

Scottish Renal Registry

*Scottish Haemodialysis
Vascular Access
Appraisal*

Summary Document

Scott W. Oliver, Jacqueline Campbell, David B. Kingsmore, Ram Kasthuri,
Jamie Traynor, Wendy Metcalfe, Peter C. Thomson

In conjunction with



*Darlinda's Charity for Renal Research
and the University of Glasgow*

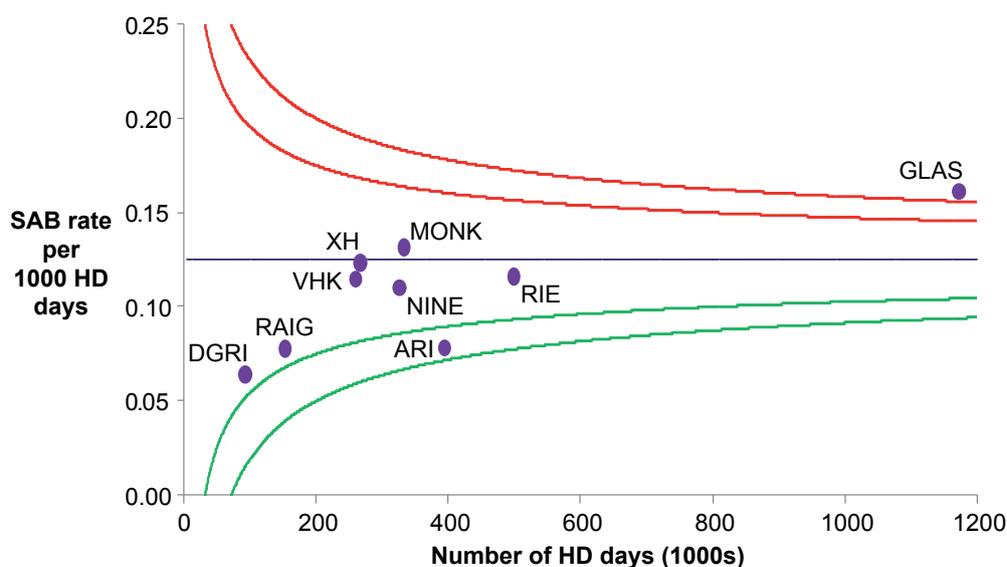
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BACKGROUND

In 2014 the Scottish Renal Registry in conjunction with Darlinda's Charity for Renal Research and the University of Glasgow, undertook a Scottish Appraisal of Haemodialysis Vascular Access Services in NHS Scotland. This project attempted to understand vascular access as a whole system rather than simply measuring individual statistics relating to certain aspects of its productivity. **The full report is available to view on the Scottish Renal Registry website in the publications section (<http://www.srr.scot.nhs.uk/Projects/Projects3.html#SVAA>).**

This was an unprecedented exercise, undertaken in light of significant variation between Scottish NHS Health Boards in the proportion of patients who receive haemodialysis (HD) through arteriovenous (AV) access. Low rates of AV access are recognised as incurring considerable financial costs to health boards, not to mention high rates of morbidity, hospitalisation and mortality to renal patients, often through the development of *Staphylococcus aureus* bacteraemia (SAB) and other complications associated with central venous catheters (CVCs) [Figure 1].

Figure 1 *Staphylococcus aureus* bacteraemia rate per 1000 HD-exposed days for HD patients by adult renal service 2010–2014.



Surgical creation of AV access is challenging and is reliant on good quality blood vessels (often requiring radiological imaging to identify them), technically demanding vascular surgery, and an indeterminate period of maturation that may last several weeks or months (thus necessitating early identification and planning of access by nephrologists). Even once AV access has been successfully created it may fail due to thrombosis or developing stenosis in the blood vessels. CVCs on the other hand provide a near-immediate usable access point to the bloodstream and therefore have traditionally been the default vascular access method of choice when AV access has not been successfully established.

METHODS

The project involved several strands; (i) visits to all nine adult and one paediatric renal units around Scotland to conduct interviews with patients and key members of the nephrology, vascular surgery and radiology teams; (ii) an internal validation study to assess the face validity of the interview process; and (iii) the collection and analysis of variables that relate to the haemodialysis population, the haemodialysis vascular access pathway, and haemodialysis vascular access practices in use in all nine adult renal units in NHS Scotland. This included measurement of all vascular access-related activity in Scotland during a six-week census period.

