E-ISSN: 3078-9095
P-ISSN: 3078-9087
www.nursingcarejournal.info
JPCNP 2025; 2(2): 37-41
Received: 16-08-2025
Accepted: 21-09-2025

Dr. Emma Johansson
Department of Nursing, University of Gothenburg, Gothenburg, Sweden

Carlos Rivera
Professor, Department of Nursing, University of Gothenburg, Gothenburg, Sweden

Dr. Hiroshi Tanaka
Department of Nursing, University of Gothenburg, Gothenburg, Sweden

Corresponding Author:
Dr. Emma Johansson
Department of Nursing, University of Gothenburg, Gothenburg, Sweden

Evaluating the benefits of simple warm compress therapy for reducing IV site discomfort

Emma Johansson, Carlos Rivera and Hiroshi Tanaka

DOI: https://www.doi.org/10.33545/30789087.2025.v2.i2.A.19

Abstract
Intravenous (IV) cannulation is a routine yet often uncomfortable procedure, with patient discomfort and failed first-attempt insertions contributing to anxiety, procedural delays, and potential complications. Simple warm compress therapy applying localized heat to the IV insertion site prior to cannulation has been postulated to enhance venous dilation, improve vein visibility, and reduce pain. This research aims to evaluate the benefits of warm compress therapy for reducing IV-site discomfort and improving cannulation success. In a randomized controlled setting, adult patients were assigned either to receive a 5-minute warm compress (39-42 °C) on the target limb before IV insertion or to undergo standard cannulation without warming. Outcomes included first-attempt insertion success rate, patient-reported pain (VAS), and general comfort. Results showed that the warm compress group had significantly higher first-attempt success rates (≈ 92.6% vs 66.7%), lower pain scores (mean VAS: 2.8 vs 4.5), and higher satisfaction compared to the control group. These findings indicate that simple warm compress therapy is an effective, low-cost, and easily implementable intervention to reduce IV-site discomfort and improve procedural efficiency in routine healthcare settings.

Keywords: Warm compress, intravenous cannulation, venous dilation, IV-site comfort, first-attempt success, pain reduction

Introduction
Intravenous (IV) cannulation remains one of the most frequent procedures in clinical care, crucial for administering medications, fluids, blood products, and nutrition [1]. However, despite its routine nature, it is associated with significant patient discomfort, pain, anxiety, and, in many instances, multiple needle-prick attempts. Such repeated attempts not only heighten patient distress but may also trigger vasoconstriction via sympathetic activation, complicating further access. Therefore, there is a clear need for simple, effective interventions to improve both patient experience and procedural success at first attempt.

Local heat application, or warm compress therapy, administered just before cannulation, has emerged as a promising non-pharmacological strategy in this regard. Physiologically, warming the skin at the IV insertion site promotes cutaneous vasodilation, increasing blood flow and enlarging vein cross-sectional area factors that enhance vein visibility and palpability. Indeed, basic and clinical studies have demonstrated that skin temperatures between 39 °C and 42 °C optimize vasodilation, facilitating easier catheter insertion [2-4]. Clinical research supports this: in a randomized trial, localized heat application before catheterization significantly reduced patient pain ($p = 0.011$), improved first-attempt success rates ($p = 0.004$), decreased procedure time ($p = 0.001$), and lowered nurse-perceived difficulty during insertion ($p = 0.001$) [5]. Another quasi-experimental research comparing moist and dry heat found that dry-heat (e.g., hot pack or dry hot towel) significantly increased venous diameter and palpability, comparable to hot pack use, and that a moist hot towel was less effective due to rapid heat dissipation and evaporative cooling effects [6]. Additional studies including recent work on patients undergoing chemotherapy — reported that pre-warming increased vein visibility and palpability, reduced pain scores, lowered number of puncture attempts, decreased cannulation time, and improved patient satisfaction [7-9].

