



Ο ΑΣΘΕΝΗΣ ΠΟΥ ΓΥΡΙΣΕ ΑΠΟ ΤΟ ΚΡΥΟ



***Το πρόβλημα της θέρμανσης του
χειρουργημένου ασθενή***

ΑΝΤΩΝΙΟΥ ΘΕΟΦΑΝΗ Ph.D



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Κέντρου*

Η υποθερμία αποτελεί συχνό φαινόμενο της
μετεγχειρητικής περιόδου

[Dtsch Arztebl Int.](#) 2015 Mar; 112(10): 166–172.

Preventing Inadvertent Perioperative Hypothermia

[Alexander Torossian](#), Prof. Dr. med.,^{*,1} [Anselm Bräuer](#), Prof. Dr. med.,² [Jan Höcker](#), PD Dr. med.,³ [Berthold Bein](#), Prof. Dr. med.,⁴ [Hinnerk Wulf](#), Prof. Dr. med.,¹ and [Ernst-Peter Horn](#), PD Dr. med.

25–90% of all patients undergoing elective surgery suffer from inadvertent postoperative hypothermia, i.e., a core body temperature below 36°C.

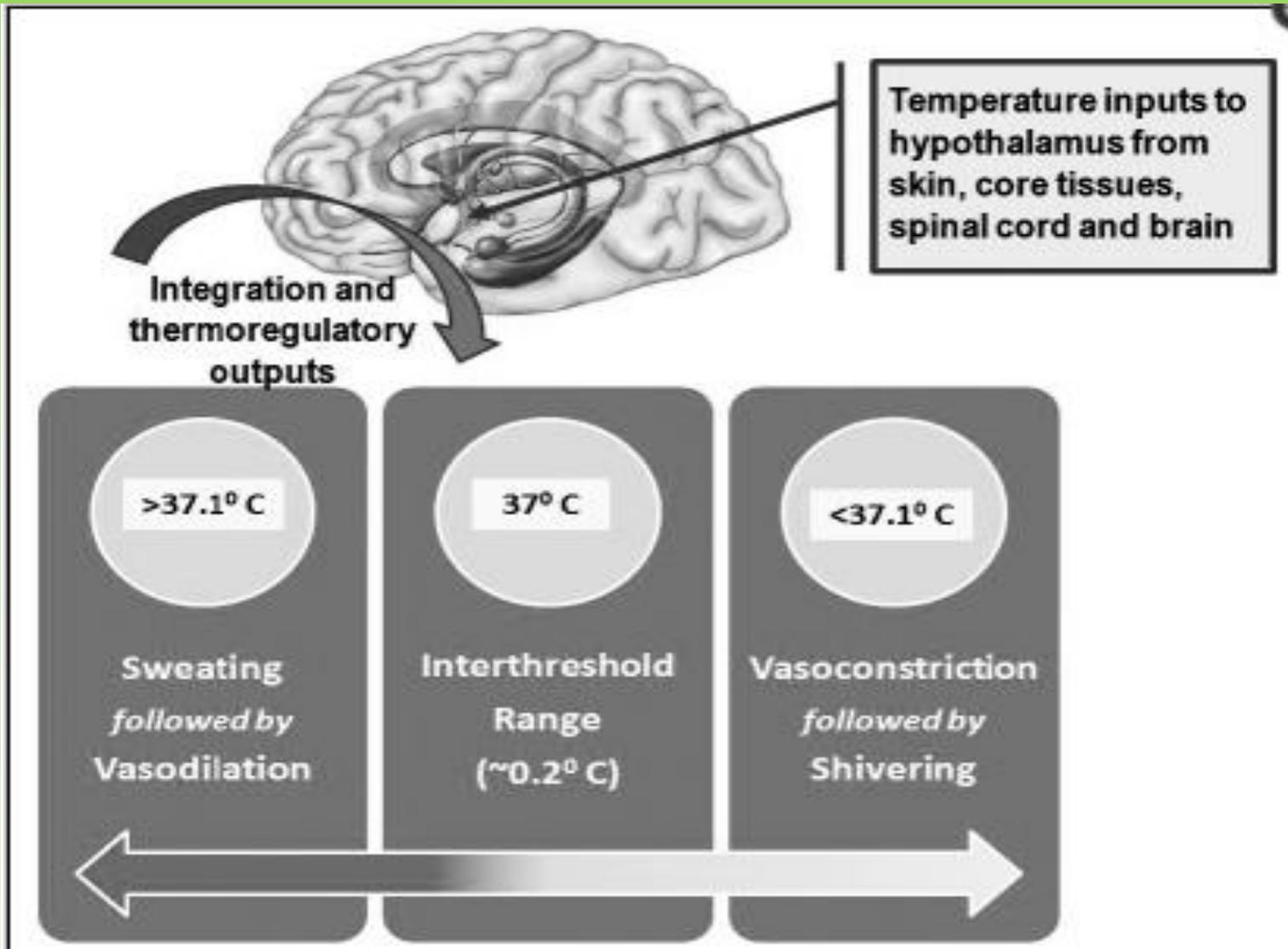
Compared to normothermic patients, these patients have **more frequent wound infections** (relative risk [RR] 3.25, 95% confidence interval [CI] 1.35–7.84), **cardiac complications** (RR 4.49, 95% CI 1.00–20.16), and **blood transfusions** (RR 1.33, 95% CI 1.06–1.66).

