UK Renal Registry 17th Annual Report: Chapter 12 Epidemiology of Reported Infections amongst Patients Receiving Dialysis for Established Renal Failure in England in 2012 to 2013: a Joint Report from Public Health England and the UK Renal Registry

David Pitcher[a], Anirudh Rao[a], Fergus Caskey[a], John Davies[b], Lisa Crowley[c], Richard Fluck[c], Ken Farrington[d]

[a]UK Renal Registry, Bristol, UK; [b]Public Health England, London, UK; [c]Royal Derby Hospital, Derby, UK; [d]Lister Hospital, Stevenage, UK

Key Words

Clostridium Difficile · Dialysis · Epidemiology · *Escherichia Coli* · Established Renal Failure · Infection · MRSA · MSSA · *Staphylococcus*

Summary

- From 1st May 2012 to 30th April 2013 there were 31 episodes of Methicillin resistant *Staphylococcus aureus* (MRSA) bacteraemia in end stage renal failure patients on dialysis.
- This represented a further small decline in MRSA bacteraemia rates which have been falling since data collection began in 2007.
- Methicillin sensitive *Staphylococcus aureus* (MSSA) bacteraemia rates were 1.59 per 100 dialysis patient years with 372 episodes of blood stream infection reported.
- There were 123 *Clostridium difficile* infection episodes with a rate of 0.55 per 100 dialysis patient years.
- *Escherichia coli* data showed a reported rate of 1.32 per 100 dialysis patient years, an increase on the rate reported last year.
- In each infection for which access data were collected, the presence of a central venous catheter appeared to correlate with increased risk.
- Future years require consistency of reporting to enable trends to be more clearly defined.

Introduction

Infection remained the second leading cause of death in patients with established renal failure (ERF) who received renal replacement therapy (RRT). The high rates of systemic infection reported in haemodialysis (HD) patients are related to their impaired immune system, the high number of invasive procedures they are exposed to and the type of vascular access used [1]. This report covers one year of reporting for Methicillin resistant *Staphylococcus aureus* (MRSA), Methicillin sensitive *Staphylococcus aureus* (MSSA), *Escherichia coli* (*E. coli*) bloodstream infections (BSI) and *Clostridium difficile* infections (CDI) in patients with ERF who were receiving dialysis in England.

Previous UK Renal Registry (UKRR) reports have detailed the epidemiology of staphylococcal bacteraemias in patients with ERF receiving dialysis. In addition to *staphylococcal* bacteraemias, last year surveillance was expanded to incorporate *E. coli* BSIs and CDIs [2]. As well as the mandatory reporting of MRSA BSIs, reporting of MSSA has been mandated since January 2011 and *E. coli* BSIs since June 2011; CDI reporting has been mandatory for all patients aged two and above since 2007. CDIs are reported according to a national testing protocol although during the timeframe of this report there may have been some inter-hospital variation in testing methods [3].

The data were supplied by clinical staff and captured using a secure web-based system, the Healthcare Associated Infection Data Capture System (HCAI-DCS). The previous report confirmed that whilst dialysis patients remained at increased risk from MRSA there has been a continued year on year decline in the number of reported episodes of bacteraemia [2].

Methods

This report covers the period of 1st May 2012 to 30th April 2013. It should be noted that although reporting is mandatory for these data collections (MRSA, MSSA and *E. coli* BSI and CDI), completion of documentation on information relating to renal failure and dialysis is currently conducted on a voluntary basis depending on the data entry policy within the reporting NHS acute Trust. Therefore variation in reported infection rates may reflect differences in reporting policies between individual units.

The methods used have been described in previous registry reports (see appendix 1) [4, 5]. Briefly, three stages of data collection and validation were undertaken by Public Health England (PHE):

1 Identification of bacteraemias and CDI potentially associated with dialysis patients. These data were captured by the NHS acute Trusts using the clinical details provided and the setting in which the sample was obtained.
2 This record was 'shared' with the parent renal centre. The NHS acute Trusts attributed the record to the renal unit responsible for the dialysis of the patient which in turn triggered an email alert to the identified contact within the parent renal centre.
3 The renal centre then 'completed' the additional renal data on the case via the HCAI-DCS website.