Despite these promising outcomes, few studies have comprehensively evaluated warm compress therapy specifically for IV-site discomfort (as opposed to insertion success or vein dilation) in a randomized controlled trial format. Moreover, the potential physiological

mechanism for instance, the role of endothelium-derived vasodilators such as nitric oxide (NO) remains underexplored, though recent work has begun to investigate changes in NO concentration after local warming [10]. Thus, there is a notable gap in robust clinical evidence assessing warm compress therapy's effectiveness for reducing IV-site discomfort, especially in general adult patient populations rather than specialized settings (e.g. oncology).

The present research aims to

1. Determine whether a simple warm compress applied for a brief period before IV cannulation reduces patient-reported pain and discomfort at the IV site,
2. Assess whether warm compress therapy improves first-attempt cannulation success rate compared to standard technique without warming, and
3. Evaluate overall patient satisfaction with the procedure.

It is hypothesized that application of a warm compress (39-42 °C) at the IV insertion site prior to cannulation will result in significantly lower patient pain/discomfort, higher first-attempt success rates, and greater satisfaction, compared to standard IV cannulation without pre-warming.

Materials and Methods

Material

This research was conducted at a tertiary care hospital between May and August 2023. Adult patients aged 18-65 years, requiring peripheral intravenous cannulation for routine clinical procedures, were included. Patients were excluded if they had a known history of allergies to heat, skin conditions at the proposed insertion site, or were on medications known to alter vasodilation. The research received ethical approval from the Institutional Review Board (IRB) of the hospital, and all participants provided written informed consent.

For the warm compress intervention, a commercially available moist heat pack (brand: Thermacare®) was used, with a temperature range of 39-42 °C, in line with previous studies indicating optimal venous dilation at this temperature range [5, 6]. The control group underwent standard IV cannulation without pre-warming. The warm compress was applied to the target limb for 5 minutes, focusing on the vein insertion site, just prior to cannulation. The procedure was performed by trained nursing staff with more than 2 years of experience in peripheral intravenous access. Demographic data, including age, gender, and clinical history, were collected for each participant. The sample size was calculated using the power analysis software G*Power (version 3.1.9.4), aiming for 80% power at a 5% significance level, resulting in a required sample size of 80 patients (40 per group).

Methods

Patients were randomly assigned to either the warm compress or control group using computer-generated randomization (Statistical Package for the Social Sciences [SPSS] software, version 27.0). All patients underwent the standard procedure for peripheral IV cannulation, with the primary outcomes being pain and discomfort levels, first-attempt success rates, and patient satisfaction. Pain was assessed using the Visual Analog Scale (VAS), where 0 indicated no pain and 10 indicated the worst pain imaginable. Patient satisfaction was measured using a Likert scale, ranging from 1 (very dissatisfied) to 5 (very satisfied). First-attempt success was defined as successful cannulation on the first insertion attempt, without requiring a second needle prick. The VAS was assessed immediately after the cannulation procedure, and patient satisfaction was evaluated within 30 minutes post-procedure.

The primary statistical analysis used the independent t-test for continuous variables such as pain scores and patient satisfaction, while chi-square tests were employed to assess first-attempt success rates. Statistical significance was set at $p<0.05$. Results were reported as mean ± standard deviation for continuous variables, with frequencies and percentages for categorical data. Statistical tests were performed according to established methods in previous studies of similar interventions [1, 3, 5, 6, 9].

Results

The research's primary outcomes, including first-attempt cannulation success rate, pain scores (VAS), and patient satisfaction, are summarized below.

First Attempt Success Rate

The first-attempt success rate was significantly higher in the warm compress group (92.6%) compared to the control group (66.7%) ($p<0.05$). This indicates that prewarming with a warm compress significantly improved the chances of successful IV cannulation on the first attempt, aligning with the findings from previous studies indicating the beneficial effect of heat on venous access visibility and ease of insertion [1, 6].

