings are compatible with previous research that has reported performance returns to satisfactory levels after one episode of re-training and further improvement after a second [38].

A previous study in Norway has evaluated the AED and CPR skills of airline cabin staff working in pairs, before they participated in a 4-h European Resuscitation Council approved BLS/AED class [39]. All subjects had previous CPR training and were provided with an AED course manual before the pre-training assessment. The performance of these subjects was compared with two discrete groups who had completed the BLS/AED class and who were tested immediately afterwards or 10 months later. Although the study design and participants were dissimilar to those used in our research, some findings were broadly the same. The proportion of subjects using the AED before training, performing an initial assessment correctly, and placing defibrillator electrodes in an acceptable position were much the same. Before and after training, both studies reported a similar percentage of subjects with errors in ventilation technique, hand position, and depth of chest compressions. Performance was generally worse for subjects in our study, which also documented a greater decline in skill retention between initial and refresher training, despite this assessment being conducted after a shorter interval. After training, students in the Norwegian study gave shocks more rapidly and safely and more gave an appropriate rate of chest compressions. Although there are important methodological dissimilarities between these two investigations it seems likely that at least some of the differences in student performance are due to variations in class content.

#### 4.2. Study limitations

This study evaluated the performance of lay responders in a simulated cardiac arrest scenario. It is unlikely that this would be entirely representative of performance in a real cardiac arrest, given the additional stress of managing a real casualty. For the same reasons, the subjects' self-assessed competence and confidence scores may not be indicative of their willingness to intervene in a real emergency. Further, any course should ideally be evaluated against an existing standard of training. However, no such course currently exists, and this study's findings may prove helpful in developing a standard educational programme.

Data collection for our study started shortly after the introduction of new resuscitation guidelines, which included the replacement of the carotid pulse check with a check for signs of circulation. The manufacturers of the training AEDs used in this research could not re-programme the devices before the start of the study. Consequently, students were taught to assess for signs of a circulation but the AED voice prompt was for a pulse check: this may have confused some

trainees, some of whom had previous training in CPR. Although this may have influenced the results, it is also representative of the population of lay responders who volunteer for AED classes, and we do not believe it adversely affects the generalisability of our findings.

The scenario selected for this study did not include a non-shockable rhythm, and it was therefore not possible to test how subjects might respond to such an event. The ability of lay responders to manage non-shockable rhythms is also important since the presenting arrhythmia may be asystole or pulseless electrical activity in at least 30% of out-of-hospital cardiac arrests [30].

#### 4.3. Conclusions and recommendations

Training using the performance competencies defined by the Department of Health, England for the National Defibrillator Programme, was judged to be effective in increasing the proportion of subjects who could rapidly deliver counter-shocks using an AED. The programme has the potential to increase survival rates from out-of-hospital cardiac arrest. However, we identified the need for more emphasis to be placed on positioning defibrillation electrodes and pre-shock safety checks when teaching the use of the AED. Opening the airway, ventilation volume, checking for signs of a circulation, correct hand positioning, and depth and rate of chest compressions were all performed sub-optimally. There was evidence of deterioration in all skills 6 months after basic training, but a refresher class at this stage improved the performance of most interventions to a level above that recorded after initial training.

Further research is required to determine the optimal interval between refresher courses, and to assess the benefits of revisions to the content and delivery of the training course. Potential strategies include standardising the content of classes through the use of video-led training, interactive CD ROMs, detailed lesson plans, implementing a standardised AED instructor-training programme and subsequent class audits, or the use of manikins that incorporate a visual or audible feedback mechanism to correct errors in performance.

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## **Bilag 6**



## Resuscitation in Europe: a tale of five European regions

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### Abstract

**Aim:** To describe cardiac arrest data from five emergency medical services (EMS) systems in Europe with regard to survival from an out-of-hospital cardiac arrest. **Methods:** Based on recommendations from various countries in Europe EMS systems were approached with regard to survival from out-of-hospital cardiac arrest. Five EMS systems were asked to report their cardiac arrest data according to the Utstein style. **Results:** The five selected EMS systems were: Bonn (Germany), Göttingen (Germany), Helsinki (Finland), Reykjavik (Iceland) and Stavanger (Norway). For patients with a bystander witnessed arrest of cardiac aetiology the percentage of patients being discharged alive from hospital in these regions were: 21, 33, 23, 23 and 35. The corresponding percentages for patients fulfilling criteria as above and being found in ventricular fibrillation were: 32, 42, 32, 27 and 55. **Conclusions:** Many EMS systems in Europe show extremely good results in terms of survival after an out-of-hospital cardiac arrest. Some of the results should be interpreted with caution since they were based on relatively small sample sizes. Furthermore, the results from one of the regions (Stavanger) was unit based and not community based. © 1999 Elsevier Science Ireland Ltd. All rights reserved.

### 1. Introduction

Over the past decades there has been a heightened awareness of the importance of sudden cardiac death and appreciation of the therapeutic implications. This has been one reason for the development of out-of-hospital emergency medical service(s) (EMS) [1].

Although originally introduced by Pantridge in Northern Ireland [2] this development took place most rapidly in Seattle, King County, USA [3]. During the last two decades various regions in Europe have reported success in terms of improved survival after an out-of-hospital cardiac

arrest [4–6]. The present survey describes resuscitation in five centres in Europe and was initiated by an invitation lecture by the organizing committee of the 4th Congress of the European Resuscitation Council (ERC) with the title ‘Resuscitation in Europe at its best: A tale of five European regions’.

### 2. Methods

Based on recommendations from the secretary of the organizing committee of the 4th Congress of the European Resuscitation Council persons in the following countries were approached: Norway, Sweden, Denmark, Finland, Iceland, Scotland, England, Germany, The Netherlands, Belgium,

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France, Switzerland, Italy, Spain, Austria and Slovenia regarding their EMS systems.

Based on their response, key persons in the following EMS systems were contacted: Stavanger, Oslo, Trondheim and Fredrikstad (Norway); Helsinki and Varkaus (Finland); Geneva (Switzerland); Berlin, Ulm, Göttingen, Mainz and Bonn (Germany); Reykjavik (Iceland); Copenhagen (Denmark); Göteborg (Sweden); Madrid (Spain); Antwerp and Brugge (Belgium); Amsterdam (The Netherlands); Udine (Italy); Ljubljana (Slovenia); Brighton (England).

They were asked the following questions:

1. In the population served by your ambulance organisation, how many patients suffer out-of-hospital cardiac arrest and in how many is resuscitation attempted by the ambulance crews of the EMS system each year?
2. What proportion of these patients were/are discharged alive from hospital?
3. What proportion of patients having a bystander witnessed out-of-hospital cardiac arrest

of cardiac aetiology are discharged alive from hospital?

4. What proportion of patients fulfilling the criteria above i.e. bystander witnessed out-of-hospital cardiac arrest of cardiac aetiology and in whom ventricular fibrillation/tachycardia are discharged alive from hospital?
5. Which time period does your data refer to?

Selection of five EMS systems was based on survival rates among patients with bystander witnessed cardiac arrest of cardiac aetiology, and bystander witnessed cardiac arrest of cardiac aetiology found in ventricular fibrillation. The size of the catchment area was also considered. The questions asked of the five selected EMS systems were as follows:

### 2.1. General aspects

1. Description of EMS organization.
2. Study area and population.
3. Proportion of population trained in CPR.

Table 1  
Survival and number of out-of-hospital cardiac arrests

	Survival (%)			Years	Number of included cardiac arrests each year in which resuscitation was attempted
	Overall	Bystander witnessed of cardiac aetiology	Bystander witnessed of cardiac aetiology found in VF		
Stavanger*	23	35	55	95-96	79
Varkaus	22	28	50	93-94	35
Geneva	22	-	-	96	92
Mainz	19	31	40	97	151
Göttingen	18	33	42	85-90	150
Helsinki	17	23	32	95	344
Reykjavik	16	23	27	91-96	60
Bonn	15	21	32	89-94	153
Copenhagen	13	-	20	94-95	230
Fredrikstad	13	15	32	97	170
Göteborg	12	16	29	91-96	276
Madrid	12	12	22	92-93	401
Oslo	8	12	21	97	209
Antwerp	11	-	23	91-97	55
Amsterdam	11	10	15	95-97	593
Berlin	9	14	16	89-95	525
Trondheim	11	-	-	90-94	105
Brugge	8	14	20	91-96	147
Udine	8	10	15	94	438
Ljubljana	6	6	13	95-97	151
Brighton	-	10	-	97	137
Ulm	-	-	27	95	124

\* Only helicopter transported patients included.

