Economic Evidence on Hemodialysis Access Creation Procedures in Patients with End-Stage Kidney Disease: A Systematic Literature Review

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Financial Disclosures/Collaborations

Ritu Gupta is employee of Skyward Analytics Pvt. Ltd. and received consulting fees from Bard Australia Pty. Ltd. (a BD Company).

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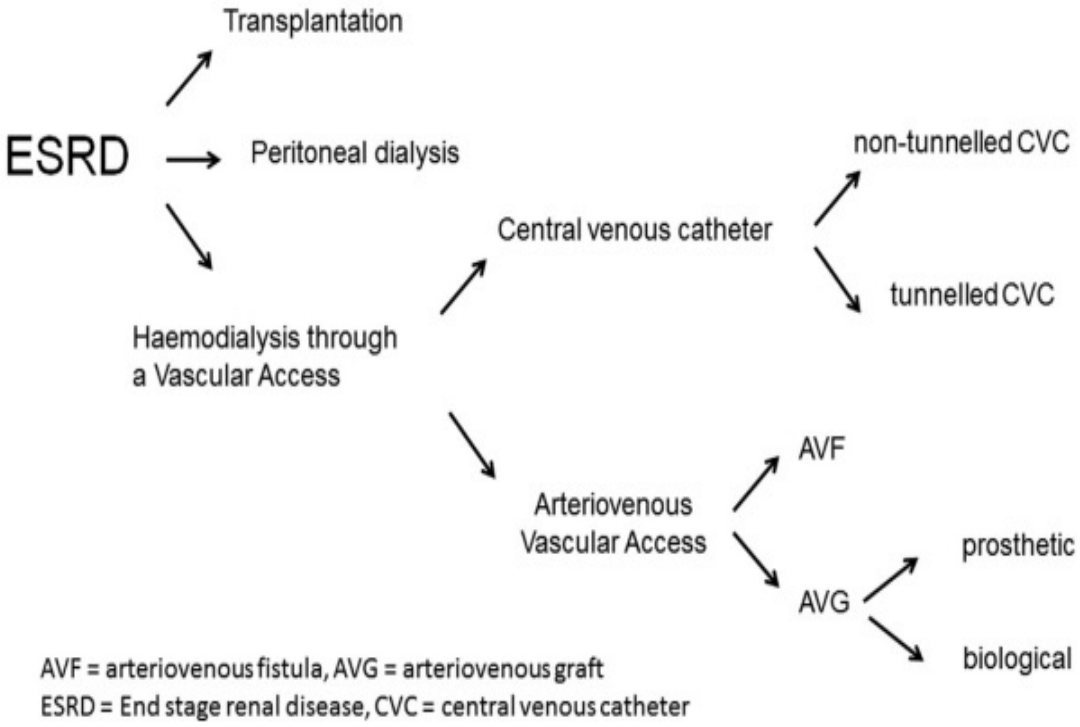
Treatment options for patients with ESKD



- End-stage kidney disease (ESKD)/end-stage renal disease (ESRD) necessitates renal replacement therapy, which is a growing global public health burden[1]
- It is important to create and maintain durable hemodialysis (HD) vascular access (VA) for healthcare systems in order to reduce morbidity and control overall cost control in patients with ESKD[1]
- European guidelines prioritize arteriovenous fistula (AVF) as the primary VA option to support HD[2]
- Unites States guidelines advocate for either AVF or prosthetic arteriovenous graft (AVG) as the first-line options for HD access[3]
- Arteriovenous access (AVF or AVG) is preferred over central venous catheter (CVC) whenever feasible[4]

Sourced from: https://www.ejves.com/action/showPdf?pii=S1078-5884%2818%2930080-7

Study Objective

- A systematic literature review was conducted to understand the health-economic implications of traditional and novel interventions for HD vascular access in patients with ESKD patients

Methodology

Database search

- Electronic databases: MEDLINE, EMBASE, and Cochrane Library were searched
- Search limited to English language articles published after 2012

