**Supplementary Material**

1. **Definitions**
2. **Power calculation**
3. **Utilities**

**Supplementary Tables**

1. **Definitions** (Adapted from Sidawy et al[a])

***Primary patency:*** The interval from the time of access placement until any intervention designed to maintain or re-establish patency or access thrombosis. Assessed by blinded Vascular Access Nurse Specialist as presence of thrill and/or bruit.

***Assisted primary patency:*** The interval from the time of access placement until access thrombosis including intervening manipulations (surgical or endovascular) designed to maintain the functionality of a patent access. Assessed by blinded Vascular Access Nurse Specialist as presence of thrill and/or bruit.

***Secondary patency:*** The interval from the time of access placement until access abandonment or thrombosis including intervening manipulations (surgical or endovascular) designed to re-establish functionality in thrombosed access. Assessed by blinded Vascular Access Nurse Specialist as presence of thrill and/or bruit.

***Functional patency:*** The interval from time of access placement until able to sustain useful haemodialysis. As patients in this study were both pre- dialysis and established on haemodialysis, several methods were used for assessing functional patency:

1. ***Ultrasonographic:*** >6mm diameter, <6mm from skin surface, flow rate >600ml/min[b]
2. ***Clinical:*** either
    a. ***Established haemodialysis patient:*** able to sustain haemodialysis flows >200ml/min via two-needle for 6 consecutive dialysis sessions
    b. ***Pre-dialysis:*** assessed by experienced dialysis nurses as being able to sustain above

All patients had functional patency assessed by both clinical and ultrasonographic means. There was 100% concordance between the two measures in the study.

**Immediate patency:** At time of discharge from hospital. Assessed by blinded Vascular Access Nurse Specialist as presence of thrill and/or bruit.

[3] Sidawy AN, Gray R, Besarab A et al. Recommended standards for reports dealing with arteriovenous haemodialysis access. *J Vasc Surg* 2002; **35(3):** 603-610

[b] Vascular Access Working Group. Clinical practice guidelines for vascular access. *AJKD* 2006; **48 Suppl 1:** S176-247.

## 2. Power calculation

A priori power calculation determined that a total of 126 patients (63 in each arm) would be required to detect an improvement in primary patency at 3 months from 65% to 85% in patients having AVF creation under BPB with 80% power and significance 0.05, allowing for 10% loss to follow-up or mortality. The 65% primary patency rate at 3 months is representative of maturation rates for AVF described elsewhere in the literature[c]. We anticipated that an increase in primary patency at 3 months from 65 to 85% was a conservative estimate given local observational data had previously demonstrated AVF patency of 93% in patients having BPB compared to 52% in those having AVF creation under LA[d].

[c] Dember LM, Beck GJ, Allon M *et al.* Effect of clopidogrel on early failure of arteriovenous fistulas for haemodialysis: a randomised controlled trial. *JAMA* 2008; **299:** 2164–71.

[d] Zaliunate R, Kearns R, Clancy M, Macfarlane AJ. Does regional compared to local anaesthesia influence outcome after arteriovenous fistula creation? Presented at the European Society of Regional Anaesthesia, Dresden, Germany. 7-10th September 2011 Available online at: http://download.lww.com/wolterskluwer_vitalstream_com/PermaLink/AAP/A/AAP_36_7_2011_09_06_DAVIS_200526_SDC1.pdf. [Accessed 13th November 2013]

## 3. Utilities

The association between alternative forms of vascular access and health-related quality of life in patients with ESRD has been previously investigated in at least two studies[e] [f]. The same methodology described in Shechter et al. (2017)[g] was applied to derive baseline health utility scores assigned to alternative HD access modalities, utilising published data from survey instruments and a conversion model to map between instruments. The baseline utility score for patients dialysing via TDC was derived from HUI-3 scores collected from 205 patients with advanced chronic kidney disease all assumed to be dialysing via a TDC. Another study demonstrated quality of life benefit (in SF-12 scores) for patients undergoing HD using an AVF instead of a TDC. To derive a baseline utility score for the 'dialysing via AVF' state using common instruments, the SF-12 Mental Composite Score (MCS) and Physical Composite score (PCS) were converted to an HUI-3 score using a mapping algorithm between the two instruments. The average age (57·8 y) and gender distribution (54% male) of the trial cohort were used to perform the mapping and the following baseline utilities used in the model:

| Health state | Baseline utility |
|---|---|
| HD via AVF | 0·767 |
| HD via TDC | 0·677 |

Patients that are pre-dialysis are assumed to derive the same baseline utility as when dialysing via AVF regardless of the functional status of their AVF. No disutility was applied following infection episodes.