Hypothermic patients feel uncomfortable, and shivering raises oxygen consumption by about 40%.

Η ελάττωση της θερμοκρασίας του ασθενούς κάτω από 36°C, χαρακτηρίζεται σαν υποθερμία διεγχειρητικά και αποτελεί συχνά εμφανιζόμενο πρόβλημα, ελάχιστα όμως διαγνωσμένο .

<i>Classification</i>	<i>Temperature</i>
Normothermia	36°C–38°C
Mild hypothermia	32.2°C–35°C
Moderate hypothermia	28°C–32.2°C
Severe hypothermia	<28°C

<i>Deleterious Effects</i>
Cardiac arrhythmias and ischemia
Increased peripheral vascular resistance
Left shift of the hemoglobin-oxygen saturation curve
Reversible coagulopathy (platelet dysfunction)
Postoperative protein catabolism and stress response
Altered mental status
Impaired renal function
Decreased drug metabolism
Poor wound healing
Increased incidence of infection



Η θερμοκρασία των εν
τω βάθει ιστών
(*core temperature*)
παραμένει σταθερή 37° C

Η διατήρηση της θερμοκρασίας πραγματοποιείται μέσω τριών μηχανισμών του θερμορυθμιστικού μας συστήματος:

- Afferent sensing
- Central control
- Efferent responses

Κεντρομόλος οδός

Ξεκινά από τα θερμο-ευαίσθητα κύτταρα

- υποδοχείς ψυχρού → Ad νευρικές ίνες
- Υποδοχείς θερμού → C ίνες

Το ερέθισμα άγεται μέσω διαφόρων επιπέδων του ΝΜ και του εγκεφάλου → **στον υποθάλαμο**

→ δίδεται η απάντηση μέσω της φυγόκεντρης οδού

Η μείωση της θερμοκρασίας (*core temperature*) ενεργοποιεί αντιρροπιστικούς μηχανισμούς από τα διάφορα συστήματα.

Φυγόκεντρος οδός

Το ερέθισμα μεταφέρεται με την φυγόκεντρη οδό → στους περιφερικούς υποδοχείς:

- αγγειοσύσπαση
- ρίγος
- ανόρθωση τριχών (*piloerection*)

Target	Following Cold Receptor Input
Subcutaneous blood flow	Enhanced sympathetic outflow to subcutaneous vessels leads to vasoconstriction mediated by alpha-1 receptors.
Sweating	Inhibited sympathetic outflow to sweat glands.
Metabolic activity*	Enhanced thyroxine production and sympathetic outflow including adrenal release of catecholamines, which increases overall metabolic rate and heat production.
Skeletal muscle tone	Enhanced outflow along somatic efferents to skeletal muscle, increasing muscle tone. Shivering results from feedback oscillations due to muscle spindle stretch reflexes.

Θερμορυθμιστικό σύστημα

Στον ουδό θερμορύθμισης φαίνεται να συμμετέχουν διάφοροι νευρομεταβιβαστές:

- Νορεπινεφρίνη
- Ντοπαμίνη
- Σερετονίνη
- Ακετυλχολίνη
- Προσταγλανδίνη E1

Κιρκάδιος ρυθμός

Θυρεοειδική λειτουργία

<i>Target</i>	<i>Following Cold Receptor Input</i>
Subcutaneous blood flow	Enhanced sympathetic outflow to subcutaneous vessels leads to vasoconstriction mediated by alpha-1 receptors.
Sweating	Inhibited sympathetic outflow to sweat glands.
Metabolic activity*	Enhanced thyroxine production and sympathetic outflow including adrenal release of catecholamines, which increases overall metabolic rate and heat production.
Skeletal muscle tone	Enhanced outflow along somatic efferents to skeletal muscle, increasing muscle tone. Shivering results from feedback oscillations due to muscle spindle stretch reflexes.