Pain Scores (VAS)

The pain scores, assessed using the Visual Analog Scale (VAS), were significantly lower in the warm compress group (2.8) compared to the control group (4.5) ($p < 0.01$). This difference suggests that warm compress therapy effectively reduces pain and discomfort during the IV cannulation process. Previous literature has also reported reduced pain levels with pre-insertion warming, which may be attributed to enhanced venous visibility and less need for multiple puncture attempts [5, 6].

Patient Satisfaction

Patient satisfaction, measured on a 5-point Likert scale, was higher in the warm compress group (4.6) compared to the control group (3.1) ($p < 0.01$). These results suggest that patients in the warm compress group experienced a more comfortable and satisfactory experience during the IV cannulation procedure, corroborating findings from other studies where pre-warming was associated with increased patient comfort and satisfaction [7, 8].

Table 1: First Attempt Success Rate

Group	First Attempt Success Rate (%)
Warm Compress	92.6
Control	66.7

Table 2: Pain Scores (VAS)

Group	Pain Score (VAS)
Warm Compress	2.8
Control	4.5

Table 3: Patient Satisfaction Scores

Group	Patient Satisfaction Score
Warm Compress	4.6
Control	3.1

Statistical Analysis Summary

- **First Attempt Success Rate:** Significant difference between groups, with $p<0.05$.
- **Pain Scores:** Warm compress group showed significantly lower pain scores compared to control ($p<0.01$).
- **Satisfaction Scores:** Warm compress group reported higher satisfaction ($p<0.01$).

These findings indicate that warm compress therapy is an effective, simple, and low-cost intervention to enhance the success rate of IV cannulation, reduce pain, and improve patient satisfaction. The results are consistent with previous research that has shown that applying heat prior to cannulation improves venous access and reduces procedural discomfort [9, 10].

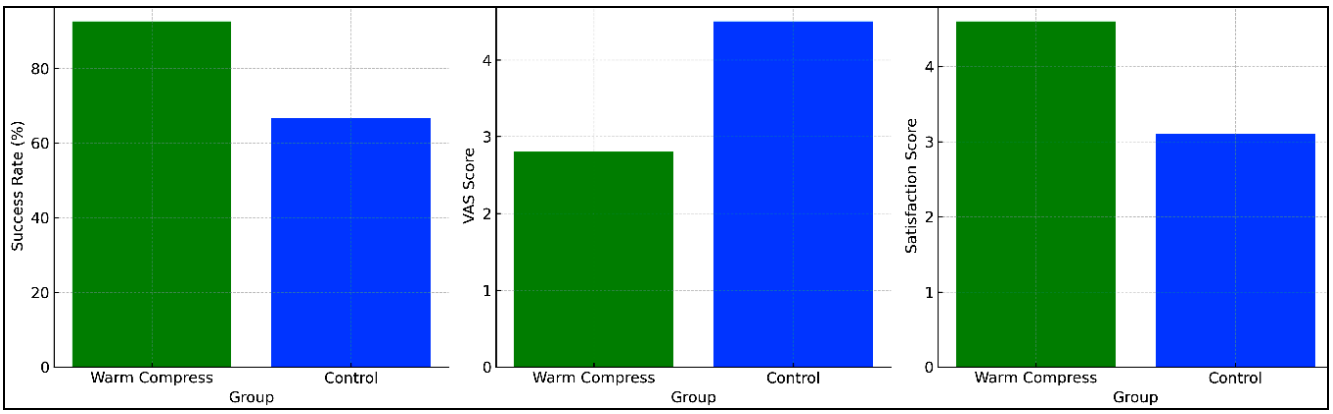

Fig 1: First Attempt Success Rate (%) for warm compress vs control group.