Table 2  
Number of patients discharged alive per 100,000 inhabitants annually

	Total	Bystander witnessed cardiac arrest of a cardiac aetiology	Bystander witnessed cardiac arrest of a cardiac aetiology found in ventricular fibrillation	Catchment population (1000)
Varkaus	22	17.6	16.1	34
Stavanger	14.6	12	12	150
Mainz	14.5	9	8.5	200
Helsinki	11.8	7.1	6.7	535
Berlin	10.3	9.0	7.9	400
Bonn	9.2	4.9	4.0	240
Fredrikstad	9.1	9.1	8.3	241
Göttingen	8.2	6.0	4.9	270
Reykjavik	8.2	6.3	4.4	130
Göteborg	7.9	4.5	4.0	434
Trondheim	7.4	–	–	155
Brugge	5.9	–	–	200
Geneva	5.3	–	–	380
Amsterdam	5.2	2.9	2.8	1300
Oslo	3	3	3	500
Udine	2.1	1.1	0.7	940

4. Number of out-of-hospital cardiac arrests per year in whom resuscitation was attempted.
5. Proportion bystander witnessed?
6. Proportion bystander witnessed and of a cardiac aetiology?
7. Distribution of patients with regard to rhythm on arrival of the ambulance crew.

#### 2.1.1. Factors at resuscitation

1. Median interval between call for and arrival of ambulance.
2. Median interval between collapse and defibrillation.
3. Proportion of bystander initiated CPR.

#### 2.2. Treatment

The following questions refer only to patients with bystander witnessed arrest of a cardiac aetiology

1. Use of lidocaine after conversion from ventricular fibrillation to a pulse generating rhythm.
2. Use of atropine in asystole.
3. Use of adrenaline in asystole and pulseless electrical activity.

#### 2.3. Survival (%)

1. Hospitalized alive

2. Discharged from hospital alive in the following groups:

- 2.1. All patients
- 2.2. Bystander witnessed and of a cardiac aetiology
  - 2.2.1. All
  - 2.2.2. Found in ventricular fibrillation/tachycardia
  - 2.2.3. Found in ventricular fibrillation/tachycardia and bystander CPR initiated
  - 2.2.4. Found in asystole
  - 2.2.5. Found in pulseless electrical activity.

3. Survival 1 year after cardiac arrest when discharged alive from hospital
4. Distribution according to cerebral performance categories (CPC) score at discharge
5. Proportion of hospitalized patients that were discharged.

The questions were asked of the five EMS systems to enable comparison according to the Utstein style [7]. Functional status was defined according to CPC score [7].

### 3. Results

#### 3.1. Initial survey

The overall survival rate varied from 23% in

Table 3  
Organisation of the five EMS systems

	Bonn	Göttingen	Helsinki	Stavanger	Reykjavik
Number of tiers	2	Mixed system	3	2	1
Number of basic life support (BLS) units	11	12	7 ambulances and 8 fire engines	9	3
Number of advanced life support (ALS) units	2	4	3	1	1
Personnel on board BLS unit	1 paramedic, 1 EMT <sup>a</sup>	2 paramedics/1 paramedic, 1 EMT	2 paramedics, EMTs	2 EMTs	2 EMT-B/EMT-I <sup>b</sup>
Personnel on board ALS unit	1 physician, 1 paramedic	1 physician, 1 paramedic, 1 EMT	Paramedics	1 physician, 1 paramedic, 1 pilot trained as basic EMT	1 physician, 1 physician, 1 EMT-I
At what level is the physician active	1 physician on board each ALS unit	1 physician on board each ALS unit	At third level (1 physician staffed unit for the whole city)	1 physician on board the ALS unit	ALS
Distribution and type of defibrillators	AED <sup>c</sup> in 5 of 11 BLS units. Defibrillator/monitor in both ALS units	1 defibrillator on each BLS and ALS unit	AED in all units	AED in all BLS units	Manual in ALS unit. AED in all BLS units
Definition of EMT	520 hours training program	520 hours training program	Fire-fighters trained to emergency care (BLS, defibrillation, intubation on adult victims)	BLS+defibrillation	110 hours of training/240 hours of training
Definition of paramedic	2 years training program	2 years training program	Qualified to perform ALS	Not applicable	Not applicable

<sup>a</sup> EMT, emergency medical technician.

<sup>b</sup> EMT-B/EMT-I, EMT Basic (110 hours of training)/EMT-Intermediate (240 hours of training).

<sup>c</sup> AED, automated external defibrillator.

Table 4  
Epidemiological aspects in the five regions

	Bonn	Göttingen	Helsinki	Reykjavik	Stavanger <sup>a</sup>
Catchment area (km <sup>2</sup> )	93	1500	590	350	–
Catchment population (1000; <i>n</i> )	240	270	535	130	150
Number of out-of-hospital cardiac arrests in whom resuscitation was attempted per year ( <i>n</i> )	153	150	344	60	79
Number of out-of-hospital cardiac arrests in whom resuscitation was attempted per year per 100,000 ( <i>n</i> )	64	55	66	50	58
Proportion of cardiac arrests being witnessed by a bystander and being of a cardiac aetiology (%)	37	63	76	77	65
Proportion of patients found in ventricular fibrillation among bystander witnessed cardiac arrests of a cardiac aetiology (%)	53	46	65	59	61
Proportion of citizens in the community educated in CPR (%)	Training when driving licence	15–20	Probably low	20	20

<sup>a</sup> Only helicopter transported patients included.

Stavanger to 6% in Ljubljana. The corresponding figures for patients having suffered a bystander witnessed cardiac arrest of a cardiac aetiology varied from 35 to 6%. Seven EMS systems reported a survival rate of more than 20% for this group (Stavanger (35%), Göttingen (33%), Mainz (31%), Varkaus (28%), Reykjavik (23%), Helsinki (23%) and Bonn (21%) (Table 1).

Among patients having suffered a bystander witnessed cardiac arrest of a cardiac aetiology found in ventricular fibrillation, the survival rate varied between 55 and 13%. Seven EMS systems

reported a survival rate of more than 30% (Stavanger (55%), Varkaus (50%), Göttingen (42%), Mainz (40%), Bonn (32%), Helsinki (32%) and Fredrikstad (32%).

The number of cardiac arrests per year in whom resuscitation was attempted by respective EMS system varied between 525 in Berlin and 35 in Varkaus.

Based on this information the following five EMS systems were selected for further studies: Bonn, Göttingen, Helsinki, Reykjavik and Stavanger.

Table 5  
Factors at resuscitation

	Bonn	Göttingen	Helsinki	Reykjavik	Stavanger
Bystander initiated CPR in patients with bystander witnessed cardiac arrest (%)	28	34	27	46	67
Median interval between call for ambulance and arrival of ambulance in bystander witnessed cardiac arrest (min)	5	7	7	5	6
Median interval between collapse and defibrillation in bystander witnessed cardiac arrest (min)	10	11	8 <sup>a</sup>	–	7
<i>Medication (%)</i>					
Lidocaine after conversion from ventricular fibrillation to a pulse generating rhythm	57	–	2	60	10
Atropine, when found in asystole	3	24	0	85	Few
Adrenaline, when found in asystole	91	97	100	85	100
Adrenaline, when found in pulseless electrical activity	91	97	100	100	Most

<sup>a</sup> Time between call for ambulance and defibrillation.



