SECTION I BACTERAEMIA IN RRT RECIPIENTS

Patients treated by renal replacement therapy (RRT) for established renal failure are at high risk of infection with associated increased morbidity and mortality. Infection was the second most frequent cause of death of RRT recipients in 2014.

All bacteraemia in Scotland, that is bacteria being detected within a patient's blood stream by means of a positive blood culture, are reported directly from microbiology laboratories to Health Protection Scotland (HPS) using the Electronic Communication of Surveillance in Scotland (ECOSS) system. Meticillin resistant *Staphylococcus aureus* (MRSA) bacteraemia incidence surveillance has been mandatory in Scotland since 2001 and surveillance was extended in 2006 to include meticillin sensitive *S. aureus* (MSSA). In addition, mandatory *Escherichia coli* bacteraemia surveillance will be introduced in Scotland in April 2016. Whilst surveillance of bacteraemia with other organisms is not mandatory, all positive blood cultures are reported to ECOSS enabling these data to be used robustly in epidemiological analyses.

In June 2015 database linkage was performed between the Scottish Renal Registry including all patients who have received RRT in Scotland and ECOSS bacteraemia data namely *S. aureus*, *Staphylococcus epidermidis*, *Streptococcus* sp., *E. coli*, *Klebsiella* sp. and *Pseudomonas* sp.. These organisms were chosen due to their clinical significance in RRT patients. For the purpose of the analyses, *E. coli*, *Klebsiella* sp. and *Pseudomonas* sp. were grouped as Gram negative organisms. Linkage was performed for the period 01 January 2010 to 31 December 2014. An episode of bacteraemia was defined as a bacteraemia in a patient without a previous episode of bacteraemia with the same organism in the preceding two weeks.

A similar linkage was previously undertaken in 2011 which solely looked at the number of *Staphylococcus aureus* bacteraemia (SAB) recorded in patients who received RRT between 2006 and 2009. This analysis has been added to the most recent time period to provide trend analysis over nine years and to calculate the difference in SAB rates in haemodialysis patients by adult renal unit.

I1 Bacteraemia reported in patients treated by RRT 2010-2014

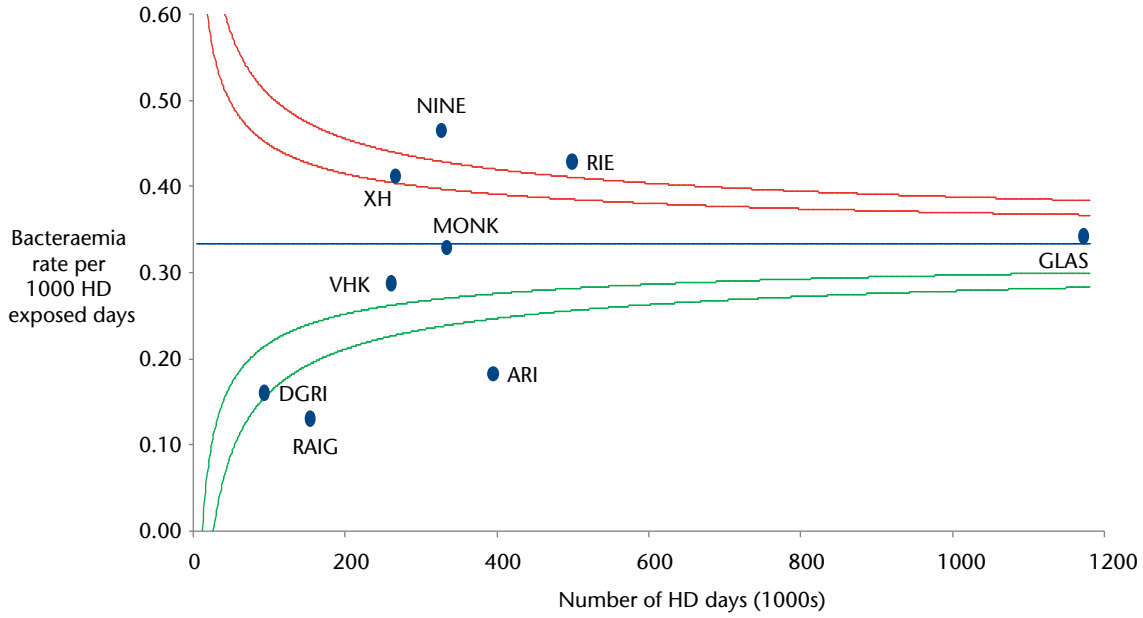
I1.1 Incidence of Bacteraemia in RRT population 2010-2014 by modality of RRT