Screening using PICOS

P: Patients undergoing HD

I: EndoAVF

C: Endovascular procedures, surgical procedures, AVF, AVG, CVC, reinterventions, medical devices

O: Incremental outcomes: costs, QALYs, LYs gained, direct and indirect costs

S: CEA; BIA; Cost analysis; Healthcare costs

Data extraction and analysis

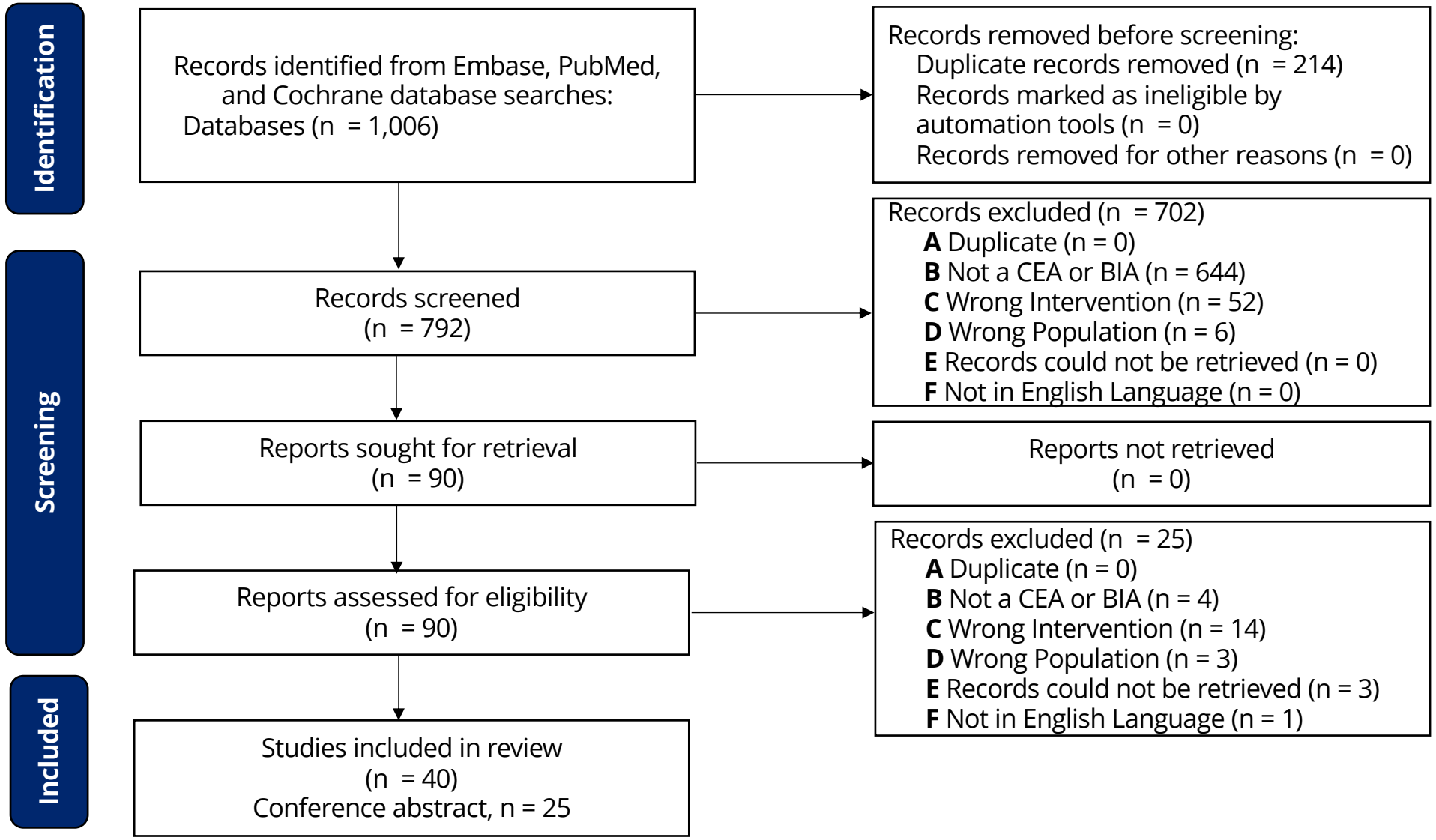
- Relevant data were extracted based on inclusion/exclusion criteria
- All cost data were converted to US dollars using a cost converter*

