

Outcomes of implantation of totally implanted vascular access devices for oncology patients in interventional radiological suites or operating rooms: A systematic review

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- UoW MPhil Student

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Background

What is a Totally Implanted Venous Access Device (TIVAD)?

- Gold standard venous access device for medium to long term intravenous access
- Prevalent in systemic anticancer therapy
- Provides a non-external device which promotes improved quality of life due to the internal nature when not accessed

Prevailing insertion methods:

- Surgical cut down
 - Setting: operating theatre
 - +/- general anaesthesia
- Interventional radiology (IR)
 - Setting: interventional radiology suite
 - Generally performed while patient awake
 - Percutaneous insertion with imaging guidance



Why This Review Was Needed

At the time this review was commenced, the last published SR on this topic was in 2014.

Significant changes since then

- Increased use and accessibility of ultrasound guidance
- Evolving cancer populations
- Surgical waitlist pressures
- Growing focus on patient-centred outcomes and co-design

The aim of this review was to gather the most contemporary evidence to

- underpin service redesign,
- evaluate safety, benefits, and consumer acceptability of surgical vs IR insertion of TIVADs in adults with cancer
- provide evidence to support health services to adopt models of care that positively impact cancer patients

PICO components

Formulation of the research question was based on the following PICO process:

P – population	Adult oncology consumers requiring TIVADs
I – intervention	Interventional Radiology Insertion - percutaneous insertion approach using local anaesthesia
C - compare	Surgical Insertion – cut down method under anaesthesia
O – outcome	Clinical and subjective outcomes –complications (e.g., infection, dehiscence, thrombus, pain), accessibility, exposure to anaesthesia for compromised cohorts, aesthetics/patient experience
S – setting	Hospitals

Methodology

Search strategy

1. Cancer* OR Oncology OR neoplasm AND
2. Totally Implanted Venous Access Device OR Totally Implanted Venous Access Port, Totally Implanted Vascular Access Device OR Totally Implanted Vascular Access Port OR TIVAP OR TIVAD OR Portacath OR Port-a-Cath OR Infusion Port AND
3. Surgical* OR Surger* OR Radiolog* OR interventional AND
4. Outcome* OR Complication* OR access* OR Accetab* OR Adverse OR reaction* OR satisf* OR success* AND
5. Adult* NOT paed* OR child* OR adolescent* OR infant
6. Publication dates from 2000

The methods to search these terms depend on the capacity of the database, for instance, PubMed has MeSH term capacity, therefore this was used. Snowballing and freehand searches were also used.

Databases: PubMed/MEDLINE, Scopus, CINAHL, EMBASE

Inclusion: English, 2015–2024, adults with cancer, any empirical study design

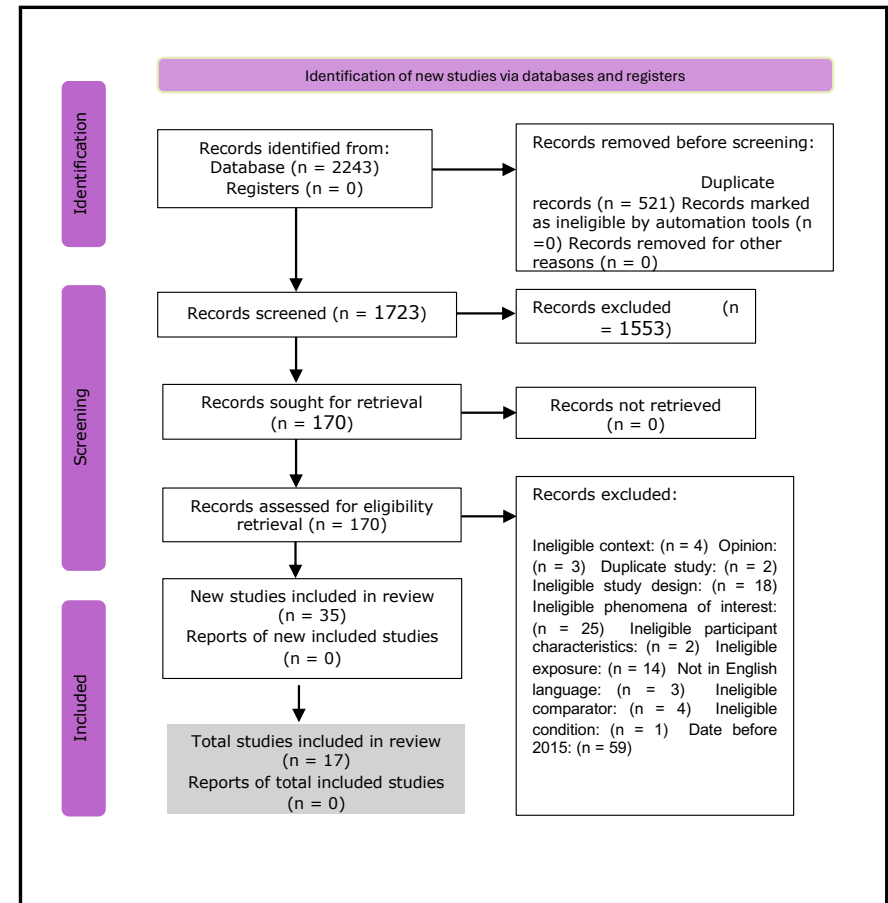
Exclusion: paediatrics, grey literature, opinion pieces, pre-2015

- Dual-reviewer screening + JBI critical appraisal
- Final inclusion: 17 studies, 6515 participants

PRISMA Flow Diagram

Key numbers:

- 2243 records identified
- 521 duplicates removed
- 170 full texts screened
- 17 included



