Ollscoil na Gaillimhe
University of Galway

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Vascular access device type for systemic anti-cancer therapies in cancer patients. A scoping review

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BACKGROUND

Globally, the incidence and prevalence of cancer are rising from 9.8 million in 2018 to 15 million in 2040.[1] While treatment options have advanced significantly, vascular access devices (VAD) are still used to give around 75% of systemic anti-cancer therapy (SACT).[2] For cancer patients, numerous invasive vascular access procedures are routine for intravenous therapy and clinical diagnostics.

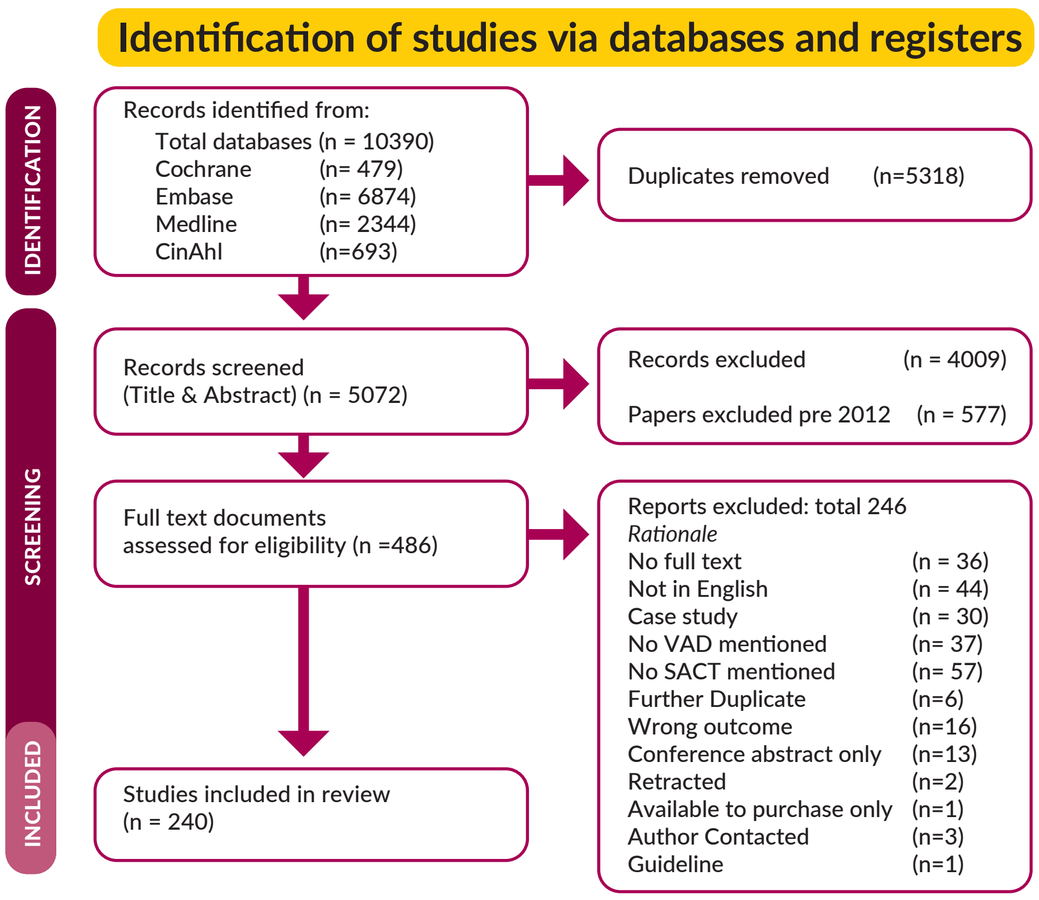
OBJECTIVES

We aimed to determine the type of VADs used for SACT, the type of insertion reported complications, the location and clinical setting and whether the choice of VAD is reported to impact quality of life (QOL).

METHODOLOGY

As per our published protocol,[3] we followed the JBI scoping review methodology.[4] The preferred reporting items for systematic reviews and meta-analyses (PRISMA-ScR) flow chart for the scoping review provides the findings of the search strategy, screening, and included full text articles (see Figure 1). We presented the discussion using the Patterns, Advances, Gaps, Evidence of Practice, and Research Recommendations (PAGER) framework.[5]

Figure 1 Prisma Flow chart



RESULTS

We screened n=5072 articles and included n=240 full texts published between 2012– 2022 for data extraction. The most common VADs were tunnelled intravenous VADs (n=67). We found 28 studies using an interventional design (see Figure 2). Catheter related thrombosis was the most frequently reported complication (n = 179, 74%) followed by infection (n = 171, 70%) (Table 1). Around half of the articles mentioned premature catheter removal (n=128) with most studies reporting removal as a result of complication such as thrombosis or infection.[6]
In total, 40% of publications referenced a particular kind of intravenous SACT, whereas 60% of them referred to it as chemotherapy. Oncology (n = 156, 65%) was the most prevalent study specialty, and 30% (n = 65) of the studies were referred to as cancer centres. Out of the research published from the haematology context (n=30) , 5% (n=11) identified as cancer centres. 34 studies focused on QOL. Only a small number of papers addressed clinical competency across all VADs (n=7, 3%). We found no core outcome sets for SACT and VADs.

