Appendix A1 BLS-1 EtD Table
Video-Based Dispatch vs. Audio-Based

QUESTION

Should video-based dispatch vs. audio-based dispatch be used for cardiac arrest?	
POPULATION:	Out-of-hospital cardiac arrest patient
INTERVENTION:	video-based dispatch
COMPARISON:	audio-based dispatch
MAIN OUTCOMES:	good CPC at discharge - unadjusted; good CPC at discharge - propensity score matching; survival at discharge - unadjusted; survival at discharge - propensity score matching; prehospital_ROSC - unadjusted; prehospital_ROSC - propensity score matching;
SETTING:	out-of-hospital setting
PERSPECTIVE:	The target audience for this guideline are clinicians and the patients they treat, the perspective is therefore that of the individual patient rather than a health system perspective.
BACKGROUND:	DA-CPR is currently provided through a standard telephone audio-call between caller and dispatcher. As mobile technology evolves, video-calls have become generalized. Video-instructed DA-CPR has the advantage that the dispatcher can see the caller performing CPR and lead CPR by providing real-time feedback. Several simulation studies reported that the video-based dispatch improved CPR quality compared to traditional audio-call based dispatch.
CONFLICT OF INTERESTS:	None

ASSESSMENT

Problem
Is the problem a priority?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	Early bystander cardiopulmonary resuscitation (CPR) is a key factor in the chain of survival of OHCA. Dispatcher-assisted CPR (DA-CPR) programs have been recommended to increase the overall provision rate of bystander CPR. As mobile technology evolves and video-calls have become generalized, dispatchers may be able to provide CPR instruction while watching the scene. Video-based DA-CPR has been introduced to improve the quality of CPR provided by dispatcher instruction compared to tranditional audio-based dispatch. Video-based DA-CPR has the advantage that the dispatcher can see the caller performing CPR and lead CPR by providing real-time feedback.	Video-based dispatch can also play a role in helping call takers to recognize cardiac arrest quickly by allowing them to see patient's status including agonal repspiration.

Desirable Effects

How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
● Trivial ○ Small ○ Moderate ○ Large ○ Varies ○ Don't know	A observational cohort study enrolled 1720 OHCA patients (1489 and 231 in the audio and video groups, respectively). The survival to discharge rates were 8.9% in the audio group and 14.3% in the video groups ($p < 0.01$). Good neurological outcome occurred in 5.8% and 10.4% in the audio and video groups, respectively ($p < 0.01$). However, the adjusted ORs (95% CIs) for survival to discharge and good neurological outcome of the video group were 1.20 (0.74-1.94) and 1.28 (0.73-2.26), respectively. The propensity score matched population (n=462) showed that the survival to discharge rate was same in the both group (both 14.3%). The rate of good neurological outcome was not significantly different between groups (11.3% in audio vs. 10.4% in video group, $p = 0.76$). The effect of video dispatch on patient outcomes has nt been assessed in a randomized controlled trial, but baised on the findings from the identified observational study - adjusted analysis suggests the effects might be trivial. Important uncertainty about desirable effects remain.	There were 13 manikin simulation studies to evaluate the CPR quality and the CPR initiation time between video vs audio-based dispatch. They showed improved CPR quality such as compression rate and time to compression in the video-based dispatch group.

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large ○ Moderate ○ Small ● Trivial ○ Varies ○ Don't know	There is no reported evidence about undesirable effect of using video-based dispatch system apart from simulation studies that suggest there might be a potential for delayed bystander CPR.	

Certainty of evidence

What is the overall certainty of the evidence of effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS

● Very low ○ Low ○ Moderate ○ High ○ No included studies	There is only one clinical study. The risk of bias of the retrospective observational study assessed as serious, the certainty of evidence is graded as very low. The results differed according to statistical adjustment. We have to wait for the results of further clinical studies.	

Values

Is there important uncertainty about or variability in how much people value the main outcomes?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Important uncertainty or variability ○ Possibly important uncertainty or variability ○ Probably no important uncertainty or variability ● No important uncertainty or variability	There is little uncertainty around the value that people put on the main outcome of neurological survival and/or survival to hospital discharge.	