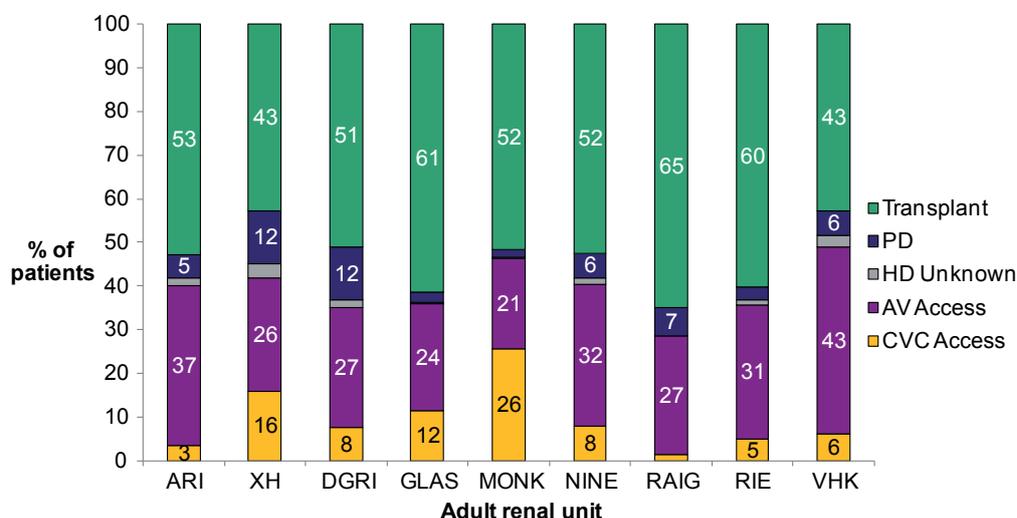
RESULTS

All renal centres in Scotland were visited where a total of fifty-two interviews were conducted and audio-recorded. The audio-recordings from each interview were transcribed by a team of secretarial staff. The transcripts were extensively quality assured and analysed with nVivo software. These data along with numerical data on variables that related to the HD populations, the vascular access pathways, and vascular access practices in use in all the renal centres were then collated and analysed.

POPULATIONS

There are currently just fewer than 1900 people in Scotland who receive regular dialysis treatment with HD. Variation exists between units, not only in the proportion of HD patients using AV access, but in the proportion of RRT patients using non-haemodialysis methods of renal replacement therapy (RRT) such as peritoneal dialysis (PD) and renal transplantation [Figure 2].

Figure 2 Proportion of patients on HD, PD and Transplant on 31/12/2014 (CVC and AV access proportions based on SRR census May 2015).



The quantitative data reflecting a 6-week period of all vascular access activity in the adult renal services provided insights into the heavy workload associated with the delivery of vascular access services. These data were used to provide projections on the total amount of activity expected in 1 year. It is expected that these projections provide conservative estimates of true activity due to under-reporting of events during the census period.

Table 1 Expected vascular access activity in Scotland over a 1-year period, based on data received during the 6 week census.

	Total in 1 Year	Total per prevalent HD Patient per Year	Total per prevalent 100 HD Patients per Year
All Surgical Activity	1309	0.699	69.9
All Interventional Radiology Activity	1863	0.995	99.5
All NTCVC insertions	234	0.125	12.5
All USS	1364	0.731	73.1
All Overnight Bed Procedures*	1019	0.546	54.6
All Day Case bed procedures*	2858	1.532	153.2

NTCVC = non-tunnelled central venous catheters, USS = ultrasound scan

* Incomplete 6-week census data makes these projections a likely underestimate of true activity.

Recommendation 1 – CVC use as a proportion of all renal replacement therapies should be regarded as the preferred method of studying the variation in vascular access methods between populations.

Recommendation 2 – SAB rates expressed as the number of events per 1000 HD-exposed days should be routinely reported by renal services.

Recommendation 3 – Renal services should expect an average of 70 surgical procedures per 100 prevalent HD patients per year to create and maintain arteriovenous access for haemodialysis.

