Reusable versus Disposable Forced Air Warming : a comparative study of thermal performance as a first step toward more sustainable practices

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Background

Perioperative hypothermia increases the risk of surgical complications making effective patient warming essential. Disposable forced air warming blankets, while effective, contribute significantly to healthcare waste and environmental impact. Reusable alternatives may offer similar efficacy while reducing environmental footprint, but their thermal performance requires rigorous evaluation.

Aims

To assess the safety and effectiveness of reusable textile blankets as an alternative to disposable forced air warming blankets.

Methods

We conducted an in vitro, prospective, head-to-head comparison of heating performance in full-body and upper-body designs, using three blanket types (disposable single-use, light-reusable and Heavy Reusable Cotton) in a simulated operating-room scenario. A single forced-air warmer was set to 38°C for all tests, simulating both normothermic (37°C) and hypothermic (25°C) patient conditions, measuring surface temperatures at six anatomically points across the simulated body.

Results

Post-hoc Comparisons (Tukey HSD). Significant differences ($p < .05$) marked with an asterisk (*)

Condition	Comparison	MD	p
Full-body blankets, 37°C	Single-use vs. Heavy	-1.30*	.007*
	Single-use vs. Light	-0.30	.751
	Heavy vs. Light	1.00*	.047*
Full-body blankets, 25°C	Single-use vs. Heavy	-1.85*	.041*
	Single-use vs. Light	-0.90	.456
	Heavy vs. Light	0.96	.408
Upper-body blankets, 37°C	Single-use vs. Heavy	-0.69	.324
	Single-use vs. Light	0.61	.416
	Heavy vs. Light	1.30*	.024*
Upper-body blankets, 25°C	Single-use vs. Heavy	-1.37	.139
	Single-use vs. Light	-0.02	1.000
	Heavy vs. Light	1.36	.145

One-way ANOVA Comparing Three Blankets Across Four Conditions

Condition	df	F	p	η^2
Full-body blankets, 37°C	2	5.484	.007*	.18
Full-body blankets, 25°C	2	3.110	.053	.11
Upper-body blankets, 37°C	2	3.714	.031*	.13
Upper-body blankets, 25°C	2	2.468	.095	.09

Full-body Blanket Design at 37°C- ($F(2,51)=5.484$, $p=0.007$, $\eta^2=0.18$). Post-hoc - HRC and DSU blankets (MD= 1.30°C, $p=0.007$), HRC and LRC blankets (MD = 1.00°C, $p=0.047$).

Full-body Blanket Design at 25°C- ($F(2,51)=3.110$, $p=0.053$, $\eta^2=0.11$). Post-hoc- HRC and DSU blankets (MD= 1.85°C, $p=0.041$).

Upper-body Blanket Design at 25°C- ($F(2,51)=2.468$, $p=0.095$, $\eta^2=0.09$).

Upper-body Blanket Design at 37°C- ($F(2,51)=3.714$, $p=0.031$, $\eta^2=0.13$). Post-hoc- HRC and LRC blankets (MD= 1.30°C, $p=0.024$)

Conclusions

- Reusable heavy cotton blankets demonstrated superior warming performance and more homogeneous temperature
- Implementation of reusable warming blankets represents a significant opportunity for developing green operating rooms by reducing medical waste while maintaining or improving patient care standards.
- The study found no safety concerns with reusable alternatives

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