This data reporting mechanism applies only to centres in England. Renal centres in Wales, Scotland and Northern Ireland are not included in the report. These data were then passed to the UKRR who implemented an additional validation and data capture step as not all records were shared or completed. This involved emailing clinical or infection control leads in the NHS acute Trusts with the records reported to PHE and requesting they completed the following actions:

1 Confirm that each of the cases in the PHE file was correct, i.e. that it related to a dialysis patient receiving treatment at their unit at the time of the infection
   a Remove any cases that occurred in patients not on dialysis and receiving treatment at their unit at the time of the infection
   b Add any cases that were not known to PHE but occurred in patients on dialysis and receiving treatment at their unit at the time of the infection
2 For all cases, to provide details on the dialysis modality and access in use at the time of the infection.

The number of alterations made by renal units varied considerably. The extent to which this reflects differences in the accuracy of the PHE data for their renal unit is not known. A centre may not have made any alterations (or even indicated that no alterations were needed) for a number of reasons ranging from their data being completely accurate to them not examining the data as critically as others. Until a new system for validating the PHE cases for renal units is developed funnel plots indicate where a centre has (1) provided no confirmation of accuracy of their PHE data, (2) confirmed accuracy of their PHE data or (3) confirmed accuracy of their PHE data and added cases. This interim measure is not intended as a judgement on quality of reporting by a renal unit, it just identifies an issue that needs to be addressed in future work.

Centre-specific rates for each infection are presented per 100 dialysis patient years. The denominator for this rate was calculated at each centre by summing the number of days that every dialysis patient contributed between the 1st May 2012 and 30th April 2013, utilising the UKRR database. For example, a patient who started dialysis on the 1st April 2013 and remained on dialysis until at least the 30th April 2013 would contribute 30 days to the total. Similarly, when calculating the modality specific rates, the number of days that every dialysis patient spent on each modality during the collection period was summed.

In order to adjust for variation in precision of estimated rate, the rate of bacteraemia/CDI per 100 dialysis patient years has been plotted against the centre size in a funnel plot. However, due to uncertainty about whether all centres were reporting on

Table 12.1. Summary of all audit measures stated in Renal Association (RA) clinical practice guidelines relating to infection

	RA audit measure	Reported	Reason for non-inclusion
1	Centres should audit all *Staphylococcus aureus* bacteraemia (MRSA and MSSA) episodes recorded as episodes per 100 patient years or episodes per 100 catheter days or episodes per 100 AVF years	Yes	
2	The annual *Staphylococcus aureus* bacteraemia rate should be less than 2.5 episodes per 100 HD patients and less than 1.0 for MRSA over two years	Yes	
3	Centres should audit all episodes of *Clostridium Difficile* toxin (CDT) and express rates as per 100 patient years	Yes	
4	Data should be collected on all episodes of VRE and ESBL bacteraemia episodes per 100 patient years	Partly	Only data on *E. coli* received from PHE

ESBL = Extended-Spectrum betaLactamase; VRE = vancomycin-resistant enterococci

the same data, the confidence limits that are usually displayed on funnel plots have been removed. Despite the removal of the confidence limits, interpretation remains similar to a funnel plot where centres towards the left of the plot can be expected to display greater variation around the country average due to smaller numbers of patients. Table 12.1 lists the summary of audit measures stated in the Renal Association clinical practice guidelines.

Results

Validation

This was the first year that the UKRR performed the additional validation and data capture step in which centres were requested to add any additional episodes which were not captured by PHE. Table 12.2 displays the number of infectious episodes reported to PHE and the changes to the data that occurred during the validation process. The majority of episodes were rejected because the patient was not receiving dialysis for established renal failure however others were removed during the validation process with no explanation.

Table 12.2. Number of infectious episodes reported to Public Health England (PHE) and validated by renal centres

	MRSA	MSSA	CDI	*E.coli*
Number of infectious episodes reported to PHE	27	301	130	317
Number of episodes rejected by centres during validation	1	16	24	47
Number of episodes added by centres during validation	5	87	17	38
Total number of episodes after validation process	31	372	123	308

There was wide variation in the response from centres to the validation process with some centres adding many additional episodes, and other centres not adding any. A Mann-Whitney U test found that there were significantly more infection episodes in centres adding additional cases than in those that did not.