Organism	HD		PD		Tx		All
	n	%	n	%	n	%	n
Gram negative*	277	**58.6**	21	**4.4**	175	**37.0**	473
Staphylococcus aureus	442	**94.0**	9	**1.9**	19	**4.0**	470
Staphylococcus epidermidis	314	**89.7**	11	**3.1**	25	**7.1**	350
Streptococcus sp.	145	**83.8**	9	**5.2**	19	**11.0**	173
Total	1178	**80.4**	50	**3.4**	238	**16.2**	1466

* Gram negative organism group comprises *Escherichia coli*, *Klebsiella* sp. and *Pseudomonas* sp.

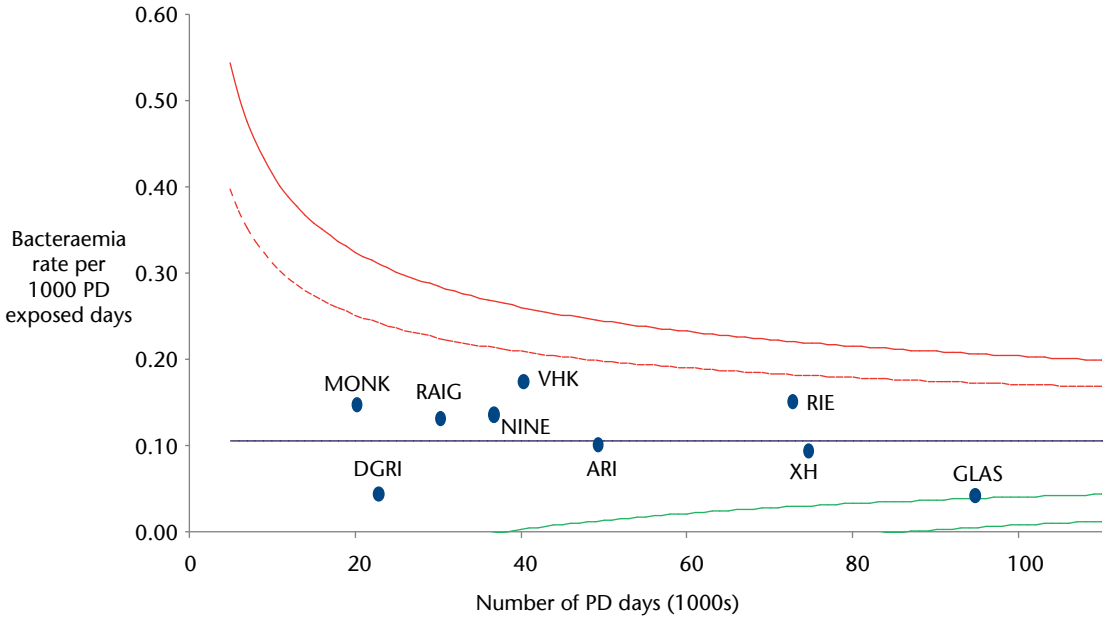
S. epidermidis, a member of the coagulase negative *Staphylococcus* group, are commonly found on the skin and may be identified in blood cultures incidentally due to a breakdown in technique during collection of blood cultures. *S. epidermidis* bacteraemia rates should be interpreted with some caution as clinical investigation, not undertaken whilst using a data linkage approach to measurement of bacteraemia outcome, is required to assess whether the bacteraemia are significant or due to contaminated blood cultures.