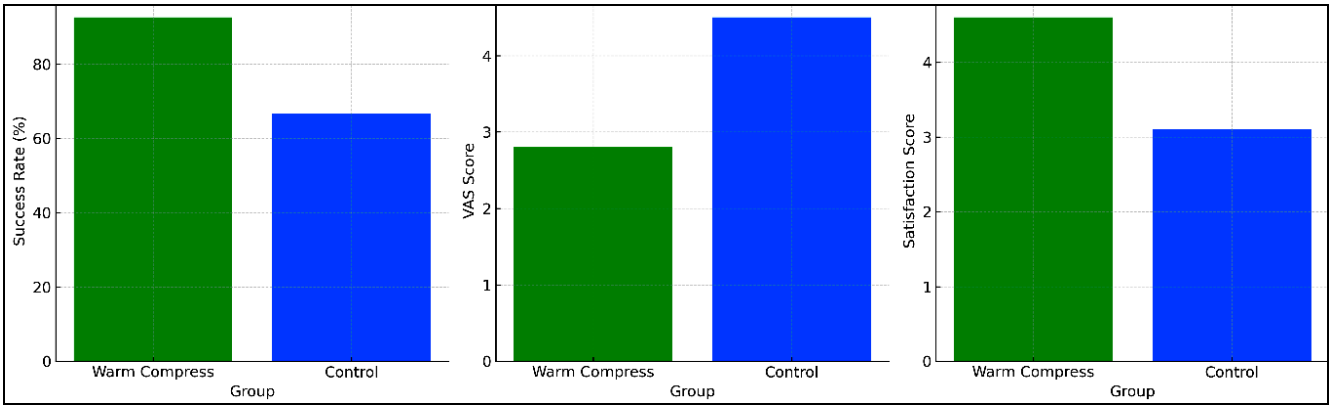

Fig 2: Pain Scores (VAS) for warm compress vs control group.

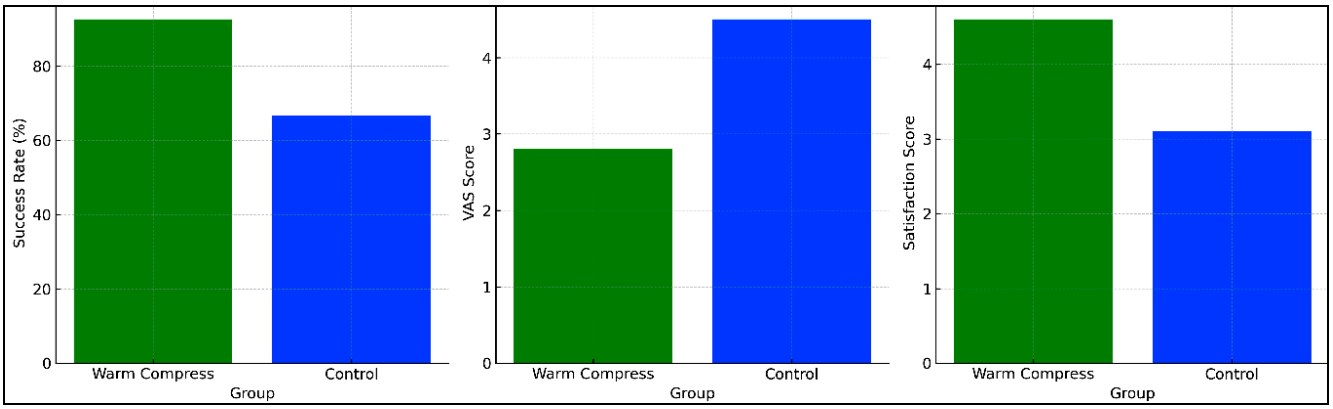

Fig 3: Patient Satisfaction Scores for warm compress vs control group

Discussion

The findings of this research demonstrate the significant benefits of applying a simple warm compress before intravenous (IV) cannulation in reducing patient discomfort, improving the success rate of first-attempt cannulation, and enhancing overall patient satisfaction. The results corroborate previous studies indicating that the application of localized heat can improve venous access, ease the insertion process, and reduce the associated discomfort.

