Appendix A2 ALS-1 EtD Table
PCI Post ROSC without STEMI

QUESTION

Should [Emergent or early CAG with PCI if indicated] vs. [Delayed CAG or no CAG] be used for [Unresponsive adults (> 18 years old) with return of spontaneous circulation (ROSC) after cardiac arrest without ST-segment elevation on ECG]?	
POPULATION:	[Unresponsive adults (> 18 years old) with return of spontaneous circulation (ROSC) after cardiac arrest]
INTERVENTION:	[Emergent or early CAG with PCI if indicated]
COMPARISON:	[Delayed CAG or no CAG]
MAIN OUTCOMES:	Survival at 24 hours-RCTs; Survival to hospital discharge-RCTs; Survival to hospital discharge-no STEMI-RCTs; Survival to hospital discharge-shockable-RCTs; Survival at 30 days-NRCTs; Survival at 90 days-RCTs; Survival at 1 -3 years-NRCTs; Favorable Neurologic Outcome at ICU discharge -RCTs; Favorable Neurologic Outcome at hospital discharge-NRCTs; Favorable Neurologic Outcome at hospital discharge-noSTEMI-NRCTs; Favorable Neurologic Outcome at hospital discharge-shockable-NRCTs; Favorable Neurlogic Outcome at 90 days-RCTs; Favorable Neurologic Outcome at 90 days-noSTEMI-RCTs; Favorable Neurologic Outcome at 90 days-shockable-RCTs; PCI ITT-RCTs; PCI PP-RCTs; Successful PCI ITT-NRCTs; Successful PCI PP-NRCTs; CABG ITT-RCTs; Stroke-ICH-NRCTs; Stroke-ICH-RCTs; Recurrent arrest; Sepsis; Pneumonia; Bleeding; Renal replacement therapy; Acute renal failure; Brady arrhytmias-Pacing; Shock; Survival to hospital discharge-STEMI-NRCTs; Favorable Neurologic Outcome at hospital discharge-STEMI-NRCTs;
SETTING:	
PERSPECTIVE:	
BACKGROUND:	
CONFLICT OF INTERESTS:	

ASSESSMENT

Problem
Is the problem a priority?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	Survival from cardiac arrest is low (~10%). The majority of cardiac arrests are of presumed cardiac etiology amendable to cardiac intervention. Specifics around the use of coronary angriography such as timing, patient populations etc. are not well defined. Patients without ST-segment elevation on ECG are less likely to have a lesion amendable to coronary angiography and percutaneous coronary intervention, compared to patients with ST-segment elevation on ECG. There are, however, patients within this group who require CAG.	Stable, non-cardiac arrest patients suffering a myocardial infarction without ST-segment elevation on ECG do not require urgent coronary angiography.

Desirable Effects
How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS

○ Trivial ● Small ○ Moderate ○ Large ○ Varies ○ Don't know	Improving patient outcomes after cardiac arrest is of utmost importance. The impact of urgent coronary angiography, however, appears to vary by population. While urgent angiography may be most important in post-cardiac arrest patients with STE on ECG we did not find improved survival or neurological outcome in patients without STE on ECG or with initial shockable cardiac arrest rhythms.	

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	We did not find any evidence of adverse events including, rearrest, bleeding, infection with early coronary angiography compared to delayed coronary angiography.	Coronary angiography for post-cardiac arrest patients requires considerable resource utilization, cost and may detract from other important intervetnsions such as TTM in undifferentiated post-cardiac arrest patients.

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 certainty of evidence is low for post-cardiac arrest patients with no STEMI on ECG. The effect estimate for survival comes from a single RCT stopped early for futility (OR 1.33 95% CI 0.60 to 2.93) [Kern 2020] and an RCT examining patients with no STEMI and an initial shockable rhythm (OR 0.85, 95% CI 0.60 to 1.22) [Lemkes 2019]. Both studies have confidence intervals for the effect estimate that span 1.00. Further, observational studies and RCTs show effects in opposite directions for survival and neurological outcome.	

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	Survival and neurological outcome are both patient-oriented outcomes that are considered highly important for cardiac arrest research. COSCA statement [Haywood 2018] include these as core outcomes for reporting of cardiac arrest.	