[e] Wasse H, Kutner N, Zhang R, Huang Y. Association of initial hemodialysis vascular access with patient-reported health status and quality of life. *CJASN.* 2007; **2(4):**708-14. Epub 05/18.

[f] Gorodetskaya I, Zenios S, McCulloch CE, Bostrom A, Hsu C-Y, Bindman AB, et al. Health-related quality of life and estimates of utility in chronic kidney disease. *Kidney International.* 2005; **68(6):**2801-8.

[g] Shechter SM, Chandler T, Skandari MR, Zalunardo N. Cost-effectiveness Analysis of Vascular Access Referral Policies in CKD. *American Journal of Kidney Diseases.* 2017; **70(3):**368-76.

## Supplementary Tables

*Table S1: Adjusted transition probabilities used in the model*

| Timeframe | Transition | BPB | LA |
|---|---|---|---|
| *At 3 months* | Success probability (functional AVF) | 41·27% | 28·57% |
| | Partial success (primary but non-functional AVF) | 42·86% | 33·33% |
| | Failure | 15·87% | 38·10% |
| | Death | 0·00% | 0·00% |
| *Post-3 months* | Functional AVF to failure | 1·30% | 5·90% |
| | Functional AVF to death | 2·63% | 3·85% |
| | Primary (non-functional) to functional patency | 30·66% | 47·72% |
| | Primary (non-functional) patency to failure | 11·05% | 3·28% |
| | Primary (non-functional) patency to death | 1·25% | 1.61% |
| | Surgical revisions* | 5.60% | 2·16% |
| | Radiological revision: angioplasty | 2·16% | 0·53% |
| | Radiological revision: stenting | 1·07% | 0·00% |

***Includes: superficialisation, collateral litigation, revision of anastomosis, DRiL, radiological declot, and proximalisation.*

*Table S2: Corresponding dosages and list prices for the medicines utilised in preparing the anaesthetic solutions and other auxiliary medicines required per treatment arm.*

| | Dosage (per patient) | Price (pack size) | Source |
|---|---|---|---|
| **LA arm** | | | |
| Anaesthetic solution of 0.5% L-bupivacaine + 1% lidocaine | 14·7 mL | Calculation | Dosage from RCT |
| *10mL 0.5% L-bupivacaine* | 1 x ampoule | £16·15 (10x ampoule) | BNF* |
| *5mL 1% lidocaine* | 2 x ampoule | £2·59 (10x ampoule) | BNF |
| **BPB arm** | | | |
| Anaesthetic solution of 0.5% L-bupivacaine + 1.5% lidocaine with adrenaline 1 in 200,000 | 23.7 mL | Calculation | Dosage from RCT |
| *10mL 0.5% L-bupivacaine (ampoule)* | 2 x ampoule | £16·15 (10x ampoule) | BNF |
| *5mL 1% lidocaine (ampoule)*** | 2 x ampoule | £2·59 (10x ampoule) | BNF |
| *5mL 2% lidocaine (ampoule)* | 2 x ampoule | £2·70 (10 x ampoule) | BNF |
| *1mg adrenaline (ampoule)* | 1 x ampoule | £80·44 (10 x ampoule) | BNF |
| 5mL 1% lidocaine to numb skin prior to BPB | 1 x ampoule | £2·59 (10 x ampoule) | BNF |
| 5 mL 1mg/mL midazolam | 1 x ampoule | £6·00 (10 x ampoule) | BNF |

*List prices were taken from the BNF)[h], with preference given to generic or less costly formulations.**Where anaesthetic supplementation was required in either arm, it was assumed the patient incurs an additional cost relating to the medicines utilised in the local anaesthetic solution.

[h] British National Formulary 2018. Available online at https://bnf.nice.org.uk. Accessed 02/09/18

