

Complication and Failures of Central Vascular Access Device



in Adult Critical Care settings

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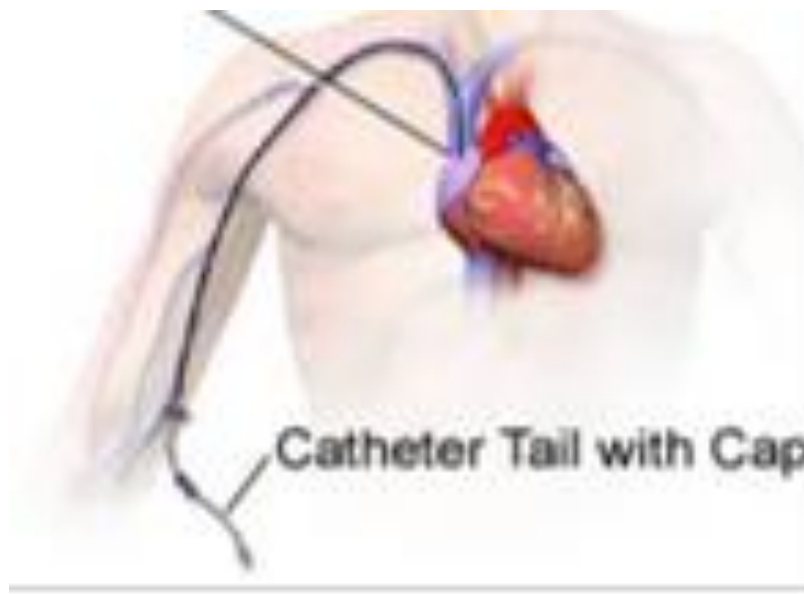
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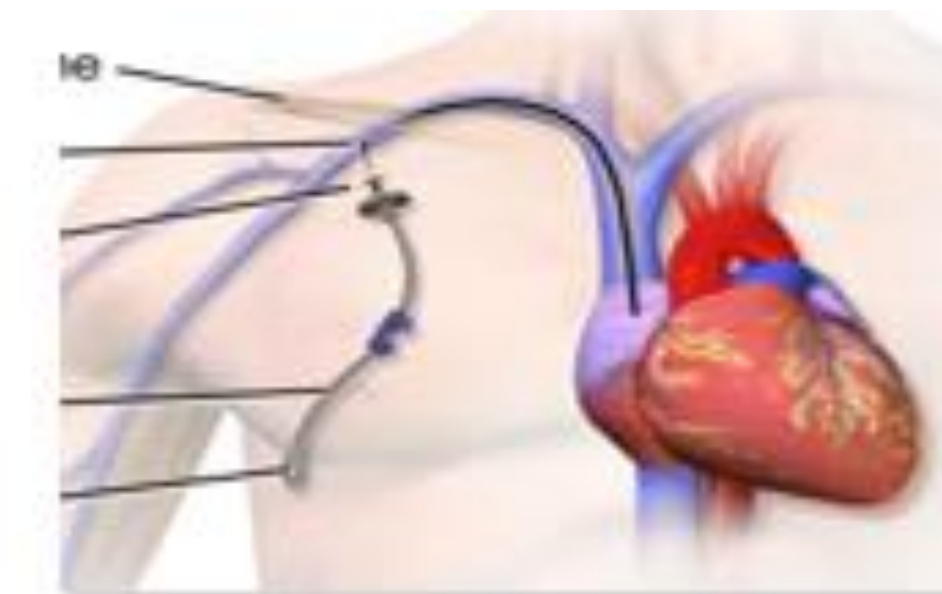
Introduction

Central venous access devices (CVADs) are a vital medical device during critical care admission. Despite CVAD commonality in the intensive care unit (ICU), serious patient harm, relating to insertion and management, remains prevalent. However, there is no such synthesis of CVAD data in adult ICU. The primary aim of this systematic review was to determine the proportion and rate of CVAD failure and complications in adult ICU.

