

# Journal Club

# 麻酔

交感神経活動抑制

筋収縮抑制

低体温

覚醒時シバリング

代謝機能抑制

血液・凝固機能抑制

免疫機能抑制

酸素需要亢進

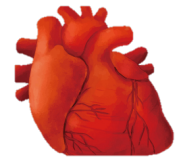
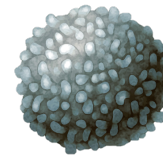
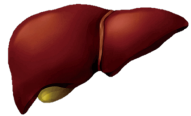
覚醒遅延

周術期出血

周術期感染

心血管合併症

周術期合併症





# 温風加温装置を用いた積極的な術中加温は 予後を改善するか？

## Aggressive intraoperative warming versus routine thermal management during non-cardiac surgery (PROTECT): a multicentre, parallel group, superiority trial

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# 積極的な術中加温 versus 日常体温管理

**P:** 全身麻酔予定患者 5056名 (腹部外科, 整形外科, 脳外科, 泌尿器科等)

45歳以上, 心血管合併症あり, 2-6時間の非心臓手術患者, 多施設RCT.

**I:** 積極的加温群 : 目標体温 37.0℃ (n=2,497)

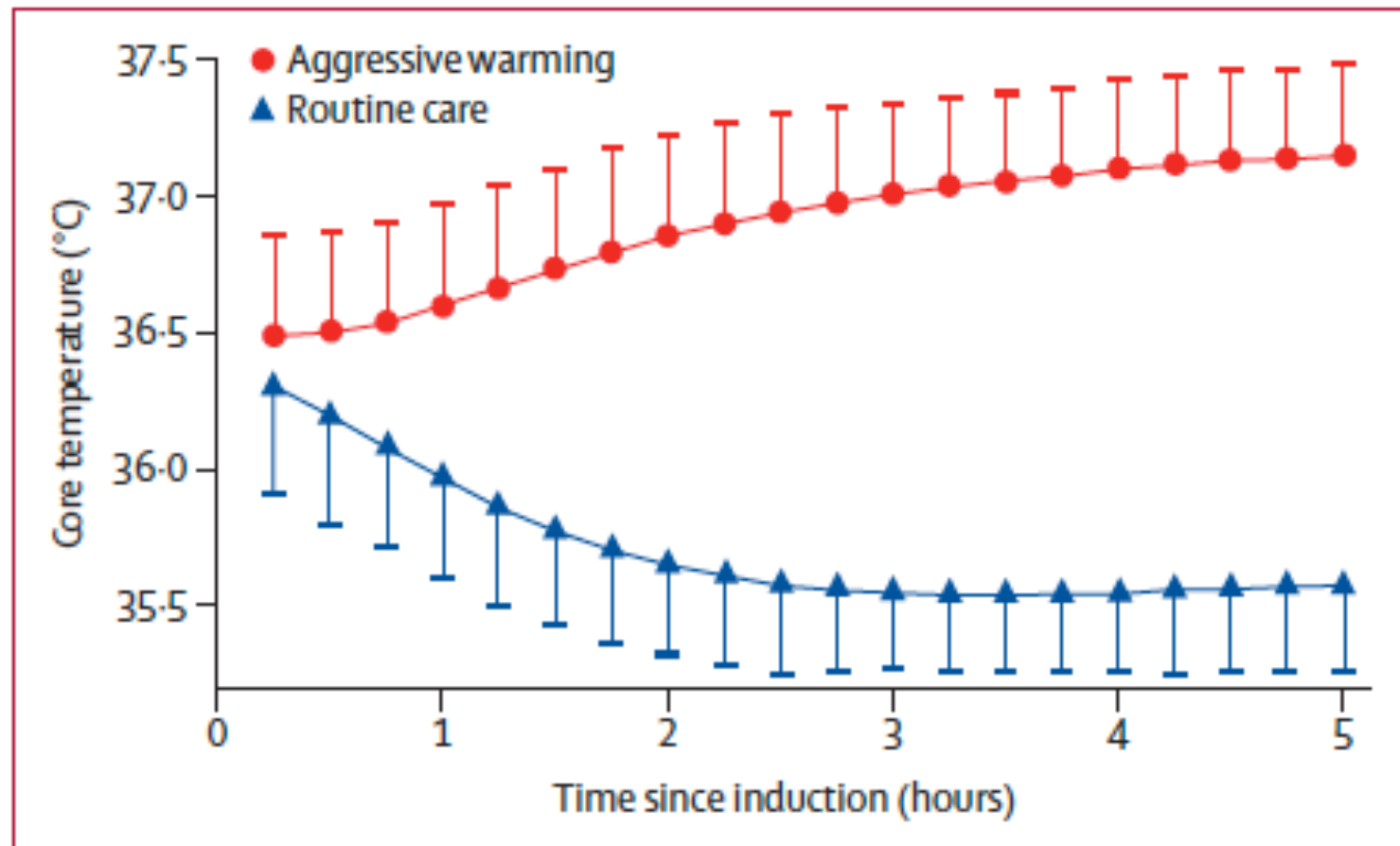
**C:** 日常体温管理群 : 目標体温 35.5℃ (n=2,490)