*CCEMG - EPPI-Centre Cost Converter v.1.4 (ioe.ac.uk)

AVF, Arteriovenous fistula; AVG, Arteriovenous graft; BIA, Budget impact analysis; CVC, Central venous catheter; CEA, Cost-effectiveness analysis; EndoAVF, Endovascular arteriovenous fistula; HD, Hemodialysis; LY, Life year; QALY, Quality-adjusted life year; EMBASE, Excerpta Medica database; MEDLINE, Medical Literature Analysis and Retrieval System Online; US, United States

PRISMA

The literature search yielded 1,006 citations, of which 40 met the inclusion criteria. The flow of studies in the systematic review process is illustrated in the PRISMA flowchart.



BIA, Budget Impact Analysis; CEA, Cost-effectiveness Analysis; PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

General characteristics and appraisal of included studies

Parameter	Number	Source
Types of studies		
CEA	9	[33-41]
Cost studies with a single intervention	7	[5-11]
Cost studies with multiple interventions	21	[12-32]
BIA	3	[42-44]
Country		
Australia and NZ	1	[10]
Brazil	1	[22]
Canada	2	[15,33]
China	1	[20]
India	1	[7]
Italy	1	[9]
Korea	1	[32]
The Netherlands	1	[34]
Portugal	1	[29]
Republic of Korea	1	[8]
Scotland	2	[13,44]
Taiwan	1	[28]
UK	2	[14,40]
USA	24	[5,9,11,12,16-19,21,23-27,30,31,35-39,42,43]
Model Structure used		
Markov model	4	[36,38,39,41]
Monte Carlo simulation	1	[33]
Decision tree & Markov	1	[34]
Decision analytic model	3	[35,37,40]

Parameter	Number	Source
Discount rate		
3%	4	[33,35,36,38]
4%	1	[34]
Not discounted	3	[40,41,43]
NR	32	[5-32,37,39,42,44]
Time horizon		
6 months	1	[44]
1 year	4	[37, 39-41]
5 years	5	[34, 36, 38,42,43]
Lifetime	2	[33,35]
Perspective		
Societal, single-payer	1	[19]
Third-party payer	2	[12,36]
Institutional or payer	1	[37]
Payer	3	[15,33,39]
Healthcare payer	1	[38]
NHS	2	[40,41]
Healthcare system	1	[38]
Medicare's	1	[43]
Public administration	1	[29]
Provider	1	[31]
Not reported	26	[5-11, 13,14,16-18, 20-28, 30, 32, 35, 42,44]
Sensitivity analysis		
Yes	8	[33-38,40,41]
No/NR	32	[5-32,39,42-44]
Quality Assessment Results		
BIA (ISPOR guidelines)		Average score: 63%
Economic evaluations (CHEERS Checklist)		Average score: 58%

BIA, Budget Impact Analysis; CEA, Cost-Effectiveness Analysis; NHS, National Health Service; NR, Not Reported; NZ, New Zealand; UK, United Kingdom; USA, United States of America

Presentation of results by intervention categories

endoAVF vs SAVF

- SAVF cost was at least five times more than endoAVF
- EndoAVF had fewer post-creation procedures and lower costs
- EndoAVF had significantly lower incidence, event rates, and costs
- EndoAVF was dominant over SAVF with lower costs and better quality of life