*Table S3: Medical equipment and consumables used for anaesthesia*

| | Units required | Price (pack size) | Source |
|---|---|---|---|
| **LA arm** | | | |
| 20mL syringe | 1 | £12·00 (120 units) | National Procurement |
| 23G needle | 2 | £2·49 (100 units) | Market price |
| | | | |
| **BPB** | | | |
| 20mL syringe | 2 | £12·00 (120 units) | National Procurement |
| 5mL syringe for midazolam | 1 | £4·99 (100 units) | Market price |
| 2mL syringe for skin infiltration | 1 | £2·79 (100 units) | Market price |
| 1mL insulin syringe to add adrenaline | 1 | £8·99 (120 units) | Market price |
| 21G Braun stimuplex A block needle | 1 | £5·40 (1 unit) | Expert opinion |
| 25G needle | 1 | £2·69 (100 units) | Market price |
| 18G drawing up needle | 1 | £2·49 (100 units) | Market price |
| 20G venflon | 1 | £1.29 (1 unit) | Market price |
| Dressing for venflon | 1 | £30·99 (50 units) | Market price |
| Chlorhexidine spray | One application* | £6·57 (1 unit) | Market price |
| Sterile surgical gloves | 1 | £48·11 (40 units) | Market price |
| Sling | 1 | £2.15 (5 units) | Market price |
| Tegaderm probe cover | 1 | £0·22 (1 unit) | Expert opinion |
| Eden Ultrasound Gel | 1 | £2·48 (1 unit) | Expert opinion |
| Ultrasound machine** | 1 | £25,000 (1 unit) | Expert opinion |

*Assuming 50 applications per recipient.

**Initial capital outlay was converted into an equivalent annual cost (EAC) using the formula[i] and assuming a discount rate of 3.5% and a five-year operating lifetime for the machine. The EAC was attributed on a per intervention basis using the mean number of surgeries performed in a day and the number of working days in a year.

[i] $EAC = \frac{Asset\ Price * Discount\ Rate}{1-(1+Discount\ Rate)^{-number\ of\ periods}}$

*Table S4: Break-down of anaesthesia staff and afferent costs involved in the two anaesthetic procedures*

| | Estimate (SD) | Source |
|---|---|---|
| **Mean time required to perform anaesthesia** | | |
| LA arm | 3·4 min (2·5) | RCT |
| BPB arm | 17 min (5·7) | RCT |
| **Staff responsible for administering anaesthesia** | | |
| LA arm | 1 x consultant surgeon | Expert opinion |
| BPB arm | 1 x consultant anaesthetist<br>1 x band 6 nurse | Expert opinion |
| **Staff cost per working hour** | | |
| Consultant anaesthetist | £108·00 | PSSRU[j] |
| Band 6 nurse | £45·00 | PSSRU |
| Band 5 nurse | £37·00 | PSSRU |

[j] Curtis LA, Burns A. Unit Costs of Health and Social Care 2018, University of Kent. Available online at: https://doi.org/10.22024/UniKent/01.02.70995 Accessed 19/05/2019

*Table S5: Additional costs relating to new AVF creation, AVF revision, TDC insertion and on-going dialysis*

| Procedure | Cost | Source |
|---|---|---|
| New AVF creation | £2,095·00 | NHS Reference Costs 2017/2018[k] YQ42Z: Open Arteriovenous Fistula, Graft or Shunt Procedures; day cases |
| Surgical revision | £1,280·00 | NHS Reference Costs 2017/2018 YR48Z: Attention to arteriovenous fistula, graft or shunt; day cases |
| Radiological revision: angioplasty | £1,262·00 | NHS Reference Costs 2017/2018 AYR11: Percutaneous Transluminal Angioplasty of Single Blood Vessel; average of CC scores 0-9+; day cases |
| Radiological revision: stenting | £2,217·00 | NHS Reference Costs 2017/2018 YR12Z: Percutaneous Transluminal Angioplasty with Insertion of Stent Graft into Peripheral Blood Vessel; day cases |
| TDC insertion* | £741·00 | NHS Reference Costs 2017/2018 YR41A: Insertion of Tunnelled Central Venous Catheter; day cases |
| HD via AVF tariff** | £161·00 | NHS Reference Costs 2017/2018 LD02A: Hospital Haemodialysis or Filtration, with Access via Arteriovenous Fistula or Graft |
| HD via TDC tariff** | £151·00 | NHS Reference Costs 2017/2018 LD01A: Hospital Haemodialysis or Filtration, with Access via Haemodialysis Catheter |
| Sepsis treatment cost | £7,583·66 | NHS Reference Costs 2017/2018 WJ06: Sepsis With Multiple Interventions; weighted average |

*****Patients required to start dialysis without a functional AVF will undertake a TDC insertion procedure. It is assumed this remains available for the patient to switch on and off TDC until the end of the time horizon.
******A tariff per dialysis session was applied. Patients were assumed to dialyse for three sessions per week.