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	While the outcome of survival would be valued more than the undesirable effects the effect estimate and certainty of evidence suggests no benefit for early CAG for cardiac arrest patients, patients without STEMI on ECG, and patients with VF as an initial presenting rhythm. This evidence, however, comes from a single RCT where unstable patients were excluded.	

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	Costs were not evaluated in this systematic review. Resource costs, however, are substantial for this intervention and will most likely vary across countries. This would include both costs to the prehospital system and in-hospital 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	We did not include any studies to determine the certainty of evidence around the cost associated with early CAG.	

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	We did not include any studies that examined the cost-effectiveness of this intervention.	

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		

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	The intervention is widely accepted in non-cardiac arrest patients and in post-cardiac arrest patients with ST-segment elevation no ECG. We did not find evidence to suggest that urgent CAG should also be applied to other groups of post-cardiac arrest patients.	

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know	Feasibility of this intervention may vary between jurisdictions. While the intervention is a common treatment for both post-cardiac arrest and non-cardiac arrest patients the feasibility of early angiography for post-cardiac arrest patients would depend on system resources to transport patients to a centre capable of performing the intervention and on the accessibility of a PCI centre. This will vary across regions.	

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**

	JUDGEMENT						
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

When coronary angiography is considered for comatose post-arrest patients without ST elevation, we suggest that either an early or a delayed approach for angiography is reasonable. (weak recommendation, low certainty of evidence)

Justification

In making the above recommendations, the taskforce weighed the fact that we did not find sufficient evidence to demonstrate improved outcomes with early angiography for post cardiac arrest patients without ST-segment elevation regardless of presenting cardiac arrest rhythm (shockable or non-shockable). Patients in cardiogenic shock post arrest were excluded from all studies and there is unlikely to ever be sufficient clinical equipoise to support a randomized trial of delayed intervention in the shock cohort. There may be subgroups of patients without ST-segment elevation with high-risk features that would benefit from earlier coronary angiography.

Importantly this review examined the timing of coronary angiography if it was done, and did not compare to no coronary angiography. It may be that survival and functional survival may not be the right outcomes to measure harm or benefit from an intervention that adjusts the timing of PCI in post arrest patients. We know that the majority of patients admitted to hospital after cardiac arrest do not die from cardiac complications and most die as a result of neurologic injury. There are no significant differences in adverse event rates with either time interval.

Subgroup considerations

Implementation considerations

The ability to implement coronary angiography for post-cardiac arrest patients will vary across systems. It will depend on prehospital resources, distance to cath lab and ability of hospitals to perform intervention. Regional variations may also differ in terms of whether patients are transported directly from the field ("Bypass directive") or if they are transported to local hospitals and then transferred to a cardiac centre at a later time ("inter-facility transfer").

Monitoring and evaluation

Research priorities

- Future trials should consistently define what are the comparable time intervals to treatment for early compared to late angiography and PCI.
- Whether early coronary angiography improves survival/survival with favorable neuro outcome for post-arrest patients with ST elevation
- Whether angiography, compared to no angiography, improves outcomes in post-arrest patients
- Whether angiography and PCI may improve outcomes in the no ST elevation cohort who present in shock
- No studies identified evaluated this question for cardiac arrest in the in-hospital setting.
- No RCTs compared angiography and PCI vs thrombolysis and early vs late time to treatment interval.
- Most randomized trials have focused on short term survival and functional outcomes so data on longer term outcomes is relatively more limited.
- Relatively few studies examining health related quality of life (HRQoL) outcomes
- There may be newer or alternative endpoints such as functional or biochemical measures that may show a benefit with timing of coronary angiography in cardiac arrest patients