AVF vs AVG

- AVG had higher costs compared to AVF, primarily due to access-related costs
- AVF was the preferred method of vascular access, offering cost savings
- ECAVGs showed potential for lower costs and improved clinical outcomes
- AVF is considered cost-effective, with an ICER <$62,167 compared to AVG

AVF, AVG and CVC/catheters

- AVF was less costly than AVG and CVC
- CVC access was associated with the highest cost burden
- The frequency and cost of per-patient AVF placement was higher than the AVG and TDC placement
- ECAVGs had significant cost savings over using an AVF and CVC

AVF vs Catheter

- AVF was more affordable and cost-effective than catheters
- AVF access had a lower economic impact vs HD dual-lumen catheter access
- Patients initially received AVF had a higher cost of complications
- Cost of HD access was higher for HD-TCC compared to PD or HD-AVF

Other results

- HeRO was the more affordable vs TDCs
- Two-stage BVTs were more cost-effective and durable than one-stage BVTs
- Increasing the proportion of patients on PD and HHD could reduce costs related to dialysis
- A MDP could save costs and decrease catheter rates in the healthcare system

AVF, Arteriovenous Fistula; AVG, Arteriovenous Graft; BVTs, Basilic vein transpositions ; CVC, Central Venous Catheter; EcAVG, early cannulation AVG; ESRD, End-stage Renal Disease; HD, Hemodialysis; HHD: Home HD; HeRO, Hemodialysis Reliable Outflow Graft; ICER, Incremental Cost-Effectiveness Ratio; MDP, Multidisciplinary Program; PD, Peritoneal dialysis; SAVF, Synthetic AVF; TCC, Tunnelled-cuffed catheters; TCVCs- Tunnelled Central Venous Catheter.

Conclusions

- This SLR summarised findings of both partial and full economic evaluations of VA creation for HD in patients with ESKD.
  - Our findings shed light on the costs and outcomes associated with various techniques used in VA to support HD, considering the specific changes in access type over time in ESKD patients.
- The results consistently indicated that on comparing AVF to AVG and catheters, AVF was the most cost-effective intervention in the majority of the included economic evaluations.
  - Furthermore, the results indicated that endoAVF creation could be a cost-saving strategy for VA to support HD patients with ESKD, compared to other methods like SAVF, AVG, HeRO graft, and CVC.
- The findings of this review highlight the importance of ongoing global economic research on VA creation techniques. High-quality economic evidence is necessary to complement the clinical evidence and inform local and societal guidelines. Furthermore, future research should aim to broaden the evidence base by comparing the costs and consequences of the identified HD VA techniques in developing countries, ensuring a broader understanding of their economic implications.

Next Steps

- Look out for a manuscript in a peer-reviewed journal….
- And hopefully you didn't miss the great poster presentation earlier today that followed on from conducting this SLR!

Budget Impact Analysis of Utilization of WavelinQ Endo Arteriovenous Fistula System for Hemodialysis Patients from an Australian Hospital Perspective

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Poster Board H: Transforming Evidence Synthesis and Health Technology Assessment: The Role of Machine Learning, Novel Tools, and Innovative Approaches

PP	Title	Presenter
101	Clinical and Economic Impact of Flushing Vascular Access Devices with Pre-filled versus Manually-Prepared Saline Flush Syringes in Korea	Yan Ma
102	Impact of Placing Peripherally Inserted Central Catheter at Patient Bedside versus Radiology Suite in a Private Australian Hospital	Yan Ma
103	Budget Impact Analysis of Utilization of WavelinQ Endo Arteriovenous Fistula System for Haemodialysis Patients: An Australian Hospital Perspective	George Papadopoulos
104	Impact of New Permbrolizumab Indications for After Initial Registration by ANVISA - Brazil	Marcus Borin
97	How Health Technology Agencies Estimate Target Population Size for Medical Devices: The Example of Spinal Cord Stimulation.	Liesl Strachan

And finally, THANK YOU

And…. don’t forget to get out of the conference centre and explore Adelaide and its amazing surroundings!