Figure 2: Research Design as they were reported in published articles

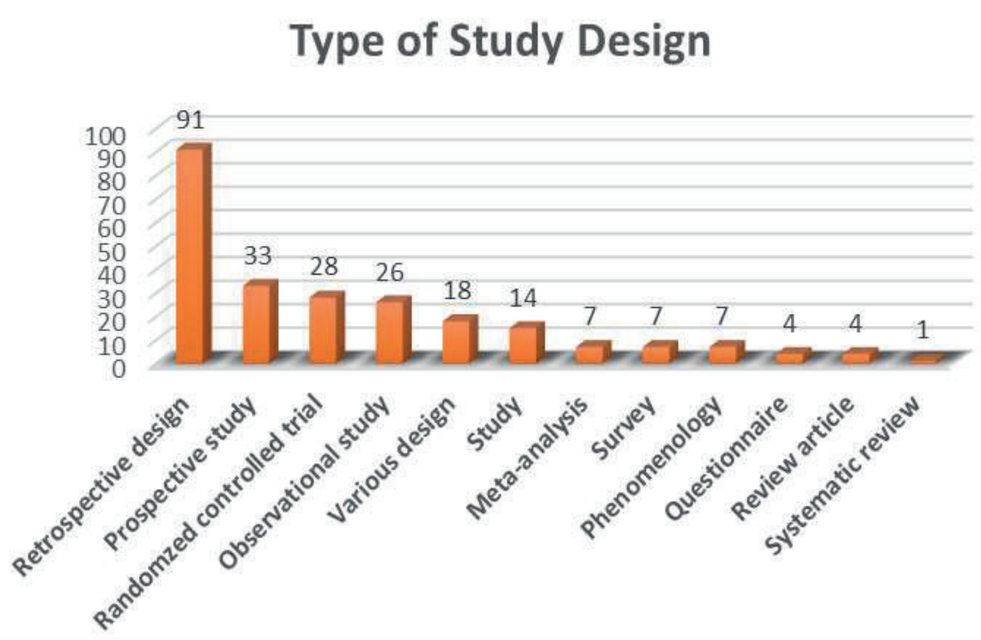


Table 1: Number of studies in relation to Insertion related complications

	PIVC	PICC	TIVAD	Hickman	NTCVAD	f-TIVAD	PICC-PORT	Combined	CVC/ CVAD	Total All VADs
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	
Type of VAD	9 (4)	58 (24)	67 (28)	4 (2)	3 (1)	3 (1)	5 (2)	70 (29)	21 (8)	240
Insertion related complication No of studies										
Bleeding	0 (0)	13 (5)	17 (7)	2(1)	1 (0)	1 (0)	0 (0)	13 (5)	5 (2)	52 (22)
Cardiac arrhythmia	0 (0)	4 (2)	7 (3)	2(1)	0 (0)	0 (0)	0 (0)	2(1)	1 (0)	17 (7)
Failure to place	4 (2)	14 (6)	19 (8)	1 (0)	0 (0)	1 (0)	1 (0)	20 (8)	1 (0)	61 (25)
Nerve injury	0 (0)	1 (0)	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	3 (1)	1 (0)	9 (4)
Arterial Puncture	0 (0)	2(1)	18 (7)	1 (0)	0 (0)	0 (0)	0 (0)	7 (3)	1 (0)	29 (12)
Malposition	1 (0)	11 (5)	23 (10)	2(1)	1 (0)	0 (0)	0 (0)	17 (7)	2(1)	57 (24)
Pneumothorax	0 (0)	3(1)	28 (12)	2(1)	1 (0)	0 (0)	0 (0)	12 (5)	3(1)	49 (20)
Subcutaneous haematoma	1 (0)	1 (0)	21 (9)	1 (0)	1 (0)	1 (0)	1 (0)	10 (4)	3(1)	40 (17)
Post Insertion complication (No of studies)										
Extravasation	3(1)	8 (3)	15 (6)	1 (0)	1 (0)	0 (0)	3(1)	22 (9)	4 (2)	57 (24)
MARSI	0 (0)	4 (2)	2(1)	0 (0)	1 (0)	0 (0)	0 (0)	4 (2)	0 (0)	11 (5)
Infection	3(1)	40 (17)	57 (24)	3(1)	3(1)	2(1)	3(1)	53 (22)	8 (3)	172 (72)
Phlebitis	4 (2)	16 (7)	6 (2)	1 (0)	1 (0)	0 (0)	2(1)	22 (9)	2(1)	54 (22)
Catheter &/venous thrombosis	2(1)	45 (19)	50 (20)	4 (2)	1 (0)	3(1)	4 (2)	57 (24)	13 (5)	179 (74)
Mechanical/ occlusion	1 (0)	22 (9)	41 (17)	3(1)	1 (0)	3(1)	4(2)	41 (17)	4 (2)	120 (50)
Pulmonary Embolism	0 (0)	9 (4)	6 (2)	1 (0)	0 (0)	0 (0)	0 (0)	6 (2)	3(1)	25(10)
Malfunction	0 (0)	6 (2)	16 (7)	0 (0)	0 (0)	0 (0)	0 (0)	13 (5)	2(1)	37 (15)
Premature catheter removal	2(1)	29 (12)	43 (18)	2(1)	3(1)	1 (0)	4(2)	40 (17)	6 (2)	130 (54)
Induration	1 (0)	3(1)	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	3(1)	0 (0)	11 (5)
Migration	0 (0)	10 (4)	15 (6)	1 (0)	0 (0)	0 (0)	0 (0)	12 (5)	1 (0)	39 (16)
Pain	5 (2)	24 (10)	21 (9)	1 (0)	0 (0)	3(1)	4(2)	25 (10)	4(2)	87 (36)
Skin dehiscence	0 (0)	0 (0)	2(1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (0)	0 (0)	3 (1)
Edema	1 (0)	10 (4)	3(1)	0 (0)	0 (0)	0 (0)	2(1)	7 (3)	1 (0)	24 (10)
Kinking	1 (0)	0 (0)	4 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (2)

