

Intrathecal Morphine–Related Perioperative Hypothermia in Women Undergoing Cesarean delivery: A Retrospective Case-Control Study

Judy Munday, BA (Hons), DipEd (Nurs), RN, Sonya Osborne, PhD, RN, Patsy Yates, PhD, DipAppSci, MSocSci, RN, FACN, FAAN

Purpose: Rates of inadvertent perioperative hypothermia among women undergoing spinal anesthesia for cesarean delivery are reported to be high. Intrathecal morphine has been noted to have a potentially potent effect on thermoregulation. This retrospective case-control study sought to investigate the incidence of perioperative hypothermia in women undergoing cesarean delivery with and without intrathecal morphine and to describe any clinical factors associated with the condition, the identification of which would provide direction for nursing priorities in the care of the condition.

Design: A retrospective case-controlled study design was used.

Methods: The charts of 358 women who had undergone emergency or elective cesarean delivery under spinal anesthesia were reviewed: 179 having received intrathecal morphine and 179 having received spinal anesthesia without intrathecal morphine (control group). SPSS (IBM, Armonk, New York), version 22, was used for data analysis, including logistic regression to predict the outcome of hypothermia across the study population.

Finding: There was no significant difference ($P = .62$; 95% confidence interval, -0.09 to 0.15) in mean postoperative temperature for the morphine group (mean postanesthesia care unit arrival temperature, 35.91°C ; standard deviation, 0.59) and the no morphine group (mean postanesthesia care unit arrival temperature, 35.88°C ; standard deviation, 0.52). However, within groups, the temperature decline preoperatively to postoperatively was statistically (and clinically) significant.

Conclusions: The results refute the suggestion that intrathecal morphine contributes to greater core temperature decline in this population; however, it does confirm that perioperative hypothermia is a prevalent concern for women undergoing cesarean delivery and that pre-emptive measures should be routinely considered by health care providers.

Keywords: cesarean delivery, intrathecal morphine, observational, opioids, perioperative hypothermia.

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Judy Munday, BA (Hons), DipEd (Nurs), RN, Registered Nurse, Post-Anaesthetic Care Unit, Mater Health Services, Brisbane, Queensland, Australia; Queensland University of Technology, Brisbane, Queensland, Australia; Sonya Osborne, PhD, RN, Senior Lecturer, School of Nursing Queensland University of Technology, Brisbane, Queensland, Australia; and Patsy Yates, PhD, DipAppSci, MSocSci, RN, FACN, FAAN, Professor/Head of School, School of Nursing Queensland University of Technology, Brisbane, Queensland, Australia.

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Address correspondence to Judy Munday, School of Nursing, Queensland University of Technology, Victoria Park, Rd, Kelvin Grove, QLD 4059, Australia; e-mail address: judy.munday@qut.edu.au.

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PERIOPERATIVE HYPOTHERMIA, IN all surgical populations is physiologically detrimental, provoking a range of adverse side effects.¹⁻⁶ Although there are reported high rates of hypothermia (defined as a core temperature $< 36^{\circ}\text{C}$ related to undergoing surgery under anesthesia)^{5,6} during and after spinal anesthesia among women undergoing cesarean delivery,⁷ it is noted that intrathecal morphine may have a potentially potent effect on thermoregulation and that a small subset of women who receive intrathecal morphine develop particularly prolonged hypothermia.⁷⁻¹¹ This presents a challenge for health care providers caring for these women postoperatively.

Profound hypothermia after intrathecal morphine administration has been reported at temperatures as low as 33.1°C ¹²; however, other reports have described a nadir of 33.2 to 34.9°C .^{7,10,13-16} As opposed to the commonly experienced perioperative hypothermia, a prolonged episode of profound temperature drop is experienced (reportedly ranging from 2 hours⁷ to 19 hours¹² to return to normothermia). In these cases, diaphoresis (sweating) and a sensation of feeling hot is commonly described, and this is sometimes accompanied by nausea and itching, causing extreme discomfort. For women undergoing cesarean delivery, any experience of perioperative hypothermia (whether this is prolonged and symptomatic as described previously or the commonly seen perioperative heat loss) can interfere with immediate postoperative recovery.¹⁷

The exact mechanism by which intrathecal morphine contributes to hypothermia is not definitively known.¹⁷ Core temperature, in all humans, is maintained within very narrow limits¹⁸ by the hypothalamus. The thermoneutral zone (also referred to as the interthreshold range),¹⁹ that is, the temperature range between which temperature receptors do not provoke the hypothalamus to initiate a too hot or too cold response, is tightly controlled within generally just a 0.4°C range.¹⁹ Outside this range, both behavioral and autonomic responses are initiated to alter the temperature. It is thought that cephalic (head wards) spread of the morphine contributes to prolonged hypothermia by⁷ altering the temperature set point,^{7,15} whereby the new

upper temperature set point (or threshold) triggering sweating (a too hot response) is below the normal interthreshold range.¹⁴ Therefore, sweating is seen at a hypothermic temperature.

The reduced benefit of active warming when spinal opioids have been administered has been suggested by a systematic review of warming interventions in this population²⁰ and other literature.^{17,21,22} Evidence suggests that preoperative¹⁸ and intraoperative active warming, shown to improve maternal and neonatal outcomes, has been less effective where women have received intrathecal morphine.^{7,17,21} In addition, conventional active warming strategies may have little benefit in profound and prolonged hypothermia,^{7,10,12,13,22} because of patients feeling hot and sweaty, despite being hypothermic, and not tolerating warming. Case reports suggest that pharmacologic interventions, using benzodiazapines such as lorazepam^{7,13} or opioid antagonists such as naloxone,^{8,10,14,15} can be helpful in the treatment of prolonged intrathecal morphine-related hypothermia. Shivering and the sensation of cold returning after the administration of lorazepam has been described,⁸ described. The return of the perception of cold enables warming to be applied.

A small observational study of 100 patients reported the incidence of hypothermia among women receiving intrathecal morphine for cesarean delivery, suggesting an incidence of hypothermia of 32% and an incidence of prolonged hypothermia (with a mean temperature of 34.9°C) of 6%⁸ and 7%.⁷ Patients with prolonged hypothermia were symptomatic for 120 to 360 minutes; however, patients who were asymptomatic but hypothermic returned to normothermia within 30 minutes postoperatively. A controlled trial also found that women receiving intrathecal morphine for cesarean delivery had significantly lower temperatures for up to 24 hours as compared with those who received epidural morphine.¹¹

Prolonged hypothermia after intrathecal morphine administration for cesarean delivery has been observed in the study hospital setting and is known to be uncomfortable for women and

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