BUDGET IMPACT ANALYSIS OF THE IMPLEMENTATION OF A PRESURGICAL WARMING PROTOCOL TO EFFECTIVELY MANAGE SURGICAL PATIENT NORMOTHERMIA

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BACKGROUND

Patients undergoing surgery under general or regional anesthesia can develop hypothermia at any stage of the perioperative pathway. Perioperative hypothermia is generally defined as a core body temperature below 36.0°C. The physiological effects of hypothermia, ranging from mild to severe, can have a significant impact on patient outcomes. Hypothermia increases the risk of developing surgical site infections (SSI) and morbid cardiac events (MCE) and is also associated with a higher need for blood transfusions and postoperative mechanical ventilation. Furthermore, hypothermia can lead to an increased length of stay (LOS), shivering and thermal discomfort.[1, 2, 3]

Inadvertent perioperative hypothermia (IPH) can be prevented using an effective warming solution. Actively warming patients doesn't ensure that patients are normothermic when arriving in the recovery room.[4] There is evidence that implementing a presurgical warming protocol can significantly reduce the hypothermia rate.[5]

OBJECTIVE

Perform a budget impact analysis from a hospital perspective and estimate the cost savings achieved by adding a presurgical warming protocol to intra-operative warming, using a forced-air warming system to prevent inadvertent perioperative hypothermia.

METHOD

The one-year time horizon budget-impact model is based on a new static decision-tree, modified from a model published by NICE in 2008 (Figure 1).[1] Based on IPH rate, the model allows a comparison of different patient temperature management strategies with associated material and adverse consequences costs.

Adverse consequences of IPH, according to the NICE guidance, are grouped in surgical site infections (SSI), morbid cardiac events (MCE) and other complications, including the need for blood transfusions. The cost of the adverse consequences is monetized via increased length-of-stay (LOS).[1]

According to a German DRG-data analysis, the number of surgeries are distributed into three magnitudes (48% minor, 30% intermediate and 22% major) and the patients into four different age groups.[6] This approach is aligned with the NICE model assumptions that the magnitude of the surgery and patient age are risk factors for SSI and MCE. The costs of a bed-day on a surgical ward (380 EUR) are derived from WHO estimates, using the costs for a secondary-level hospital and applying an appropriate inflation and exchange rate.[7] (Table 1)

The explored scenario uses IPH rates measured in a German hospital when implementing active pre-warming plus intra-operative warming versus intra-operative warming only. The hypothermia rate from a retrospective study including 7786 surgical procedures under general anesthesia shows an IPH decrease from 12.4% to 5.1% with the introduction of active pre-warming in addition to intra-operative warming.[5]

Furthermore, parametric uncertainty is evaluated with a one-way sensitivity analysis and the impact of the main cost drivers is shown in a tornado diagram.

Figure 1: Model structure

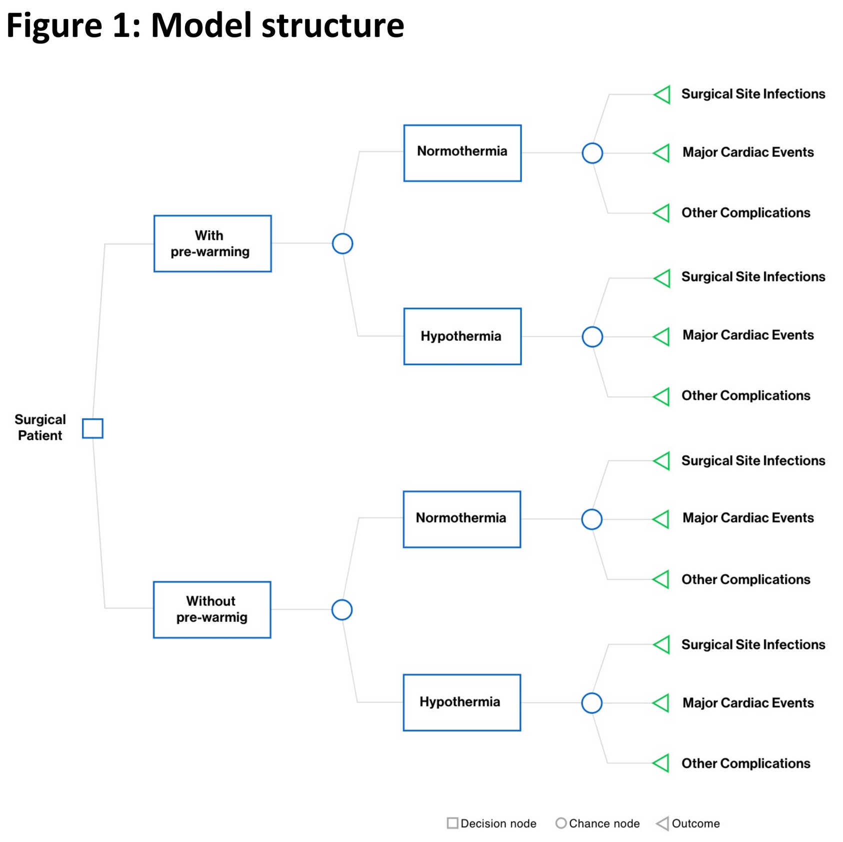


Table 1: Input parameters

Parameter	Value
Number of surgical procedures	7,786
Cost of a bed on a surgical ward	380 EUR
Hypothermia rate current practice	12%
Hypothermia rate optimised warming	5%
Minor surgery	48%
Intermediate surgery	30%
Major surgery	22%
18-34 years	12%
35-49 years	18%
50-69 years	36%
>70 years	34%