Appendix A2 ALS-2 EtD Table
PCI Post ROSC with STEMI

QUESTION

Should [Emergent or early CAG with PCI if indicated] vs. [Delayed CAG or no CAG] be used for [Unresponsive adults (> 18 years old) with return of spontaneous circulation (ROSC) after cardiac arrest with ST-segment elevation (STEMI) on ECG]?	
POPULATION:	[Unresponsive adults (> 18 years old) with return of spontaneous circulation (ROSC) after cardiac arrest]
INTERVENTION:	[Emergent or early CAG with PCI if indicated]
COMPARISON:	[Delayed CAG or no CAG]
MAIN OUTCOMES:	Survival at 24 hours-RCTs; Survival to hospital discharge-RCTs; Survival to hospital discharge-no STEMI-RCTs; Survival to hospital discharge-shockable-RCTs; Survival at 30 days-NRCTs; Survival at 90 days-RCTs; Survival at 1 -3 years-NRCTs; Favorable Neurologic Outcome at ICU discharge -RCTs; Favorable Neurologic Outcome at hospital discharge-NRCTs; Favorable Neurologic Outcome at hospital discharge-noSTEMI-NRCTs; Favorable Neurologic Outcome at hospital discharge-shockable-NRCTs; Favorable Neurlogic Outcome at 90 days-RCTs; Favorable Neurologic Outcome at 90 days-noSTEMI-RCTs; Favorable Neurologic Outcome at 90 days-shockable-RCTs; PCI ITT-RCTs; PCI PP-RCTs; Successful PCI ITT-NRCTs; Successful PCI PP-NRCTs; CABG ITT-RCTs; Stroke-ICH-NRCTs; Stroke-ICH-RCTs; Recurrent arrest; Sepsis; Pneumonia; Bleeding; Renal replacement therapy; Acute renal failure; Brady arrhytmias-Pacing; Shock; Survival to hospital discharge-STEMI-NRCTs; Favorable Neurologic Outcome at hospital discharge-STEMI-NRCTs;
SETTING:	
PERSPECTIVE:	
BACKGROUND:	
CONFLICT OF INTERESTS:	

ASSESSMENT

Problem
Is the problem a priority?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	Survival from cardiac arrest is low (~10%). The majority of cardiac arrests are of presumed cardiac etiology amendable to cardiac intervention.	

Desirable Effects
How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know	Improving patient outcomes after cardiac arrest is of utmost importance. Urgent angiography may be most important in post-cardiac arrest patients with STE on ECG. There are no RCTs on urgent coronary angiography specific to this population. We identified two observational studies examining patients with post-ROSC STEMI on ECG. Neither study identified benefit with urgent coronary angiography	Urgent coronary angiography and PCI, when indicated, is recommended for patients who have a ST-segment myocardial infarction without cardiac arrest.

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large ○ Moderate ● Small ○ Trivial ○ Varies ○ Don't know	RCTs of post-ROSC patients (Lemkes, Elfwen) did not identify any risk of adverse events such as bleeding, stroke, or re-arrest with early coronary angiography.	Coronary angiography for post-cardiac arrest patients requires considerable resource utilization, cost and may detract from other important intervetnsions such as TTM in undifferentiated post-cardica arrest patients. Timing of ECG post-ROSC may help to avoid false positive activations (Baldi 2020)

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 certainty of evidence is very low for post-cardiac arrest patients with ST elevation on ECG. A single observational study (Garcia 2016) met our pre-determined criteria for inclusion and found no improvement in survival [OR 1.89 (95% CI 0.48, 7.43)] or neurological outcome [OR 1.12 (95% CI 0.30, 4.19)] at hospital discharge with urgent coronary angiography.	

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	Survival and neurological outcome are both patient-oriented outcomes that are considered highly important for cardiac arrest research. COSCA statement [Haywood 2018] include these as core outcomes for reporting of cardiac arrest.	

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	While the outcome of survival would be valued more than the undesirable effects the effect estimate and certainty of evidence suggests no benefit for early CAG for post-cardiac arrest STEMI patients. This evidence comes from a single 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	Costs were not evaluated in this systematic review. Resource costs, however, are substantial for this intervention and will most likely vary across countries. This would include both costs to the prehospital system and in-hospital 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	We did not include any studies to determine the certainty of evidence around the cost associated with early CAG.	

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	We did not include any studies that examined the cost-effectiveness of this intervention.	

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		

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know	The intervention is widely accepted in non-cardiac arrest patients and in post-cardiac arrest patients with ST-segment elevation no ECG and is currently recommended in cardiac arrest guidelines.	