Ορισμένες κατηγορίες ασθενών είναι
περισσότερο επιρρεπείς στη δηλητηριώδη
επίδραση της υποθερμίας

Ασθενείς αυξημένου κινδύνου

- Παχύσαρκοι
- Ασθενείς με μεταβολικά νοσήματα
- Ασθενείς με νευρολογικές διαταραχές

- Παιδιατρικοί ασθενείς
- Ηλικιωμένοι

Διαταραχή θερμορυθμιστικών μηχανισμών από τους
αναισθησιολογικούς παράγοντες

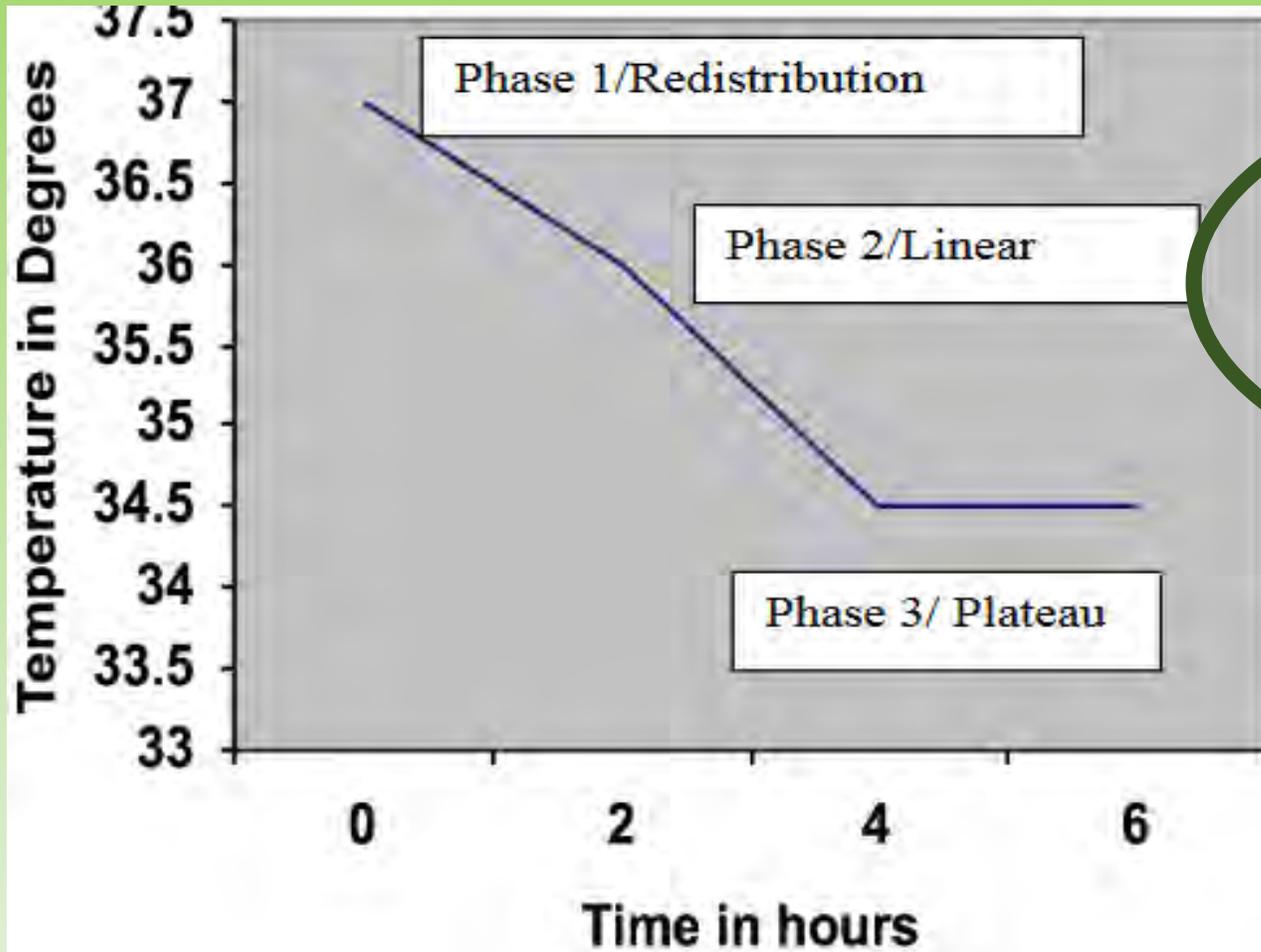
Αίτια

- ✓ Προκαλούμενη αγγειοδιαστολή
- ✓ Μείωση της δραστηριότητας του μεταβολισμού
- ✓ Αύξηση της θερμορυθμιστικής ουδού από τα οπιοειδή

Αίτια διεγχειρητικής υποθερμίας

- Θερμοκρασία δωματίου
- Κρύα διαλύματα χορηγούμενα ενδοφλέβια
- Κρύα διαλύματα χρησιμοποιούμενα στο χειρουργικό πεδίο
- Αναισθησιολογικοί παράγοντες

Μεταβολές της θερμοκρασίας μετά την έναρξη της αναισθησίας



- Ακτινοβολίας ~ 60%
- Εξάτμισης ~ 22%
- Αγωγής \searrow ~ 15%
- Επαφής \nearrow ~ 15%

[Anaesthesia](#). 2011 Sep;66(9):780-4, 2011 Jun 21.

Postoperative hypothermia and patient outcomes after elective cardiac surgery.

