Economic Evidence on Hemodialysis Access Creation

Procedures in Patients with End-Stage Kidney Disease: A

Systematic Literature Review

Authors:

Ritu Gupta¹, Upasna Gaba¹, Chris Delaney^{2,3}, <u>George Papadopoulos</u>⁴ ¹Skyward Analytics Pvt. Ltd., Gurugram, India; ²Flinders University, Australia; ³Flinders University Medical Centre, Australia; ⁴Lucid Health Consulting, Australia









Financial Disclosures/Collaborations

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

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

Chris Delaney is employee of Flinders University and Flinders University Medical Centre, Australia.

George Papadopoulos is employee of Lucid Health Consulting Pty. Ltd. and received consulting fees from Bard Australia Pty Ltd. (a BD Company).

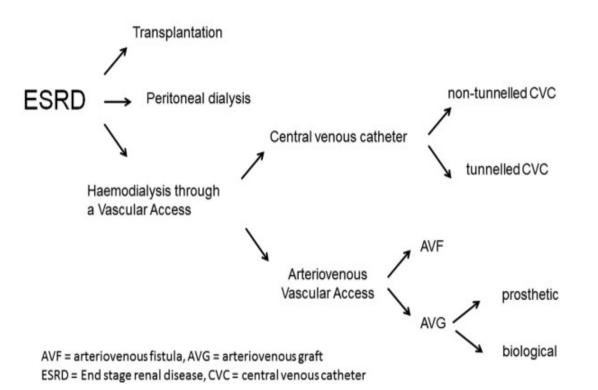








Treatment options for patients with ESKD



- End-stage kidney disease (ESKD)/end-stage renal disease (ESRD) necessitates renal replacement therapy, which is a growing global public health burden¹
- 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 ESKD¹
- European guidelines prioritize arteriovenous fistula (AVF) as the primary VA option to support HD²
- Unites States guidelines advocate for either AVF or prosthetic arteriovenous graft (AVG) as the first-line options for HD access³
- Arteriovenous access (AVF or AVG) is preferred over central venous catheter (CVC) whenever feasible⁴

Objective/Methods

Study Objective

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

Methodology

Screening using PICOS

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

Database search

- 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

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

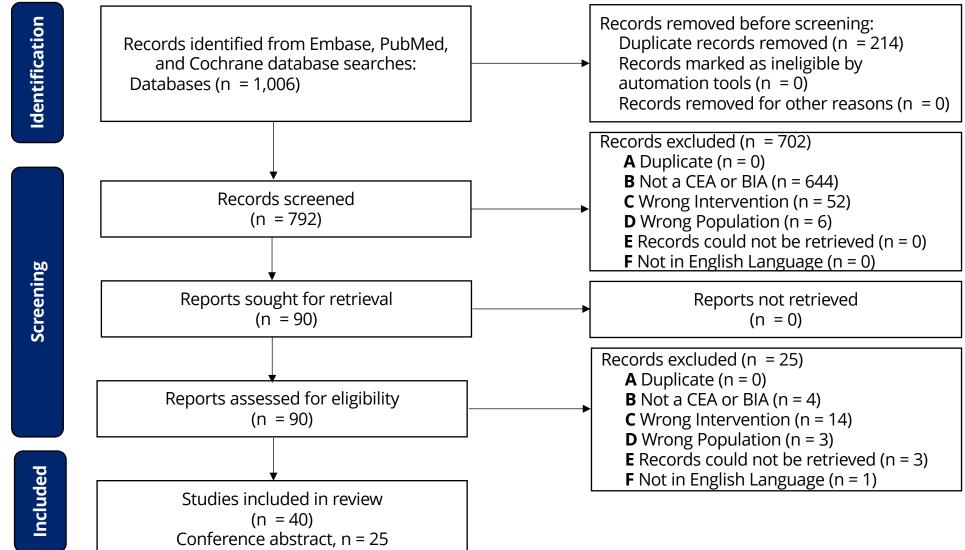
Data extraction and analysis

*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, 4 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.