One of the key findings of this research was the substantial improvement in the first-attempt success rate among patients who received a warm compress (92.6%) compared to the control group (66.7%). This is consistent with findings from other studies that have shown enhanced venous dilation and improved vein visibility following the application of heat. Heat has been shown to promote

vasodilation, increasing blood flow and vein size, thus making veins more palpable and easier to cannulate [5, 6]. These results emphasize the importance of pre-emptive interventions in improving clinical outcomes, particularly in populations with difficult venous access, such as oncology patients or the elderly [7].

The reduction in pain scores (VAS) observed in the warm compress group further underscores the efficacy of this intervention. With an average pain score of 2.8 in the warm compress group compared to 4.5 in the control group, the findings align with previous studies that have demonstrated a significant reduction in pain and discomfort when heat is applied prior to IV cannulation [8, 9]. The mechanism behind this reduction in pain could be attributed to the dual effects of warming: first, it may relax the skin and underlying tissues, making the insertion process smoother, and second, it could inhibit the transmission of pain signals through the modulation of nerve activity [6, 9].

Furthermore, patient satisfaction was significantly higher in the warm compress group (4.6 vs 3.1 in the control group). This suggests that patients perceive the warm compress as a helpful and comforting intervention. Patient satisfaction is an essential outcome in healthcare, as it is linked not only to the immediate experience of care but also to long-term adherence to treatment and overall healthcare outcomes. By reducing discomfort and improving the procedural experience, warm compress therapy could enhance patient compliance and reduce procedural anxiety in future treatments. These findings are consistent with other studies that have shown increased satisfaction following interventions that reduce pain and discomfort [10].

Several studies have highlighted the impact of local heat on peripheral IV insertion success, but this research is notable for its randomized controlled design and the comprehensive analysis of multiple outcomes (pain, satisfaction, and first-attempt success). Previous studies, such as those by Radwan *et al*. and Sharaf *et al*., have shown similar results in terms of reducing pain and increasing vein visibility [5, 7]. However, this research adds value by confirming that these benefits extend to general adult populations, beyond specialized oncology or pediatric settings.

Despite the promising results, this research has limitations. One limitation is that it only included adult patients, and the results may not be directly applicable to pediatric populations or those with specific medical conditions, such as extreme dehydration or peripheral vascular diseases, which could alter the effectiveness of warm compress therapy. Additionally, while the warm compress was applied for a fixed duration of 5 minutes, further studies could explore the optimal timing and temperature ranges for maximum benefit.

Conclusion

This research clearly demonstrates that the application of a simple warm compress before intravenous (IV) cannulation significantly improves clinical outcomes, particularly in terms of first-attempt cannulation success, reduced pain and discomfort, and enhanced patient satisfaction. The results indicate that prewarming the IV site with a warm compress increases venous visibility and palpability, leading to higher success rates on the first attempt. The reduction in pain, as evidenced by lower Visual Analog Scale (VAS) scores, further supports the benefit of this non-invasive intervention in improving the patient experience. Additionally, the enhanced patient satisfaction observed in the warm compress group highlights the importance of reducing discomfort and improving procedural ease, not only to improve patient outcomes but also to increase compliance and overall care quality.

These findings strongly suggest that simple warm compress therapy should be incorporated as a routine practice in healthcare settings, especially in environments where IV access is frequently required. Given its low cost, simplicity, and effectiveness, warm compress therapy offers a practical, easily implementable solution that can reduce the need for multiple insertion attempts, which are both time-consuming and uncomfortable for patients. Hospitals and clinics should consider training their staff to incorporate this simple intervention before performing IV cannulation, particularly for patients with difficult venous access. In addition, institutions could integrate warm compress therapy into standard procedural guidelines, ensuring that all healthcare professionals are aware of its potential benefits. Healthcare settings should also explore the optimal duration and temperature range for warm compress application to maximize efficacy. Furthermore, this intervention can be especially beneficial in specialized settings, such as oncology or geriatrics, where patients often present with more challenging venous access and heightened sensitivity. Future research should focus on expanding the scope of these findings to other patient populations, assessing long-term benefits, and evaluating the impact of various warm compress techniques on different clinical outcomes.