Recommendation 4 – Renal services should expect an average of 100 interventional radiology procedures per 100 prevalent HD patients per year to create and maintain haemodialysis access.

Recommendation 5 – Renal services should expect an average of 70 departmental vascular access ultrasound sessions per 100 prevalent HD patients per year to create and maintain haemodialysis access.

Recommendation 6 – Renal services should expect 25% of all haemodialysis access procedural activity to require an overnight inpatient hospital stay of at least one day in duration.

THE PATIENT EXPERIENCE

No units routinely surveyed patients about their experiences having vascular access created or maintained, although every centre had a patient education programme. Patients were generally supportive of their clinicians but reported significant uncertainty, frustration and physical discomfort when discussing their AV access or CVC. There was

limited recollection of education programmes and in most cases patients' opinions about access modalities were influenced more by personal experience and other patients in the haemodialysis units than by staff education.

Recommendation 7 – Measurement of patient experience should be a focus for future assessments of a vascular access service.

Recommendation 8 – Time should be allocated for the delivery of education about vascular access methods and maintenance to all patients for whom haemodialysis is being contemplated. This should include information about avoiding venepuncture and blood pressure measurement on the appropriate arm.

Recommendation 9 – Education on vascular access methods and maintenance should be provided regularly to patients throughout their tenure on haemodialysis. This should be considered a cornerstone of routine haemodialysis care, rather than a single intervention delivered prior to commencing haemodialysis, with the aim of facilitating patient-reporting of potential access problems.

CREATION OF VASCULAR ACCESS

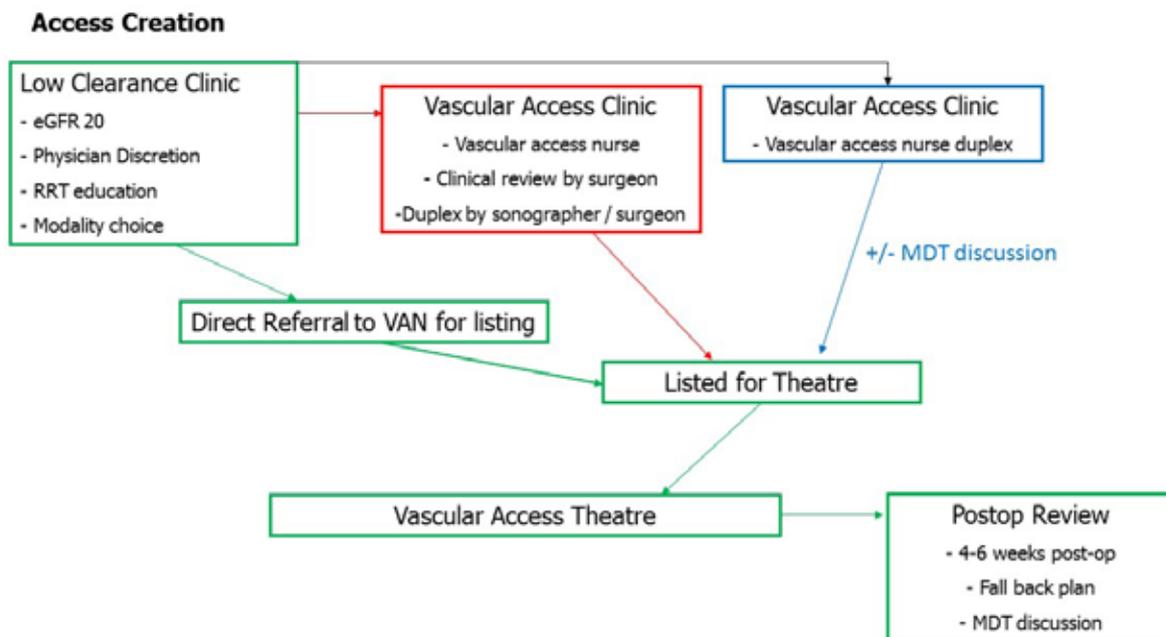
Nephrologists tended to refer patients for access creation based upon their degree of kidney failure, but often struggled to gauge the timing of referral. Lengthy delays awaiting vascular imaging or anaesthetic pre-assessment were reported in some centres.

