Can High-Quality CPR Be Performed on **Active** Mattresses?

Independent Study: White Cross Training Study | Laurence Peacock, 30 July 2025

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Introduction

Effective cardiopulmonary resuscitation (CPR) requires immediate, high-quality chest compressions on a firm surface. Traditional alternating air mattresses can compromise this, as residual air under the torso reduces stability and delays compressions while responders locate and activate CPR valves. Recent work (Soppi et al., 2016) has suggested that CPR may actually be more effective when performed on fully inflated surfaces. (1)

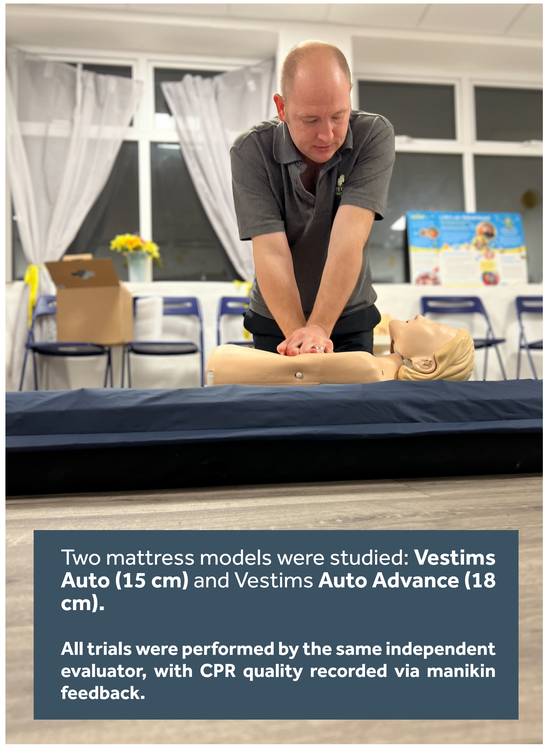
This study evaluated CPR performance on novel dual-layer vascular endothelial stimulation (Vestims®) mattresses, designed with a permanently inflated base section to provide a stable foundation while the upper cells alternate for pressure redistribution.

Previously shown to enhance blood flow by +336% (2) and significantly reduce the incidence of pressure ulcers (3), Vestims® is a Squirrel Medical active mattress system registered with the MHRA as a Class IIa medical device (4).

Methods

Three scenarios were tested using a Laerdal QCPR manikin:

1. **Floor (control)** – CPR commenced immediately.
2. **Inflated mattress** – Manikin placed on a fully inflated Vestims mattress in alternating mode; CPR commenced immediately.
3. **Deflated mattress** – CPR valve activated; compressions started during mattress deflation.



Two mattress models were studied: **Vestims Auto (15 cm)** and Vestims **Auto Advance (18 cm).**

All trials were performed by the same independent evaluator, with CPR quality recorded via manikin feedback.

Results

Scenario	Auto Advance (15 cm)	Auto Advance (18 cm)
Floor (control)	99% CPR success rate	99% CPR success rate
Inflated mattress	99% CPR success rate	99% CPR success rate
Deflated mattress	99% CPR success rate	99% CPR success rate

CPR performance scores remained consistently high, with a 99% success rate across all conditions and both mattress types. However, the evaluator expressed a strong preference for the inflated mattress condition, citing immediate readiness, improved patient head positioning, and easier maintenance of the head-tilt chin-lift.

The dual-layer design ensured that the lower chamber mimicked the firmness of a carpeted floor, while the alternating top layer supported pressure redistribution. CPR on Vestims mattresses was also noted to be more stable and effective than on many standard foam mattresses commonly found in care settings.

Discussion

Although compression scores were similar across surfaces, the qualitative findings highlight critical advantages of the inflated mattress condition. Eliminating the need to locate and activate a CPR valve reduces delays and cognitive load during emergencies, allowing responders to focus on immediate, uninterrupted compressions.

This stability directly addresses long-standing concerns about soft support surfaces and builds on earlier findings by Soppi et al. (2016).

The Vestims design provides both therapeutic benefit and emergency readiness, potentially resolving the conflict between pressure ulcer prevention and resuscitation needs.

Operationally, simplifying protocols to "start CPR immediately" rather than deciding whether to use a valve has implications for hospitals, care homes, and community settings. In environments where responder experience varies, this clarity may improve outcomes and confidence in resuscitation events. While further clinical research is warranted, the repeatability of this manikin study provides a strong basis for reconsidering existing CPR guidance.

Conclusion

- CPR can be performed safely and effectively on Vestims mattresses in both inflated and deflated conditions.
- The stable base design removes the need for CPR valve activation or moving patients to the floor.
- Findings support a potential revision of CPR protocols for modern alternating pressure mattresses, integrating both pressure relief and emergency readiness.

Vestims® mattresses allowed immediate, **uncompromised CPR** while continuing to **protect against pressure ulcers.**

References

(1) Soppi, E., Iivanainen, A., Sikanen, L. & Jouppila-Kupiainen, E. (2016) 'Performance of different support surfaces during experimental resuscitation (CPR)', Heliyon, 2(2), e00074. doi: 10.1016/j.heliyon.2016.e00074.

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(3) Atherton, J. & Joannides, A. (2024) Evaluating the impact of a true automatic active dynamic support surface on pressure ulcer management in a long term care setting. Wounds UK, Poster Presentation.

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