General characteristics and appraisal of included studies Results

Parameter	Number	Source	Parameter	Number	Source	
Тур	bes of studies	5	Discount rate			
CEA	9	[33-41]	3%	4	[33,35,36,38]	
Cost studies with a single	7	[5-11]	4%	1	[34]	
intervention			Not discounted	3	[40,41,43]	
Cost studies with multiple	21	[12-32]	NR	32	[5-32,37,39,42,44]	
interventions				Time horizon		
BIA	3	[42-44]	6 months	1	[44]	
	Country		1 year	4	[37, 39-41]	
Australia and NZ	1	[10]	5 years	5	[34, 36, 38,42,43]	
Brazil	1	[22]	Lifetime	2	[33,35]	
Canada	2	[15,33]		Perspective	[40]	
China	1	[20]	Societal, single-payer	1	[19]	
India	1	[7]	Third-party payer	2	[12,36]	
Italy	1	[9]	Institutional or payer		[37]	
Korea	1	[32]	Payer Healthcare payer	5 1	[15,33,39] [20]	
The Netherlands	1	[34]	NHS	2	[38] [40,41]	
Portugal	1	[29]	Healthcare system	1	[38]	
Republic of Korea	1	[8]	Medicare's	1	[43]	
Scotland	2	[13,44]	Public administration	1	[29]	
Taiwan	1	[28]	Provider	1	[31]	
UK	2	[14,40]	Not reported	26	[5-11, 13,14,16-18, 20-28,	
USA	24	[5,9,11,12,16-19,21,23-			30, 32, 35, 42,44]	
		27,30,31,35-39,42,43]		Sensitivity analysis		
Model Structure used			Yes	8	[33-38,40,41]	
Markov model	4	[36,38,39,41]	No/NR	32	[5-32,39,42-44]	
Monte Carlo simulation	1	[33]	Quality Assessment Results			
Decision tree & Markov	1	[34]	BIA (ISPOR guidelines)		Average score: 63%	
Decision analytic model	3	[35,37,40]	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 perpatient 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 costeffective 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 costeffective 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: 7 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

Chris Delaney^{1,2}, Blaise Agresta³, Ritu Gupta⁴, George Papadopoulos⁵

¹Flinders University, Australia; ²Flinders University Medical Centre, Australia; ³NHMRC Clinical Trials Centre, the University of Sydney, Australia; ⁴Skyward Analytics, India; ⁵Lucid Health Consulting, Australia

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			

udget Impact Ana	lysis of Utilization	of WavelinQ End	o Arteriovenou	ıs Fistula
System for Hemo	dialysis Patients fr	om an Australian	Hospital Persp	ective

Chris Dalang¹⁷, Malin Agenta¹, Mile Soft, Garry C, Janoge Translopeda² Radon Schereby, Anthele Y Belan Schereby Mellin Strate, Nachol Schereby of Spiroz, Anthele, Yayard analytis, Inde Spatistical Schereby, Lander, Vieland Schereby, Lander, Vieland Schereby, Lander, Vieland Schereby, 1991

mitation of minimumilana.

Table 3: Anno your results

and the second s

Redground and Oldesheet

Patients with and elaps Winey datases (1922) respine receil registerment thange. • The basis and often in the term of harmotalayite (H2), which requires ansular senses (H2) features, 10. Notestably has into generary relias, maching in hespanti interactions and applications.¹ Chinal guideline memory and angle photospansa areas (M2 et al.02) and a statisticant distancement.¹

method version authorizer (CAC) for VA in KC partners.¹ • Technological cohereneously such as endomatorial AP (antibitVP) enables a more methodisation and individual diffusion symposite for methods.¹ • Evaluational marginal APP (addP).¹⁴ Evaluation supports can of antibitVP utilizing the

 Weath-Q Sprine in terms of patency and reduced minimumities.³
 A hadget impact analysis was constanted from an Australian heapital perspection to antimate the badget impact of using analysis³ with the WanalinQ system in HQ

patiants compared to the GAVP and CAC alone.