**O:** 主要評価項目 : 術後複合心イベント (心筋傷害, 非致命的心停止, 死亡率)

# 積極的な術中加温 versus 日常体温管理

|                                                 | Aggressive warming<br>(n=2507) | Routine care<br>(n=2506) | Absolute standardised<br>difference* |
|-------------------------------------------------|--------------------------------|--------------------------|--------------------------------------|
| <b>Baseline characteristics</b>                 |                                |                          |                                      |
| Mean age, years (SD)                            | 67 (8)                         | 67 (8)                   | 0.027                                |
| Sex                                             |                                |                          |                                      |
| Female                                          | 836 (33%)                      | 801 (32%)                | 0.029                                |
| Male                                            | 1668 (67%)                     | 1701 (68%)               | ..                                   |
| Mean body-mass index,<br>kg/m <sup>2</sup> (SD) | 23 (3)                         | 23 (3)                   | 0.053                                |
| Type of surgery                                 |                                |                          |                                      |
| Orthopaedic                                     | 56 (2%)                        | 49 (2%)                  | 0.096                                |
| Laparoscopic                                    | 1313 (52%)                     | 1301 (52%)               | ..                                   |
| Open abdominal                                  | 610 (24%)                      | 613 (25%)                | ..                                   |
| Neurosurgical                                   | 126 (5%)                       | 89 (4%)                  | ..                                   |
| Urological                                      | 138 (6%)                       | 138 (6%)                 | ..                                   |
| Other                                           | 261 (10%)                      | 312 (12%)                | ..                                   |