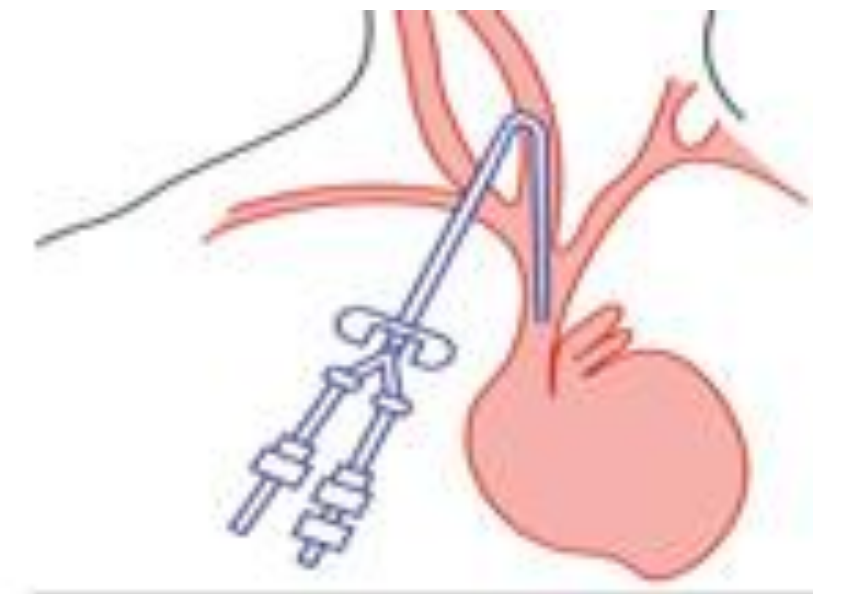
Peripherally Inserted Central catheter



Non-tunnelled CVAD



Haemodialysis Catheter



Blausen.com staff (2014). "Medical gallery of Blausen Medical 2014". *WikiJournal of Medicine* 1 (2). DOI:10.15347/wjm/2014.010. ISSN 2002-4436.

Methods

A systematic search [11/2006-09/2017] was undertaken in four electronic databases. Included studies were of observational or interventional design and reported CVAD failure and complications in adult ICU settings. Data were extracted on the primary outcome, CVAD failure, and secondary outcomes: CVAD complications (central line associated bloodstream infection [CLABSI], catheter related bloodstream infection [CRBSI], catheter-associated venous thrombosis (CAVT), occlusion, catheter removal due to suspected infection, dislodgement, breakage, and local infection).

Results

A total of 63 studies involving 50,000 CVADs (396,951 catheter days) were included. A mix of ICU specialties were represented, including medical/surgical ICU (24%), medical ICUs (11%), and surgical and neurological ICUs (9%), with 25 studies (34%) not specifying the ICU specialty.

CVAD Failure

CVAD failure was 5% (95% CI 3-6%), with the highest rates and proportion of failure in hemodialysis catheters [7% (95% CI 3-12)].

Results (continued)

CVAD Complication

Non-tunnelled CVAD (NTCVAD)

NTCVAD had the highest pooled complication proportion of 4% for CRBSI and CLABSI [3%] and pooled IR of 3.92 per 1,000 catheter days for CRBSI and 5.28 per 1,000 catheter days for CLABSI. NTCVAD had the highest local infection pooled failed proportion [2% and pooled IR [3.01 per 1,000 catheter days].

Peripherally inserted central catheter (PICC)

PICC had the highest CAVT pooled failure proportion of 11% but the lowest CAVT IR of 9.31 per 1,000 catheter days.

Haemodialysis catheter (HD)

HD catheters had the highest IR for CAVT 26.6 per 1,000 catheter days.

Removal of CVAD due to suspected infection was high overall.

Event and CVAD type	Studies	CVADs	Outcomes	Pooled %	95% CI
Failure					
Overall	54	25,770	1,115	5	3-6
NTCVAD	41	22,635	885	4	3-6
PICC	9	1,654	100	6	2-12
HD	4	1,481	130	7	3-12
CRBSI					
Overall	40	24,865	658	3	2-4
NTCVAD	32	22,784	637	4	3-5
PICC	5	671	6	0	0-1
HD	3	1,410	15	1	1-2
CLABSI					
Overall	14	20,297	405	2	1-4
NTCVAD	10	19,115	349	3	1-5
PICC	4	1,182	56	1	0-3
Removal of catheter due to suspected catheter infection					
Overall	19	9,306	1,527	17	13-22
NTCVAD	15	8,003	1,407	20	15-25
PICC	2	66	8	10	3-19
HD	2	1,237	112	9	7-11
Catheter Associated Venous Thrombosis					
Overall	22	7,224	729	10	4-17
NTCVAD	11	4,790	547	9	1-22
PICC	9	1,638	163	11	7-16
HD	2	796	19	1	0-2
Occlusion / Blockage					
Overall	5	807	96	11	4-22
NTCVAD	3	702	78	8	1-20
PICC	1	34	13	38	24-55
HD	1	71	5	7	3-15
Dislodgment / migration					
Overall	16	4,934	114	2	1-3
NTCVAD	13	4,759	108	2	1-3
PICC	2	104	5	2	0-7
HD	1	71	1	1	0-8
Local infection/ phlebitis					
Overall	7	2,044	44	1	1-3
NTCVAD	6	1,994	44	2	1-3
PICC	1	50	0	0	0-7

Table 1: Proportions of CVAD complications across device type (subgroups) in included studies

CVAD: central vascular access device; CI: confidence interval; NTCVAD: non-tunnelled central venous access device; PICC: peripherally inserted central catheter; HD: haemodialysis catheter; No HD studies for CLABSI and local infection/phlebitis outcomes