I1.2 Haemodialysis patient bacteraemia* rate per 1000 HD treatment days by adult renal unit 2010-2014



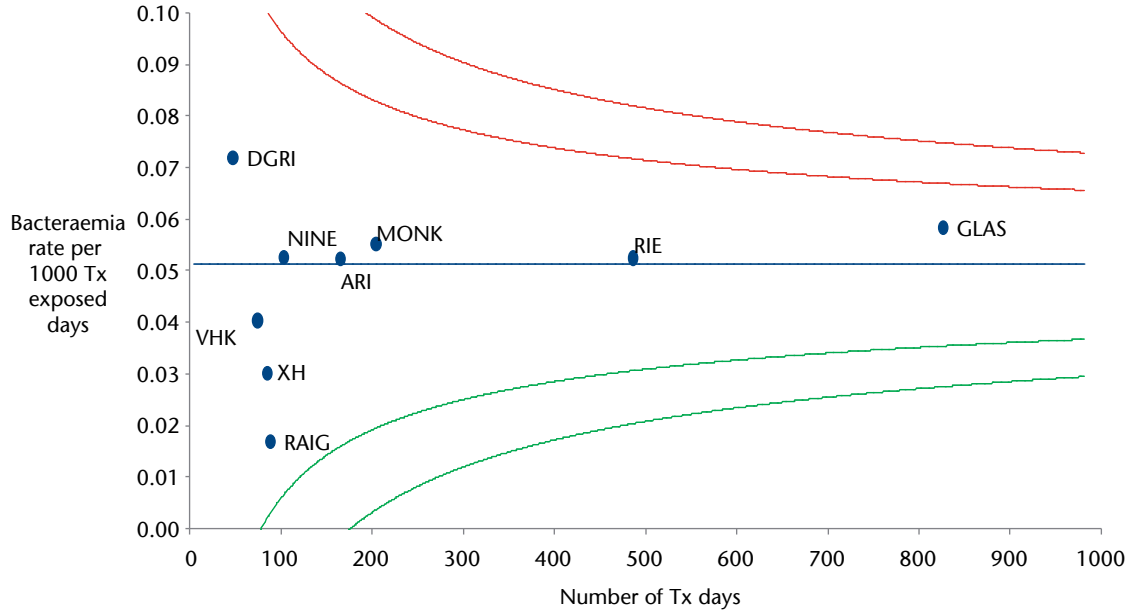
* Includes *S. aureus*, *S. epidermidis*, *Streptococcus* sp. and Gram negative group as previously defined.

I1.3 Peritoneal dialysis patient bacteraemia* rate per 1000 PD treatment days by adult renal unit 2010-2014



*Includes *S. aureus*, *S. epidermidis*, *Streptococcus* sp. and Gram negative group as previously defined.

I1.4 Transplanted patient bacteraemia* rate per 1000 Tx treatment days by adult renal unit 2010-2014



*Includes *S. aureus*, *S. epidermidis*, *Streptococcus* sp. and Gram negative group as previously defined.

Graphs I1.2, I1.3 and I1.4 show the bacteraemia rate occurring in patients treated by each mode of RRT. The number of treatment days for each modality is the total number of days provided at each adult unit for all patients in the time period 2010-2014.

I2 *Staphylococcus aureus* bacteraemia reported in patients treated by RRT 2006-2014

I2.1 Incidence of SAB in RRT population and percentage of SAB reported in NHS Scotland 2006-2014