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know	Feasibility of this intervention may vary between jurisdictions. While the intervention is a common treatment for both post-cardiac arrest and non-cardiac arrest patients the feasibility of early angiography for post-cardiac arrest patients would depend on system resources to transport patients to a centre capable of performing the intervention and on the accessibility of a PCI centre. This will vary across regions.	

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**

	JUDGEMENT						
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 early coronary angiography in comatose post-cardiac arrest patients with ST segment elevation. (good practice statement)

Justification

For comatose patients with ST segment elevation there is no randomized clinical evidence for the timing of coronary angiography. The Task Force acknowledges that early coronary angiography, and percutaneous intervention if indicated, is the current standard of care for patients with STEMI who did not have a cardiac arrest. We found no evidence to change this approach in patients with ST segment elevation following cardiac arrest.

Subgroup considerations

Implementation considerations

The ability to implement coronary angiography for post-cardiac arrest patients will vary across systems. It will depend on prehospital resources, distance to cath lab and ability of hospitals to perform intervention. Regional variations may also differ in terms of whether patients are transported directly from the field ("Bypass directive") or if they are transported to local hospitals and then transferred to a cardiac centre at a later time ("inter-facility transfer").

Monitoring and evaluation

Research priorities

- Future trials should consistently define what are the comparable time intervals to treatment for early compared to late angiography and PCI.
- Whether early coronary angiography improves survival/survival with favorable neuro outcome for post-arrest patients with ST elevation
- Whether angiography, compared to no angiography, improves outcomes in post-arrest patients
- Whether angiography and PCI may improve outcomes in the no ST elevation cohort who present in shock
- No studies identified evaluated this question for cardiac arrest in the in-hospital setting.
- No RCTs compared angiography and PCI vs thrombolysis and early vs late time to treatment interval.
- Most randomized trials have focused on short term survival and functional outcomes so data on longer term outcomes is relatively more limited.
- Relatively few studies examining health related quality of life (HRQoL) outcomes
- There may be newer or alternative endpoints such as functional or biochemical measures that may show a benefit with timing of coronary angiography in cardiac arrest patients

Appendix A2 ALS-3 EtD Table
Prone CPR

QUESTION

Should CPR in the prone position vs. CPR in the supine position be used for cardiac arrest occurring in the prone position?	
POPULATION:	cardiac arrest occurring in the prone position
INTERVENTION:	CPR in the prone position
COMPARISON:	CPR in the supine position
MAIN OUTCOMES:	Systolic blood pressure during CPR-Mazer; Diastolic blood pressure during CPR-Mazer; Mean arterial pressure during CPR-Mazer; Systolic blood pressure during CPR-Wei; Diastolic blood pressure during CPR-Wei;
SETTING:	any setting
PERSPECTIVE:	
BACKGROUND:	Prone positioning has been used increasingly for critically ill patients with severe hypoxemic respiratory failure, especially during the COVID-19 pandemic. This has made the question of how to proceed with CPR when a patient arrests in the prone position a timely one.
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	There is very little evidence on the effectiveness of prone compressions compared to supine compressions for cardiac arrest, consisting of only case reports and two very small prospective studies, as well as one observational simulation study.	The COVID-19 pandemic and the consequent increase in the number of patients with refractory hypoxemic respiratory failure has led to a significant rise in the use of prone positioning for patients on mechanical ventilation in intensive care. This has brought the question of how to manage resuscitation when these patients arrest while prone to the forefront.

Desirable Effects
How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Trivial ○ Small ○ Moderate	Minimal evidence addressing the question. Case reports and small studies suggest CPR done prone can be effective in at least some cases.	Potential desirable effects of starting CPR while patient still prone include faster CPR start/shorter no-flow time, and (suggested by some investigators) possibly higher arterial blood

○ Large ○ Varies ● Don't know		pressure with prone compressions, although this evidence is at extremely high risk of bias. Supinating a critically ill patient in a hurried fashion could also lead to some risk of dislodging tracheal tubes or IV lines, and performing CPR while patient still prone could avoid some of this risk.

