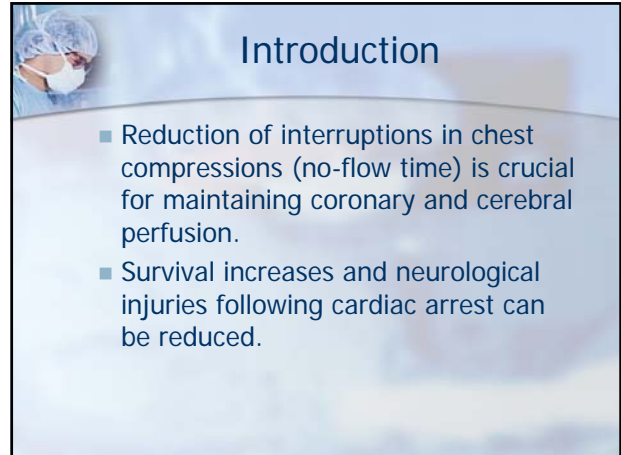


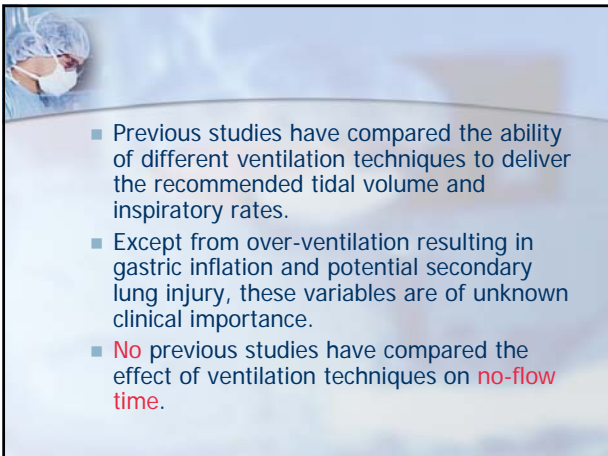
Mouth-to-mouth ventilation is superior to mouth-to-pocket mask and bag-valve-mask ventilation during lifeguard CPR: A randomized study

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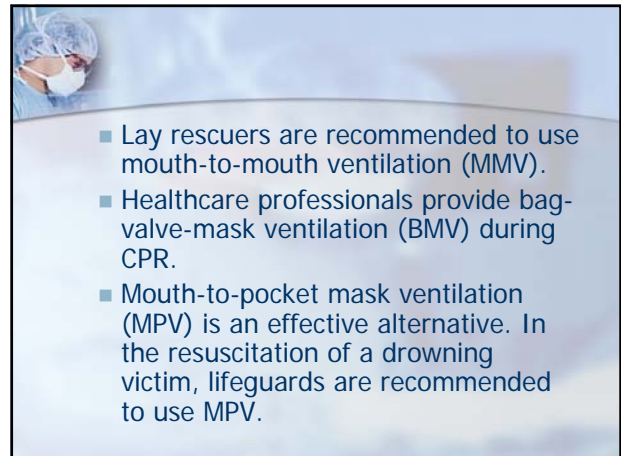


Introduction

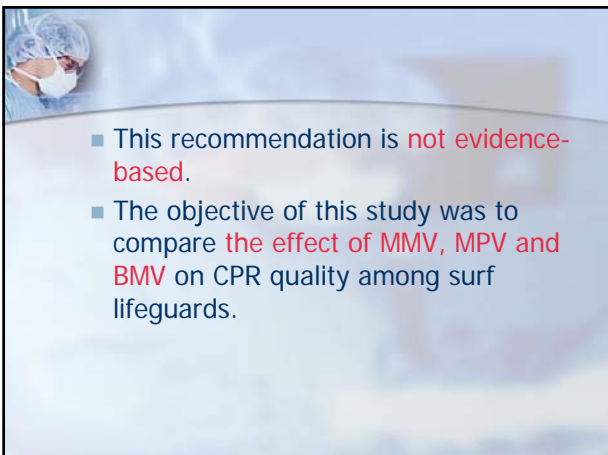
- Reduction of interruptions in chest compressions (no-flow time) is crucial for maintaining coronary and cerebral perfusion.
- Survival increases and neurological injuries following cardiac arrest can be reduced.



- Previous studies have compared the ability of different ventilation techniques to deliver the recommended tidal volume and inspiratory rates.
- Except from over-ventilation resulting in gastric inflation and potential secondary lung injury, these variables are of unknown clinical importance.
- **No** previous studies have compared the effect of ventilation techniques on **no-flow time**.



- Lay rescuers are recommended to use mouth-to-mouth ventilation (MMV).
- Healthcare professionals provide bag-valve-mask ventilation (BMV) during CPR.
- Mouth-to-pocket mask ventilation (MPV) is an effective alternative. In the resuscitation of a drowning victim, lifeguards are recommended to use MPV.



- This recommendation is **not evidence-based**.
- The objective of this study was to compare **the effect of MMV, MPV and BMV** on CPR quality among surf lifeguards.




Methods

Participant recruitment and ethics

- Eligible participants were **professional, paid surf lifeguards in active service** (seasonal: May–August) aged 18 or above.
- Recruited from two Danish lifeguard organisations.
- All surf lifeguards complete **annual mandatory CPR re-training** before commencing active service.

Characteristics of study participants (n = 60).