Table 6  
Survival and CPC score among survivors

	Bonn	Göttingen	Helsinki	Reykjavik	Stavanger
<i>Discharged alive (%)</i>					
All cardiac arrests	15	18	17	16	23
Bystander witnessed cardiac arrest of a cardiac aetiology	21	33	23	23	35
Bystander witnessed cardiac arrest of a cardiac aetiology found in ventricular fibrillation	32	42	32	27	55
Bystander witnessed cardiac arrest of a cardiac aetiology found in ventricular fibrillation and where bystander CPR was initiated	33	64	40	34	74
Bystander witnessed cardiac arrest of a cardiac aetiology found in asystole	8	6	2	9	5
Bystander witnessed cardiac arrest of a cardiac aetiology found in pulseless electrical activity	6	3	4	0	-
Hospitalised alive after bystander witnessed cardiac arrest of a cardiac aetiology	40	48	45	54	86
Alive after 1 year among those who were discharged alive and had a bystander witnessed cardiac arrest of a cardiac aetiology (%)	73	86	89	83	-
<i>CPC score at discharge among survivors (%)<sup>a</sup></i>					
I or II	77	88	93	93	83
I	47	76	89	-	72

<sup>a</sup> Only patients with a bystander witnessed arrest of a cardiac aetiology were included.

We also evaluated outcome in terms of number of saved lives per 100,000 inhabitants and year. The results are shown in Table 2

### 3.2. Final survey

The five EMS systems were scrutinized in various aspects. The organisations of the five systems are described in Table 3.

#### 3.2.1. Epidemiology

The catchment area varied between 1500 km<sup>2</sup> in Göttingen and 93 km<sup>2</sup> in Bonn. The catchment population varied between 535,000 in Helsinki and 130,000 in Reykjavik. The number of out-of-hospital cardiac arrests per year where CPR was attempted varied from 344 in Helsinki to 60 in Reykjavik. However, the incidence of out-of-hospital cardiac arrest in which resuscitation efforts were attempted per 100,000 inhabitants was remarkably similar in the five regions. The proportion of cardiac arrests due to cardiac aetiology and witnessed by a bystander varied from 77% in Reykjavik to 37% in Bonn. The proportion of patients found in ventricular fibrillation among bystander witnessed arrest of cardiac aetiology varied from 65% in Helsinki to 43% in Göttingen (Table 4).

The proportion of people in the community educated in CPR was around 20% with no obvious difference between regions (no precise data from Bonn and Helsinki).

#### 3.2.2. Factors at resuscitation

The proportion of patients with bystander witnessed cardiac arrest who received bystander CPR varied from 67% in Stavanger to 27% in Helsinki (Table 5).

The median interval between the call for an ambulance and arrival of the ambulance on scene varied between 7 min in Helsinki to 5 min in Bonn and Reykjavik. The median interval between collapse and defibrillation varied between 10 min in Bonn and 7 min in Stavanger.

#### 3.2.3. Use of medication

The use of lidocaine for patients who converted from ventricular fibrillation to a pulse generating rhythm varied from 60% in Reykjavik to 10% in Stavanger. The use of atropine for patients found in asystole varied from 85% in Reykjavik to 0% in Helsinki (Table 5).

The use of adrenaline for patients found in either asystole or pulseless electrical activity was nearly 100% and similar between the regions.

### 3.2.4. Survival

The survival rate for all patients, patients with bystander witnessed arrest of cardiac aetiology and patients being found in ventricular fibrillation was surprisingly high, with the highest values in Stavanger. For patients with bystander witnessed arrest of cardiac aetiology in ventricular fibrillation, and with bystander initiated CPR, up to 74% were discharged alive from hospital in Stavanger but only 33% in Bonn (Table 6).

For patients with bystander witnessed arrest of cardiac aetiology in asystole, 9% were discharged from hospital in Reykjavik and 8% in Bonn.

For patients with similar criteria found in pulseless electrical activity the best results were found in Bonn with a survival rate of 6%.

For patients with a bystander witnessed cardiac arrest of cardiac aetiology and hospitalized alive, about 50% were discharged alive with the exception of Stavanger where 86% were discharged alive.

Among the patients who were discharged the vast majority were alive 1 year later in all regions where information was available.

### 3.2.5. CPC score

The majority of patients who were discharged alive had a CPC score of either I or II at discharge in the four regions where information was available. The proportion of survivors having a CPC score of I at discharge varied between 89% in Helsinki and 47% in Bonn (Table 6).

## 4. Discussion

The aim of this study was to describe resuscitation in five different regions in Europe.

It must be emphasized that some of the information is based on a small sample size and consequently the data have to be interpreted with caution. The data from Stavanger are not population based, but merely unit based.

It is possible that there are other regions in Europe in which EMS systems operate with similar results in terms of survival from an out-of-hospital cardiac arrest. Furthermore, EMS systems being approached in respective country were based on personal recommendations rather than a systematic overview. Thus the centres were not selected on a scientific basis.

Two regions outside the five finally selected are worth a special comment.

Varkaus in Finland had a very high survival rate among patients with out-of-hospital cardiac arrest. The following two facts were the reason for not selecting Varkaus: (1) the results were based on a very small sample size; (2) Varkaus is located close to Helsinki, also with very good results which were based on a larger sample size.

The results from Mainz were impressive. Their results were received after this article was in its final format. In order not to change the original aim and presentation of this work, i.e. a tale of five regions, we decided not to include Mainz in the more detailed description.

### 4.1. Epidemiology

The catchment area and the catchment population varied considerably among the five selected EMS systems.

There was also a variability in terms of the proportion of patients having bystander witnessed arrest of a cardiac aetiology. Such an observation might be explained by the difficulties in defining whether the aetiology is cardiac or not in the absence of an autopsy or might be explained by a variability in the proportion of patients with a witnessed arrest. Bonn differed remarkably from the others. The proportion of bystander witnessed arrests was relatively low in Bonn.

### 4.2. Bystander CPR

Bystander CPR has repeatedly been shown to be associated with an increased survival from out-of-hospital arrest [8–10]. It has, however, also been suggested that the effect of bystander CPR is limited if very prompt defibrillation can be achieved [11].

It seemed that around 20% of people in the community were trained in CPR, although satisfactory information was only available in three of the five regions. Although such figures are promising, they can be further improved possibly by telephone guided CPR [12]. The frequency and the quality of bystander CPR has been reported to be of importance for high survival rates [13–15]. There was a discrepancy between the data being gathered with regard to proportion in the community trained and the actual incidence of bystander

initiated CPR. There is no obvious explanation of these findings. Possible explanations are lack of motivation, fear of doing it wrong, inconvenience etc.

#### 4.3. Delay time until delivery of treatment

Many previous studies have reported that the time between collapse and defibrillation is of great importance for survival [16,17]. The five EMS systems overall showed a relatively short median time between call and arrival of ambulance, as well as between collapse and defibrillation.

The median interval between collapse and defibrillation of 10 min in Bonn was somewhat longer than expected. However, the median interval between call for ambulance and defibrillation was 7 min in Bonn which is comparable to 8 min in Helsinki. However, the interval does probably not explain the results alone since other organisations apparently have similar intervals to these five EMS systems with poorer outcome. For example in a national Swedish survey, a delay time of 8-9 min from collapse to defibrillation was associated with a survival rate of less than 20% [17].

#### 4.4. Use of medication

None of the medications used in out-of-hospital cardiac arrest has been shown to increase survival in humans [18]. Thus, none of them are used according to the principles of evidence based medicine [19]. Therefore, it was not surprising to find a large variability with regard to the use of lidocaine and atropine in the five EMS systems. Use of adrenaline was common and fairly uniform.

Use of adrenaline is part of both the American Heart Association (AHA) and the ERC guidelines [20-22]. There is overwhelming evidence from animal experimental data clearly showing that adrenaline, like other alpha adrenergic drugs, will increase perfusion of the myocardium during chest compressions and therefore increase the rate of successful resuscitation [23-26]. No prospective randomized clinical trial using adrenaline and placebo has been performed in man to answer the question of whether adrenaline is beneficial.

#### 4.5. Survival

The overall survival rate varied between 15 and

23% in the five systems. The survival rate among patients with a bystander witnessed arrest of cardiac aetiology varied between 21 and 35% and the survival rate among patients with a bystander witnessed arrest of cardiac aetiology found in ventricular fibrillation varied between 27 and 55%. In all three categories the survival rate was highest in Stavanger.