Methicillin resistant Staphylococcus aureus

Thirty-one MRSA bacteraemias were recorded as being associated with a dialysis patient during the time frame of this report, at a rate of 0.13 (95% CI 0.09–0.19) per 100 dialysis patient years (table 12.3). This rate was lower than the 0.22 per 100 patients reported last year, continuing the year-on-year reduction displayed by the boxplot in figure 12.1. The modality in use at the time of infection was completed for all episodes but comparisons between the modalities are difficult due to small numbers.

Centre level data can be seen in table 12.4 and includes the absolute number of episodes and rates per 100 dialysis patient years. The majority of centres did not report any MRSA bacteraemia episodes and no centre had an infection rate in excess of one per 100 dialysis patient years. Figure 12.2 plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases. The extremely low numbers of episodes at each centre make comparisons of rates uncertain.

The Renal Association (RA) audit standard states that the annual MRSA rate should be less than 1.0 per 100 HD patients averaged over two years. Figure 12.3 displays a funnel plot of MRSA rate per 100 prevalent HD patients across the two year period from 1st May 2011

Table 12.3. Number and rate of infectious episodes in patients with established renal failure between 1/05/2012 and 30/04/2013, by modality

	Infection			
	MRSA	MSSA	CDI	*E.coli*
Number of episodes				
Total	**31**	**372**	**123**	**308**
HD	30	341	94	228
PD	1	7	12	19
Not completed	0	24	17	61
Rate (95% CI) per 100 patient years				
Total	**0.13 (0.09–0.19)**	**1.59 (1.43–1.76)**	**0.55 (0.46–0.66)**	**1.32 (1.17–1.47)**
HD	0.15 (0.10–0.21)	1.70 (1.53–1.89)	0.49 (0.40–0.60)	1.14 (1.00–1.30)
PD	0.03 (0.00–0.17)	0.21 (0.08–0.43)	0.37 (0.19–0.65)	0.57 (0.34–0.88)

HD = haemodialyis; PD = peritoneal dialysis

to 30th April 2013. No centres had rates higher than this standard.

Methicillin sensitive Staphylococcus aureus

In total, 372 episodes of MSSA bacteraemia were recorded in the period covered by this report, at a rate of 1.59 per 100 dialysis patient years (95% CI 1.43–1.76). This was higher than last year's rate of 1.15 per 100 dialysis patient years. Four centres did not report any MSSA episodes and the highest reported rate was 7.22 per 100 dialysis patient years (table 12.4). Based on the reported data, the rate of MSSA at renal centres in England has remained fairly steady over the past three years, but figure 12.4 demonstrates the impact of the additional episodes included by some of the centres in the validation step on the distribution and variation in rates.

Figure 12.5 plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases. Caution must be exercised when interpreting the rates as centres appear to have taken differing approaches to the validation of the data collection questioning the value of between-centre comparisons.

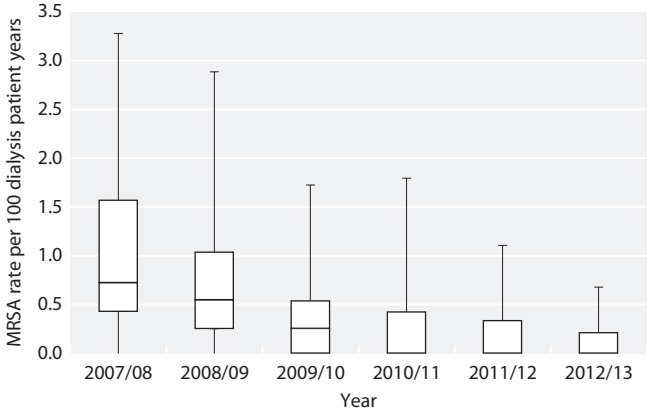

Fig. 12.1. Box and whisker plot of renal centres' MRSA rates per 100 dialysis patient years by reporting year

The peritoneal dialysis (PD) cohort had a lower rate of MSSA bacteraemia per 100 patient years than the HD cohort (0.21, 95% CI 0.08–0.43 compared with 1.7, 95% CI 1.53–1.89) (table 12.3). Modality data was not completed for 6% of the episodes.

Type of dialysis access and infection

There were major variations in the number of episodes of both MRSA and MSSA bacteraemia according to access type. Patients dialysing through a central venous catheter (CVC) at the time of the infection were subject to more episodes of bacteraemia than those with other types of access (table 12.5). Rates have not been calculated because of lack of data on denominators.

