QUESTION

Should CPR commence with compressions (30:2) or ventilations (2:30)?	
PROBLEM:	Adults and children in any setting (in-hospital or out-of-hospital) with cardiac arrest
OPTION:	commencing CPR with compressions first (30:2)
COMPARISON:	commencing CPR with ventilation first (2:30)
MAIN OUTCOMES:	*Critical*: Survival with favorable neurological outcome at hospital discharge or 30-days, Survival at hospital discharge or 30 days, Survival with favourable neurological outcome to one-year, Survival to one-year, Event survival, Any ROSC. *Important*: Time to commencement of rescue breaths, Time to commencement of first compression, Time to completion of first CPR cycle, Ventilation rate, Compression rate, Chest compression fraction, Minute ventilation
SETTING:	in-hospital or out-of-hospital
PERSPECTIVE:	Traditionally, cardiopulmonary resuscitation (CPR) commenced with opening the airway and ventilations then, chest compressions (i.e. A-B-C). However, airway and breathing are technical skills and previous systematic reviews by the International Liaison Committee on Resuscitation (ILCOR) have found that starting CPR with compressions in simulation studies resulted in faster times to key elements of resuscitation (rescue breaths, chest compressions, completion of first CPR cycle).
BACKGROUND:	CPR compression—ventilation sequences CAB versus ABC represents a compromise between the need to generate blood flow and the need to supply oxygen to the lungs
CONFLICT OF INTERESTS:	No conflicts to declare

ASSESSMENT

Problem

Is the problem a priority?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	Since the 2020 ILCOR review of this PICOST,[1,2] there is ongoing debate in the scientific literature regarding the merits of commencing resuscitation with chest compressions prior to ventilations. Internationally, most adult BLS guidelines commence chest compressions prior to ventilations; however, there is variability in pediatrics and aquatic rescue with different approaches in various jurisdictions.	

Desirable Effects

How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know	Delivering high-quality chest compressions as early as possible is vital to high-quality CPR and optimizes the chance of ROSC and survival after cardiac arrest. However, patients who suffer cardiac arrest from respiratory or asphyxia causes (eg. children, drowning) will benefit from additional ventilatory support.	Indirect evidence from before-and-after OHCA registry studies in adults, which examined changes in dispatcher telephone CPR instructions[3] and the implementation of guideline changes[4,5], suggests that switching from the A-B-C to C-A-B approach was associated with increased rates of bystander CPR[3] and improved patient outcomes.[3,4,5] Similar data on in-hospital cardiac arrest show conflicting evidence in patient outcomes.[6,7] One large registry study from Japan demonstrated increased bystander CPR rates in children with bystander-witnessed OHCAs after compression-only CPR was introduced.[8] Whether the change in sequence to CAB by some ILCOR member councils has resulted in more infants and children receiving compression-only CPR overall is unknown, although available data continues to support the combination of compressions and breaths is needed for optimal pediatric CPR.[9,10]

		ROSC and survival to hospital discharge. Coronary perfusion pressure is generated by effective chest compressions and is cumulative, therefore when chest compressions stop, it falls to near zero. Early effective chest compressions are vital to establishing and maintaining coronary perfusion pressure. [11] Time to first compression is associated with better patient outcomes, including good neurological outcomes in adults.[12]

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	Starting CPR with compressions first results in faster times to key elements of resuscitation, such as time to commencement of chest compressions, time to start and complete the first cycle of compressions, and a higher chest compression fraction. One simulated study in pediatric resuscitation found starting with compressions delayed time to commencement of rescue breaths in cardiac arrest, but the differences was of questionable clinical significance.	Opening the airway and delivery of ventilations is technical, and bystanders, especially if untrained or minimally trained, are typically unable to deliver effective ventilations during simulated CPR.[13] Further evidence suggests that delivering the A-B-C approach has more errors in CPR[14]; and that lay-bystanders prefer C-A-B, and it is easier to learn and retain[14]. The delivery of non-mouth-to-mouth ventilation requires the retrieval and preparation of equipment (e.g. bag-valve-mask, pocket mask), which, when multiple rescuers are present, can occur during chest compressions.

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	This systematic review did not identify any human studies, but identified 5 manikin studies; 1 randomized study [15] focused on adult resuscitation, 2 randomized studies focused on pediatric resuscitation, [16,17]and 2 observational studies focused on adult resuscitation [18,19].	

Outcome	Relative importance	Certainty of the evidence (GRADE)
Time to commencement of chest compressions – RCTs and non RCTs	IMPORTANT	⊕◯◯◯ VERY LOW
Time to commencement of rescue breaths – RCTs	IMPORTANT	⊕◯◯◯ VERY LOW
Time to completion of first CPR cycle - RCT	IMPORTANT	⊕◯◯◯ VERY LOW
Ventilation rate -RCT	IMPORTANT	⊕◯◯◯ VERY LOW
Compression rate -RCT and non RCTs	IMPORTANT	⊕◯◯◯ VERY LOW
Chest compression fraction (CCF) -RCT and non RCTs	IMPORTANT	⊕◯◯◯ VERY LOW
Minute alveolar ventilation in the first minute of resuscitation	IMPORTANT	⊕◯◯◯ VERY LOW

	Time to diagnosis of need for resuscitation (unresponsive, respiratory arrest, cardiac arrest) - RCT	IMPORTANT	⊕◯◯◯ VERY LOW

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 no data on critical patient outcomes.	

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	Mankin studies show minimal differences in times to key resuscitation elements, but most favour commencing with compressions.	

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	No relevant published data was identified that answers this question. In many jurisdictions, CAB is already in place in adult and paedatric BLS so resource requirements are small. In jurisdictions where ABC is used, there are a number of resources required to implement CAB in preference to ABC including investments required to train rescuers, reconfiguration of CPR feedback devices and AEDs, and production of educational materials.	

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 relevant published data was identified for review so unable to provide any certainty here.	

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 relevant published data was identified that answers this question	

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	No relevant published data was identified that answers this question.	

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE – CHECK CURRENT FLOW CHARTS	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	In adults, the recommendation of CAB in preference to ABC will be acceptable to resuscitation key stakeholders as there is no significant deviation from current practice. In children, there is international variability so a recommendation of CAB in preference to ABC may create some debate.	Due to the public's concerns with mouth-to-mouth ventilations,[20] commencing CPR with airway and ventilations may result in no bystander CPR being provided.

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	In adults, many BLS guidelines recommend CAB in preference to ABC thus the intervention (CAB) presents no significant deviation from current practices. In children, feasibility will be more problematic given the degree of international variation in BLS guidelines.	

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 option	Conditional recommendation against the option	Conditional recommendation for either the option or the comparison	Conditional recommendation for the option	Strong recommendation for the option
○	○	○	○	●

CONCLUSIONS

Recommendation

In adults and children in cardiac arrest, we suggest commencing CPR with compressions rather than ventilations (weak recommendation, very-low-certainty evidence).

Justification

For most outcomes CAB resulted in faster times to key elements of resuscitation (rescue breaths, chest compressions, completion of first CPR cycle) across the five papers reviewed. This very small delay in commencing rescue breaths with CAB may be acceptable given the decreased time to other elements of resuscitation, however it should be noted that the certainty of the evidence is very low and all studies reviewed were manikin studies. There was also consideration given to training requirements of a single approach versus separate approaches for adults and children.

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