## 積極的な術中加温 versus 日常体温管理



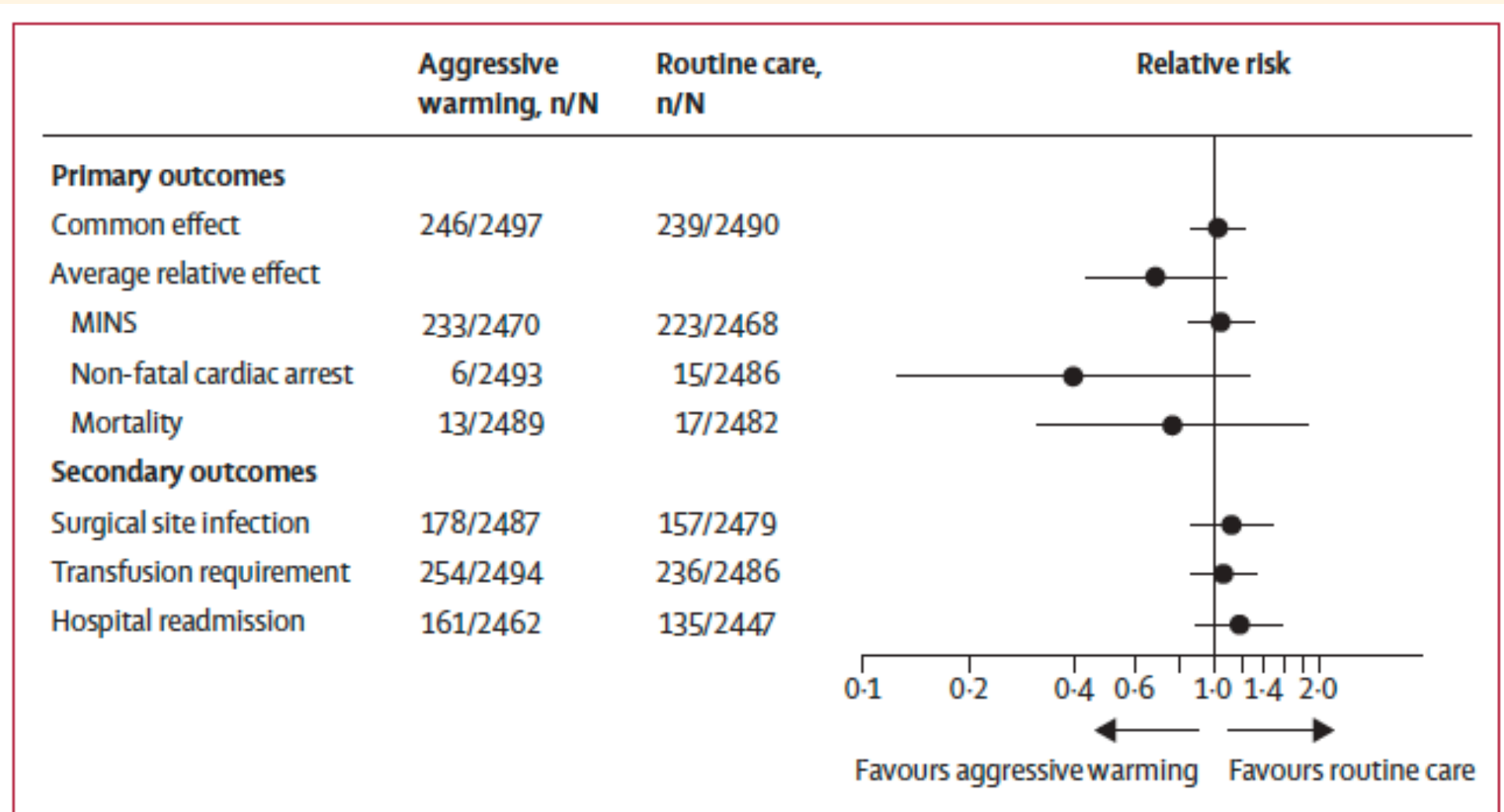
# 積極的な術中加温 versus 日常体温管理

|                                                        | Aggressive warming<br>(n= 2507) |            | Routine care (n=2506) |            | Treatment effect  | p value |
|--------------------------------------------------------|---------------------------------|------------|-----------------------|------------|-------------------|---------|
|                                                        | Nmiss                           | Summary    | Nmiss                 | Summary    |                   |         |
| Primary outcomes                                       |                                 |            |                       |            |                   |         |
| Overall*                                               |                                 |            |                       |            |                   |         |
| Common effect                                          | 10                              | 246 (9.9%) | 16                    | 239 (9.6%) | 1.04 (0.87–1.24)  | 0.69    |
| Distinct†                                              |                                 |            |                       |            |                   |         |
| Average relative effect                                | ..                              | ..         | ..                    | ..         | 0.68 (0.43–1.08)  | 0.10    |
| MINS                                                   | 37                              | 233 (9.4%) | 38                    | 223 (9.0%) | 1.05 (0.85–1.30)  | 0.57    |
| Non-fatal cardiac arrest                               | 14                              | 6 (0.2%)   | 20                    | 15 (0.6%)  | 0.40 (0.13–1.27)  | 0.057   |
| All-cause mortality                                    | 18                              | 13 (0.5%)  | 24                    | 17 (0.7%)  | 0.76 (0.32–1.84)  | 0.46    |
| Secondary outcomes                                     |                                 |            |                       |            |                   |         |
| Surgical site infection‡                               | 20                              | 178 (7.2%) | 27                    | 157 (6.3%) | 1.13 (0.87–1.47)  | 0.25    |
| Transfusion requirement‡                               | 13                              | 254 (10%)  | 20                    | 236 (9.5%) | 1.07 (0.87–1.33)  | 0.41    |
| Readmission‡                                           | 45                              | 161 (6.5%) | 59                    | 135 (5.5%) | 1.19 (0.89–1.57)  | 0.13    |
| Median length of hospital stay, days (IQR)             | 35                              | 8 (6–12)   | 41                    | 8 (6–12)   | 0.98 (0.91–1.05)§ | 0.46    |
| Exploratory outcomes                                   |                                 |            |                       |            |                   |         |
| Mean reduction in hemoglobin from preoperative to POD1 | 161                             | 1.2 (1.5)  | 148                   | 1.1 (1.5)  | ..                | ..      |
| Mean Quality of Recovery-15 score on POD3              | 27                              | 110 (17)   | 33                    | 110 (17)   | ..                | ..      |
| 30-day superficial surgical site infection             | 18                              | 109 (4%)   | 25                    | 97 (4%)    | ..                | ..      |
| 30-day myocardial infarction                           | 38                              | 51 (2%)    | 38                    | 45 (2%)    | ..                | ..      |