Clostridium difficile

In total, 123 episodes of CDI were recorded in the period covered by this report, at a rate of 0.55 (95% CI 0.46–0.66) per 100 dialysis patient years. Based on the reported data, this was slightly lower than last year's rate of 0.61 per 100 dialysis patient years. Nineteen centres did not report any CDI episodes and the highest reported rate was 2.97 per 100 dialysis patient years (table 12.4). Figure 12.6 plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases. Caution must be exercised when interpreting the rates as centres appear to have taken differing approaches to the validation stage of the data collection

Table 12.4. Number and rate of infectious episodes in patients with established renal failure by renal centre

Centre	Dialysis patient years	Number of episodes (1/05/2012–30/04/2013)				Rate per 100 dialysis patient years			
		MRSA	MSSA	CDI	*E.coli*	MRSA	MSSA	CDI	*E.coli*
B Heart	479	1	7	7	2	0.21	1.46	1.46	0.42
B QEH	1,169	2	15	1	6	0.17	1.28	0.09	0.51
Basldn	194	0	14	0	1	0.00	7.22	0.00	0.52
Bradfd	232	1	6	5	3	0.43	2.59	2.16	1.29
Brightn	457	0	8	4	3	0.00	1.75	0.88	0.66
Bristol	573	1	5	4	3	0.17	0.87	0.70	0.52
Camb	470	0	8	1	5	0.00	1.70	0.21	1.06
Carlis	89	0	0	0	2	0.00	0.00	0.00	2.24
Carsh	866	3	11	2	8	0.35	1.27	0.23	0.92
Chelms	157	0	0	0	0	0.00	0.00	0.00	0.00
Colchr	116	0	3	0	1	0.00	2.58	0.00	0.86
Covnt	464	0	9	0	7	0.00	1.94	0.00	1.51
Derby	322	0	5	1	0	0.00	1.55	0.31	0.00
Donc	192	0	3	1	0	0.00	1.56	0.52	0.00
Dorset	307	1	5	0	1	0.33	1.63	0.00	0.33
Dudley	231	0	1	0	2	0.00	0.43	0.00	0.87
Exeter	462	1	4	0	2	0.22	0.87	0.00	0.43
Glouc	253	0	8	1	14	0.00	3.17	0.40	5.54
Hull	411	1	10	2	3	0.24	2.43	0.49	0.73
Ipswi	160	0	1	0	2	0.00	0.63	0.00	1.25
Kent	447	0	8	2	2	0.00	1.79	0.45	0.45
L Barts	1,094	0	1	0	25	0.00	0.09	0.00	2.28
L Guys	669	1	11	4	7	0.15	1.64	0.60	1.05
L Kings	590	1	0	3	2	0.17	0.00	0.51	0.34
L Rfree	816	3	11	8	18	0.37	1.35	0.98	2.21
L St.G	344	0	0	1	5	0.00	0.00	0.29	1.45
L West	1,530	4	34	11	22	0.26	2.22	0.72	1.44
Leeds	577	0	16	7	5	0.00	2.77	1.21	0.87
Leic	1,030	0	21	*	34	0.00	2.04	*	3.30
Liv Ain	169	0	5	5	2	0.00	2.97	2.97	1.19
Liv Roy	480	0	6	4	4	0.00	1.25	0.83	0.83
M RI	591	4	2	8	11	0.68	0.34	1.35	1.86
Middlbr	343	0	5	4	4	0.00	1.46	1.16	1.16
Newc	331	1	2	0	1	0.30	0.61	0.00	0.30
Norwch	372	0	2	0	3	0.00	0.54	0.00	0.81
Nottm	496	0	12	0	9	0.00	2.42	0.00	1.82
Oxford	548	0	6	2	11	0.00	1.10	0.37	2.01
Plymth	171	1	5	2	2	0.58	2.92	1.17	1.17
Ports	628	0	6	1	4	0.00	0.96	0.16	0.64
Prestn	597	1	13	2	11	0.17	2.18	0.33	1.84
Redng	356	0	2	0	0	0.00	0.56	0.00	0.00
Salford	505	2	4	11	4	0.40	0.79	2.18	0.79
Sheff	655	0	20	2	5	0.00	3.05	0.31	0.76
Shrew	232	0	10	2	7	0.00	4.31	0.86	3.02
Stevng	528	0	8	1	9	0.00	1.52	0.19	1.71
Sthend	131	0	3	0	1	0.00	2.28	0.00	0.76
Stoke	386	0	1	1	2	0.00	0.26	0.26	0.52
Sund	214	0	5	0	1	0.00	2.33	0.00	0.47
Truro	172	1	2	0	3	0.58	1.16	0.00	1.74
Wirral	230	1	3	0	3	0.43	1.30	0.00	1.30
Wolve	378	0	11	2	11	0.00	2.91	0.53	2.91
York	162	0	2	3	4	0.00	1.23	1.85	2.47
England	**23,377**	**31**	**372**	**123**	**308**	**0.13**	**1.59**	**0.55**	**1.32**