[k] NHS Reference Costs 2017-18. Available online at https://improvement.nhs.uk/resources/reference-costs/. Accessed 02/09/18

*Table S6: Parameters included in the probabilistic sensitivity analysis and their associated distributions*

| Parameter | Sample mean | low 95% CI | high 95% CI | SD | SE | Alpha | Beta | Distribution |
|---|---|---|---|---|---|---|---|---|
| BPB administration time | 17 | 15·59 | 18·41 | 5·7 | 0·72 | 560·3878116 | 0·030336134 | Gamma |
| BPB pre-assessment time | 15 | | | | 1·5 | 100 | 0·15 | Gamma |
| LA supplementation (LA arm, %) | 14% | 7% | 21% | 0·0182 | | 52·68286383 | 316·097183 | Beta |
| LA supplementation (BPB arm, %) | 3% | 2% | 5% | 0·0040 | | 59·51212395 | 1815·119781 | Beta |
| Consultant anaesthetist unit cost per working hour | £108·00 | | | | £10·80 | 100 | 1·08 | Gamma |
| Nurse (band 6) unit cost per working hour | £45·00 | | | | £4·50 | 100 | 0·45 | Gamma |
| Nurse (band 5) unit cost per working hour | £37·00 | | | | £3·70 | 100 | 0·37 | Gamma |
| New AVF cost | £2,095·00 | | | | £209·50 | 100 | 20·95 | Gamma |
| New TDC insertion cost | £741·00 | | | | £74·10 | 100 | 7·41 | Gamma |
| AVF surgical revision cost | £1,218·00 | | | | £121·80 | 100 | 12·18 | Gamma |
| AVF radiological revision: angioplasty | £1,262·00 | | | | £126·20 | 100 | 12·62 | Gamma |
| AVF radiological revision: stenting | £2,217·00 | | | | £221·70 | 100 | 22·17 | Gamma |
| HD via AVF tariff | £161·00 | | | | £16·10 | 100 | 1·61 | Gamma |
| HD via TDC tariff | £151·00 | | | | £15.10 | 100 | 1·51 | Gamma |
| BPB arm: 3m success probability (functional AVF) | 41·27% | 21% | 62% | 0·0526 | | 36·09751781 | 51·36954457 | Beta |
| BPB arm: 3m partial success (primary but not functional AVF) | 42·86% | 21% | 64% | 0·0547 | | 35·12190922 | 46·82921229 | Beta |
| BPB arm: post-3m functional AVF to failure | 1·30% | 1% | 2% | 0·0017 | | 60·66502556 | 4610·013219 | Beta |
| BPB arm: post-3m functional AVF to death | 2·63% | 1% | 4% | 0·0034 | | 59·84512741 | 2213·205359 | Beta |
| BPB arm: post-3m primary (non-functional) to functional patency | 30·66% | 15% | 46% | 0·0391 | | 42·61630053 | 96·3625595 | Beta |
| BPB arm: post-3m primary (non-functional) patency to failure | 11·05% | 6% | 17% | 0·0141 | | 54·66962694 | 439·9313871 | Beta |
| BPB arm: post-3m primary (non-functional) patency to death | 1·25% | 1% | 2% | 0·0016 | | 60·69496882 | 4794·393517 | Beta |
| LA arm: 3m success probability (functional AVF) | 28·57% | 14% | 43% | 0·0364 | | 43·90238652 | 109·7559663 | Beta |
| LA arm: 3m partial success (primary but not functional AVF) | 33·33% | 17% | 50% | 0·0425 | | 40·97556075 | 81·95112151 | Beta |
| LA arm: post-3m functional AVF to failure | 5·90% | 3% | 9% | 0·0075 | | 57·83921846 | 923·0855287 | Beta |
| LA arm: post-3m functional AVF to death | 3·85% | 2% | 6% | 0·0049 | | 59·09698489 | 1475·878215 | Beta |
| LA arm: post-3m primary (non-functional) to functional patency | 47·72% | 24% | 72% | 0·0609 | | 32·13045074 | 35·19482229 | Beta |
| LA arm: post-3m primary (non-functional) patency to failure | 3·28% | 2% | 5% | 0·0042 | | 59·44667933 | 1752·355146 | Beta |
| LA arm: post-3m primary (non-functional) patency to death | 1·61% | 1% | 2% | 0·0021 | | 60·47182354 | 3688·125613 | Beta |
| BPB arm: surgical revisions probability | 5·60% | 3% | 8% | 0·0071 | | 58·02225518 | 978·348738 | Beta |
| BPB arm: radiological revisions (angioplasty) probability | 2·16% | 1% | 3% | 0·0028 | | 60·13398507 | 2720·186311 | Beta |
| BPB arm: radiological revisions (stenting) probability | 1·07% | 1% | 2% | 0·0014 | | 60·80592879 | 5624·112499 | Beta |
| LA arm: surgical revisions probability | 2·16% | 1% | 3% | 0·0028 | | 60·13398507 | 2720·186311 | Beta |
| LA arm: radiological revisions (angioplasty) probability | 0·53% | 0% | 1% | 0·0007 | | 61·13640228 | 11432·28985 | Beta |
| HD via AVF utility | 0·767121 | | | 0·0767 | | 23·2879 | 7·069631602 | Beta |