The results are even better than those being previously regarded as the most successful [27]. As previously stated the sample size on which results were based were generally small, particularly in Stavanger.

An often neglected aspect of survival after an out-of-hospital arrest is the survival rate among patients hospitalised alive [28]. In this survey we found that about 50% survived in four of the systems, whereas Stavanger showed even better results.

Another important aspect is the long-term survival among patients being discharged alive. In three of the systems information was available, reporting 1-year survival varying between 73 and 89%. These findings are in agreement with previous reports [29-31].

#### 4.6. CPC score

In this survey we found that a minority had CPC scores of III or worse. The proportion of patients with CPC score I at discharge varied between 89 and 47%. Improvement can occur even after discharge from hospital, as previously reported [32]. Only the CPC scores among the survivors after bystander witnessed arrest of cardiac aetiology were shown since this was the question under consideration, and this may represent a group of patients with better neurological recovery. The CPC scores being reported from these five centres are similar to results being reported in previous publications [6,32,33].

#### 4.7. Possible explanations of the high survival rate

Each of the authorities responsible for the respective five selected EMS systems were asked about the most important contributing factors to their successful results. In aggregate they were as follows: (1) short response time; (2) a high proportion of bystander CPR which might be due to a high level of CPR training and/or telephone guided CPR; (3) well trained EMS personnel; and (4) well trained

emergency physicians. These factors appeared to be generally agreed upon. Then there were local comments such as the importance of reperfusion and oxygenation of the non-beating heart, the use of bicarbonate, multidisciplinary cooperation between the dispatching centre, the rescue department and health authorities.

#### 4.8. Further improvement being considered

##### 4.8.1. Bonn

1. Training program for dispatchers in telephone guided CPR, to increase the frequency and quality of bystander CPR.
2. Intensification of the automated external defibrillation (AED) training program for the basic life support (BLS) units to shorten the collapse to defibrillation interval.
3. Intensification of feed back to the EMS system from the hospitals to motivate EMS personnel.

##### 4.8.2. Göttingen

1. The time interval between onset of first symptoms and activation of the EMS system is too long. Improvements may be possible by continued education of the public.
2. The time interval between the arrest and activation of the EMS system by bystanders frequently is too long. Here also: continued education of the public is the goal
3. The rate of bystander CPR should be increased, e.g. by telephone CPR.

##### 4.8.3. Helsinki

1. Public education should be incorporated into the EMS role and supported by legislative action.
2. The time delay involved in responding units should be shortened, e.g. by introducing a satellite location system.
3. Implementation of public access defibrillation into certain predefined risk areas, e.g. harbour terminals.

##### 4.8.4. Reykjavik

1. To be able to keep a short response time to

defibrillation in an enlarging service area a two tiered system was introduced in 1997.

##### 4.8.5. Stavanger

1. Efforts to reduce patient delay in reporting symptoms to the central medical dispatch.
2. Increased deployment of AEDs into society for Public Access Defibrillation (PAD) to reduce time from cardiac arrest to first shock.
3. Programmes for prehospital thrombolysis to reduce time from onset of symptoms of myocardial infarction to start of thrombolytic therapy.

#### 4.9. EMS structure

No study has proved the value of a high level training for ambulance personnel. In one study it was suggested that presence of a nurse on board the ambulance in addition to two paramedics might increase survival in out-of-hospital arrest compared with two paramedics alone [34]. It has also been suggested that survival is better when patients are treated by paramedics rather than EMT's [35,36]. All five organisations employed a well educated emergency physician. The importance of this can only be speculated upon. However, some of the authors regarded this as a major contributing factor to the high success rate in their EMS system. Another possible contributing factor is a high training level of the first tier.

#### 5. Limitation

The aim of this manuscript is to give examples of resuscitation in Europe. The results in Table 1 should be used as background information and not as a comparison of the effectiveness between various organisations. Such a comparison could only be made if data were collected uniformly in a common data base. In this survey data were gathered during different time periods.

Factors other than medical performance or organisation may explain the differences between rescue organisations in terms of survival after out-of-hospital cardiac arrest. A selection might occur in the earliest steps of the Utstein template i.e. between 'considered for resuscitation' and 'resuscitation attempted'. Therefore, Table 2 was

constructed which shows the number of lives saved annually per 100,000 inhabitants. All the five selected regions showed high figures in terms of overall number of lives saved which argues against a strong selection process. Other centres, such as Berlin and Fredrikstad also showed a high number of survivors in this evaluation. A fair evaluation of the success rate of a rescue organisation in terms of survival after out-of-hospital cardiac arrest should include both values as well as the absolute numbers as shown in Tables 1 and 2.

## 6. Conclusion

This survey demonstrated the type of results that can be achieved for resuscitation after out-of-hospital cardiac arrest in Europe. There are links in the chain of survival which can be further improved even in the best of EMS systems. Future research will clarify whether some of the data, which were based on a relatively small sample size can be confirmed in a larger patient population. Whether survival after an out-of-hospital cardiac arrest can be further improved remains to be determined.

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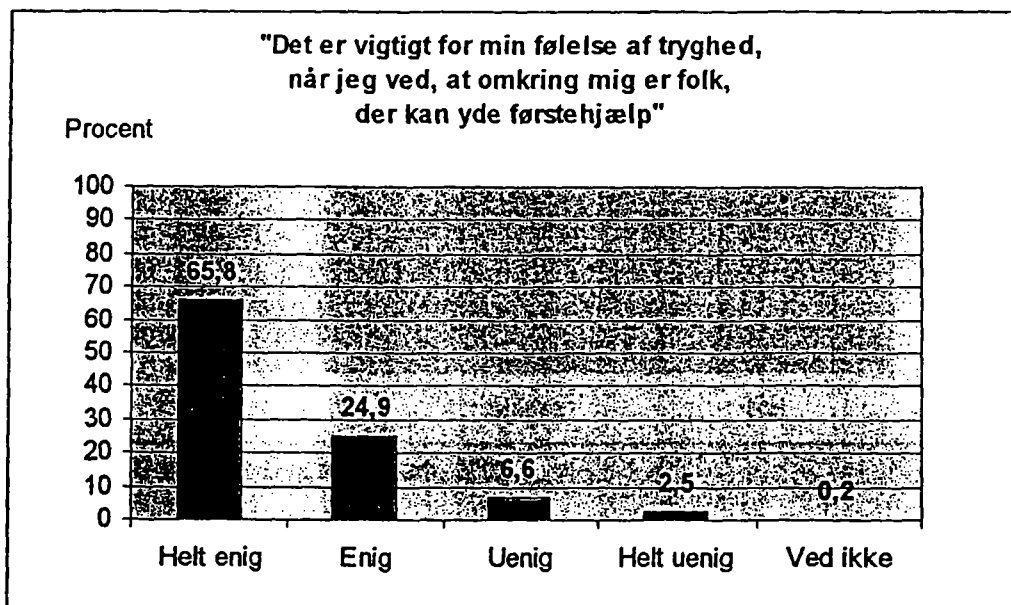
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## **Bilag 7**

