

Minimizing Blood Leakage During Peripheral IV Cannulation: The role of Blood Control Septum Technology

Akhil Agrawal,

Deputy General Manager (DGM), B. Braun India Pvt. Ltd.

ABSTRACT

Corresponding author

Akhil Agrawal

Deputy General Manager, B.
Braun India Pvt. Ltd.

E-mail: akhil.agarwal@bbraun.com

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Peripheral intravenous (IV) cannulation is one of the most common invasive procedures, yet blood leakage during placement and manipulation remains an under-monitored issue that increases occupational pathogen exposure, patient discomfort, and hospital costs. Standard open catheters lack anti-reflux mechanisms, frequently causing blood spillage during line connection. Evidence from multiple independent randomized controlled and observational studies shows that blood-control septum IV cannulas, which feature an internal valve that automatically closes upon needle withdrawal, significantly reduce blood leakage from rates as high as 68.4% down to 2.0%–14.1%. Adopting blood-control technology alongside structured standard operating procedures, mandatory competency training, and routine clinical audits offers a pragmatic strategy to eliminate avoidable blood exposure. Furthermore, addressing the absence of localized data through formal surveillance will help optimize infusion nursing practice and health-system safety.

Keywords:

Peripheral IV cannulation, Blood leakage, Blood-control cannula, Occupational exposure, Infusion nursing.

Introduction

Peripheral intravenous (IV) cannulation remains one of the most frequently performed invasive procedures in clinical practice. International prevalence data indicate that roughly one in four hospitalized patients carries a peripheral IV catheter at any given time, and more than a billion such devices are placed worldwide each year.^[1,2] While essential for delivering fluids, medications, blood products, and parenteral nutrition, cannulation is not free of complications.^[1-2]

Phlebitis, infiltration, catheter failure, and blood leakage during insertion or manipulation are well recognized, yet blood leakage remains under-monitored and inconsistently reported in routine practice.^[2-3]

Clinical Context

The principal causes of blood exposure and spillage during cannulation are blood splashes, blood leakages, and insufficient compression of the punctured vein during connection or disconnection of Luer devices.^[4-5] Blood leakage typically occurs when blood backflows through the cannula hub after successful venous access, before the IV line or obturator is connected. In conventional open cannula systems, even this brief window can result in blood spillage onto gloves, linen, and surrounding surfaces, raising the risk of contamination and occupational exposure. Clinical data and surveys have estimated that clinicians encounter a very high percentage of visible blood leakages up to 61.2% during placement and 74% during disconnection or catheter manipulation.^[6-8]

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Occupational exposure to blood carries direct infection risk. The World Health Organization's widely cited estimate is that around three million healthcare workers sustain percutaneous blood exposure annually, contributing to tens of thousands of new hepatitis B, hepatitis C, and HIV infections each year.^[9]

Despite growing awareness of occupational blood exposure risk, blood leakage during IV Cannulation remains common with conventional cannulas. This document is a clinical practice-focused synthesis intended to share the latest technology to reduce blood leakage.

Innovation – Blood-Control Septum IV Cannula

Device design plays a central role in preventing blood leakage. Conventional cannulas have no anti-reflux mechanism, so blood flows freely once the vein is accessed until the line is connected. Blood-control IV cannulas address this by incorporating an internal septum or valve that closes automatically when the introducer needle is withdrawn, converting the device into a closed system during vessel entry.

The evidence base for this design has strengthened over the past decade. Notably, the effect has been replicated across independent research studies evaluating different blood-control devices, rather than resting on a single study. A prospective, randomized controlled trial in an emergency department setting found blood leakage with a blood-control catheter was reduced to 14.1%, compared with 68.4% for a standard catheter, with the blood-control device also superior in eliminating blood-exposure risk (93.9% vs 19.1%) and in removing the need for manual digital compression (95.3% vs 19.1%).^[10] A separate two-phase randomized trial reported blood leakage falling from 39.1% with a conventional catheter to 2.0% with a blood-control catheter, with clinician-rated acceptability equal to or better than the standard device.^[5] A third prospective observational evaluation of a blood-control catheter designed specifically to prevent leakage reported a comparable reduction versus conventional safety catheters, together with lower associated cleaning workload.^[11]

Taken together, these three independently conducted studies, carried out by different research teams and evaluating different blood control catheter devices, consistently demonstrate reductions in blood leakage and clinician blood-exposure risk, which strengthens confidence that the benefit arises from the closed-system mechanism itself rather than the performance of any single device or study.

Key Learning

No published Indian data currently quantify the incidence of blood leakage during IV cannulation. International audits of IV therapy continue to identify blood leakage, and dressing contamination is common but inconsistently documented occurrences.^[2,3] This gap supports the case

for structured local data collection alongside adoption of blood-control technology.

Implications for Infusion Nursing Practice

Blood leakage during cannulation has consequences across three domains. For healthcare workers, it raises exposure risk to blood-borne pathogens, increases needlestick risk during hurried line connection, and adds psychological stress and post-exposure workflow burden.^[8,9] For patients, visible leakage can signal compromised aseptic technique, contributing to infection risk, repeated attempts, discomfort, and reduced confidence in nursing care.^[2,12] For hospitals, blood leakage generates additional cannula use, cleaning and waste-management costs, occupational-exposure follow-up costs, and potential quality and medico-legal exposure.^[4,11]

Table 1: Blood Leakage Prevention Toolkit (based on available evidence and clinical practice)

1. Any visible blood leakage, regardless of volume, should prompt immediate dressing and linen replacement. ^[13,14]
2. Every hospital should have a written SOP defining blood leakage, reporting requirements, escalation pathways, and response actions ^[14].
3. Competency-based training and simulation for cannulation techniques should be mandatory at onboarding. ^[1,14,15]
4. Where feasible, hospitals should preferentially adopt blood-control cannulas for routine peripheral access. ^[5,10,11]
5. Blood leakage prevention should be embedded into routine nursing audits, rather than treated as an incidental observation.

Conclusion

Blood leakage during peripheral IV cannulation is a common but under-documented event with real consequences for healthcare worker safety, patient experience, and increased treatment cost. The evidence for blood-control cannula design is consistent and has been reinforced by more recent randomized and observational data, while broader literature on occupational exposure also confirms that sharps injuries and blood exposure remain persistent risks for nursing staff, including in India. Closing the local data gap through structured surveillance, paired with SOP-driven practice and device-level prevention, represents a pragmatic path to reducing this avoidable exposure.

Declarations

This communication is intended for educational purposes.

Funding

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Conflict of Interest

There is no conflict of interest

Ethical Considerations

This communication is based on previously published literature; no primary patient data was collected.

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