[Karalapillai D](#), [Story D](#), [Hart GK](#), [Bailey M](#), [Pilcher D](#), [Cooper DJ](#), [Bellomo R](#).

Hypothermia after elective cardiac surgery is an important physiological abnormality and is associated with increased morbidity and mortality. The Australian and New Zealand intensive care adult patient database was studied to obtain the lowest and highest temperature in the first 24 h after surgery. Hypothermia was defined as core temperature < 36 °C; transient hypothermia as temperature < 36 °C that was corrected within 24 h; and persistent hypothermia as hypothermia that was not corrected within 24 h. Hypothermia occurred in 28,587 out of a total of 43,158 consecutive patients (66%) and was persistent in 111 (0.3%). **Transient hypothermia was not independently associated with increased hospital mortality (OR = 0.9, 95% CI 0.8-1.1), whereas persistent hypothermia was associated with markedly increased risk of death (OR = 6.3, 95% CI = 3.3-12.0).** Hypothermia is common in postoperative cardiac surgery patients during the first 24 h after ICU admission but, if transient, is not independently associated with an increased risk of death.

Η υποθερμία μετεγχειρητικά προδιαγράφεται μέσα από την χειρουργική αίθουσα και συνοδεύεται με 3πλασιασμό:

- Καρδιακών επεισοδίων
- Κινδύνου χειρουργικών λοιμώξεων
- Κινδύνου αιμορραγιών

Anesth Prog. Dias M et al. 2010; 57, pp.25-33

Καρδιαγγειακό σύστημα

1. Αύξηση μεταφορτίου
2. Αύξηση κυκλοφορούμενων κατεχολαμινών
3. Μείωση της ροής αίματος των στεφανιαίων
4. Αύξηση της κατανάλωσης του O_2

[Cochrane Database Syst Rev.](#) 2016 Apr 21;4

Active body surface warming systems for preventing complications caused by inadvertent perioperative hypothermia in adults.

[Madrid E¹](#), [Urrútia G](#), [Roqué i Figuls M](#), [Pardo-Hernandez H](#), [Campos JM](#), [Paniagua P](#), [Maestre L](#), [Alonso-Coello P](#).

BACKGROUND:

Inadvertent perioperative hypothermia is a phenomenon that can occur as a result of the suppression of the central mechanisms of temperature regulation due to anaesthesia, and of prolonged exposure of large surfaces of skin to cold temperatures in operating rooms. Inadvertent perioperative hypothermia **has been associated with clinical complications, increased bleeding or cardiovascular events.** One of the most frequently used techniques to prevent inadvertent perioperative hypothermia is active body surface warming systems (ABSW), which generate heat mechanically (heating of air, water or gels) that is transferred to the patient via skin contact.

[Crit Care](#). 2016; 20: 107.

A recommended early goal-directed management guideline for the prevention of hypothermia-related transfusion, morbidity, and mortality in severely injured trauma patients

- **Hematological effects**

- Clotting factor enzymes and platelets work optimally at 37 °C. Hypothermia **impairs platelet function between 33 and 37 °C** and the activity of clotting factors and fibrinogen synthesis below 33 °C [[30](#)]. Rohrer and Natale investigated the effects of temperature on coagulation.

- **Partial thromboplastin time levels increased** from 36.0 s at 37 °C to 39.4, 46.1, and 57.2 s at 34 °C, 31 °C, and 28 °C, respectively [[31](#)]. Temperatures below 33 °C also **inhibit thrombin, glycoprotein Ib–IX complex, platelet aggregation, and thromboxane B2 production**. One study investigated the reversibility of these effects in whole blood flow cytometric analysis and the complications were shown to resolve with rewarming back to 37 °C [[32](#)].

Διαταραχές αιμοποιητικού

Αύξηση γλοιότητας αίματος
(προδιάθεση εμβολών)

Intraoperative Hypothermia During Surgical Fixation of Hip Fractures.

[Frisch NB](#), [Pepper AM](#), [Jildeh TR](#), [Shaw J](#), [Guthrie T](#), [Silverton C](#).

Abstract

Hip fractures are common orthopedic injuries and are associated with significant morbidity/mortality. **Intraoperative normothermia is recommended by national guidelines to minimize additional morbidity/mortality, but limited evidence exists regarding hypothermia's effect on orthopedic patients.** The purpose of this study was to determine the incidence of intraoperative hypothermia in patients with operatively treated hip fractures and evaluate its effect on complications and outcomes. **Retrospective chart review was performed on clinical records from 1541 consecutive patients** who sustained a hip fracture and underwent operative fixation at the authors' institution between January 2005 and October 2013. A total of 1525 patients were included for analysis, excluding those with injuries requiring additional surgical intervention. Patient demographic data, surgery-specific data, postoperative complications, length of stay, and 30-day readmission were recorded. **Patients with a mean intraoperative temperature less than 36°C were identified as hypothermic.** Statistical analysis with univariate and multivariate logistic regression modeling evaluated associations with hypothermia and effect on complications/outcomes. **The incidence of intraoperative hypothermia in operatively treated hip fractures was 17.0%. Hypothermia was associated with an increase in the rate of deep surgical-site infection** (odds ratio, 3.30; 95% confidence interval, 1.19-9.14; P=.022). Lower body mass index and increasing age demonstrated increased association with hypothermia (P=.004 and P=.005, respectively). ~~To the authors' knowledge, this is the first and largest study analyzing the effect of intraoperative hypothermia in orthopedic patients.~~ **In patients with hip fractures, the study's findings confirm evidence found in other surgical specialties that hypothermia may be associated with an increased risk of deep surgical-site infection and that lower body mass index and increasing age are risk factors for intraoperative hypothermia**