*Leicester were unable to confirm their CDI episodes within the timescale but confirmed the data from PHE was incomplete

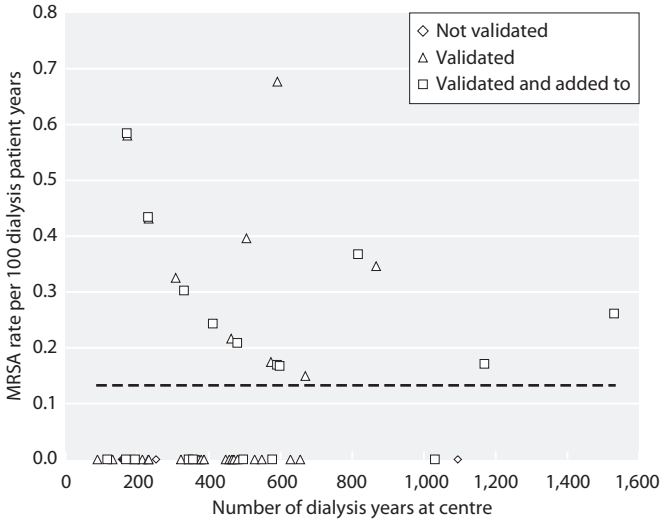

Fig. 12.2. Funnel plot of the MRSA bacteraemia rate per 100 dialysis patient years by renal centre, 1st May 2012 to 30th April 2013
Dotted line depicts rate for whole cohort

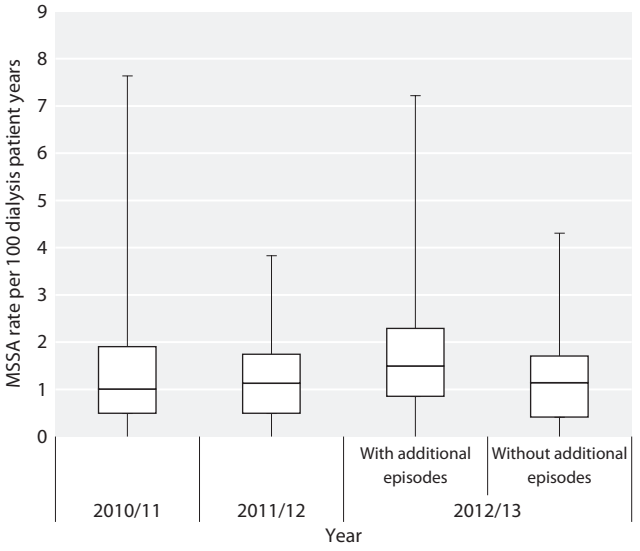

Fig. 12.4. Box and whisker plot of renal centres' MSSA rates per 100 dialysis patient years by reporting year
The additional episodes were added by centres during the UKRR validation step of the data collection process

calling into question the value of between-centre comparisons. Rates were slightly higher in the HD than the PD cohort (table 12.3).