Some units operated 'one stop clinics' where patients had a vascular scan and met a surgeon and vascular access nurse at the same appointment. Elsewhere practice varied between every case being routinely discussed at a multi-disciplinary team (MDT) meeting before listing for theatre, to patients seeing a vascular access nurse who would perform a scan and list the patient for a specific procedure or an 'explore and proceed' procedure depending on the scan result.

While most units had some protected operating space for AV fistula (AVF) or graft (AVG) creation it was common for procedures to be postponed for non-clinical reasons, or displaced by other cases. Post-operative review varied from six times in the first two weeks, to once within six weeks following surgery. It was uncommon for patients to have a pre-defined plan to follow in the event that a fistula failed to mature. In every centre it was reported to be common for patients to start haemodialysis using a CVC due to the logistical difficulties in creating a functioning AVF within the available time.

Three types of simple pathway were identified for routinely establishing new arteriovenous access (figure 3):-

Figure 3 The three types of simple pathway used by renal services to create new arteriovenous access.



Recommendation 10 - All patients who may require haemodialysis should have a clear “personal access strategy” that defines optimal form of vascular access and is framed within the wider context of their “personal renal replacement therapy solution”.

Recommendation 11 – All patients’ “personal access strategies” should be documented by the time their eGFR reaches 15 ml/min, following which the strategy may be reviewed regularly, and activated when necessary.

Recommendation 12 – Clinicians or teams running low clearance clinics are responsible for documenting the “personal renal replacement therapy (RRT) strategy” and “personal access strategy” for each patient.

Recommendation 13 – Clinicians or teams running low clearance clinics should have access to the current waiting times for successful AV access creation in their service.

Recommendation 14 – Renal units should have clearly articulated, written pathways for the creation and maintenance of vascular access.

Recommendation 15 – Electronic health records should be utilised to simplify referral into access creation and maintenance pathways, and to assist in tracking the patient journey thereafter.

Recommendation 16 – Pre-operative vein map ultrasound scanning is preferable prior to undergoing arteriovenous fistula creation surgery, however in some instances may not be required where there is a clear native arteriovenous access option on clinical examination.

Recommendation 17 - All renal services should have access to a suitably trained sonographer to perform ultrasound vein mapping.

Recommendation 18 - In the majority of patients there is uncertainty as to what native arteriovenous access options exist. For these patients, they should have access to a one-stop vascular access clinic, where ultrasound scanning, clinical review and a decision for theatre may all be undertaken at a single attendance.

Recommendation 19 - USS duplex vein mapping scan should be available for all patients within two weeks of referral.

Recommendation 20 - All patients who present late with likely advanced chronic kidney disease and require renal replacement therapy should have an initial personal access strategy determined within one week of referral to nephrology. This strategy should be activated once recovery of sufficient native renal function appears to be unlikely.

Recommendation 21 - Patients who require emergency vascular access provision in the setting of established renal failure should be routinely audited in the setting of a vascular access morbidity and mortality meeting.

Recommendation 22 - All renal services should have access to protected slots for interventional radiology (IR) and surgical vascular access procedures related to their expected workload (see Table 1).

Recommendation 23 - Slots for elective vascular access creation procedures should be available to book with at least four weeks' notice.

Recommendation 24 - Slots for emergency vascular access creation and maintenance procedures should be available with 48 hours' notice.

Recommendation 25 - Vascular access procedures should be categorised as 'urgent' or 'emergency' and should not be subject to displacement by other cases for non-clinical reasons

Recommendation 26 - Any vascular access procedure that is cancelled for non-clinical reasons should be routinely audited and reviewed at a vascular access morbidity and mortality meeting.

Recommendation 27 - Vascular Access Coordinators should have the clinical authority, the technical knowledge and the administrative capability to directly allocate specific surgery or interventional radiology slots to named patients for the creation or maintenance of vascular access in keeping with the clinical confidence of the clinicians on the team.

Recommendation 28 - Vascular Access Coordinators (VAC) should be enabled to re-order existing vascular access surgery and radiology procedure lists.

Recommendation 29 - Where administrative staff are required to book procedures, they should be available during normal working hours to liaise with VAC, and their role should be prospectively covered in the event of planned or unplanned absences.

Recommendation 30 – Renal units should maintain a ‘priority list’ of patients that identifies which patient is next in line to have a procedure performed, in the event of an additional slot becoming available. This should be easily accessible to all relevant members of the broader clinical team.