RESULTS

Using the input parameters that are shown in the method, the implementation of a presurgical warming protocol could result in total cost savings of 235,845 EUR, corresponding to 58% direct cost decrease (Figure 2), 545 less hypothermia events and 621 days reduction in attributable LOS.

RESULTS CONTINUED

Sensitivity analysis indicates that the most impactful model parameters were hypothermia rate in current practice, cost of a bed on a surgical ward, and cost of a hypothermia event (Figure 3).

Figure 2: Results, annual costs

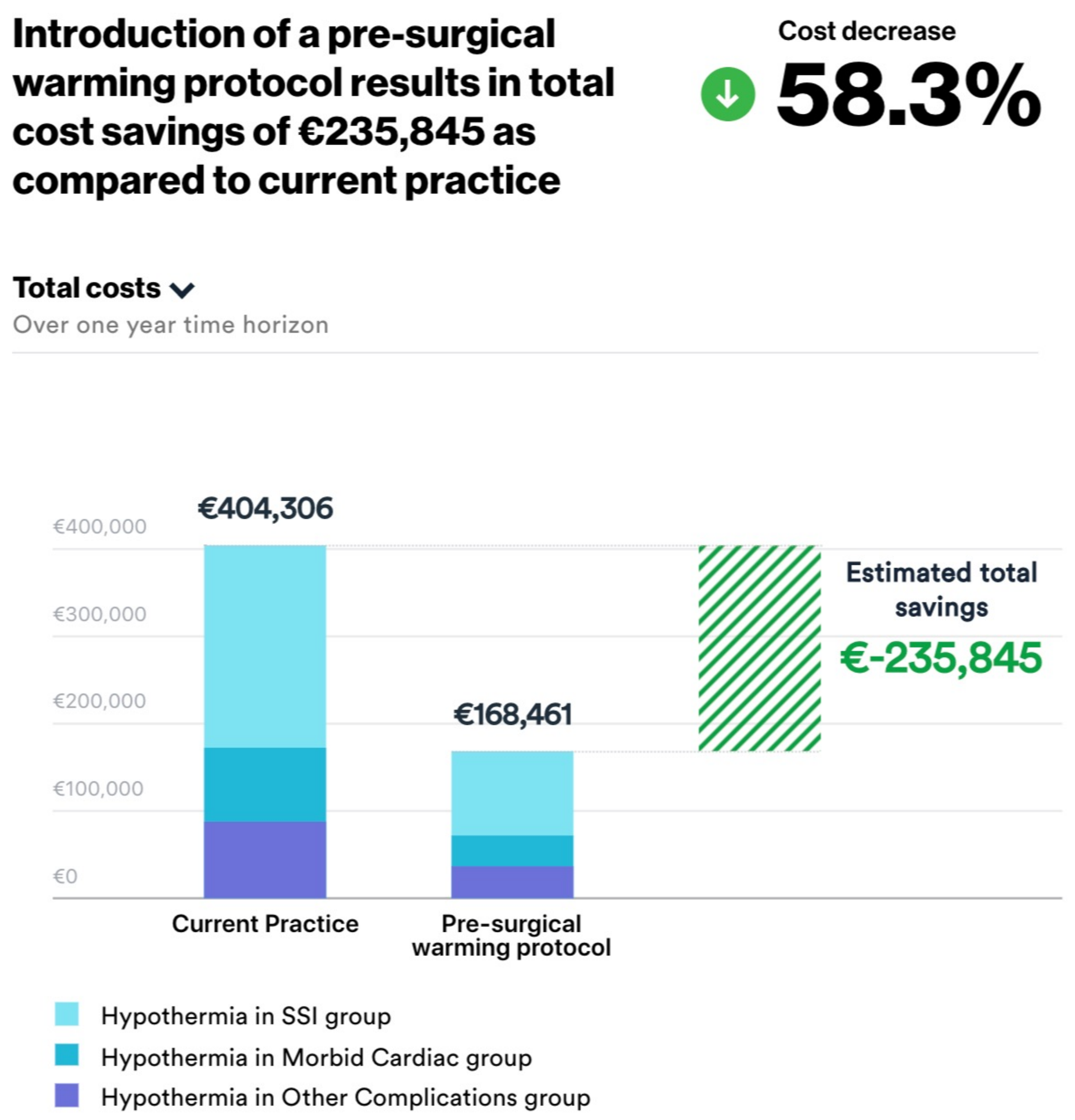
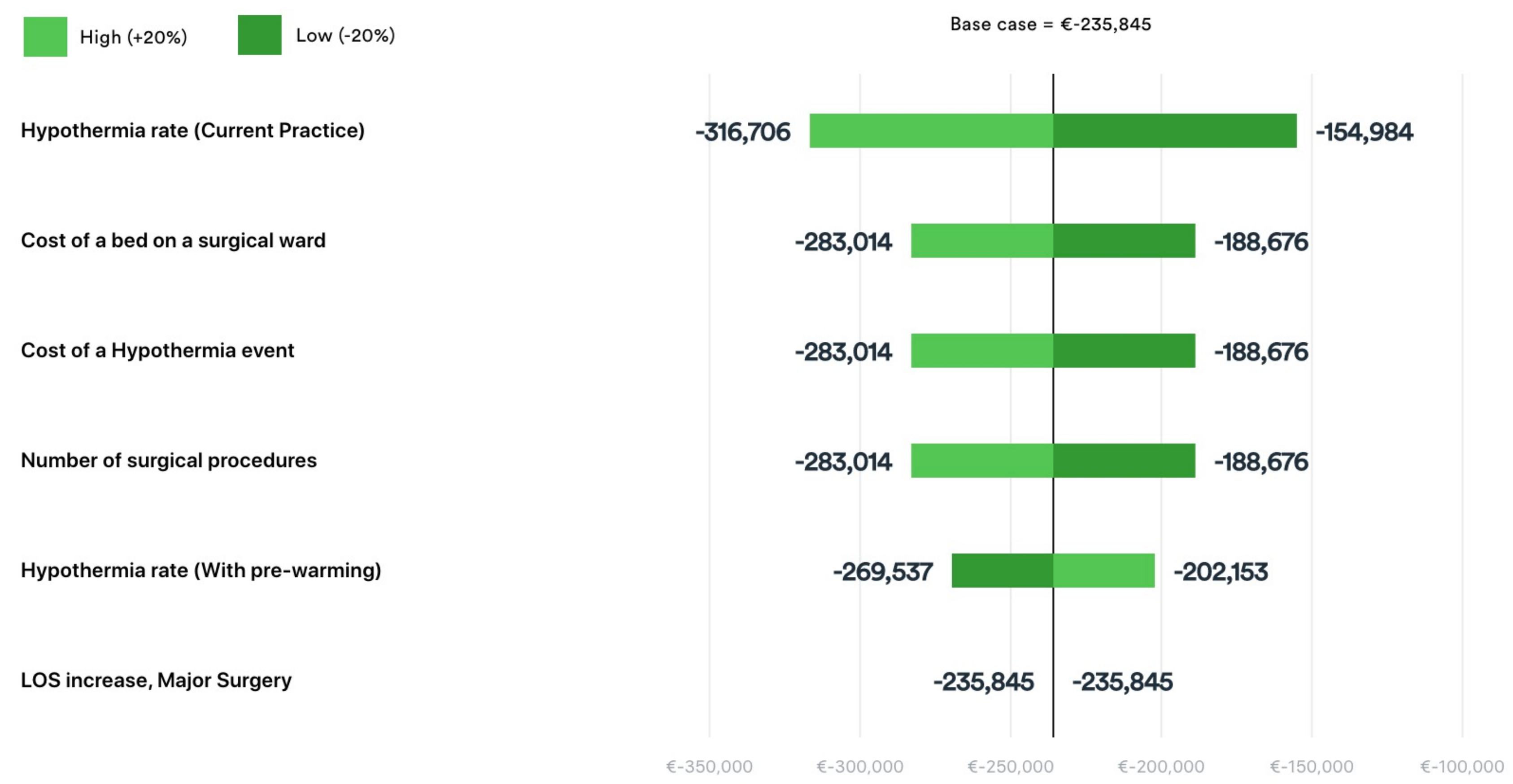


Figure 3: One-Way sensitivity analysis



LIMITATIONS

The current model reflects the limitations of the method used to develop the NICE guideline. The NICE expert group created assumptions to overcome the paucity of available clinical evidence. Additionally, the costs of the adverse consequences were translated in extra length of stay. This approach may have overestimated costs in patients in day surgery and for patients who had minor surgeries. For overcoming the limitations NICE adopted a conservative approach and explored uncertainty through sensitivity analysis.

Moreover, the surgical patient population included in the study by Grote et al. may not reflect the distribution of surgery magnitude estimated from national DRG-data. Therefore the budget impact estimation should be carefully considered and the model recalibrated with hospital specific data.

CONCLUSION

In addition to an intraoperative warming, the implementation of a presurgical warming protocol appears as a cost saving intervention for the base case scenario defined. A 20% variation in the parameters identified as main cost drivers always results in savings. This intervention should be considered for effective management of patient normothermia.

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