increased oxygen consumption
coagulopathy
impaired immune system



impaired
wound
healing



surgical site
infections

Διαταραχές πήκτικότητας → μεταγγίσεις → ανοσοκαταστολή

*Ira L. Leeds, MD, MBA Elizabeth C et al. Advance in sSurgery
2014;48. 65-76.*

Δηλητηριώδης επίδραση στο ανοσοποιητικό

Ευοδώνονται οι φλεγμονές λόγω:

- ✓ *Καταστολής του ανοσοποιητικού (καταστολή των επιφανειακών αντιγόνων)*
- ✓ *Μείωσης φαγοκυτταρικών ιδιοτήτων λευκοκυττάρων (migration + activation)*
- ✓ *Αγγειοσύσπασης → μείωση της απελευθέρωσης O₂*

Qadan M et al. Ann Surg 2009; 250:134-40

[J Thorac Cardiovasc Surg.](#) 2010 Jun;139(6):1568-1575.

The relationship between perioperative temperature and adverse outcomes after off-pump coronary artery bypass graft surgery.

[Hannan EL](#)¹, [Samadashvili Z](#), [Wechsler A](#), [Jordan D](#), [Lahey SJ](#), [Culliford AT](#), [Gold JP](#), [Higgins RS](#), [Smith CR](#).

The study objective was to determine predictors of hypothermia and hyperthermia, and the impact of hypothermia and hyperthermia on postoperative outcomes for off-pump coronary artery bypass grafting.

METHODS:

We performed a **retrospective study of 2294 patients who underwent off-pump coronary artery bypass grafting in New York in 2007.**

Patients were classified as moderately to severely hypothermic (< or = 34.5 degrees C), mildly hypothermic (34.6 degrees C-35.9 degrees C), or mildly hyperthermic (37.5 degrees C-38.8 degrees C) after leaving the operating room. Significant independent predictors of these temperature states and the independent impact of each of these states on in-hospital mortality and complications were identified.

RESULTS:

A total of 37.7% of patients were mildly hypothermic, 9.0% of patients were moderately to severely hypothermic, and 5.6% of patients were mildly hyperthermic. Significant independent predictors for postoperative hypothermia included older age, female gender, lower body surface area, congestive heart failure, higher ventricular function, non-Hispanic ethnicity, single/double-vessel disease, low postoperative hematocrit, previous cardiac surgery, race other than white or black, and organ transplant. **Patients with moderate to severe hypothermia had significantly higher risk-adjusted in-hospital mortality than patients with normothermia** (adjusted odds ratio 3.00; 95% confidence interval, 1.11-8.08). Patients with mild hyperthermia also had significantly higher mortality (adjusted odds ratio 5.04; 95% confidence interval, 1.18-21.55). **Patients with either mild or moderate to severe hypothermia had significantly higher rates of respiratory failure and unplanned operations, and patients with mild hyperthermia had a significantly higher rate of respiratory failure than normothermic patients.**

CONCLUSION:

It is important to maintain normal postsurgical core temperatures in patients who have undergone cardiac surgery to minimize or avoid death and complications.

ΑΝΑΠΝΕΥΣΤΙΚΟ ΣΥΣΤΗΜΑ

- Υποαερισμός
- Μη φυσιολογικό μοντέλο αναπνοής
- Μείωση της βρογχικής αιμάτωσης

Leftward shift in oxygen-hemoglobin dissociation curve

Μεταβολή μεταβολισμού των φαρμάκων λόγω
μείωσης της αιμάτωσης του ήπατος→
επιμήκυνση χρόνου ανάνηψης

Επιμήκυνση χρόνου ανάνηψης

PROPOFOL: ↑ δραστηκής ουσίας κατά 30%

ΠΤΗΤΙΚΑ ΑΝΑΙΣΘΗΤΙΚΑ: ↓ MAC κατά 5% για κάθε °C

Temperature Monitor

- Τυμπανική
- Οισοφάγου
- Ρινοφάρυγγα
- Κύστης
- Ορθού

[Best Pract Res Clin Anaesthesiol.](#) 2008 Mar;22(1):39-62.

Thermal care in the perioperative period.

[Kurz A](#)¹.