ǂPIVC (Peripheral intravenous catheter); ᵡ PICC (Peripherally Inserted Central Catheter); † TIVAD (Totally implantable venous access devices); ɣ Hickman (Type of tunnelled central catheter commonly referred to as a Hickman); ⁹NTCVAD (Non-tunnelled central venous access device; ~ f-TIVAD (Totally implantable venous access devices placed via femoral vein); ⁵PICC-PORT (Totally implantable central venous access in the arm); †Combined, when studies reported two or more VAD Types; * CVC/CVAD (Central venous catheter / Central venous access device);

SUMMARY OF FINDINGS

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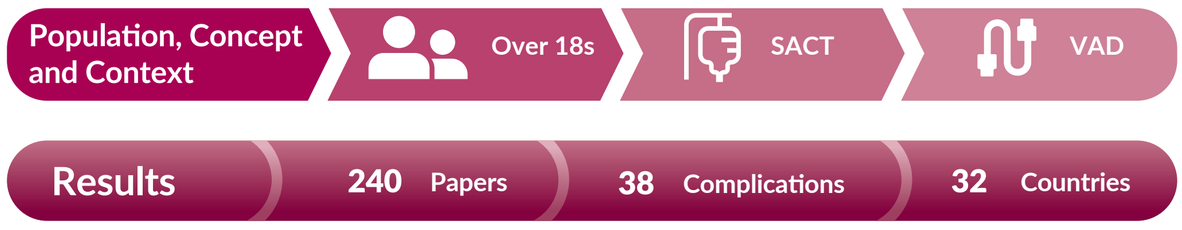
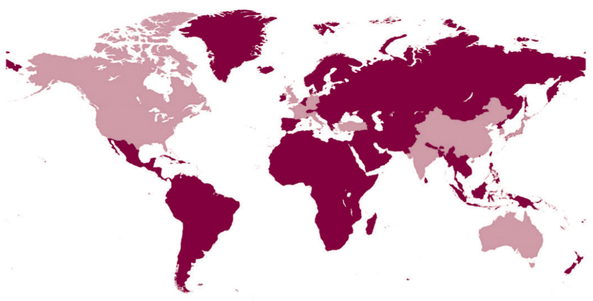


China	62	Canada	13	Korea	10
USA	26	Germany	12	Australia	9
Italy	21	Jordan	10	France	9
UK	15	India	10	Turkey	6



CONCLUSION AND RECOMMENDATIONS

Our results imply that it is appropriate to do a systematic review and meta-analysis on VADs for intravenous SACT. For cancer patients needing VADs for SACT, a particular QOL tool is required. We recommend that post-insertion problems, clinical competency, and the effect of multi-agent SACT regimens on VAD selection need particular study. The multitude of problems associated with VADs and SACT necessitates improvements to current medical device technologies and health service practices. It is necessary to gather vascular access outcomes for the administration of SACT in cancer populations. Ultimately, to support the most optimal VAD for SACT, more interventional studies encompassing all VAD types used for SACT delivery are required.

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ACKNOWLEDGEMENTS

This work is supported through the Research Grant CNRA21DUG.
We would like to acknowledge the support received from the Cancer Managed Clinical Academic Network, Galway and Portiuncula University Hospital. Ballinasloe. Co. Galway.

Irish Cancer Society
National Cancer Control Programme
Office of the Nursing & Midwifery Services Director