Balance of effects

Does the balance between desirable and undesirable effects favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ○ Probably favors the intervention ○ Favors the intervention ○ Varies ● Don't know	The undesirable effect on video-based dispatch is not known, but the effect of video-based dispatch is also not significant. It is difficult to judge from only one reported observational study.	

Resources required

How large are the resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS

○ Large costs ● Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ○ Don't know	To implement video-based dispatch system, the dispatch center should set up appropriate video-related equipment, and relevant protocols should be developed and trained to the dispachers. The availability of mobile video phones in local communities should be high. Cost and resources needed is expected to vary greatly between systems, and some dispatch systems might have already implemented video communication for other purposes. Still, the BLS task force assessed the likely costs associated with implementation of video dispatch to be moderate.	

Certainty of evidence of required resources

What is the certainty of the evidence of resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Very low ○ Low ○ Moderate ○ High ● No included studies	No research examined the resource requirements for the video-based dispatch. There is a high degree of uncertainty regarding required resources.	

Cost effectiveness

Does the cost-effectiveness of the intervention favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS

○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ○ Probably favors the intervention ○ Favors the intervention ○ Varies ● No included studies	No research examined the cost-effectiveness for the video-based dispatch. There is a high degree of uncertainty regarding cost effectiveness as both effectiveness and cost of intervention is uncertain.	

Equity

What would be the impact on health equity?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Reduced ● Probably reduced ○ Probably no impact ○ Probably increased ○ Increased ○ Varies ○ Don't know	There is a possibility that video-based dispatch will not be available for the low socioeconomic cardiac arrest patients, who do not have a video-capable telephone at home, since there must be someone on site with a video phone. Dispatch systems with less resources is also likely to be disadvantaged as the cost of implementation is assumed to be moderate.	

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ○ Yes ○ Varies ● Don't know	There is not yet sufficient evidence to judge whether the stakeholders accept the video-based dispatch compared to audio-based dispatch.	

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know	It is likely that the feasibility will be dependent on the setting that it is applied. The included observation study would suggest it is feasible for systems with sufficient resources.	

SUMMARY OF JUDGEMENTS

	JUDGEMENT						
PROBLEM	No	Probably no	**Probably yes**	Yes		Varies	Don't know
DESIRABLE EFFECTS	**Trivial**	Small	Moderate	Large		Varies	Don't know
UNDESIRABLE EFFECTS	Large	Moderate	Small	**Trivial**		Varies	Don't know
CERTAINTY OF EVIDENCE	**Very low**	Low	Moderate	High			No included studies
VALUES	Important uncertainty or variability	Possibly important uncertainty or variability	Probably no important uncertainty or variability	**No important uncertainty or variability**			
BALANCE OF EFFECTS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	Probably favors the intervention	Favors the intervention	Varies	**Don't know**
RESOURCES REQUIRED	Large costs	**Moderate costs**	Negligible costs and savings	Moderate savings	Large savings	Varies	Don't know
CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES	Very low	Low	Moderate	High			**No included studies**
COST EFFECTIVENESS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	Probably favors the intervention	Favors the intervention	Varies	**No included studies**
EQUITY	Reduced	**Probably reduced**	Probably no impact	Probably increased	Increased	Varies	Don't know
ACCEPTABILITY	No	Probably no	Probably yes	Yes		Varies	**Don't know**
FEASIBILITY	No	Probably no	Probably yes	Yes		**Varies**	Don't know

TYPE OF RECOMMENDATION

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	**Conditional recommendation for the intervention**	Strong recommendation for the intervention
○	○	○	●	○

CONCLUSIONS

Recommendation

We suggest that the usefulness of video-based dispatch system be assessed in clinical trials or research initiatives (weak recommendation, very-low-certainty evidence).

Justification

Only a single human observational study was identified, so the evidence informing the guideline is very uncertain. As new communication technologies offer promising new avenues in emergency medical dispatch, the Basic Life Support Task Force felt it was important to encourage research in this important area and therefore provided conditional recommendation for video-based dispatch system to be assessed in clinical trials or research initiatives.