Abstract

Perioperative hypothermia is a common and serious complication of anesthesia and surgery. Core body temperature, which is normally regulated to within a few tenths of a degree centigrade, can fall by as much as 6 degrees C during anesthesia. The combination of anesthetic-induced impairment of thermoregulatory control and exposure to a cool operating room environment causes most surgical patients to become hypothermic. Mild intraoperative hypothermia triples the incidence of postoperative wound infections, triples the incidence of postoperative myocardial events and increases perioperative blood loss. Furthermore, it prolongs postoperative recovery and prolongs the duration of action of almost all anesthetic drugs. Effective methods are available for preventing inadvertent perioperative hypothermia. Consequently, it is now routine to maintain intraoperative normothermia. There is no widely accepted definition for the term 'mild hypothermia'. Furthermore, the term is not used consistently within the literature. For the purpose of this review, mild hypothermia refers to core temperatures between 34 and 36 degrees C

[Anaesthesia](#). 2013 Jun;68(6):605-11. 2013 Apr 17.

Postoperative hypothermia and patient outcomes after major elective non-cardiac surgery.

[Karalapillai D](#), [Story D](#), [Hart GK](#), [Bailey M](#), [Pilcher D](#), [Schneider A](#), [Kaufman M](#), [Cooper DJ](#), [Bellomo R](#).

Using a multicentre adult patient database from Australia and New Zealand, we obtained the lowest and highest temperature in the first 24 h after admission to the intensive care unit after elective non-cardiac surgery. **Hypothermia was defined as core temperature < 36 °C; transient hypothermia as a temperature < 36 °C that was corrected within 24 h, and persistent hypothermia as hypothermia not corrected within 24 h.** We studied **50,689** patients. Hypothermia occurred in 23,165 (46%) patients, was transient in 22,810 (45%), and was persistent in 608 (1.2%) patients. **On multivariate analysis, neither transient (OR = 1.07, 95% CI 0.96-1.20) nor persistent (OR = 1.50. 95% CI 0.96-2.33) hypothermia was independently associated with increased hospital mortality.**

[Surg Infect \(Larchmt\)](#). 2016 Oct;17(5):570-6.

Influence of Peri-Operative Hypothermia on Surgical Site Infection in Prolonged Gastroenterological Surgery.

[Tsuchida T](#)¹, [Takesue Y](#)², [Ichiki K](#)², [Uede T](#)², [Nakajima K](#)², [Ikeuchi H](#)³, [Uchino M](#)³.

There have been several recent studies on the correlation between intra-operative hypothermia and the occurrence of surgical site infection (SSI). Differences in the depth and timing of hypothermia and the surgical procedure may have led to conflicting results.

METHODS:

Patients undergoing gastroenterologic surgery with a duration of >3 h were analyzed. Hypothermia was defined as a core temperature <36°C and was classified as mild (35.5-35.9°C), moderate (35.0-35.4°C), or severe (<35.0°C). Hypothermia also was classified as **early-nadir (<36°C within two h of anesthesia induction) and late-nadir (after that time)**. Risk factors for SSIs were analyzed according to these classifications.

CONCLUSIONS:

Severe and late-nadir hypothermia were associated with a greater incidence of SSIs and organ/space SSIs. However, **neither of these patterns was identified as an independent risk factor for SSIs**, possibly because of the small number of patients.

[Adv Surg.](#) 2014;48:65-76.

Does close temperature regulation affect surgical site infection rates?

[Leeds IL](#), [Wick EC](#), [Melton GB](#).

Abstract

The argument for close temperature control, to which regulatory bodies have held health systems in an effort to reduce the burden of hospital-acquired infections, is not fully supported by current evidence. The literature is complex on the topic, and over interpretation of historical data supporting close temperature regulation does not preclude an important recognition of these early works' contribution to high-quality surgical care. Avoidance of hypothermia through the regular use of active rewarming should be a routine part of safe surgical care. **The biochemical basis of emphasizing temperature regulation is sound, and ample evidence shows the frank physiologic derangements seen when biological processes occur at suboptimal temperature.** It is also recognized that patients tend to do better when warmed during the perioperative period, suggesting that warming devices are an important and essential adjunct to good perioperative care. Clinicians, researchers, and policymakers must be careful in how they apply these well-supported findings to process metrics in an era of limited resources with increasingly stringent quality guidelines and outcomes measures. Discrete temperature targets in current measures are not supported by the existing literature. Not only do these targets artificially anchor clinicians to temperature values with an inadequate scientific basis but they demand intensive resources from health institutions that could potentially be better used on quality requirements with stronger evidence of their ultimate effect on patient care

Κατευθυντήριες οδηγίες

Γερμανικής Εταιρείας Αναισθησιολογίας και Εντατικής Θεραπείας

+

Γερμανικής Χειρουργικής Εταιρείας

*Θέρμανση του ασθενούς καθ' όλη την περιεγχειρητική περίοδο
(παθητική και ενεργητική)*