Results:

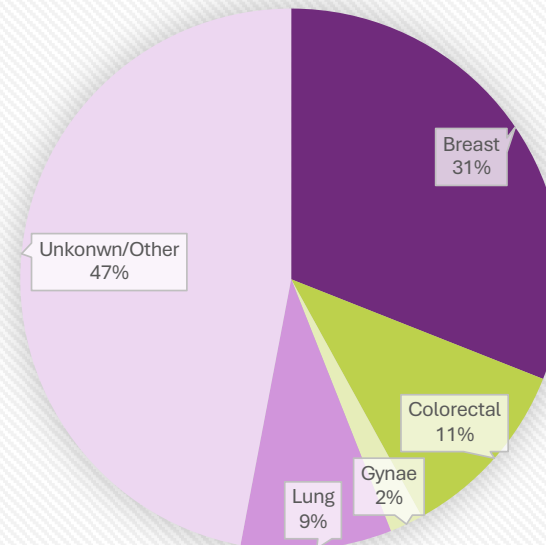
Participant Characteristics

- 6515 participants
- 63% female, 33% male

Most common cancers:

- Breast cancer: 31%
- Gastrointestinal: 11%
- 47% malignancy type not specified

Percentage of malignancies represented in the literature



Results:

Procedure Time & Acceptability

Procedure time:

- comparable between surgical and IR across 10 studies

Patient satisfaction:

- Only 3 studies reported
- 90% rated cosmetic outcomes “good” or “excellent”

Comfort/acceptability:

- 80% (544/681) rated IR insertion as acceptable
- ?bias due to lack of papers discussing acceptability



Results:

Complications - Surgical

Overall surgical complication rate: 4.44%

Key findings:

- Higher infection rates within 30 days
- 18 local + 6 systemic infections
- Immediate complications low
- Early complications included: bleeding, haematoma, thrombosis, occlusion, pain

Surgical complications						
	Immediate		Early		Undetermined	
		Percentage		Percentage		Percentage
Infection						
Local	1	0.029%	18	0.52%	3	0.09%
Systemic	-	-	6	0.17%	-	-
Not stated	-	-	-	-	13	0.38%
Arterial injury	7	0.107%	-	-	-	-
Bleeding	-	-	5	0.14%	-	-
Haematoma	-	-	6	0.17%	-	-
Malposition	-	-	-	-	-	-
Tip	-	-	4	0.12%	2	0.06%
Port body	-	-	1	0.03%	2	0.06%
Disconnection	-	-	11	0.32%	-	-
Pneumothorax	-	-	-	-	-	-
Arrhythmia	1	0.015%	-	-	-	-
Nerve injury	-	-	-	-	-	-
Thrombosis	-	-	17	0.49%	26	0.75%
Catheter occlusion	2	0.031%	5	0.14%	3	0.09%
Seroma	-	-	3	0.09%	1	0.03%
Skin complication	-	-	-	-	8	0.23%
Pain	-	-	9	0.26%	-	-
Extravasation	-	-	-	-	-	-

Results:

Complications: IR

Overall IR complication rate: 4.19%

Key findings:

- Higher immediate complications, including
 - Arterial puncture
 - Pneumothorax
 - Arrhythmia
- Very low infection rates (3 early infections)
- Late complications similar to surgical

	Immediate		Early		Undetermined	
Infection						
Local		-	3	0.098%	4	0.13%
Systemic		-	-	-	2	0.07%
Not stated		-	-	-	10	0.33%
Arterial injury	26	0.852%	-	-	7	0.23%
Bleeding	1	0.033%	-	-	-	-
Haematoma		-	-	-	1	0.03%
Malposition		-	-	-	-	-
Tip	8	0.262%	-	-	3	0.10%
Port body		-	-	-	-	-
Disconnection		-	-	-	-	-
Pneumothorax	12	0.393%	-	-	2	0.07%
Arrhythmia	11	0.361%	-	-	-	-
Nerve injury		-	-	-	-	-
Thrombosis		-	2	0.066%	11	0.36%
Catheter occlusion		-	-	-	16	0.52%
Seroma		-	-	-	-	-
Skin complication		-	-	-	-	-
Pain	1	0.033%	2	0.066%	-	-
Extravasation		-	-	-	6	0.20%

Discussion:

Complications

- **Immediate risks differ by method**
 - IR present with more acute mechanical complications
 - Surgical presents with more periprocedural infections
- **Late complications difficult to attribute to insertion method**
 - Influenced by long-term device use, comorbidities, and variable maintenance practices

Both methods demonstrate acceptable safety profiles



(Schutt, et.al., 2025)



(O'Donnell, 2026)



(Simon, 2022)

Gaps in the Literature

- Cost analysis almost entirely absent
- Consumer experience under-reported
- Terminology inconsistency across studies
- Limited Australian-context data

Recommendations

- Increase access to IR insertion
- Lower infection risk
- Reduced reliance on surgical theatres
- Co-designed consumer experience studies
- Australian cost-benefit analysis
- Standardised terminology and reporting
- Embed ultrasound guidance to reduce IR mechanical complications

Implications for Practice

Both methods safe, therefore, decision making should consider:

- Patient comorbidities
- Local waitlist pressures
- Infection prevention priorities
- Consumer preference

IR may support timely access, reduced anaesthetic exposure, and improved flow in overstretched services.

Conclusion

- Surgical and IR insertion methods are equally safe overall, with different risk profiles.
- IR shows lower infection rates and high patient acceptability.
- More research needed on cost, consumer experience, and Australian implementation.
- Findings support expanding IR access within regional health services.



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