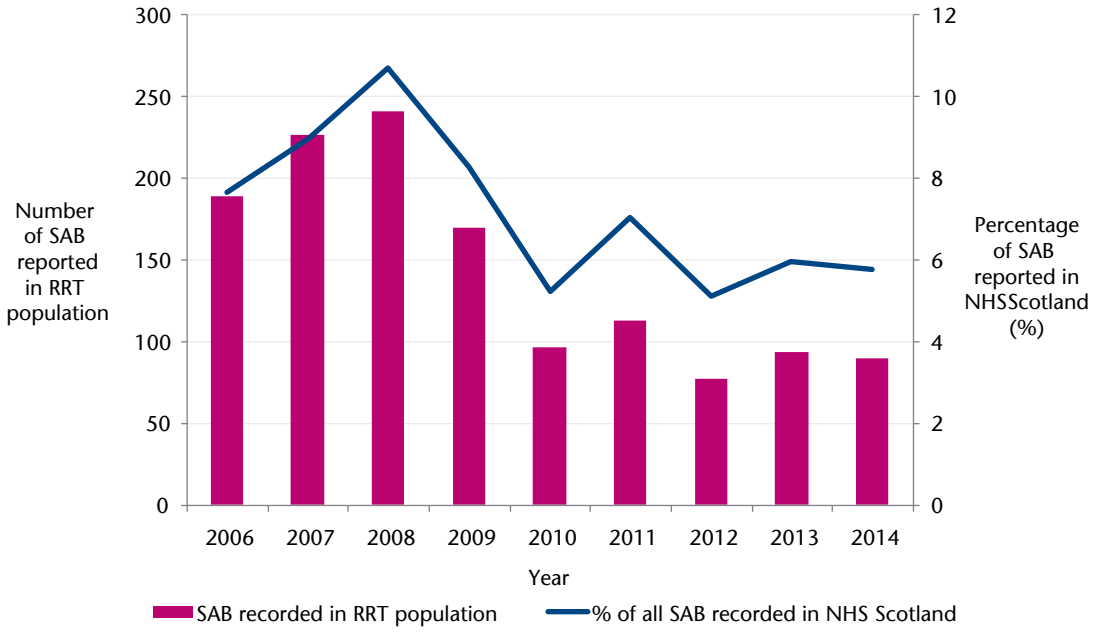
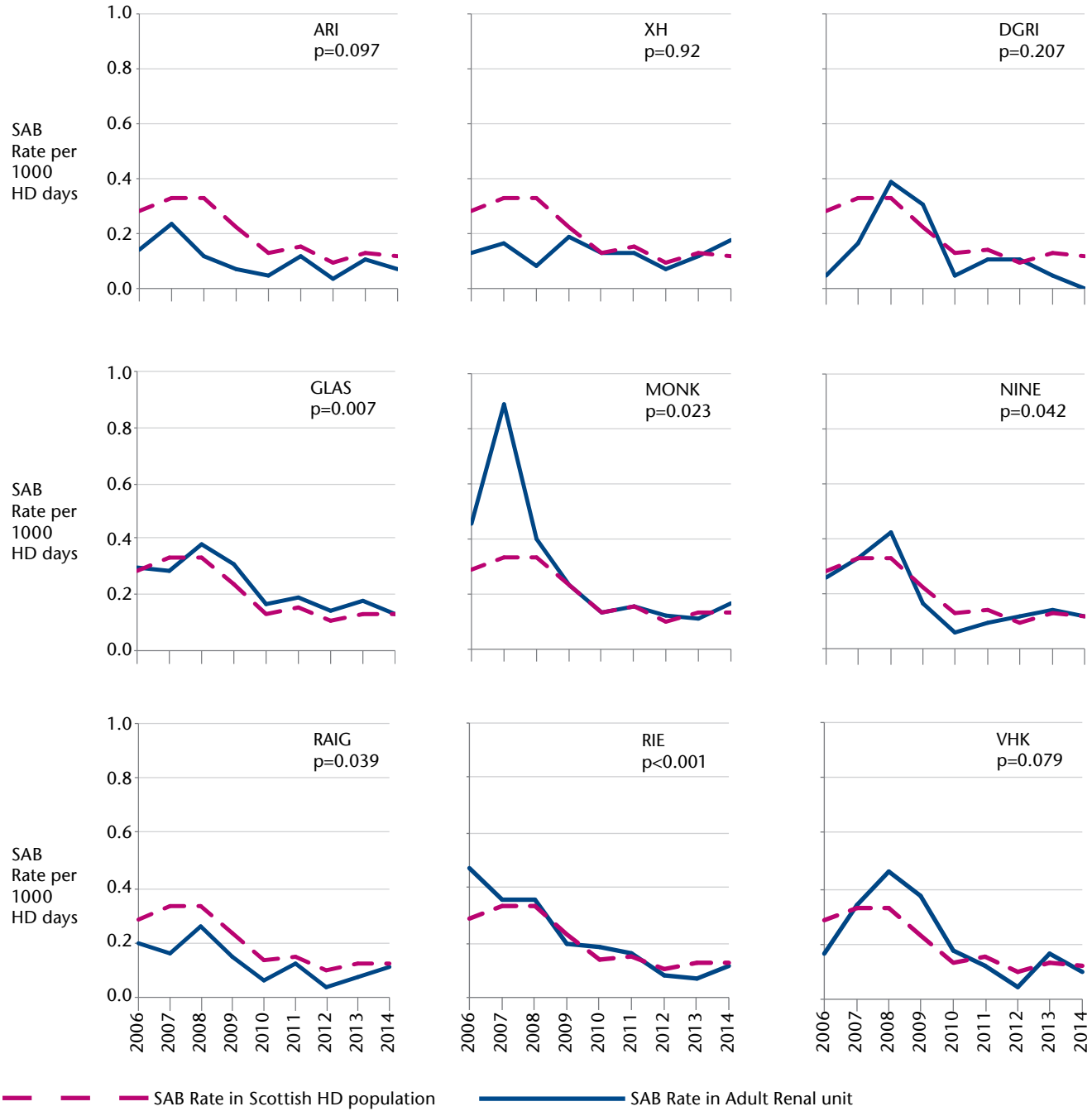