MINS; Myocardial Injury after non-cardiac surgery

Sessler D et al. Lancet 2022; 399: 1799-808

# 積極的な術中加温 versus 日常体温管理



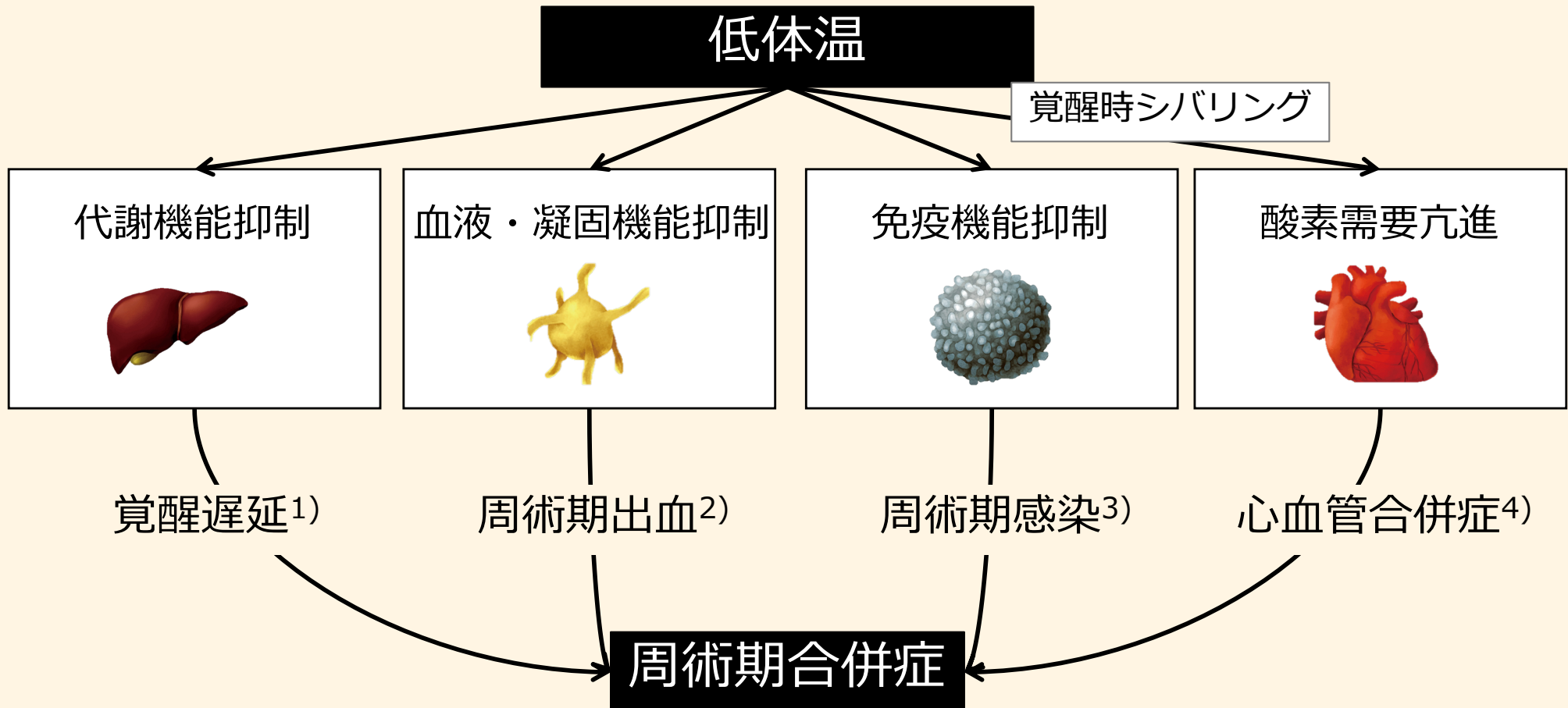
MINS; Myocardial Injury after non-cardiac surgery



35.5℃前後の体温管理であれば  
術後合併症の発生率は変わらない。

Sessler D et al. Lancet 2022; 399: 1799-808

# 35.0℃未満が様々な合併症を引き起こすとされる



1. Lenhardt R, et al. Anesthesiology 1997; 87: 1318-23
2. Rajagopalan S, et al. Anesthesiology 2008; 108:71-77
3. Kurz A, et al. N Engl J Med 1997; 334: 1209-15
4. Sessler DI, et al. Anesthesiology 1991; 75: 594-610

術後合併症と関連する周術期低体温閾値は  
手術・患者リスクによって異なる可能性がある。