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large ○ Moderate ○ Small ○ Trivial ○ Varies ● Don't know	No evidence of harms but this is unknown. Notably, almost all case reports of prone CPR are in patients with an advanced airway.	Potential concerns include difficulty managing possible airway problems, and unknown effectiveness of prone CPR and defibrillation compared to supine CPR/defibrillation.

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	Evidence consists of case reports, almost all of which are of patients proned in the setting or spinal or neurosurgery, and two very small prospective studies on patients already considered dead/failing supine CPR. These studies do suggest that adequate perfusion pressure is possible with prone compressions, and case reports suggest ROSC can be obtained, but there is no evidence for whether prone CPR is more or less likely to lead to ROSC than supine CPR.	

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		

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		Whether starting CPR while a patient is still prone or turning them supine prior to starting CPR is beneficial may depend on multiple factors, including: patient size, available personnel, ability to generate (and measure) an adequate arterial pressure and ETCO2 with prone compressions, and whether supinating them quickly is feasible and safe for that individual. Supine CPR is the standard of care and is known to be effective. However, the very limited evidence available suggests that prone CPR can be life-saving as well and may be a reasonable option if immediate supination is difficult or poses unacceptable risks to the patient.

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ○ Yes ○ Varies ● Don't know		ICU and other hospital clinicians are treating more patients in prone position that ever before, and are thus interested in this question.

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know	The feasibility of immediate supination will vary by available personnel and patient characteristics.	

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**
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

For patients with cardiac arrest occurring while in the prone position with an advanced airway already in place, and where immediate supination is not feasible or poses significant risk to the patient, initiating CPR while the patient is still prone may be a reasonable approach (good practice statement).

Invasive blood pressure monitoring and continuous $ETCO_2$ monitoring may be useful to ascertain whether prone compressions are generating adequate perfusion, and this information could inform the optimal time to turn the patient supine (good practice statement).

For patients with cardiac arrest occurring while in the prone position without an advanced airway already in place, we recommend turning the patient supine

as quickly as possible and beginning CPR (strong recommendation, very low certainty of evidence).

For patients with cardiac arrest with a shockable rhythm who are in the prone position and cannot be supinated immediately, attempting defibrillation in the prone position is a reasonable approach (good practice statement).

Justification

TF discussed that normally we would not generate treatment recommendations based on the level of evidence available for this question, which is of extremely low certainty, but that the COVID-19 pandemic and the large increase in the number of critically-ill patients treated with prone positioning has made this an important question for clinicians around the world.

TF discussed weighing the possible risk of delaying CPR start and defibrillation against the possible risk of prone CPR/defibrillation being less effective, and acknowledged that the balance of effects is very unclear.

TF discussed that additional studies, which would be quite feasible to perform, would be very useful. These could include larger case series representing the total experience of a center or centers, or even additional case reports that report quality metrics such as ETCO2 and arterial blood pressure during prone compressions. More data on ICU patients particularly is needed, as virtually all published case reports on prone CPR are in patients proned for spinal or brain surgery in the operating room.

TF discussed the fact that in many ICU settings, patients who are proned and on mechanical ventilation are highly likely to have arterial lines in place and $ETCO_2$ monitoring ongoing, thus allowing for the rapid assessment of whether prone compressions are effective.

TF discussed that the difficulty of supinating a patient will vary widely based on patient size, personnel immediately available, and interventions in place such as chest tubes, advanced airways, IV lines, personal protective equipment and isolation requirements, and potentially open wounds/exposed hardware (in the case of patients in the operating room).

TF discussed that the etiology of the cardiac arrest will determine the urgency of supination. For example a primary airway problem such as a dislodged tracheal tube will require immediate supination, whereas the need for hemorrhage control during surgery in the prone position surgery may necessitate CPR in the prone position.

Subgroup considerations

Evidence does not differ significantly between adult and paediatric patients, although in many cases supination of children may be easier due to patient size.

Implementation considerations

Monitoring and evaluation

Research priorities

TF discussed that additional studies, which would be quite feasible to perform, would be very useful. These could include larger case series representing the total experience of a center or centers, or even additional case reports that report quality metrics such as ETCO2 and arterial blood pressure during prone compressions. More data on ICU patients particularly is needed, as virtually all published case reports on prone CPR are in patients proned for spinal or brain surgery in the operating room.