Figure I2.1 describes the number of SAB (MRSA and MSSA) reported in the RRT population and the percentage of all reported in NHS Scotland during 2006-2014 that occurred in the RRT population. The decline in the number of SAB in the RRT population is contributing to the overall decline in the number of SAB reported in NHS Scotland. There was a significant decrease in the percentage of all SAB in NHS Scotland that were reported in the RRT population (Pearson's correlation r=-0.7, p=0.03).

I2.2 Trend in SAB rate for haemodialysis patients by adult renal unit 2006-2014



Between 2006-2014 there has been a significant decrease (Pearson's correlation r=-0.873, p=0.002) in rate of SAB per 1000 HD days in the Scottish RRT haemodialysis population.

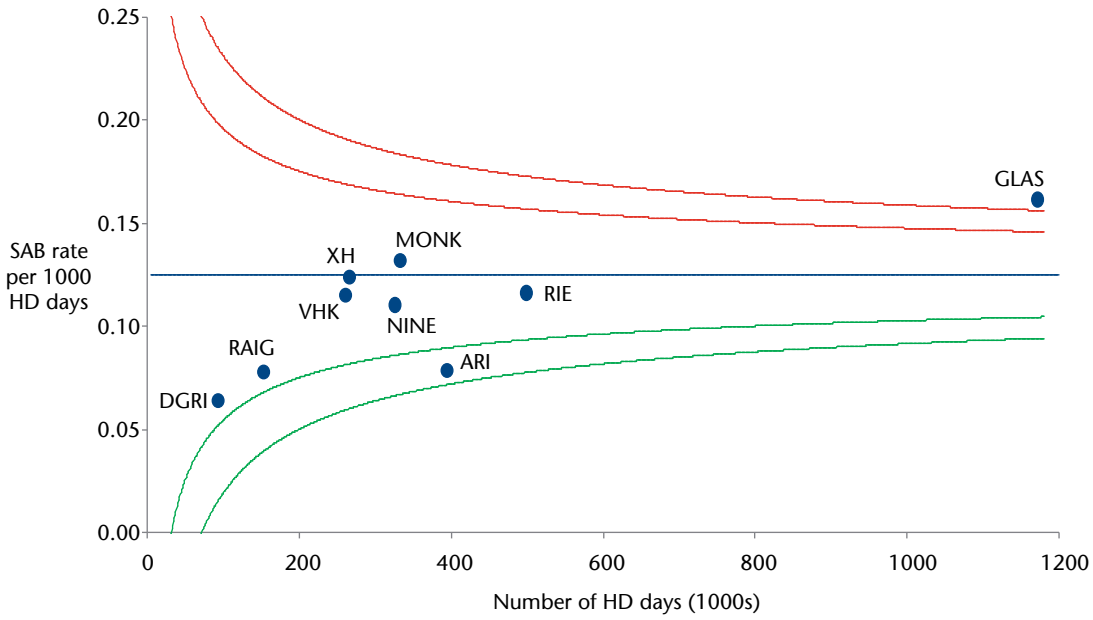
I2.2 show data according to the renal unit providing haemodialysis at the time of the reported *S. aureus* bacteraemia. 5 out of the 9 adult renal units (GLAS, MONK, NINE, RAIG, RIE) show a significant decrease in SAB rates over the study period.