Recommendation 31 – Administrative delays should be routinely audited and discussed at the vascular access morbidity and mortality meeting.

Recommendation 32 – Referrals made that do not involve the referral pathway for vascular access should be considered ‘adverse events’ and specifically discussed at a vascular access morbidity and mortality meeting.

Recommendation 33 – Renal services should have access to ‘Day surgery’ beds for elective/semi-elective arteriovenous access work.

Recommendation 34 – Renal inpatient services should have co-located vascular surgical and interventional radiology services available for patients undergoing complex access work or who require an overnight stay.

MAINTENANCE OF VASCULAR ACCESS

Maintenance seemed most successful in centres that proactively identified potential problems and either rapidly intervened or acted to create new access before the existing strategy failed.

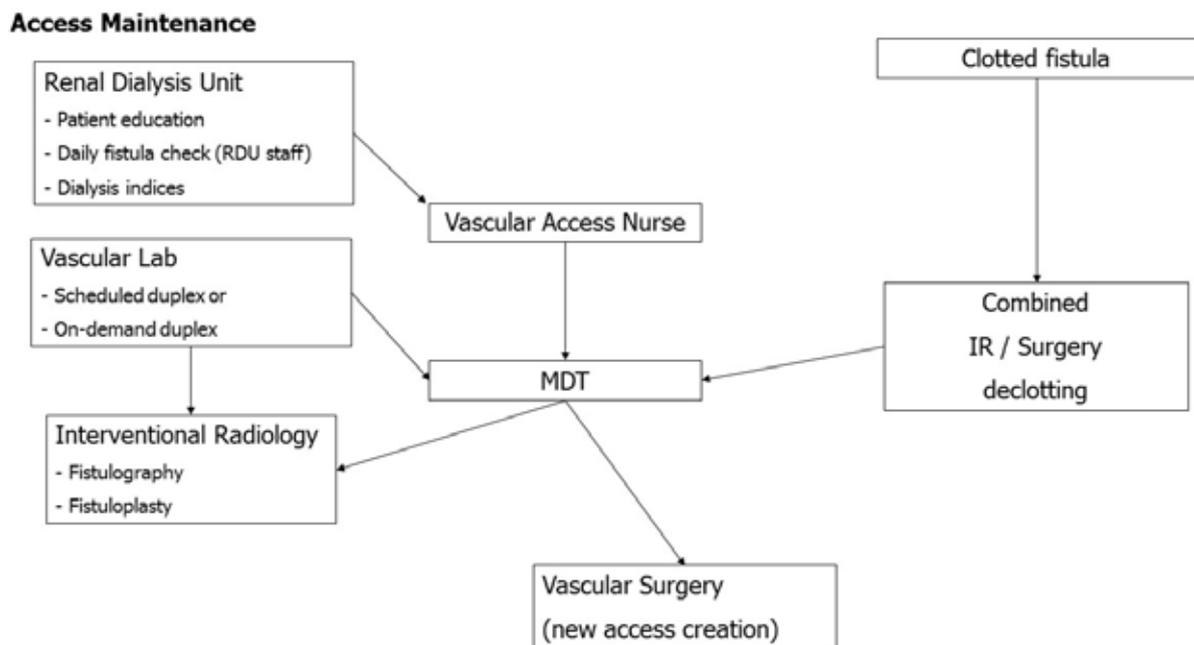
Most units reported informal nurse-led ‘fistula checks’ during haemodialysis sessions; some centres also performed regular transonic readings. It was uncommon to routinely schedule duplex imaging.

Some departments informally protected slots in interventional radiology for AVF maintenance, but nowhere formally designated a proportion of slots for access work.

Multidisciplinary team (MDT) meetings were regular and formalised in some units, but elsewhere the MDT almost never met as a group. MDT working seemed least functional where nephrology, interventional radiology and vascular surgery were not co-located on the same campus.

The simplest pathways used by renal services to deal with maintaining problematic arteriovenous access are demonstrated overleaf (figure 4):-

Figure 4 The most simple pathways used by renal services to maintain problematic arteriovenous access.



Recommendation 35 – A vascular access-specific multidisciplinary team (MDT) meeting should be regularly convened with at least one nephrologist, one surgeon, one interventional radiologist and a vascular access coordinator in attendance. Appropriate secretarial support should be provided and an attendance register should be kept.

