QUESTION

Short PICO title here	
POPULATION:	Adults and children in cardiac arrest
CONCEPT	Adverse events and outcomes associated with pad placement and/or defibrillation without removing the patient's bra/brassiere (including those with metal components)
CONTEXT	In patients wearing a bra/brassiere in any setting (in-hospital or out-of-hospital)
BACKGROUND:	In preparation for defibrillation, defibrillator pads or paddles must come into full contact with the skin of the chest wall and avoid contact with metal objects. Some Resuscitation guidelines recommend the removal of all clothes covering the chest,[1] this includes bras as they may contain metal (e.g. underwire and clips) under the assumption that this may result in the defibrillator malfunctioning or harm to the patient.
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	This topic was chosen for review by the BLS Task Force because of ongoing controversies in the published literature: • In preparation for defibrillation, defibrillator pads or paddles must come into full contact with the skin of the chest wall and avoid contact with metal objects. Some Resuscitation guidelines recommend the removal of all clothes covering the chest, including bras, as they may contain metal (e.g., underwire, and clips), under the assumption that this may result in the defibrillator malfunctioning or harm to the patient or rescuer.[1] • However, a growing body of research has identified that women are less likely to receive CPR and defibrillation by the public.[2,3] Public opinion surveys show that some members of the public do not feel comfortable exposing women's breasts, and fear accusations of inappropriate touching and sexual assault.[4] These concerns may impact bystanders' willingness to perform CPR and defibrillation and explain why rates are lower in women.[4] Whether it is necessary to remove such undergarments is unknown.	

Desirable Effects

How substantial are the desirable anticipated effects?		
JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Trivial ○ Small ○ Moderate ● Large ○ Varies ○ Don't know	Bystander defibrillation is associated with the greatest survival from out-of-hospital cardiac arrest, but rates are lower in women.[3,4] Removing barriers to the public applying pads is a significant outcome. Harms to patient skin may be minor.	

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	**RESEARCH EVIDENCE**	**ADDITIONAL CONSIDERATIONS**
○ Trivial ○ Small ○ Moderate ○ Large ○ Varies ● Don't know	Delays in defibrillation and incorrect pad placement is undesirable. Harms to defibrillators may be significant.	

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	Certainty of evidence was not assessed, but most of the existing evidence lacks per-review and full methods. Three studies met inclusion criteria, including one animal study[5] and two simulation mannikin studies.[6,7] Two studies were published as conference abstracts from the same group of authors who were employed by a company that develops and manufactures AEDs.[5,6]	

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	There may be cultural and religious variabilities and sensitivities.	

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	• We found no evidence reporting patient outcomes or any case studies reporting adverse events about defibrillation without removing a bra. • In the animal study, published as a conference abstract, investigators gave 126 shocks (200J) to four pigs via self-adhering AED pads that were in direct contact with the metal underwire of a bra.[5] The authors report 100% 1st shock success, with no adverse events: no arcing or redirection of current, scorching or burning of the bra or pig's skin, and no adverse events to the rescuer or AED. • A simulation study, published as a conference abstract, of 78 untrained AED users tested the impact of the addition of bra removal on time to place pads or the delivery of the first shock.[6] No differences were seen in these times for clothed male or female manikins. • The remaining fully reported simulation study, in 69 rescuers using an AED, noted that male rescuers were less likely to completely de-robe the female manikin than female rescuers (13.3% vs 66.7%, p=0.002). When interviewed, participants cited being unaware of the need to remove the bra, social norms, and concerned for the patient's modesty, and men did not want to remove more clothing than necessary.[7]	

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	There is no evidence.	

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	There is no evidence.	

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	There is no evidence.	

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	May reduce some of the inequities seen in the application of AED pads and public defibrillation seen in women.	

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	Although insufficient studies were identified to support a more specific systematic review of defibrillation while wearing a bra at this time, the Task Force felt the need to highlight and address the inequality in AED application in women by making Good Practice Statements to highlight this issue to the international community.	

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know	Some regions are already implementing defibrillation and training without removing a bra.	

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	Trivial	Small	Moderate	Large		Varies	**Don't know**
CERTAINTY OF EVIDENCE	**Very low**	Low	Moderate	High			No included studies

	JUDGEMENT						
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

CONCLUSIONS

Recommendation

There is insufficient evidence to guide the routine removal of a bra, but it may not always be necessary to remove a bra for defibrillation. Pads must be placed on bare skin in the correct position, which may be possible by adjusting the bra's positioning rather than removing it (Good Practice Statement).

Manufacturers should develop realistic manikins that reflect different body sizes that can impact pad placement (Good Practice Statement).

Where possible, CPR training should cover defibrillation for patients wearing bras, focusing on correct pad placement and minimizing pauses in compressions (Good Practice Statement).

Justification

- Although insufficient studies were identified to support a more specific systematic review of defibrillation while wearing a bra at this time, the Task Force felt the need to highlight and address the inequality in AED application in women by making Good Practice Statements to highlight this issue to the international community.
- We put greater weight on placing the pads in the right place over routine bra removal.
- Implementing the Good Practice Statements may reduce inequity, address an important problem, align with the goals of the relevant organisations, may benefit society, and are likely to be acceptable and feasible.

Subgroup considerations

n/a

Implementation considerations

A single adjustable manikin is likely to be preferred over different types.
BLS training materials may require adjustment.

Monitoring and evaluation

Monitoring and peer-review publishing of the implementation of these practices will be important guide future recommendations.

REFERENCES

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