Escherichia coli

A total of 308 episodes of *E. coli* bacteraemia were recorded in the period covered by this report, at a rate of 1.32 per 100 dialysis patient years (95% CI 1.17–1.47). This was higher than last year's rate of 0.92 per

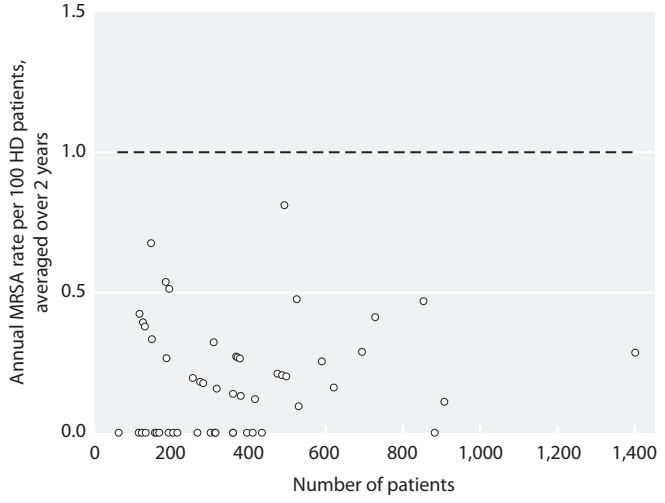

Fig. 12.3. Funnel plot of the MRSA bacteraemia two-year rate per 100 prevalent HD patients, 1st May 2011 to 30th April 2013
Dotted line depicts Renal Association standard

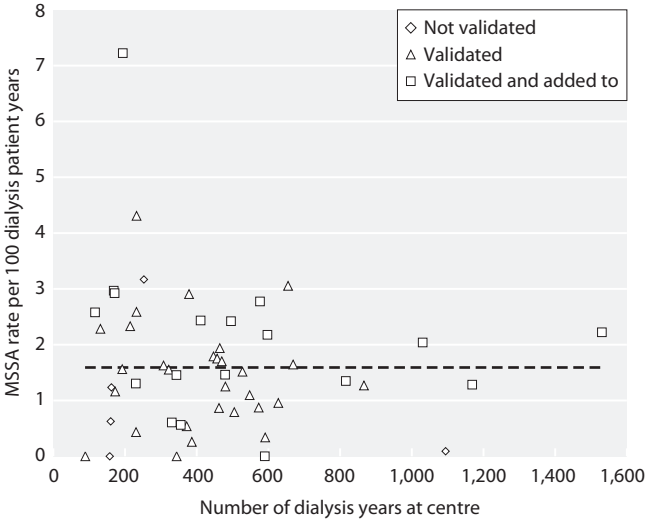

Fig. 12.5. Funnel plot of the MSSA bacteraemia rate per 100 dialysis patient years by renal centre, 1st May 2012 to 30th April 2013
Dotted line depicts rate for whole cohort

Table 12.5. Type of dialysis access in use at the time of infection for HD patients

Centre	Number of episodes (1/05/2012–30/04/2013)				
	AVF	AVG	CVC	PD	No data
MRSA	8	0	22	1	0
MSSA	127	27	186	7	25

AVF = arteriovenous fistula; AVG = arteriovenous graft; CVC = central venous catheter; PD = peritoneal dialysis

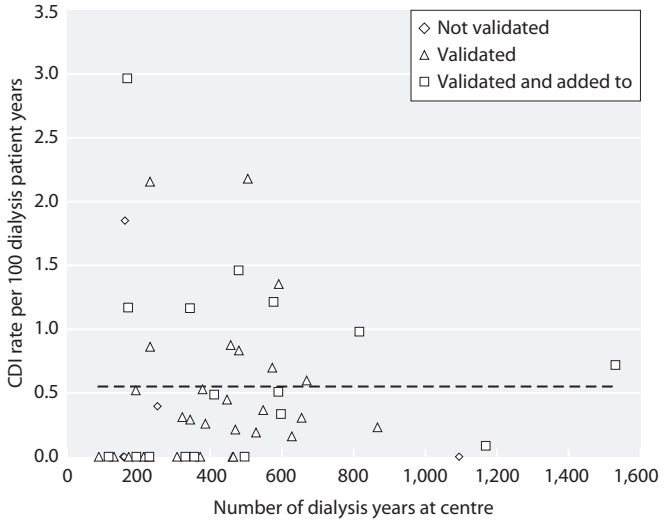

Fig. 12.6. Funnel plot of the CDI rate per 100 dialysis patient years by renal centre, 1st May 2012 to 30th April 2013
Dotted line depicts rate for whole cohort

100 dialysis patient years, and remains higher even if episodes added by the centres during the additional validation stage are excluded from the rate calculation.

