Adopting a Closed Integrated Peripheral Intravenous Cannula System in an Australian Hospital: Clinical and Economic Impact

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Introduction

Up to 90% of inpatients require an intravenous cannula during their hospital stay[1]. Multiple studies demonstrated that adopting a closed integrated peripheral intravenous cannula (PIVC) system protects veins for longer and reduces the risk of complications and unnecessary restarts[2–4]. As insertion and maintenance of PIVCs are often performed by nurses, the reduction in restarts and complications can help improve operational efficiency. This study assessed the annual clinical and economic impact of adopting a closed integrated PIVC system, when compared with a non-integrated system, for inpatients in an Australian hospital.

Methods

A budget impact model was developed in Microsoft Excel® to analyze the clinical and economic impact from the hospital perspective, over a one-year period.

Analysis was based on the following:

- 500-bed hospital with 85% occupancy rate,
- 5.4 days average patient's length of stay[5], and
- 70% of inpatients requiring PIVC[6].

The hospital adopts a 72-hour routine replacement protocol. A scenario analysis was conducted considering a 144-hour clinically indicated replacement protocol[4] for the integrated PIVC system.

Published studies were referenced for clinical inputs such as cannula failure rate (Table 1) while the consumables and complication management costs were informed by local data (Table 2). Outcomes evaluated include consumables utilisation, cannula failure, dislodgement, nurse time, and cost impact.

Table 1: Clinical inputs, from published studies, used in the budget impact analysis

Clinical Parameter	Integrated System	Non-Integrated System
Insertion attempts	1.12[7]	1.19[7]
Cannula failure rate	28.7%[8]	35.0%[8]
Dislodgement rate	9.5%[8]	12.9%[8]

Table 2: Local cost inputs used in the budget impact analysis

Cost Parameter	Cost (AUD)	Cost (USD)*
Cannula start up	$2.58	$1.68
Integrated system	$3.89	$2.53
Non-integrated system	$3.48	$2.26
Nurse hourly salary	$55.72[9]	$36.22

*AUD $1.00 = USD $0.65

Results

Table 3: Annual clinical and operational outcomes evaluated in the budget impact analysis

Outcomes	Integrated System	Non-Integrated System
Cannula utilisation	51,543	56,273
Dislodgement	1,914	2,587
Cannula failure	5,775	7,043
Nurse hours	13,143	14,350

- The model estimated 20,123 inpatients requiring PIVC annually. Adopting the closed integrated PIVC system reduced the annual number of cannulas by 8.4% (4,730), as a result of fewer insertion attempts and reduced cannula failure (Table 3). Dislodgement episodes decreased by 26% (673), cannula failure episodes reduced by 18% (1,268), and nurse hours decreased by 8.4% (1,207).
- The estimated reduction in dislodgement and cannula failure saved AUD8,898. Improved operational efficiency with the closed integrated PIVC system saved AUD67,208 of nurse time. As presented in Figure 1, these offset the increase in consumable costs of AUD1,648, resulting in an overall annual cost saving of AUD74,458 (6.5%).
- As shown in Figure 2, when the hospital adopted the closed integrated PIVC system with a 144-hour clinically indicated cannula replacement protocol, the annual number of cannulas decreased significantly (48.5%), and the estimated annual cost saving increased to AUD540,502 (47.4%).

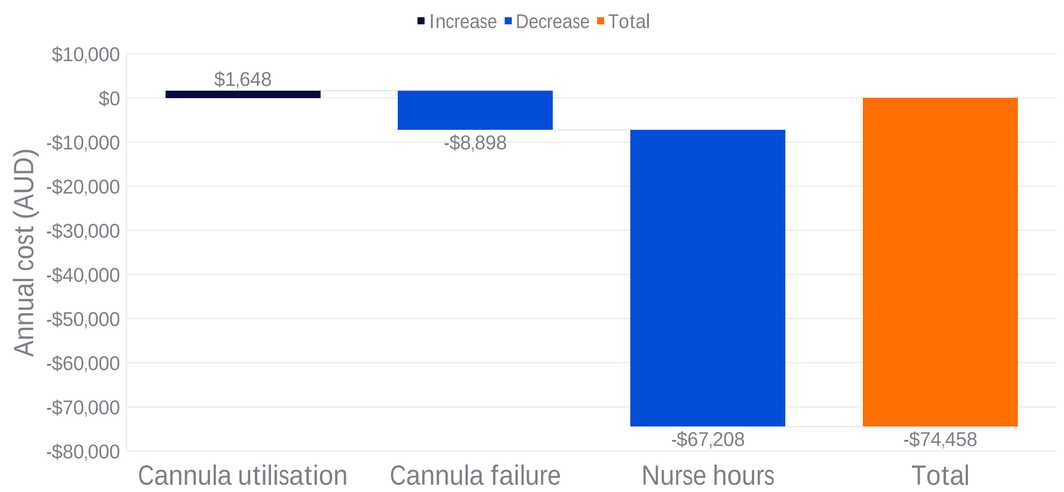

Figure 1: Annual budget impact associated with adopting the closed integrated PIVC system, with a 72-hour routine replacement protocol

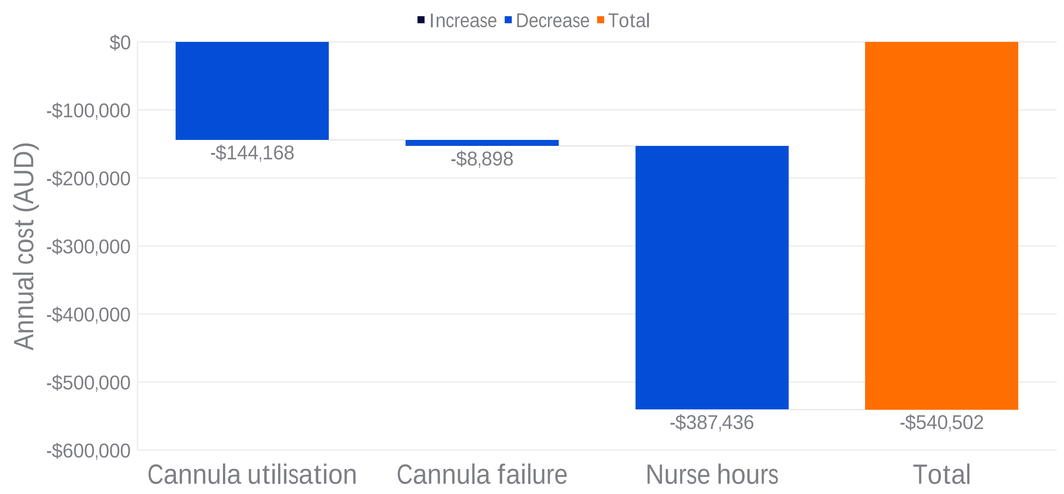

Figure 2: Annual budget impact associated with adopting the closed integrated PIVC system, with a 144-hour clinically indicated replacement protocol

Conclusion

A closed integrated PIVC system can reduce clinical complications and improve operational efficiency, leading to better patient outcomes and more efficient use of nurses' time with less time spent on complication management. These benefits can result in potential overall cost savings.

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Conflict of Interest: Author is an employee of Becton, Dickinson and Company (BD)

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