September 2002

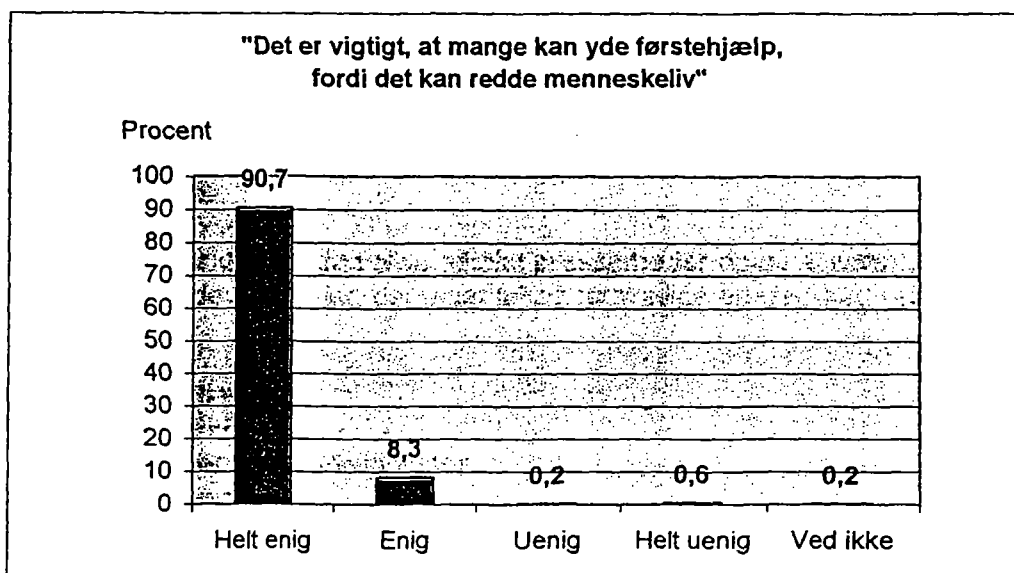
## Førstehjælp i Danmark

Ifølge en undersøgelse, som Gallup har gennemført for Tryk i Danmark, mener godt 90 % af danskerne, at de ville føle sig mere trygge i hverdagen, hvis flere kunne førstehjælp:



Kilde: Gallup for Tryk i Danmark, 2002

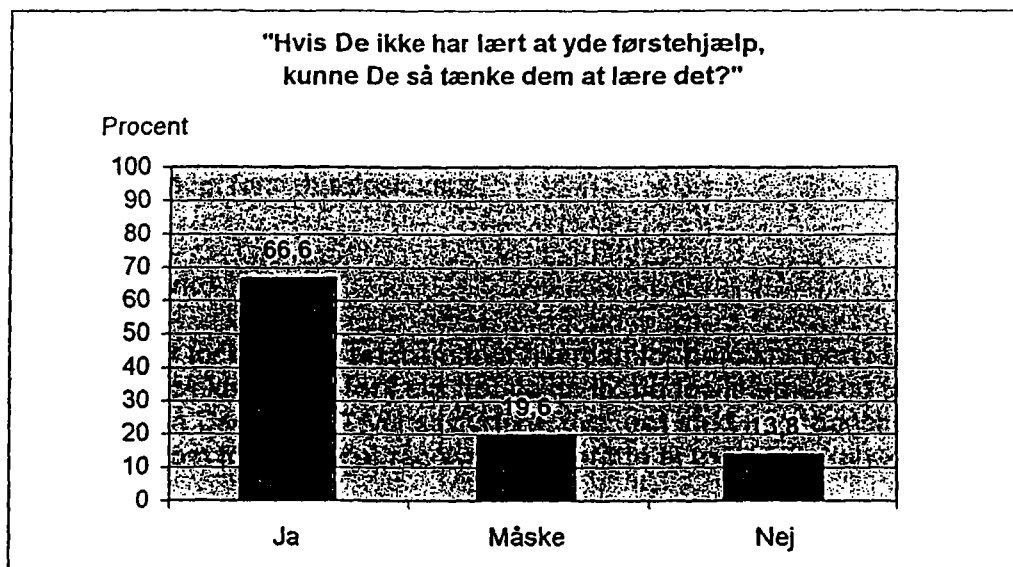
Alligevel viser Falcks opgørelser, at kun mellem 5 % og 20 % af den danske befolkning har gennemgået et kursus i førstehjælp. Og mange af disse har givetvis gennemført kurset år tilbage. Næsten alle de adspurgte i Gallup-undersøgelsen er dog enige i, at det er vigtigt, at folk kan førstehjælp:



Kilde: Gallup for Tryk i Danmark, 2002



Gallup-undersøgelsen viser også, at ca. 2/3 af de, der ikke allerede kan førstehjælp, er motiverede for at lære førstehjælp:



Kilde: Gallup for Tryk i Danmark, 2002

Med andre ord er det et begrænset antal danskere, der har gennemgået et førstehjælpskursus og har det i frisk erindring. Samtidig er der stor og positiv interesse for førstehjælp i den danske befolkning. Dermed er der et stort potentiale for at få flere til at lære førstehjælp.

### Førstehjælpsugen

På baggrund af ovenstående ønsker Tryk i Danmark at udbrede kendskabet til livreddende førstehjælp. Hensigten er, at flere danskere får viden om førstehjælp og i sidste ende gennemgår et kursus i førstehjælp.

Derfor gennemfører Tryk i Danmark i uge 41 en førstehjælpsuge, hvor der sættes fokus på hele området førstehjælp. Ugen har bl.a. til formål at få medier, politikere, eksperter og befolkning til at diskutere behovet for førstehjælp. Tryk i Danmark ønsker at inddrage andre interessenter, der arbejder med førstehjælp, i Førstehjælpsugen – så opgaven med at få flere danskere til at lære førstehjælp kan løftes i flok.

I Førstehjælpsugen vil der dag for dag blive afholdt pressemøder og blive iværksat andre, opmærksomhedsskabende aktiviteter, der tager fat på forskellige emner med relation til førstehjælp:

- Førstehjælp i familien
- Førstehjælp i trafikken
- Førstehjælp i skoler og daginstitutioner
- Førstehjælp i fritiden

## **Bilag 8**

## Rapport vedrørende førstehjælp udført af lægpersoner i forbindelse med tilskadekomst.

**Formålet** med undersøgelsen er at belyse antallet af patienter involveret i færdselsuheld i Frederiksborg Amt og i hvilket omfang der blev givet førstehjælp før ankomst af ambulance fra lægpersoner. Desuden at belyse hvilken førstehjælp som blev ydet.

### Data:

I alt 774 ambulancetransporter blev registreret som trafikuheld i sygehusets registrerings-system. 464 patienter var mænd og median alderen var 35 år (tabel 1).

Der var flest skader på alle andre anatomiske regioner end cranie og rygsøjle (268 skader), men 116 patienter havde pådraget sig et hovedtraume (tabel 1).

I 48 cases havde lægpersoner udført førstehjælp på skadestedet, hvoraf den hyppigste indsats var lejring af patienten (28 cases). I 7 cases var brud blevet bandageret og i 1 case var det ydet førstehjælp i form af hjertemassage (tabel 2).

Hvis man ser nøjere på de patienter, hvor førstehjælp i høj grad må formodes at have betydning, blev dette kun ydet i ganske få tilfælde. I disse analyser blev der ikke taget højde for, at de fysiske omstændigheder på skadestedet kunne have vanskeliggjort førstehjælp fra en lægperson. Hermed menes, at det måske pga. omstændighederne på skadestedet var umuligt at komme frem til patienten, eller at der måske slet ikke var lægpersoner tilstede på skadestedet.

Blandt patienter, som havde mindre end 10 pulsslag / minut ved ambulancens ankomst og som med stor sandsynlighed enten havde hjertestop eller var svært tilskadekomne, blev der ikke udført førstehjælp fra lægpersoner f.eks i form af hjertemassage eller lejring.

Blandt patienter, som var bevidstløse vurderet på baggrund af Glasgow Coma Scale Score  $\leq 7$  var der udført førstehjælp i 2 cases. I den ene var der udført hjertemassage, i den anden var patienten lejret.

### Diskussion:

Overordnet set blev der ydet førstehjælp i 6% af disse cases, hvor der var tale om trafikuheld. På dette punkt antager Frederiksborg Amt en beklagelig ringe position. Og desværre har jeg ikke formodning om, at Frederiksborg Amt antager særstatus som et amt, hvor befolkningen ikke udfører førstehjælp til patienter involveret i trafikuheld. Jeg tror, at dette tal kan generaliseres til det øvrige Danmark.

Til sammenligning viser analyser af hjertestop i Danmark fra Dansk Hjertestopregister, at der ydes basal genoplivning ved lægpersoner til 18% før ambulancens ankomst. Såfremt hjertestoppet også var observeret, var der forsøgt genoplivning i 23% af tilfældene inden ambulancens ankomst.

En forklaring på, at der ydes førstehjælp i langt færre cases, når der er tale om trafikuheld er muligvis, at omstændighederne på skadestedet kan være meget kaotiske alt afhængig af skadernes omfang og antal involverede personer. Således kan det virke meget uoverskueligt for en lægperson at vurdere, hvor førstehjælpen ydes bedst. Det kræver vedligeholdende træning at have overblik på et skadested og især ved trafikuheld.