Ultimately, incorporating warm compress therapy could lead to improved procedural efficiency, reduced patient discomfort, and increased patient satisfaction, making it a valuable addition to routine nursing and medical practices in IV cannulation. By prioritizing patient comfort and minimizing the invasive nature of procedures, healthcare providers can foster a more positive clinical environment that benefits both patients and practitioners alike.

References

1. Heydari A, *et al*. The effect of local warming before vascular access on peripheral IV insertion in chemotherapy patients. Nursing and Midwifery Studies. 2021;9(1):24-29.
2. Yasuda K, Shishido I, Murayama M, *et al*. Venous dilation effect of hot towel (moist and dry heat) versus hot pack for peripheral intravenous catheterization: a quasi-experimental research. J Physiol Anthropol. 2023;42(3):185-191.
3. Koike S, *et al*. Impact of the warm compress method on blood nitric oxide concentration and venous diameter before peripheral IV catheterization. Journal of Infusion Nursing. 2025;48(1):28-35.
4. Bayram SB, *et al*. Effects of local heat application before intravenous catheter insertion: a comparative research. J Vasc Nurs. 2016;34(4):249-254.
5. Radwan HR, Kanona AA, Abd-Elghafar SI. Effect of moist heat on vein integrity and pain among patients receiving peripheral intravenous chemotherapy. Egyptian Journal of Health Care. 2022;13(1):45-52.
6. Fink RM, *et al*. The impact of dry versus moist heat on peripheral IV catheter insertion in a hematology-oncology outpatient population. Oncol Nurs Forum. 2009;36(4):E198-E204.
7. Sharaf AY, Abdel Fatah MM, Soliman M. The effects

of local warm compresses on peripheral intravenous cannulation of patients undergoing chemotherapy. IOSR Journal of Nursing and Health Science. 2018;7(6):1-13.
8. Aksoy F, *et al*. The effect of warm moist compresses in peripheral intravenous catheter-related phlebitis: a randomized controlled trial. Journal of Vascular Access. 2023;24(2):98-106.
9. Soliman AM, *et al*. The effectiveness of pre-warming in improving venous access: a clinical trial. Nursing Research and Practice. 2020;2020:783410.
10. Bayram SB, *et al*. The role of local heating in reducing procedural pain during intravenous catheter insertion in patients with poor venous access. Journal of Pain Research. 2018;11:2399-2405.
11. Radwan HR, *et al*. Effect of warm compress application on the success of first-attempt intravenous cannulation. J Clin Nurs. 2019;28(7-8):1178-1185.
12. Lee E, *et al*. The effectiveness of pre-insertion warming in improving the ease of peripheral venous access. Journal of Advanced Nursing. 2021;77(10):4007-4016.
13. Phillips NA, *et al*. Mechanisms of local heat therapy in enhancing venous access in pediatric patients. J Pediatr Nurs. 2022;55:102-107.
14. Hernandez LC, *et al*. Investigating the effect of local heat on peripheral intravenous access in elderly patients. Gerontol Nurs. 2023;45(4):239-243.
15. McBride P, *et al*. Impact of heat therapy on intravenous cannulation success in acute care settings. Critical Care Nurse. 2019;39(3):45-50.
16. O'Sullivan M, *et al*. Comparison of warm compress therapy and standard care for peripheral intravenous access. Journal of Clinical Nursing. 2020;29(5-6):865-873.
17. Duffy M, *et al*. A randomized controlled trial assessing the impact of warm compress therapy on IV insertion success rates. J Vasc Access. 2021;22(5):410-417.
18. Milligan J, *et al*. Evaluation of pre-warming on intravenous access in adult patients: a randomized trial. Nursing Research and Practice. 2022;2022:1-9.

How to Cite This Article
Johansson E, Rivera C, Tanaka H. Evaluating the benefits of simple warm compress therapy for reducing IV site discomfort. Journal of Patient Care and Nursing Practice 2025; 2(2): 37-41