Centre level data are displayed in table 12.4 and as with MSSA there was considerable between-centre variation in bacteraemia rates. Four centres did not report any episodes and the highest reported rate was 5.54 per 100 dialysis patient years. Figure 12.7 plots each centre's estimated rate against the number of patient years to take into account the greater variation expected as centre size decreases. Again, caution must be exercised when interpreting the rates as centres appear to have taken differing approaches to the validation stage of the data collection calling into question the value of between-centre comparisons.

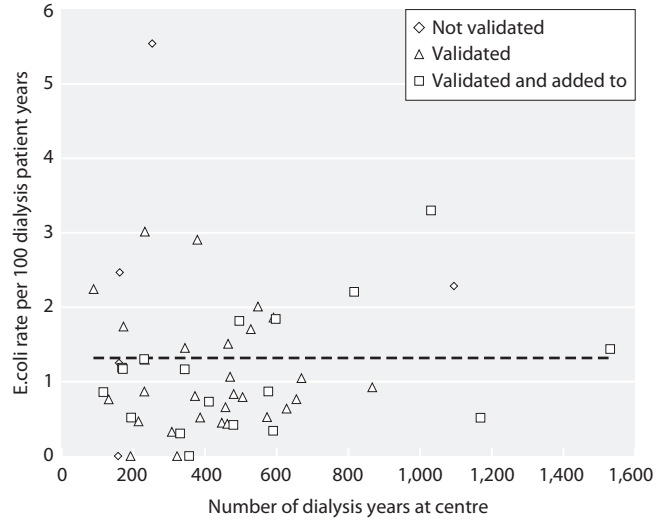

Fig. 12.7. Funnel plot of the *Escherichia coli* bacteraemia rate per 100 dialysis patient years by renal centre, 1st May 2012 to 30th April 2013
Dotted line depicts rate for whole cohort

Here too PD was associated with a lower rate of infection per 100 patient years than HD (0.57, 95% CI 0.34–0.88 compared with 1.14, 95% CI 1.00–1.30, respectively) (table 12.3). Modality data was not completed for 20% of the episodes.

Conclusions

This report has presented data from one year of infections in ERF patients receiving dialysis and extends the work done in previous reports from Public Health England and the UK Renal Registry [2]. Numbers and rates of MRSA BSIs in dialysis patients have fallen in each of the last six years this report has been published. This is likely to be due to a number of factors including the effect of enhanced screening programmes and increased attention to care of access.

This report also presents the second full year of reporting of MSSA bacteraemia. The rate of MSSA bacteraemia was significantly higher than for MRSA. The presence of a central venous catheter confers an increased risk of MSSA bacteraemia on the patient as opposed to an arteriovenous fistula. The discrepancy between the rates of MRSA and MSSA is notable and suggests that MSSA continues to be a significant issue in the dialysis population. Whilst it is true that caution should be exercised due to the apparent differing approaches to validation taken by centres, the number of additional episodes added suggests underreporting of infection. Whilst only two full years of reported data are available the figures raise the possibility that although screening and decolonisation programmes for MRSA are an undoubted success, the reduction of MRSA strains has left patients still vulnerable to MSSA.

The considerable between-centre variation in infection rates in the data submitted to PHE was increased during the validation step implemented this year, with some centres submitting additional episodes, some others rejecting episodes that had been allocated to them by reporting NHS acute Trusts and other centres not completing the validation step. Due to the UKRR undertaking

the data validation for the first time this year, the deadlines were extremely tight and did not allow centres sufficient time to fully investigate the infection data. In future years, the process will be refined to enable centres to contribute accurate and fully completed data, and also to ensure that all centres are applying the same definitions. This will allow much greater clarity and interpretation in an area which is of high importance.

Further work is needed to establish the overall trend in MSSA, CDI and *E. coli* and to also refine the data definitions and data collection process to ensure consistency of reporting across centres. Increased awareness of infection reporting amongst both renal units and microbiology units would also help to improve the robustness of this data set, as would better data linkage between UK Renal Registry and Public Health England data systems.

Conflicts of interest: none

Acknowledgements

The authors wish to acknowledge the help of our colleagues at renal centres across the country for their assistance in compiling this report.