Til sammenligning er det formodentlig langt mere overskueligt at udføre basal genoplivning på en person, som findes med hjertestop og som måske til-og-med er en pårørende. Udenlandske studier har fundet, at der blev forsøgt genoplivning imellem 27% og 67% ved hjertestop, hvor f.eks Sverige ligger på 36%.

Desværre er indsatsen fra lægpersoner meget mangelfuld i tilfælde, hvor den tilskadekomne i høj grad havde brug for førstehjælp. I denne rapport vurderet ud fra patienter, som havde meget lav puls og som muligvis havde hjertestop eller som var bevidstløse. Om dette forhold skyldes en generel berøringsangst hos danskere eller manglende tradition i Danmark for obligatorisk førstehjælp er uvis.

Spørgsmålet er så, hvem der yder førstehjælp på skadestedet. Det kan undersøgelsen fra Frederiksborg Amt ikke belyse. Men i en undersøgelse fra Vestsjællands amt som analyserede 51 traumbetingede ulykkesdødsfald i 1993/94 blev der ydet førstehjælp i 19 (37%) cases, overvejende af personer, der i kraft af deres erhverv havde erfaring med at hjælpe syge og tilskadekomne. Det kunne være fra en læge, en sygeplejerske, en Falckredder / brandmand eller soldater.

#### **Konklusion:**

Alt i alt må det konkluderes, at der sjældent ydes førstehjælp fra lægpersoner på skadestedet ved trafikuheld.

Muligvis skyldes dette, at det er svært at få overblik på skadestedet og tilbyde hjælpen til netop dén tilskadekomne, som har mest brug for det. Men forklaringen skal nok i højere grad findes i manglende uddannelse og træning i at kunne udføre førstehjælp blandt lægpersoner, som ikke i forvejen har faglig viden og træning i at kunne yde førstehjælp til tilskadekomne involveret i trafikuheld.

## Tabelsamling:

**Tabel 1. Ambulancetransporter registreret som trafikuheld i sygehusets registreringssystem**

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<b>Ambulancetransporter i alt = 774</b>	
<b>Populationen som kørte i ambulance:</b>	
Mænd (%)	464 (60%)
Alder (år) (median, interkvartil spændvidde)	35 (21-49)
<b>Skadestyper:</b>	
Hovedtraume (%)	116 (15%)
Brud, forvriddning, ledscred, slag på rygsøjle, kranie eller ansigt (%)	207 (27%)
Brud, forvriddning, ledscred, slag på alle andre (%)	268 (35%)

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**Tabel 2. Cases, hvor lægpersoner udførte førstehjælp på skadestedet**

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<b>Ambulancetransporter i alt = 48 (6%)</b>	
<b>Hvilken førstehjælp blev ydet?</b>	
Hjertemassage (%)	1 (2%)
Bandagering af brud (%)	7 (15%)
Lejring af patienten (%)	28 (58%)

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## **Bilag 9**

# 1 års overlevelsen efter avanceret hjertestopbehandling udenfor hospitalet udført af lægeambulancen i Århus

Anette Fedder, Alf Jørgen Møl Christensen, Niels Kim Schönemann

Anette Fedder har lavet flere posters og abstracts i præhospitalet behandling og lavet forskning indenfor forskellige anæstesiformer, ødemudvikling og immunologisk respons. Hun har også undervist i hjertestop behandling samt Bipap.

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One years follow-up after received advanced cardiac life support out of hospital

Scand J Trauma Emerg Med 2002; 10 (4): 191-193

**Background:** The Mobile Emergency Care Unit (MECU) in Aarhus is mounted with an experienced anaesthesiologist and a special trained rescuer. It covers a radius of 25 km from the centre of Aarhus with 330.000 inhabitants. Rescue workers in Denmark are allowed to perform basic life support and defibrillation. The MECU performs advanced cardiac life support in accordance to "The 1998 Guidelines of the European Resuscitation Council".

**Material and methods:** Retrospective analysis of data collected by the MECU doctor on a standardized chart and data received from the Central Hospital Database with respect to survival data was performed.

**Results:** In 1998 4725 emergency calls were received. 515 patients had cardiac disease, of these 158 patients had cardiac arrest. In 86 patients dead was determined on scene and no treatment was performed. Seventy-two patients received advanced cardiac life support. Twenty-five patients were admitted to hospital. Thirteen patients were alive one year after, which gives a survival rate of 52 % of the patients admitted to hospital.

**Conclusion:** These results illustrate that for the patients with out-of-hospital cardiac arrest early treatment with advanced cardiac life support performed by experienced doctors probably had a positive impact on survival.

## Correspondence

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Prognosen for patienter med hjertestop uden for hospitalet er alvorlig og afhængig af en række forskellige faktorer, bl.a årsagen, befolkningens uddannelse i basal hjerte-lungeredning (HLR), tid indtil alarmering til 112, udrykningstiden og tidlig defibrillering (1,2). Det er tidligere vist, at avanceret HLR øger frekvensen af overlevende med god cerebral funktion (3-5).

## Materiale og metode

Fra 28. april 1997 har der været lægeambulance (LA) i Århus. Lægeambulancen rykker ud samtidig med primære ambulance når det skønnes, at være en akut livstruende situation. Herved skabes muligheden for avanceret HLR på skadestedet. LA dækker en radius af 25 km fra Århus centrum, svarende til en befolkning på 330.000. Lægeambulancen er bemannet med en anæstesi-læge og en specialuddannet redder, som er chauffør og assistent for lægen. I lægeambulancen findes udstyr til basal og avanceret hjertestop behandling. Behandlingsprincipperne ved hjertestop følger "The 1998 European Resuscitation Council guidelines" (3). Undersøgelsen er retrospektiv og omfatter perioden 1.1.98-31.12.98. Data stammer fra ambulance-lægenes journaler, udfyldt i.h.t. Utstein-mal (15) ved hver udrykning. Journalen indeholder oplysninger om patientens tilstand ved ankomst, behandling (iv medicin, DC konvertering, intubation osv) og patientens tilstand ved afslutning af den præhospitale behandling. Overlevelsen til udskrivelse er opgjort ud fra den centrale hospitals database. Etårsoverlevelsen blev undersøgt ved kontakt til egen læge.

## Resultater

Lægeambulancen kørte til 515 patienter med kardiovaskulære sygdomme, 158 havde hjertestop, svarende til en incidens på 48 pr 100.000 indbyggere pr år. Herudover kørte LA til 165 patienter, som blev erklæret døde. Typiske meldinger i denne situation var, hvor "anmelder" havde meddelt alarmcentralen, at det drejede sig om en død patient, men hvor der alligevel var usikkerhed i meldingen. Af de 158 patienter, som havde hjertestop ved LA's ankomst, blev 86 patienter umiddelbart erklæret døde, uden genoplivningsforsøg fra LA's personale (Fig 1). I denne gruppe indgik

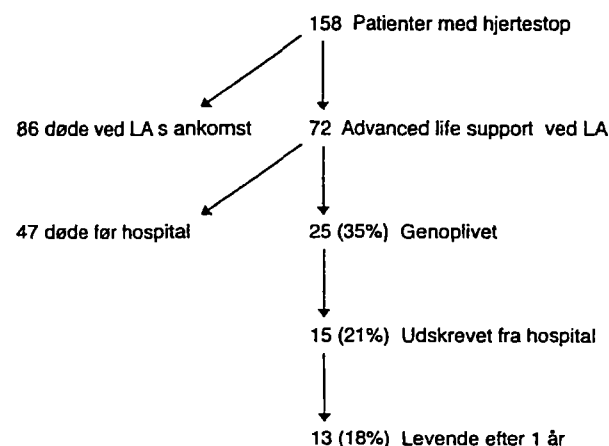


Fig. 1. Behandlingsresultat efter hjertestop udenfor hospitalet

patienter med sikre dødstejn, samt de patienter, hvor HLR skønnedes udsigtsløs.