Several manikin simulation studies were identified evaluating video vs audio-based dispatch. Lin et al. published a systematic review comparing the effect of video-based and audio-based dispatch on quality of dispatcher-assisted CPR.15 The review included 6 simulation studies that showed that video-based dispatcher-assisted CPR significantly improved the chest compression rate compared to the audio-based dispatch, and a trend for more correct hand position was also observed. However, video-based dispatch caused a delay in the commencement of bystander-initiated CPR.15 While not directly informing clinical practice, these simulation studies provide important information about the aspects that need to be addressed and evaluated in future clinical studies evaluating video-dispatch.

Subgroup considerations

To process video-based DA-CPR, more than two persons are needed, one to provide chest compressions and one to view the scene using a mobile phone. Therefore, it is expected that the feasibility and outcome of video-based dispatcher CPR may be differ between crowded public place and cardiac arrest at home.

Implementation considerations

In order to process video-based DA-CPR, the caller also needs to use a mobile phone capable of video telephony. Consideration should be given to whether the rate of penetration of video telephony is sufficient in the community.

Monitoring and evaluation

If video-based dispatch system is implemented, the assessment for protocol and performance should be monitored.

Research priorities

Knowledge Gaps

· No RCT has compared video-based vs audio-based dispatch in any patient population.

· Further observation studies evaluating the use of video communication in emergency medical dispatch will provide important new insight.

· Two rescuers may be needed to effectively process video-based DA-CPR, one to provide chest compressions and one to handle the mobile phone and assist with communication. This might lead to varying feasibility of implementing video-based dispatcher CPR according to location of arrest (crowded public place vs. at home) etc.

Note to Webmaster: CoSTR posting should be linked to ETD summary table

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Appendix A1 BLS-2 EtD Table
Heads-Up CPR vs. Standard CPR

QUESTION

Should Head up CPR vs. standard CPR be used for cardiac arrest?	
POPULATION:	Adult patients in cardiac arrest
INTERVENTION:	Head-up CPR
COMPARISON:	Standard CPR
MAIN OUTCOMES:	Admitted to hospital with spontaneous circulation;
SETTING:	In- and out-of-hospital settings
PERSPECTIVE:	The target audience for this guideline are clinicians and the patients they treat, the perspective is therefore that of the individual patient rather than a health system perspective.
BACKGROUND:	This topic was prioritized by the BLS Task Force based on increasing interest and debate surrounding head-up CPR within the resuscitation community. The BLS Task Force was aware of the growing body of animal research addressing head-up CPR, and aware that this strategy is currently being used in some Emergency Medical Services Systems.
CONFLICT OF INTERESTS:	None

ASSESSMENT

Problem
Is the problem a priority?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	Mortality after cardiac arrest remains high, and there is broad consensus that new treatments and strategies are needed.	

Desirable Effects
How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS

○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know	The limited observational evidence identified in this review suggest head-up CPR might have the potential to improve short-term outcome from cardiac arrest (RR, 1.90; 95%CI, 1.61–2.26), but the certainty of evidence is very low with very high risk of bias. Head-up CPR was only assessed as a bundle with mechanical CPR with active decompression and the use of an impedance threshold device questioning the generalizability of the results to other systems. With a before-and-after design, the study is also at additional risk of being influenced by unrelated changes in practice with time which are not fully reported in particular, a change in ventilation strategy and potentially more efficient deployment of mechanical CPR that accompanied the intervention. Outcome measures were also limited to ROSC to hospital arrival, without any information on longer-term survival or functional outcomes.	

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large ○ Moderate ○ Small ○ Trivial ○ Varies ● Don't know	As the single clinical study evaluating this treatment strategy was a retrospective before-and-after without any information about prospectively registered complications, the frequency and extent of undesirable effects are unknown. In experimental animal studies, the head-up strategy is only effective with mechanical CPR, an impedance threshold device and a when performed in a certain sequence of sequential elevation. There would therefore be reason to suspect it could have undesirable effects, or be ineffective, if not performed correctly.	