Author, title, reference	Evidence type, Oxford evidence level	n	Quality incl. studies	Patient characteristics	Measure taken/ comparison measure	Outcome measurement	Effect, size, outcome	Funding	Comment
Roberson MC et al.: A review of the evidence for preoperative warming of adults undergoing general anesthesia. <i>AANA J</i> 2013; 81: 351–6.	Syst. review, 1a	7 RCTs 1 cohort study, n = 665	II–III	Adult surgical patients	Preoperative warming using forced-air blankets without carbon fiber or carbon polymer mats	Postoperative core body temperature (CBT)	7 studies show postoperative CBT >36 °C; 1 study shows no positive effect or has inadequate statistical power; overall prewarming is effective	No data	Confirms review by de Brito Poveda V, et al. A systematic review on the effectiveness of prewarming to prevent periop. hypothermia. <i>J Clin Nurs</i> 2013; 22: 906–18.
Kellam MD et al.: Forced-air warming devices and the risk of surgical site infections. <i>AORN J</i> 2013; 98: 354–66.	Syst. review, 1a	3 RCTs, n = 1483, 12 OR/ device studies	II–IV	Adult surgical patients, volunteers, manikins	Forced-air blankets	No. of bacteria, postop. wound infections	No. of bacteria increased in forced-air device but not in OR or on patient; effect on postop. wound infection unclear. Devices should be clean and used with filters	No support	Many of the studies were commercially funded.
Alderson P et al.: Thermal insulation for preventing inadvertent perioperative hypothermia. <i>Cochrane Database Syst Rev</i> 2014; 6: CD009908	Syst. review, 1a	16 RCTs, n = 421	III–IV Blinding was inadequate or not mentioned	Adult surgical patients	Forced-air blankets vs. insulation (passive warming)	Core body temperature (CBT)	Forced-air blankets raise CBT by 0.5–1 °C compared with insulation; effect on postoperative complications unclear	No data	Supports NICE Guideline CG 65

Αντιμετώπιση υποθερμίας περιεγχειρητικά

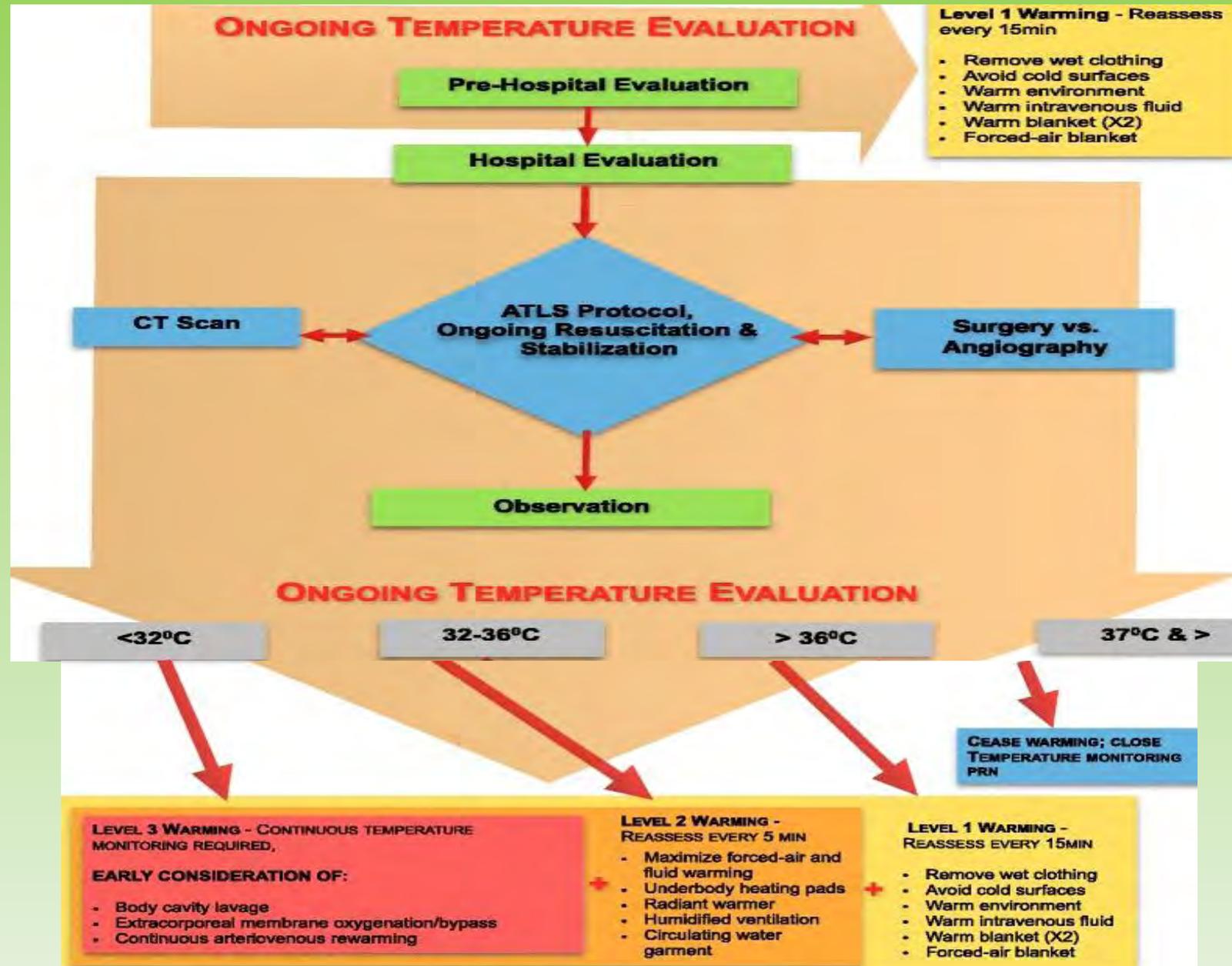
- Προθέρμανση
- Σύστημα διοχέτευσης θερμού αέρα ώστε να ελαχιστοποιηθεί η μείωση της *core temperature* (*active warming*) .
- Αποφυγή απώλειας θερμότητας (*passive warming*)
- Θέρμανση των χορηγούμενων ορών