Table 1. Alders-fordeling for 25 patienter, som alle er blevet genoplivet efter hjertestop uden for hospital

Alder år	Antal
0-9	1
10-19	0
20-29	1
30-39	0
40-49	3
50-59	5
60-69	7
70-80	8
80-	0

Der blev ydet avanceret HLR til 72 patienter. Af disse blev 25 (35%), hvoraf 20 mænd genoplivet og indlagt på hospital (Fig 1).

Fem patienter døde inden for det første døgn, og yderligere tre patienter døde inden for den første uge. I alt blev 15 (21%) patienter udskrevet fra hospitalet. Tretten patienter var i live efter et år. Dette svarer til 52 % af de patienter som blev indbragt til hospitalet og 18 % af dem, som blev forsøgt genoplivet. Af de 13 patienter, som overlevede mere end et år, er en svært handicappet i dag. De øvrige 12 patienter er alle udskrevet til samme adresse som før hjertestoppet, og ifølge oplysninger fra egen læge har de alle samme cerebrale status som før de fik hjertestop.

Af de 72 patienter, som blev forsøgt genoplivet, var der i ni tilfælde (12%) startet basal genoplivning ved lægmand og i tre tilfælde ved lægmand sammen med redder. En af disse patienter blev udskrevet fra hospitalet. I 31 tilfælde var der påbegyndt HLR ved behandler og ambulanceassistent, med ventilation på maske med ilt, hjertemassage og DC-stød før lægeambulancens ankomst. I fire tilfælde var der startet basal HLR ved læge eller sygeplejerske. I 19 tilfælde var lægeambulancen først fremme, og ud af disse 19 tilfælde fik patienten i tre tilfælde først hjertestop efter lægeambulancens ankomst. Hos seks patienter mangler der oplysning om, hvorvidt der var påbegyndt nogen form for genoplivning før lægeambulancens ankomst. Aldersfordelingen fremgår af Tabel 1. Barnet på nul år fik hjertestop i forbindelse med fødsel i hjemmet (fastsiddende hoved). Personen mellem 20 og 30 år var en ung mand, som havde ventrikelflimren (VF) ved LA's ankomst, og det viste sig senere, at han havde en medfødt hjertefejl. Samme patient har i dag svær motorisk og kognitiv deficit. Dette fandtes ikke hos de resterende patienter der var i live efter et år. Primære EKG-fund fremgår af Tabel 2. Af de 25 patienter, som blev indlagt, havde 15 VF ved LA's ankomst, ni havde asystoli eller elektromekanisk dissociation (EMD), og en patient var en traumepatient med ukendt rytme/ikke beskrevet rytme.

For de 25 patienter, som blev genoplivet, bestod den medi-

cinske behandling bl.a af DC-konvertering hos 21 patienter, 16 patienter blev intuberet, 19 fik adrenalin, 11 lidocain, ni amiodaron. Der blev desuden anvendt atropin, natriumbicarbonat, sotalol og calciumchlorid under resuscitationen. Mean responsinterval (tiden fra alarmeringen af lægeambulancen til ankomst på adressen) for de 72 patienter med hjertestop, hvor der blev ydet avanceret HLR, var 7.7, min median (min-max) 6.0 (1-28) min. I gruppen med hjertestop, hvor patienterne blev indlagt, var responsintervallerne mean (min-max) 7.0 (12-28) min. Det reelle responsinterval var lidt længere, da tiden fra alarm 112, til turen blev modtaget, ikke er medregnet. Responsintervallet på 28 min var et enkelttilfælde, det næstlængste responsinterval var på 21 min. I gruppen af patienter, som var i live mere end et år, var responsintervallet mean (min-max) 4.6 (1-11) min. Dog var lægeambulancen på adressen i to tilfælde da patienten fik hjertestop. Sættes responsintervallet til nul i disse to tilfælde, bliver responsintervallet mean 3.5 min. Antal indlæggelsesdage i gruppen med patienter, som lever mere end et år, varierer fra seks til 190 dage, dog er det kun en patient, som er indlagt i lang tid. De øvrige 12 patienter er indlagt fra seks til 30 dage.

Tabel 2. Rytme ved lægeambulancens ankomst (hos 72 patienter med hjertestop).

Rytme	VF / VT	non VF / VT	Ukendt	I alt
Hjertestop	35	32	5	72
Indlagt	15	9	1	25
1 års overlevelse	10	2*	1**	13

\* disse to patienter havde ekstrem bradycardia og en kort periode med asystoli  
\*\* denne patient var en traume patient.

## Diskussion

I denne opgørelse fra lægeambulancen i Århus er incidensen af hjertestop uden for hospital 48 pr 100.000 indbyggere pr år. Dette er lavere end i andre studier (6,7), som finder incidenser på 88-100 pr 100.000 indbyggere pr år. I Odense (8) fandt man 120 pr 100.000 indbyggere pr år. Årsagerne til disse forskelle kan blandt andet være befolkningssammensætningen og registreringen. Dog er det således, at havde man medregnet de 165 patienter, hvor alarmmeldingen var "mulig mors", og hvor alle blev erklæret døde ved lægeambulancens ankomst, havde incidensen været 98 pr 100.000 indbyggere pr år.

En patient ud af 13 har fået alvorlig hypoksisk hjerneskade. Dette går godt i tråd med en undersøgelse fra Odense (9), hvor man udførte psykologisk test (demenstest) på overlevende efter hjertestop udenfor hospitalet. Resultatet af denne viser jo bedre præhospital hjertestop behandling, jo flere overlevede med god cerebral funktion.

At 52 % af de indlagte kan udskrives fra hospitalet, er en forbedring i forhold til tidligere studier af hjertestop uden for hospital (10-12). At 21% af de patienter, hvor avanceret HLR blev udført, udskrives fra hospitalet, viser ligeledes en forbedring i forhold til tidligere danske studier (6), hvor



resultatet var 6-16%. En metaanalyse (10) finder, at 10.8 % udskrives fra hospital efter avanceret præhospital hjertestop-behandling, og 6.3% efter basal genoplivning med defibrillering.

At 13 patienter (18%) ud af 72, hvor avanceret HLR blev udført, lever mere end et år, er også bedre end i to undersøgelser fra København, hvor begge fandt, at 12% var i live efter et år (10,15). Dog fandt man i undergruppen med VF en etårs-overlevelse på 16% (15). I Bonn-undersøgelsen (12) fandtes fra 4.5% til 15.9% ved henholdsvis ikke-bevidnet og bevidnet hjertestop.

Disse forskelle kan skyldes mange faktorer som hurtigere responsintervaller, bedre redderuddannelse og indførelse af 1998-guidelines. Andre mulige forklaringer kunne fx være, at man i dag er mere aggressiv, hvad angår trombolyse og akut percutan coronar intervention (PCI). Desuden kunne en årsag være, at man ikke forsøger at genoplive personer, når behandling er udsigtsløs. Der findes en bedre overlevelse i gruppen med VF/ventrikulær takykardi (VT) sammenholdt med gruppen uden VF/VT, som er i overensstemmelse med andre studier (3,12). Dette er i god overensstemmelse med en undersøgelse fra Bonn (8) som fandt 24%. Andre (1,7) viste lavere frekvens af overlevelse i gruppen med VF på henholdsvis 8.8% og 13%.

Kun i 12% af tilfældene var basal HLR påbegyndt af tilstedeværende lægmand. Dette er i overensstemmelse med en engelsk (1) undersøgelse, som fandt 14.5%, lægeambulancen i København 1988 (10), som fandt 6%, og undersøgelsen fra Odense (14), som fandt at kun i 4% (tre patienter, lille materiale) havde lægmand påbegyndt HLR. I en metaanalyse var der stor variation (11-61%) i andelen hvor lægmand havde påbegyndt HLR (4). Odenseundersøgelsen fra 1987-1988 (8) konkluderede, at basal hjertestopbehandling, udført før ambulancens ankomst, samt en varighed af hjertestop under seks minutter før genoplivning i sig selv medførte en positiv behandlingseffekt.