Data within I2.2 does not include data from RHSC. There were 4 instances of SAB reported between 2006-2014.

I2.3 SAB rate for haemodialysis patients by adult renal unit 2006-2009 and 2010-2014

Year	Rate per 1000 HD Days		
	2006-2009	2010-2014	Difference
ARI	0.14	0.08	-0.06
XH	0.14	0.12	-0.02
DGRI	0.23	0.06	-0.16
GLAS	0.32	0.16	-0.16
MONK	0.49	0.13	-0.36
NINE	0.30	0.11	-0.19
RAIG	0.19	0.08	-0.11
RIE	0.34	0.12	-0.22
VHK	0.34	0.11	-0.22
SCOTLAND	0.29	0.13	-0.17

I2.4 SAB rate for haemodialysis patients by adult renal unit 2010-2014



I2.5 Type of vascular access for haemodialysis at the time of SAB 2006-2009 and 2010-2014

Unit	Arteriovenous						Central venous catheter						Unknown						All		
	2006-2009		2010-2014		Total		2006-2009		2010-2014		Total		2006-2009		2010-2014		Total		2006-2009	2010-2014	Total
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	n	n
ARI	25	**61.0**	18	**58.1**	43	**59.7**	16	**39.0**	13	**41.9**	29	**40.3**	0	**0.0**	0	**0.0**	0	**0.0**	**41**	**31**	**72**
XH	15	**53.6**	16	**48.5**	31	**50.8**	13	**46.4**	16	**48.5**	29	**47.5**	0	**0.0**	1	**3.0**	1	**1.6**	**28**	**33**	**61**
DGRI	6	**35.3**	0	**0.0**	6	**26.1**	11	**64.7**	6	**100.0**	17	**73.9**	0	**0.0**	0	**0.0**	0	**0.0**	**17**	**6**	**23**
GLAS	80	**27.5**	48	**25.4**	128	**26.7**	211	**72.5**	141	**74.6**	352	**73.3**	0	**0.0**	0	**0.0**	0	**0.0**	**291**	**189**	**480**
MONK	29	**26.4**	19	**43.2**	48	**31.2**	59	**53.6**	18	**40.9**	77	**50.0**	22	**20.0**	7	**15.9**	29	**18.8**	**110**	**44**	**154**
NINE	18	**25.7**	23	**63.9**	41	**38.7**	52	**74.3**	13	**36.1**	65	**61.3**	0	**0.0**	0	**0.0**	0	**0.0**	**70**	**36**	**106**
RAIG	19	**76.0**	8	**66.7**	27	**73.0**	6	**24.0**	4	**33.3**	10	**27.0**	0	**0.0**	0	**0.0**	0	**0.0**	**25**	**12**	**37**
RIE	40	**30.5**	12	**20.7**	52	**27.5**	91	**69.5**	46	**79.3**	137	**72.5**	0	**0.0**	0	**0.0**	0	**0.0**	**131**	**58**	**189**
VHK	28	**51.9**	18	**60.0**	46	**54.8**	0	**44.4**	12	**40.0**	36	**42.9**	2	**3.7**	0	**0.0**	2	**2.4**	**54**	**30**	**84**
SCOT-LAND	260	**33.9**	162	**36.9**	422	**35.0**	483	**63.0**	269	**61.3**	752	**62.4**	24	**3.1**	8	**1.8**	32	**2.7**	**767**	**439**	**1206**

These data were collected by members of staff in each renal unit from case notes, dialysis records and electronic patient records. The access shown is that in use for haemodialysis at the time of the SAB.

SAB rates have not been calculated for the type of vascular access as the denominator (time on access) is not currently available.