> ## Critical Review Form
> ## Therapy
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> Fair J 3rd, Mallin MP, Adler A, Ockerse P, Steenblik J, Tonna J, Youngquist ST. Transesophageal Echocardiography During Cardiopulmonary Resuscitation Is Associated With Shorter Compression Pauses Compared With Transthoracic Echocardiography. Ann Emerg Med. 2019 Jun;73(6):610-616.

Objectives: **To test the hypothesis "that TEE-guided pulse and rhythm checks would be shorter, on average, than TTE or manual pulse and rhythm checks." (p. 2)**

Methods: **This retrospective observational study was conducted at the University of Utah emergency department (ED), a level 1 trauma center and tertiary care center associated with an emergency medicine residency program, between March 1, 2016 and May 25, 2017. Video recordings from consecutive adult (age ≥ 18 years) medical or traumatic cardiac arrest cases receiving active resuscitation were reviewed. Two abstractors recorded the time and duration of all pauses in chest compressions (with precision to 1 second) until efforts were ceased, as well as whether TTE or TEE was used during the pause. Average pause duration was compared between 3 groups: those in whom manual palpation alone was used, those in whom TTE was used, and those in whom TEE was used during rhythm checks. Pauses during which procedures were performed were excluded.**

During the study period, there were a total of 25 cardiac arrests (23 medical, 2 traumatic) including 208 pauses. Of these, 139 pauses were for pulse analysis and 69 were for procedures. Among all patients, 88% experienced an out-of-hospital arrest and 12% arrested in the ED. 48% were male.

Guide	Comments
Critical Review Form: Therapy	
Are the results valid?	
Did experimental and control groups being the study with a similar prognosis?	
Were patients randomized?	No. This was a retrospective review of previously recorded resuscitations and hence at risk of selection bias.
Was allocation concealed? Was it possible to subvert the randomization to ensure a patient would be "randomized" to a particular group?	N/A
Were patients analyzed in the groups to which they were randomized?	This was not a randomized controlled trial, and rather than analyze the data at the patient level, this study analyzed data by CPR pause. In other words, rather than analyze by patient, each CPR pause was considered independently to assess the effect of pulse check modality on pause duration.
Were patients in the treatment and control groups similar with respect to known prognostic factors?	N/A. As data was analyzed by CPR pause rather than by individual patient, it would not have been possible to make a comparison of prognostic factors between groups.
Did experimental and control groups retain a similar prognosis after the study started?	

Were patients aware of group allocation?	No. Patients were in cardiac arrest and would not have had any idea what interventions were being performed.
Were clinicians aware of group allocation?	Yes. This was a retrospective study and blinding would not have been feasible given the nature of the intervention. However, clinicians would not have been aware of the outcomes being studied given the retrospective nature of the study and it is unlikely that performance bias would have impacted results.
Were outcome assessors aware of group allocation?	No. Abstractors were blinded to the study hypothesis, making observer bias unlikely. Additionally, the outcome (pause duration) is fairly objective.
Was follow-up complete?	Yes. The only outcome being assessed was CPR pause duration, which would have been captured on video recording. No long-term outcomes beyond the resuscitation were measured in this study.

What are the results?

How large was the treatment effect?	- The mean duration of pulse checks was significantly lower for resuscitations guided by TEE (9 seconds; 95% CI: 5–12) than those guided by TTE (19 seconds; 95% CI: 16–22). The mean difference was 10 seconds (95% CI 5 to 14). - While the mean pulse check duration when TEE was used was lower than the mean duration for manual pulse checks (11 seconds; 95% CI: 8–14), this difference did not achieve statistical significance (-2 seconds, 95% C -6 to 2).
How precise was the estimate of the treatment effect? (i.e. what 95% CIs were associated with the results?)	See above.

How can I apply the results to patient care?

Were the study patients similar to my patient?	Uncertain. While the patients in this study were likely similar to those seen in our institution, the authors provide no details regarding those performing the ultrasounds, including what percent are ultrasound trained and whether any sort of formal TEE training was instituted prior to the study period.
Were all clinically important outcomes considered?	No. The only outcome considered was the duration of pulse checks. While previous studies have demonstrated an inverse correlation between outcomes and the duration of pauses in chest compressions (Cheskes 2011, Brouwer 2015) this study did not attempt compare any patient-centered outcomes between those undergoing TEE-guided resuscitation, those undergoing TTE-guided resuscitation, and those in whom manual pulse checks alone were used.
Are the likely treatment benefits worth the potential harm and costs?	Uncertain, while this study demonstrated a decrease in mean duration of pulse checks when TEE was used to guide resuscitation compared with TTE, this small, retrospective study alone is insufficient evidence of a clear benefit to TEE use in cardiac arrest.

Limitations:

1. **This was a retrospective review of previously recorded resuscitations and hence at risk of selection bias.**

2. **The authors provide no details regarding those performing the ultrasounds, including what percent are ultrasound trained and whether any sort of formal TEE training was instituted prior to the study period (external validity).**

3. **As data was analyzed by CPR pause rather than by individual patient, it would not have been possible to make a comparison of prognostic factors between groups.**

4. While this study found a significant difference in the mean duration of pulse checks when TEE was used compared with TTE, the authors did not address any [patient-centered outcomes](#).

Bottom Line:

This small, retrospective, single-center review of patients in cardiac arrest found that mean pulse duration was shorter when TEE was used to guide resuscitation when compared with cases in which TTE was used to guide resuscitation (mean difference was 10 seconds; 95% CI 5 to 14). No significant difference in pulse check duration was seen between cases in which TEE was used compared to cases in which manual pulse checks alone were used.