Certainty of evidence

What is the overall certainty of the evidence of effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
● Very low ○ Low ○ Moderate ○ High ○ No included studies	The effect of head up CPR is very uncertain, and only short term outcomes have been reported. Head-up CPR was only assessed as a bundle with mechanical CPR with active decompression and the use of an impedance threshold device questioning the generalizability of the results to other systems. With a before-and-after design, the study is also at additional risk of being influenced by unrelated changes in practice with time which are not fully reported in particular, a change in ventilation strategy and potentially more efficient deployment of mechanical CPR that accompanied the intervention.	

Values

Is there important uncertainty about or variability in how much people value the main outcomes?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Important uncertainty or variability ● Possibly important uncertainty or variability ○ Probably no important uncertainty or variability ○ No important uncertainty or variability	The only outcome evaluated in the identified evidence evaluaing head-up CPR was return of spontaneous circulation (ROSC) at hospital admission. Long-term outcomes and functional outcomes were unknown. In keeping with the guidance provided by the COSCA initiative ("Core Outcome Set for Cardiac Arrest" - a partnership between patients, their partners, clinicians, research scientists, and the International Liaison Committee on Resuscitation, sought to develop a consensus core outcome set for cardiac arrest for effectiveness trials), there is uncertainty about how much people would value ROSC as an outcome in the abscence of information about functional survival .	Haywood K, Whitehead L, Nadkarni VM, Achana F, Beesems S, Böttiger BW, Brooks A, Castrén M, Ong MEH, Hazinski MF, Koster RW, Lilja G, Long J, Monsieurs KG, Morley PT, Morrison L, Nichol G, Oriolo V, Saposnik G, Smyth M, Spearpoint K, Williams B, Perkins GD; COSCA Collaborators. COSCA (Core Outcome Set for Cardiac Arrest) in Adults: An Advisory Statement From the International Liaison Committee on Resuscitation. Resuscitation. 2018 Jun;127:147-163. doi: 10.1016/j.resuscitation.2018.03.022.

Balance of effects

Does the balance between desirable and undesirable effects favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ○ Probably favors the intervention ○ Favors the intervention ○ Varies ● Don't know	As both desirable and undesirable effects are very uncertain, balancing them is not really possible.	

Resources required

How large are the resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large costs ○ Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ● Varies ○ Don't know	Implementation of head-up CPR might require purchasing expensive equipment (mechanical CPR and the impedance threshold device), along with a substantial amount of education and training both in the use of this equipment and in the manner in which head-up CPR itself is deployed. The extent that Emergency Medical Services systems have already implemented mechanical CPR and the use of impedance threshold devices will impact on the cost related to implementation of the head-up CPR bundle, makes the cost far less in these systems. Our assessment is that there would be large variations in resource requirements depening on the system.	

Certainty of evidence of required resources

What is the certainty of the evidence of resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Very low ○ Low ○ Moderate ○ High ● No included studies	The cost of mechanical CPR and impedance threshold devices are substatial when implemented in resuscitation systems, as is the cost of training and education. There are no important uncertainties regarding the required cost/resources.	

Cost effectiveness

Does the cost-effectiveness of the intervention favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Favors the comparison ○ Probably favors the comparison ○ Does not favor either the intervention or the comparison ○ Probably favors the intervention ○ Favors the intervention ○ Varies ● No included studies	The doubling in short term survival reported with the bundle including head-up CPR is promicing, and if translated into improved long-term functional outcomes, and generalizable to other resuscitation systems, the intervention might be cost-effective. However, there is not enough evidence to determine the effectiveness of head-up CPR, and no evidence assessing cost-effectiveness.	

Equity

What would be the impact on health equity?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Reduced ● Probably reduced ○ Probably no impact ○ Probably increased ○ Increased	As the strategy requires expensive equipment, health equity would likely be negatively impacted.	