Recommendation 36 - All clinicians who are responsible for the care of patients receiving HD should have job planned time allocated to attending at least one vascular access MDT meeting per month. In larger centres this time could be allocated between groups of clinicians.

Recommendation 37 – The amount of time required for MDT discussion equates to the same number in minutes, per week, as 10-15% of the prevalent HD population size. This reflects the average MDT duration currently seen in the Scottish renal services. It may be appropriate to hold these meetings on a fortnightly or three-weekly basis.

Recommendation 38 - Systems should be in place to enable the direct booking of interventional radiology and surgical procedures from the MDT meeting.

Recommendation 39 – MDT outcomes should be recorded on the electronic health record (EHR) in a format that is accessible and meaningful to the wider clinical team.

Recommendation 40 - Discussion of strategic elements of the vascular access service should take place in a regular meeting that is separate to the clinical discussion of individual patients' cases.

Recommendation 41 – Regional Dialysis Unit (RDU) staff should be trained in the assessment of fistulae and to identify potential fistula problems.

Recommendation 42 – The performance of the specific haemodialysis vascular access in use should be documented at each haemodialysis session.

Recommendation 43 – Challenging vascular access should be identified and, where possible, these patients should receive their haemodialysis care in an area of the RDU where there is a sufficient concentration of staff with the appropriate cannulation (and other related) skills.

Recommendation 44 – AVF and AVG patency should be routinely audited and discussed at a vascular access morbidity and mortality meeting.

Recommendation 45 – An ‘intervention history’ should be recorded on the patient’s health record for every AVF and AVG.

Recommendation 46 – A ‘threatened AVF / AVG’ should be considered as a medical emergency and managed accordingly.

Recommendation 47 – Renal services should adopt a proactive approach to identifying the failing arteriovenous AVF that involves patients and front-line staff, with early access to investigative imaging and intervention where problems are identified. The associated workload and procedure outcomes should be recorded and discussed at the vascular access morbidity and mortality meeting.

Recommendation 48 – RDUs should have a written policy that describes and governs the escalation of potential access problems.

Recommendation 49 – Renal units should have a written policy that describes and governs the management of clotted AVF or AVG.

Recommendation 50 – All cases of clotted AVF or AVG should be routinely audited and discussed at the VA morbidity and mortality meeting.

Recommendation 51 – Patients with a clotted AVF or AVG should have urgent access to a combined surgical / interventional radiology or IR declotting procedure in a timely fashion to avoid the use of a temporary line.

Recommendation 52 – Patients who have undergone access creation or maintenance surgery should have a plan documented at the time of surgery to direct further action in the event that the AVF is unsatisfactory at the time of this assessment.

Recommendation 53 – Patients who have undergone access creation or maintenance surgery should be assessed at 2-4 weeks postoperatively by a suitably trained clinician.

SERVICE PERFORMANCE & DEVELOPMENT NEEDS

No centre routinely measured vascular access-related clinical activity or procedure outcomes. Vascular access did not appear within NHS Boards' corporate structures and there was no forum for strategic service discussion or routine analysis of related morbidity and mortality.

Streamlined referral pathways and more robust protection of theatre lists is required to improve access creation. Formalised MDT working, supported by job-planned clinical time and allocated slots for procedures is needed to adequately maintain access. A variety of educational needs were identified for clinicians working in all areas of the vascular access service.

Recommendation 54 – A vascular access coordinator role is required to facilitate the efficient flow of patients through the elective access pathway. Part of this role requires clinical expertise and demands a clinical background. Part of this role involves an administrative remit that could be performed by a non-clinician – e.g. a vascular access 'tracker'.

Recommendation 55 – Renal services should expect a minimum requirement of 0.75 whole-time equivalent (WTE) vascular access coordinators per 100 prevalent haemodialysis patients (inclusive of both clinical and administrative roles), reflecting the average level of vascular access coordinator provision across the Scottish renal services currently.

Recommendation 56 – The dynamic nature of vascular access provision (especially emergent problems) requires that formal, accessible mechanisms are needed to keep track of active patients and optimally allocate resources to them. This would also help with capacity control and planning of catch-up lists.