References

1 Bray BD, Boyd J, Daly C, Donaldson K, Doyle A, Fox JG, et al.: Vascular access type and risk of mortality in a national prospective cohort of haemodialysis patients. QJM – an International Journal of Medicine. 2012;105(11):1097–103

2 Crowley L, Pitcher D, Wilson J, Guy R, Fluck R: UK Renal Registry 16th Annual Report: Chapter 15 Epidemiology of Reported Infections amongst Patients Receiving Dialysis for Established Renal Failure in England from May 2011 to April 2012: a Joint Report from Public Health England and the UK Renal Registry. Nephron Clinical Practice. 2013;125:295–308

3 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/215135/dh_133016.pdf

4 Fluck R, Wilson J, Tomson CRV: UK Renal Registry 12th Annual Report (December 2009): Chapter 12 Epidemiology of Methicillin Resistant *Staphylococcus Aureus* Bacteraemia Amongst Patients Receiving Dialysis for Established Renal Failure in England in 2008: a joint report from the UK Renal Registry and the Health Protection Agency. Nephron Clinical Practice. 2010;115:C261–C70

5 Fluck R, Wilson J, Davies J, Blackburn R, O'Donoghue D, Tomson C: UK Renal Registry 11th Annual Report: Chapter 12 Epidemiology of Methicillin Resistant *Staphylococcus aureus* bacteraemia amongst patients receiving Renal Replacement Therapy in England in 2007. Nephron Clinical Practice. 2009;C247–C56

Appendix 1: Processes for reporting of infections to Public Health England

All infection cases are reported via the Healthcare Associated Infection Data Capture System (HCAI-DCS) which is a real-time, secure web enabled system. Criteria for what constitutes an infection are as follows:

1 MRSA bacteraemia: The following MRSA positive blood cultures must be reported to PHE:
All cases of MRSA bacteraemia caused by *S. aureus* resistant to methicillin, oxacillin, cefoxitin or flucloxacillin. Further details on surveillance of MRSA bacteraemia in patients with renal disease are available online [1].
All reported MRSA bacteraemia are subject to a post infection review [2]. The included renal data includes *all* cases regardless of whether they were assigned to a Trust or CCG via the post infection review process.
2 MSSA bacteraemia: The following MSSA positive blood cultures must be reported to PHE:
All cases of MSSA bacteraemia caused by *S. aureus* which are not resistant to methicillin, oxacillin, cefoxitin, or flucloxacillin i.e. not subject to MRSA reporting.
3 *E. coli* bacteraemia: The following *E. coli* positive blood cultures must be reported to PHE:
All laboratory confirmed cases of *E. coli* bacteraemia.
4 *C. difficile* Infection: Any of the following defines a *C. difficile* infection case in patients aged 2 years and above and must be reported to PHE [3]:

a Diarrhoeal stools (Bristol Stool types 5–7) where the specimen is *C. difficile* toxin positive.
b Toxic megacolon or ileostomy where the specimen is *C. difficile* toxin positive.
c Pseudomembranous colitis revealed by lower gastro-intestinal endoscopy or Computed Tomography.
d Colonic histopathology characteristic of *C. difficile* infection (with or without diarrhoea or toxin detection) on a specimen obtained during endoscopy or colectomy
e Faecal specimens collected post-mortem where the specimen is *C. difficile* toxin positive or tissue specimens collected post-mortem where pseudomembranous colitis is revealed or colonic histopathology is characteristic of *C. difficile* infection.

Information on patient identifiers, date the specimen was taken, the patient's location at the time the sample was taken and whether the patient was an inpatient or outpatient was collected for each episode. Cases were considered to be renal patients where it is indicated that the patient was in established renal failure at the time the specimen was taken. For these cases it was intended that they were to be shared with the renal service. 'Shared' records were required to have additional fields completed by the designated local contact in each renal centre.

The relevant renal hub for each record is identified using pre-defined relationships on the PHE surveillance system (Trusts are mapped to renal units behind the scenes). Low levels of cases being shared and completed may be the result of the fact that these listings have not recently been updated.

References

1 http://webarchive.nationalarchives.gov.uk/20140714084352/http://www.hpa.org.uk/webc/HPAwebFile/HPAweb_C/1194947399620
2 http://www.england.nhs.uk/wp-content/uploads/2014/04/mrsa-pir-guid-april14.pdf
3 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/215135/dh_133016.pdf