I vores studie blev 298 patienter erklæret døde i hjemmet. Dette står i kontrast til tiden før lægeambulancens eksistens hvor der alene var ambulanceredder til stede. Disse havde kun i specielle tilfælde ret til at erklære patienter døde og måtte derfor starte behandling, uanset om det var etisk eller lægefagligt korrekt. Der er en betydelig fordel ved, at ambulancelægen, modsat redderne, kan fravælge eller afslutte en behandling og erklære patienten død i hjemmet. Familien kan tage en ordentlig afsked med afdøde, de kan umiddelbart modtage trøst og vejledning fra læge og efter ønske beholde den afdøde i hjemmet. Desuden medfører det en mindre belastning af skadestuerne.

### Konklusion

Ud fra tidligere resultater publiceret fra lægeambulancen i København (11), forsøget i Odense i 1987-1988, udenlandske undersøgelser (1,5) og sammenholdet med de aktuelle data er det sandsynligt, at hurtig start af avanceret CPR, som omfatter intubation, defibrillering og intravenøs mediciner, øger overlevelsen og reducerer antallet af patienter med svære hypoksiske hjerneskader efter hjertestop

udenfor hospital.

CPR, som omfatter intubation, defibrillering og intravenøs mediciner, øger overlevelsen og reducerer antallet af patienter med svære hypoksiske hjerneskader efter hjertestop udenfor hospital.

### Litteratur

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## **Bilag 10**

## **Bilag 10**

## **Førstehjælpsuddannelse ved erhvervsmæssig køreuddannelse (stor vogn)**

Uddannelsen foreslås at omfatte 7½ times undervisning indeholdende førstehjælp i basal genoplivning (3 timer) og specifik førstehjælp og ulykkesforebyggelse målrettet erhvervschauffør på storvogn (4½ time).

Det foreslås endvidere, at undervisningen gives en handlingsorienteret, praktisk tilgangsvinkel, hvilket medfører, at undervisningen struktureres og gennemføres som case- og færdighedsundervisning, dog med mindre seancer indlagt, hvor den nødvendige teoretiske baggrundsforståelse gives.

Case- og færdighedsundervisningen opbygges omkring typiske ulykkes- og skadestyper på et skadested relateret til transportområdet.

Endvidere foreslås det, at førstehjælpsuddannelsen indeholder elementer af forebyggende karakter, hvorfor det foreslås, at deltageren skal være vidende om de ulykkesforebyggende tiltag, der kan indarbejdes i transportområdets daglige arbejde.

Dansk Førstehjælpsråd har udarbejdet nedenfor anførte forslag til indhold og indlæringsniveau i en førstehjælpsuddannelse for erhvervskørekort til stor vogn.

Dansk Førstehjælpsråd stiller gerne sin førstehjælpsfaglige ekspertise til rådighed ved en senere egentlig udarbejdelse af uddannelsesplan med tilhørende undervisningsmaterialer.

Forslag til indhold og indlæringsniveau i førstehjælpsuddannelse ved erhvervsmæssig køreuddannelse (stor vogn)

### **Genoplivning:**

Ved uddannelsens afslutning skal deltageren kunne anvende basal genoplivning (BLS) til en bevidstløs med vejrtrækning og til en bevidstløs uden livstegn.

Resultatet er tilfredsstillende, såfremt deltageren:

- sikrer sig at ulykken er standset
- undersøger bevidsthedsniveau ved at tale, ruske og evt. smertepåvirke
- bruger "hoved-bøj – kæbe-skub" ("head-tilt/chin-lift maneuver") til at skabe frie luftveje
- undersøger vejrtrækning ved at se, føle og lytte
- opretholder frie luftveje under kunstigt åndedræt
- benytter mund-til-mund-metode som førstevalg og mund-til-næse-metode som andet valg ved kunstigt åndedræt
- ved kunstigt åndedræt blæser til brystkassen synligt hæver sig
- ved konstatering af livstegn observerer for:
  - o vejrtrækningsforsøg
  - o bevægelse/trækninger
  - o hoste

- udpeger trykstedet til nederste halvdel af brystbenet uanset aldersgruppe
- giver hjertemassage med frekvensen minimum 100 tryk min<sup>-1</sup> uanset aldersgruppe
- anvender forholdet 15:2 (tryk/kunstigt åndedræt) ved voksne og 5:1 (tryk/kunstigt åndedræt) ved spædbørn og småbørn
- giver initialt kunstigt åndedræt i 1 minut til spædbørn
- kunne lejre den tilskadekomne i aflåst sideleje

### **Specifik førstehjælp og ulykkesforebyggelse:**

Ved uddannelsens afslutning skal deltageren kunne agere initiativrigt og hensigtsmæssigt på et skadested relateret til transportområdet, herunder kunne yde den nødvendige førstehjælp til områdets typiske og alvorligere skadestyper. Endvidere skal deltageren være vidende om de ulykkesforebyggende tiltag, der kan indarbejdes i områdets daglige arbejde.

Resultatet er tilfredsstillende, såfremt deltageren:

- Forhold ved større ulykker relateret til trafikområdet
  - o Skaber overblik over skaden og de tilskadekomne
  - o Sikrer skadestedet så det er sikkert at færdes på – herunder tager de nødvendige forholdsregler for ikke selv at udsætte sig for fare
  - o Vurderer de enkelte tilskadekomnes skader
  - o Prioriterer hvem der skal have hvilken førstehjælp i hvilken rækkefølge samt behov for evt. nødflytning
  - o Anvender evt. hjælpere ud fra deres førstehjælpskundskaber og de tilskadekomnes skader og tilstand
  - o Alarmerer hensigtsmæssigt i forløbet
- ABC-systemet, den livsvigtige iltransport
  - o Gengiver den livsvigtige iltransport
  - o Undersøger den livsvigtige iltransport i rækkefølgen ABC
  - o Giver førstehjælp ved ulykker der omhandler luftvejene
    - Skaber frie luftveje
  - o Giver førstehjælp ved ulykker der medfører nedsat eller standset vejrtrækning
    - Giver kunstigt åndedræt
  - o Giver førstehjælp ved ulykker der medfører nedsat eller standset cirkulation
    - Anlægger forbindinger ved store blødninger
    - Giver kunstigt åndedræt og hjertemassage
  - o Lægger den tilskadekomne i aflåst sideleje for at sikre frie luftveje eller observerer denne indtil redningsmandskab tager over
- Hovedlæsioner, brud på nakke, rygsøjle og bækken
  - o Gengiver virkning og symptomer ved læsioner på/i kraniet
  - o Demonstrerer førstehjælp ved ulykker med læsioner på/i kraniet
  - o Gengiver virkning og symptomer ved læsioner på rygsøjlen og bækkenet
  - o Gengiver mulige komplikationer i forhold til læsioner på rygsøjlen og bækkenet samt forholdsregler
  - o Demonstrerer førstehjælpen ved ulykker med læsioner på rygsøjlen og bækkenet

- **Knoglebrud**
  - o Gengiver virkning og symptomer for knoglebrud på fingre, tæer, hånd- og fodrod samt brud på ekstremiteterne
  - o Afgør om et brud er åbent eller lukket
  - o Støtter bruddet i findestillingen
  - o Forbinder om muligt åbne brud samt minimerer forureningsrisiko
  
- **Shock**
  - o Gengiver virkning og symptomer ved Shock
  - o Giver eksempler på de typer af Shock der omtales i forbindelse med førstehjælp
  - o Demonstrerer forebyggelse af shock i forbindelse med ulykker (og livstruende sygdom)
  
- **Forbrændinger**
  - o Gengiver forbrændingers virkning og symptomer
  - o Demonstrerer førstehjælp ved større forbrændinger
  
- **Psykisk førstehjælp**
  - o Skaber ro og fremtræde roligt og kompetent
  - o Optræder bestemt over for øvrige hjælpere
  - o Viser omsorg og sætter sig i den tilskadekomnes situation
  - o Lytter til den tilskadekomne og bruger den nødvendige tid til og nærvær i samtalen
  
- Revurderer sin undersøgelse af ABC og tager resultatet med i den videre ydelse af førstehjælpen
  
- Foretager top til tå undersøgelse
  
- Overleverer den tilskadekomne til redningsmandskabet
  
- Forebyggelse af ulykker inden for transportområdet