| | | | | | |
|---|---|---|---|---|---|
| HD via TDC utility | 0·676824 | 0·0677 | 32·3176 | 15·43129779 | Beta |
| Sepsis incidence on AVF (per 1,000 dialysis days) | 0·2 | 0.02 | 100 | 0.002 | Gamma |
| Sepsis incidence on TDC (per 1,000 dialysis days) | 1·4 | 0·14 | 100 | 0·014 | Gamma |
| Weighted average sepsis cost | £7,583·66 | £758·37 | 100 | 75·83659252 | Gamma |

*Table S7: Scenario sensitivity analysis*

| **Scenario** | **ICER (£/QALY)** |
|---|---|
| Baseline | £12,898·87 |
| Excluding ongoing haemodialysis costs | Dominating |
| % starting cohort pre-dialysis: 0% | £11,114·15 |
| % starting cohort pre-dialysis: 100% | £15,259·33 |
| Time horizon: 4 years | £10,193·59 |
| Time horizon: 3 years | £4,399·35 |
| Time horizon: 2 years | Dominating |
| Time horizon: 1 year | Dominating |
| Discount rate: 0% | £13,425·35 |
| Discount rate : 5% | £12,667·69 |
| Cohort starting age: 50 | £12,759·65 |
| Cohort starting age: 70 | £13,019·88 |
| Gender distribution: 100% female | £12,862·49 |
| Gender distribution: 100% male | £12,920·34 |

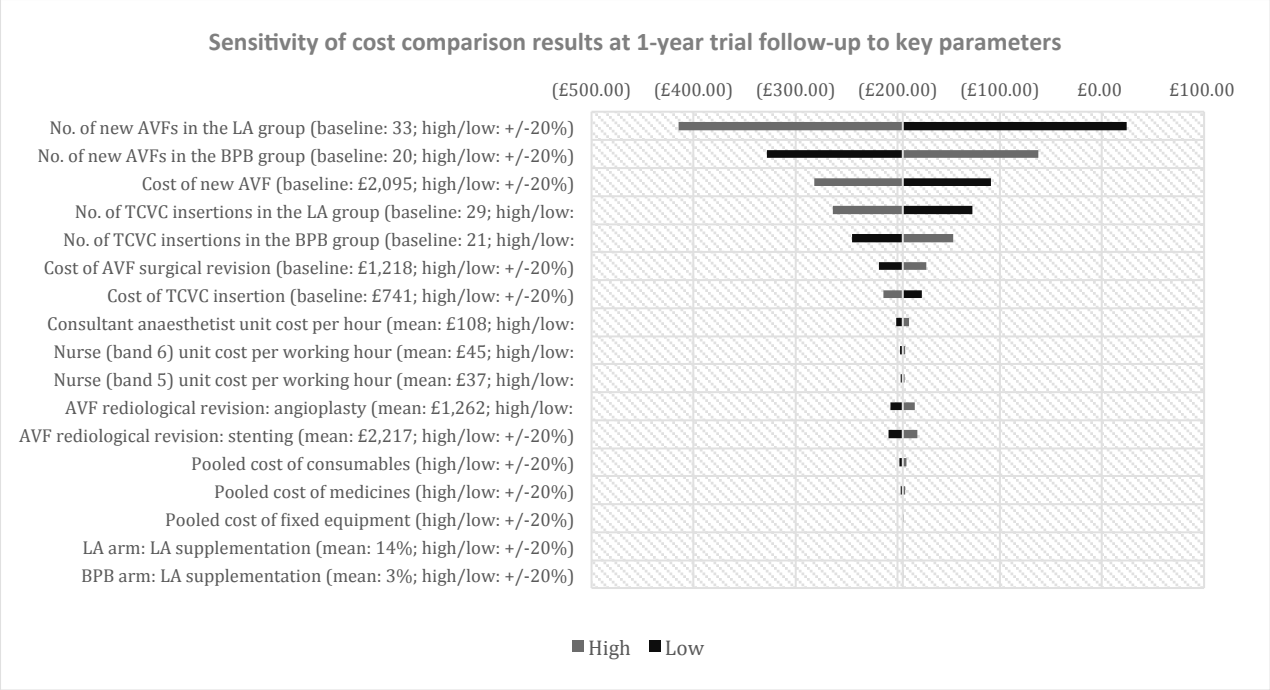


Figure S1: One-way sensitivity of RA vs LA incremental cost at 1-year to key analysis parameters