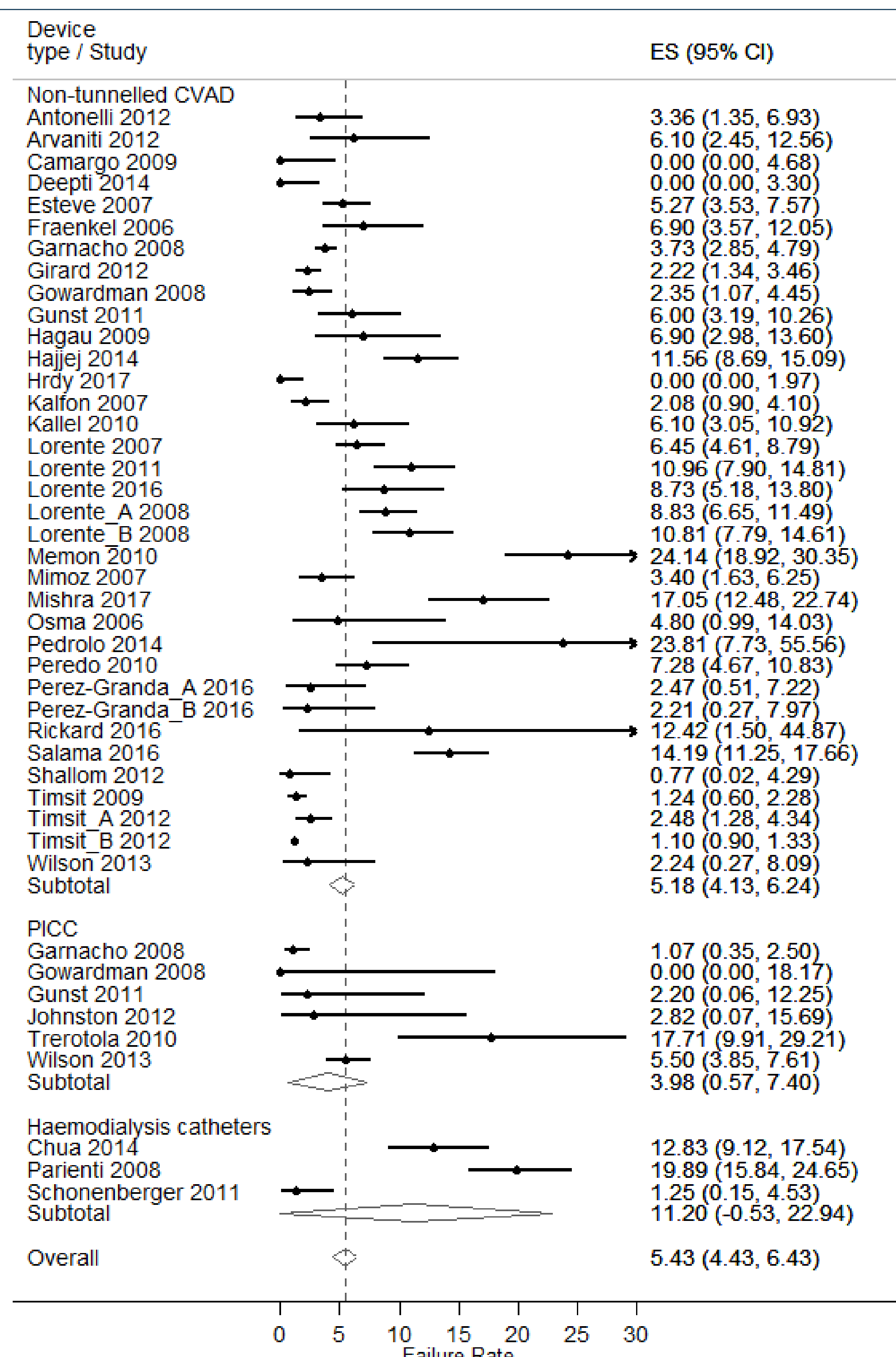


Figure 1. Proportion of CVAD failure (n=54 studies)

CVAD: Central Vascular Access Device; ES: effect size; CI: confidence interval; PICC: peripherally inserted central catheter;

Publication

Takashima M, Schults J, Mihala G, et al. Complication and Failures of Central Vascular Access Device in Adult Critical Care Settings. *Critical Care Medicine* 2018; Online First.

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Conclusion

This systematic review identifies that CVAD complications and failure is a significant problem in adult ICU patients and further efforts are clearly warranted to address this problem. HD catheters particularly require focused research studies and practice innovation, due to the paucity of evidence in this area and their potentially high complication rates. The high proportion of CVADs removed due to suspicion of infection, despite low overall CLABSI and CRBSI rates, indicates a need for robust practice guidelines for removal of CVADs suspected of infection.