○ Varies ○ Don't know		

Acceptability
Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ● Probably no ○ Probably yes ○ Yes ○ Varies ○ Don't know	Without a demonstrable improvement in longer-term outcomes, it is unlikely to be an acceptable strategy for key stakeholders. The Basic Life Support Task Force does not find the current evidence sufficient to recommend routine use of this strategy and encourages further research before its clinical deployment.	

Feasibility
Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ○ Yes ○ Varies ● Don't know	The use of the bundle including head-up CPR has been implemented at two different EMS systems, so is feasible to implement for similar systems with similar resources. The feasibility of broader implementation is not known.	

SUMMARY OF JUDGEMENTS

	JUDGEMENT						
PROBLEM	No	Probably no	Probably yes	**Yes**		Varies	Don't know
DESIRABLE EFFECTS	Trivial	Small	Moderate	Large		Varies	**Don't know**
UNDESIRABLE EFFECTS	Large	Moderate	Small	Trivial		Varies	**Don't know**
CERTAINTY OF EVIDENCE	**Very low**	Low	Moderate	High			No included studies
VALUES	Important uncertainty or variability	**Possibly important uncertainty or variability**	Probably no important uncertainty or variability	No important uncertainty or variability			
BALANCE OF EFFECTS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	Probably favors the intervention	Favors the intervention	Varies	**Don't know**

	JUDGEMENT						
RESOURCES REQUIRED	Large costs	Moderate costs	Negligible costs and savings	Moderate savings	Large savings	**Varies**	Don't know
CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES	Very low	Low	Moderate	High			**No included studies**
COST EFFECTIVENESS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	Probably favors the intervention	Favors the intervention	Varies	**No included studies**
EQUITY	Reduced	**Probably reduced**	Probably no impact	Probably increased	Increased	Varies	Don't know
ACCEPTABILITY	No	**Probably no**	Probably yes	Yes		Varies	Don't know
FEASIBILITY	No	Probably no	Probably yes	Yes		Varies	**Don't know**

TYPE OF RECOMMENDATION

Strong recommendation against the intervention	**Conditional recommendation against the intervention**	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	Strong recommendation for the intervention
○	●	○	○	○

CONCLUSIONS

Recommendation

We suggest against the routine use of head-up CPR during CPR (weak recommendation, very-low-certainty evidence).

We suggest that the usefulness of head-up CPR during CPR be assessed in clinical trials or research initiatives (weak recommendation, very-low-certainty evidence).

Justification

This topic was prioritized by the BLS Task Force based on increasing interest and debate surrounding head-up CPR within the resuscitation community. The BLS Task Force was aware of the growing body of animal research addressing head-up CPR,2-7 and aware that this strategy is currently being used in some Emergency Medical Services Systems.

The limited observational evidence identified in this review suggest head-up CPR might have the potential to improve short-term outcome from cardiac arrest, but the certainty of evidence is very low with very high risk of bias. Head-up CPR was only assessed as a bundle with mechanical CPR with active decompression and the use of an impedance threshold device questioning the generalizability of the results to other systems. With a

before-and-after design, the study is also at additional risk of being influenced by unrelated changes in practice with time which are not fully reported in particular, a change in ventilation strategy and potentially more efficient deployment of mechanical CPR that accompanied the intervention. Outcome measures were also limited to ROSC to hospital arrival, without any information on longer-term survival or functional outcomes.

Implementation of head-up CPR requires purchase of expensive equipment (mechanical CPR and the impedance threshold device), along with a substantial amount of education and training both in the use of this equipment and in the manner in which head-up CPR itself is deployed. Without a demonstrable improvement in longer-term outcomes, it is unlikely to be an acceptable strategy for key stakeholders. The Basic Life Support Task Force does not find the current evidence sufficient to recommend routine use of this strategy and encourages further research before its clinical deployment.

Subgroup considerations

Implementation considerations

Monitoring and evaluation

Research priorities

· No studies were identified that assessed head-up CPR alone versus standard care.

· We did not identify any RCTs that evaluated the effect of head-up CPR either alone or as part of a bundle of care.

· In the identified observational study, only short term/surrogate outcomes were evaluated, and future studies should document survival/neurologically intact survival to hospital discharge/30days.