Recommendation 57 – Renal services should routinely audit their access creation and access maintenance pathway waiting times and procedure outcomes. These should be published on a quarterly basis and used to inform clinical decision making within the unit.

Recommendation 58 – Renal services should conduct a quarterly strategic service review meeting. This would be the forum for discussion of service performance, waiting times, procedures outcomes, morbidity and mortality.

Recommendation 59 – There is a need to develop service performance data that can be presented in a standardised format that facilitates a national overview.

Recommendation 60 – A successful vascular access service should be defined according to the proportion of patients for whom incident and prevalent vascular access is according to their pre-defined 'personal access solution'.

Recommendation 61 – NHS boards should have a nominated board-level stakeholder (eg Medical Director) who must work alongside a named lead vascular access nephrologist, vascular surgeon, interventional radiologist and service manager to oversee the strategic delivery of vascular access services.

Recommendation 62 – The roles and responsibilities of each member of the VA team should be clearly defined in a written description of the VA service. This should be accessible to patients and members of the wider clinical team.

Recommendation 63 – Renal units should develop educational secondment programmes that enable RDU nurses to have protected time to working with vascular access nurses (VAN).

Recommendation 64 – Cases of central venous stenosis should be routinely audited and discussed at the VA morbidity and mortality meeting.

Recommendation 65 – All patients should have access to AVG if required. In some instances this may require the establishment of ‘complex access centres’ who provide this as a specialist service.

Recommendation 66 – Vascular access service needs should be considered as part of any recruitment exercise into relevant clinical and non-clinical departments within NHS Boards.

Recommendation 67 – Nephrology, Vascular Surgery and Interventional Radiology specialty training curricula should include a formalised Vascular Access training block as a core competency

Recommendation 68 – Training should be given to nurses and other clinical staff who provide peri-procedural care for patients undergoing access creation or maintenance procedures.

Recommendation 69 – All vascular access service delivery should be formally job planned. NHS Boards should backfill vascular access activity in periods of prolonged absence.

Recommendation 70 – The financial cost of haemodialysis vascular access services needs to be clearly visible to NHS Boards. This must be based on all nephrology, surgical AND radiological vascular access related activity. These data must be overseen by a named service manager and viewed as a whole by the board.

Recommendation 71 – All patients should have access to an appropriately trained team (nephrologist, surgeon or interventional radiologist) irrespective of the geographical location, within a clinically appropriate timeframe when they develop a vascular access-related problem.

CONCLUSION

This report has generated a significant number of recommendations for action by front-line clinicians, service managers and NHS Boards. Most of the recommendations are self-explanatory, and many have already been mooted or formally proposed in previous such investigations.

For patients to benefit from the significant work that has gone into the research and preparation of this report it is necessary for action to be taken in relation to most, if not all, of the recommendations. As with most other areas of clinical practice it is necessary for NHS Boards to work in partnership with front-line clinicians if these measures are to be truly successful in delivering safe, effective and patient-centred vascular access care.

AUTHORS

Scott W. Oliver¹, Jacqueline Campbell², David B. Kingsmore³, Ram Kasthuri⁴, Jamie Traynor⁵, Wendy Metcalfe⁶, Peter C. Thomson⁷

- 1 Specialty Registrar in Renal Medicine; Clinical Teaching Fellow, NHS Lanarkshire.
- 2 Senior Information Analyst, Information Services Division, NHS National Services Scotland.
- 3 Consultant Vascular and Renal Transplant Surgeon, NHS Greater Glasgow & Clyde.
- 4 Consultant Interventional Radiologist, NHS Greater Glasgow & Clyde.
- 5 Technical Director, Scottish Renal Registry & Consultant Nephrologist, NHS Greater Glasgow & Clyde.
- 6 Chair, Scottish Renal Registry & Consultant Nephrologist, NHS Lothian.
- 7 Consultant Nephrologist, NHS Greater Glasgow & Clyde.

CONTACTS

scottoliver@nhs.net

peter.thomson@nhs.net

[@VAccessScotland](https://twitter.com/VAccessScotland)

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Scottish Renal Registry

Meridian Court
ISD Scotland
5 Cadogan Street
Glasgow G2 6QE

Tel + 00 44 (0) 141 282 2253
Web www.srr.scot.nhs.uk