Modeling free

A single inpact model and included the induction and provident tO patients of the induction in the induction of the inductino of the inductino of the induction of the induction of the indu

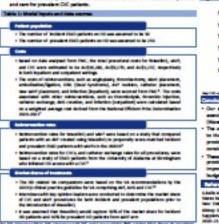
Carter (NIC), for all index providents and automations (applying), threeholysis, threehousteney, senter planeauxi, anderhavion/garine, threehoulogicales, 2011, (2014), spectra of planeauxi, anderse surfaces, 2014 control, neurolif planeauxi, infestion (spectra of an equation). The invidence and provident control and an INC efficient patterns.

- Market shares of CRC and sKVP some dataminant for the incident and prove populations in the yes Waterford plane.
- · Considering the one year time horizon, so descurit rate was applied.
- The mainty part for the analysis are 2021.
 Total noise pre-Manufact introduction wave compared to part Manufact
- sublitution to determine the budget impart. Subservention reduction wave also antimated.

- Table 1 presents the databal model inputs and that data another

 The sufficient and angle rate for Viscolini, and sXVP was assumed to be equival to the second to the XVP.

The number of CAC planetarity use assumed to be one for inci-



1. Second state of the second state of the

that all NTAI 2023, Annual Meeting, 20 28 June 2023 Adminish Avenue



The base case results descendented onto exercising with WarninG. CVC and skill

prevaluran per orderst and per patient for incident and prevalent HD patients at the

PAC in Australia Additionally the implementation of Wavelet2 resultati

Table 3 presents a remandantian symplex of lasts care results of state for inside

and prealest patients at FMC per minori. Although Watalin() incread an

approximately AUG26.3 willing to AUG26.4 willing landing to paramial savings a AUG2.8 willing part wheel.

Face 1 Residue the neuroscient of one may costs per patient for each presenter

The introduction of Washing lighting a significant reduction in 2 year raising

for each presentions in both instituted and prevalues ordereds, as avoidenced by the par-

school and per-patient date. Prior to Wavalled, the initial relationships users 3,333 (a4)47, no.3,353; Circ. no.346, Alber the Introduction of Wavalled, the initial

miniamantions decreased to 1,003, (ManalinG, radio sAVA, rad, 764; CVC, radial

Los techys

is terms of our matters that, the event instantion is relatencestings are 1.04.

101101-001-001

A101.000.000

before and also the benefaction of Wanadelli, Constatying are patient data, it was based that while Wanabell, incurred antibiand material Add(Add), and manifest wavelling the strategy. The third and pare patient of Add(Add) during the pare Wanabelli, phase, decrement in Add(Add) pare patient during the part Wanabelli phase, maching in submerstal accession of Add(Add) pare patient.

becamping out of AU(13) million, its implementation musical in and saving due to subscitus in minimumities rates. The potential total main same subscall from

Stam Stam St. Por specific States and States States

Deskalar

Ger analysis provides actiones suggesting the circled barafile and not analyge associated with the andresanchin actionic-based approach for creating Ad-(Manuful) option in HC patients.

(reaching space of the planes. The adjustion of the planes, is antispated in much in and such p private patricular in the reduction is relationarily providing. Therefore, hespitals and hashing providing doubt not activity from on the initial increase in advect main but does

consider the potential long term savings derived from decrement reinterventions. • Team Realings have important implications for destination makes and hardbares provides the program that this includingly may apprear a specific providing service for improving the efficiency of 10 ares. There is a mask for continual respective to the

kolpt inpet of different IC modelline arrest multiple settings. References

Labels A., Signet H., Dones M., et al. Nature Induces Statistical (2014). Set: A statistical Statisti

And finally, THANK YOU

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