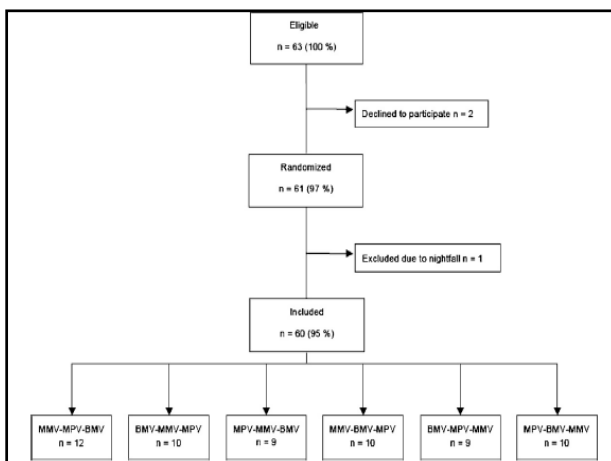

Mean age ± SD (years)	25.4 ± 5.9
Sex (n, %)	
Female	20 (33%)
Male	40 (67%)
Surf lifeguard certification year (mean ± SD)	2006 ± 4.4
Surf lifeguard experience (mean years ± SD)	4.4 ± 4.0
Preferred ventilation technique (n, %)	
Mouth-to-mouth ventilation	11 (18%)
Mouth-to-pocket-mask ventilation	42 (70%)
Bag-valve-mask ventilation	6 (10%)
No reply	1 (2%)
Healthcare professional (n, %)	
Yes	7 (12%)
No	53 (88%)
Educational level (n, %)	
None	1 (2%)
Primary and lower secondary school	2 (3%)
Gymnasium (equivalent to VI form college, preuniversity)	41 (68%)
Higher education (<2 years)	1 (2%)
Higher education (2–4.5 years)	7 (12%)



Methods

Design


- Participants were randomized into **six groups**.
- Each performing three sessions of single-rescuer CPR on a manikin, using three ventilation methods: MMV, MPV and BMV.
- Each session was of 3 min duration and separated by 5 min of rest.
- 3-5-3-5-3**

- CPR was performed according to the **European Resuscitation Council 2005 guidelines**.
- No instructions were given on how to perform CPR as participants complete mandatory annual pre-service training.
- Participants were allowed to kneel at both sides of the manikin, but they used the same side during all three sessions.



- Prior to each session, participants were allowed to familiarise themselves with the equipment.
- All sessions were conducted **on the beach**.



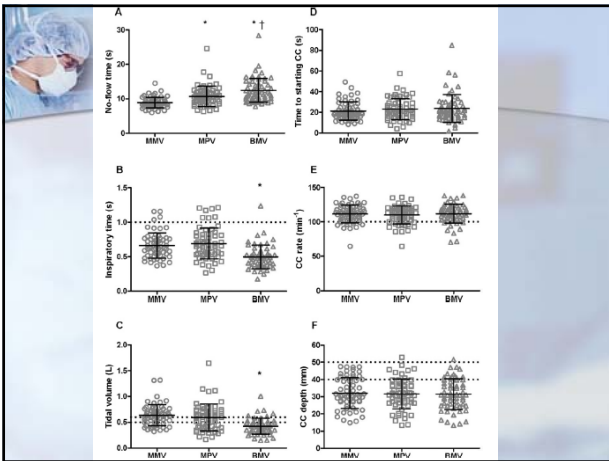
Methods

Data analysis

- The **same manikin and mask system** was used.
- The manikin was connected to a laptop, and data were recorded using Ambu® CPR Software.
- The first four cycles of ventilations and compressions were examined and included in the data analysis.

- Custom-made software was employed to calculate the following variables: time to starting compression, compression rate and depth, no-flow time, tidal volume and inspiratory time.
- Each session was recorded on video and reviewed by two investigators assessing the proportion of effective breaths (visible chest rise).
- In case of disagreement, the video was reassessed and consensus was reached.

Results




- MMV (91%) produced a significantly higher proportion of effective ventilations compared to MPV (79%) and BMV (59%).


Discussion

- MMV significantly reduces interruptions in CPR and produces a higher proportion of effective ventilations compared to MPV and BMV.

- When MPV and BMV were used, there was a mean delay in starting compressions of 1.8 s and 3.6 s in each cycle compared to MMV (MMV 8.9 s, MPV 10.7 s and BMV 12.5 s).
- In Denmark, surf lifeguards often work on beaches far from EMS. Assuming 20 min of lifeguard CPR before arrival of the EMS at the beach and a compression-ventilation ratio of 30:2, the use of MMV reduces the total no-flow time by 50 s and 94 s compared to MPV and BMV.




- In the hands-off time during CPR, the coronary and brain perfusion fall precipitously, making prolonged interruptions in CPR detrimental.
- Our study shows that using MMV instead of MPV and BMV can reduce the no-flow time.



Discussion

Limitations

- 1. 用假人, 非真人.
- 2. 只在丹麥.
- 3. 只假設1 to 1.
- 4. the effect 對真人的survival needs?



Conclusion

- This study is the first to demonstrate that MMV is superior to MPV and BMV during simulated single-rescuer CPR, as it reduces the no-flow time and results in more effective ventilations.
- Our results suggest that compared to MPV and BMV, CPR quality is improved using MMV.



Thanks for your attention!