Αντιμετώπιση υποθερμίας μετεγχειρητικά

- **Μεπεριδίνη:**
 - ✓ δρα μέσω των υποδοχέων των κ-οπιοειδών
 - ✓ αποτελεσματικότερη από άλλους μ-αγωνιστές
 - ✓ αντιχολινεργική δράση
 - ✓ agonist activity των α_2 -adrenoreceptors κεντρικά
- **Κλονιδίνη:** agonist activity των α_2 -adrenoreceptors κεντρικά
- **Φυσοστιγμίνη:** agonist activity των α_2 -adrenoreceptors κεντρικά

A recommended early goal-directed management guideline for the prevention of hypothermia-related transfusion, morbidity, and mortality in severely injured trauma patients

[Crit Care](#). 2016; 20: 107



ΝΕΥΡΙΚΟ ΣΥΣΤΗΜΑ

Προστασία νευρικού

- Μείωση μεταβολισμού
- Μείωση αναγκών σε O₂
- Μείωση νευροδιαβιβαστών
- Μείωση κυτοκινών
- Μείωση ενδοκρανίου πίεσης-αιμάτωσης
- Ελάττωση απόπτωσης



Προσοχή
Μείωση της αιματικής ροής
→νευρολογικές διαταραχές

Η ευεργετική επίδραση στο ΝΣ ελαττώνοντας την
θερμοκρασία από 1°C έως 3°C

ΣΥΜΠΕΡΑΣΜΑΤΑ - 1

Υποθερμία ως συμβάν

- Η υποθερμία αποτελεί συχνό φαινόμενο περιεγχειρητικά
- Η απώλεια θερμότητας γίνεται κατά κύριο λόγο μέσω ακτινοβολίας και αγωγής
- Πτώση 1°C - 2°C δεν είναι ασύνηθες

ΣΥΜΠΕΡΑΣΜΑΤΑ - 2

Ανεπιθύμητα επακόλουθα υποθερμίας

- *Ισχαιμία μυοκαρδίου*
- *Μείωση αντίστασης στις λοιμώξεις*
- *Διαταραχές πήκτικότητας*
- *Καθυστέρηση ανάνηψης*

ΣΥΜΠΕΡΑΣΜΑΤΑ - 3

Στόχοι

- Διατήρηση της core temperature $> 36^{\circ}\text{C}$
- Βελτίωση της ασφάλειας της αναισθησιολογικής μας τεχνικής

Ευχαριστώ
για την
προσοχή σας

The
End

[Cochrane Database Syst Rev.](#) 2015 Aug 10;(8)

Alpha-2 adrenergic agonists for the prevention of shivering following general anaesthesia.

[Lewis SR¹](#), [Nicholson A](#), [Smith AF](#), [Alderson P](#).

BACKGROUND:

Shivering after general anaesthesia is common. It is unpleasant but can also have adverse physiological effects. Alpha-2 (α -2) adrenergic agonist receptors, which can lead to reduced sympathetic activity and central regulation of vasoconstrictor tone, are a group of drugs that have been used to try to prevent postoperative shivering

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Μετεγχειρητική ρύθμιση της θερμοκρασίας

- Αγγειοσύσπαση (τέλος δράσης αναισθητικών παραγόντων)
- Η μεταφορά θερμότητας κεντρικά μειώνεται σημαντικά λόγω της αγγειοσύσπασης.
- Ασθενείς με περιοχική αναισθησία ζεσταίνονται γρηγορότερα από τους ασθενείς με γενική

Πρέπει να επισημανθεί όμως ότι τα πτητικά
αναισθητικά και τα ενδοφλέβια πλην
βενζοδιεπινών συμβάλλουν στην πτώση της
κεντρικής θερμοκρασίας