



Vascular Access-Related Bloodstream Infections in Hemodialysis Patients

Surveillance results: 2013-2014

From April 1st, 2013, to March 31st, 2014, 44 hemodialysis units took part in the surveillance of vascular access-related bloodstream infections (VARBSIs) in hemodialysis (HD) patients, for a combined total of 54,878 patient-periods (Table 1). Participating units reported 157 VARBSIs in 149 patients. Patient-periods involving a fistula accounted for 44.9% of patient-periods. The VARBSI incidence rate was 0.10 cases per 100 patient-periods for patients with an arteriovenous (AV) fistula, 0.22 for patients with a synthetic fistula (graft), 0.38 for patients with a permanent catheter and 6.20 for patients with a temporary catheter. In 2013-2014, incidence rates were stable for patients with a graft and for patients with a temporary catheter compared to 2009-2013, while incidence rates decreased significantly for patients with an AV fistula as well as patients with a permanent catheter. In 2013-2014, three HD units opened up and joined the program; one HD unit carried out the surveillance but could not report its results so these were excluded from analysis. Data was extracted on May 15, 2014.

Table 1 - Participation of Hemodialysis Units in the Surveillance of VARBSIs in Hemodialysis Patients, Québec, 2009-2010 to 2013-2014

	2009-2010	2010-2011	2011-2012	2012-2013	2013-2014
Units (N)	26	30	42	42	44
Patients monitored (average number per period)	3,035	3,337	3,871	3,977	4,221
Patient-periods* (N)	39,458	43,387	50,327	51,697	54,878
Patient-months (N)	36,947	40,607	47,245	48,340	51,362
Dialysis sessions (N)	475,033	522,087	607,436	621,516	660,365
Catheter-days (N)	592,317	659,463	753,432	798,816	847,947
VARBSIs (cat. 1a, 1b and 1c, N)	199	191	216	218	157
VARBSIs with AV fistulas or grafts (N)	35	30	38	46	27
VARBSIs with permanent or temporary catheters (N)	164	161	178	172	130
Infected patients (N)	186	182	208	209	149

* A period corresponds to 28 days for a total of 13 periods per year.

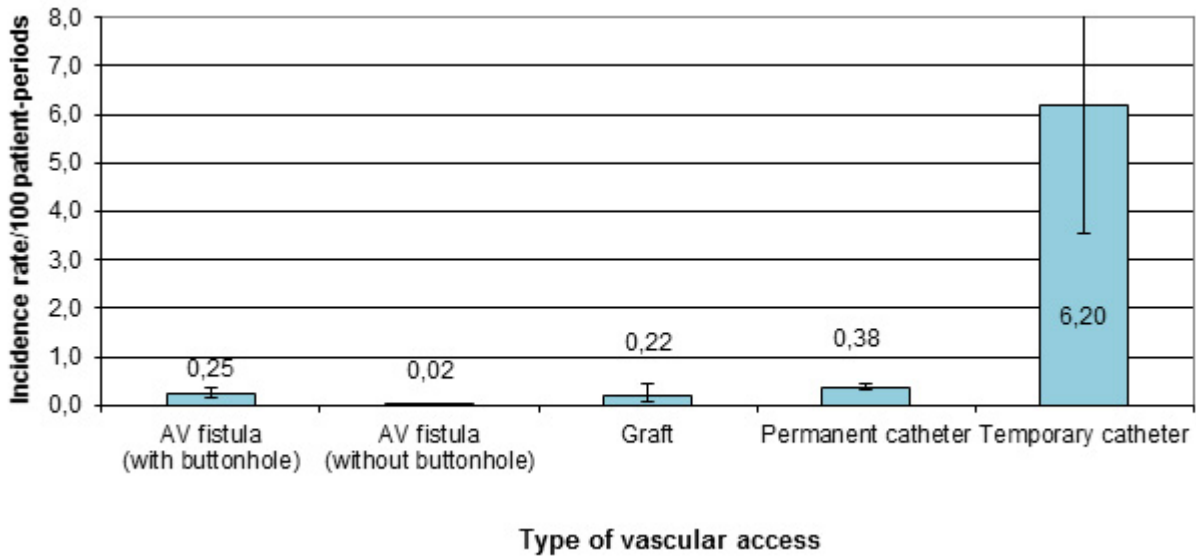
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Incidence Rates

In 2013-2014, the VARBSI incidence rate was 0.10 cases per 100 patient-periods for patients with an AV fistula, 0.22 for patients with a graft, 0.38 for patients with a permanent catheter and 6.20 for patients with a temporary catheter (Figure 1). The VARBSI incidence rate was higher when the buttonhole technique was used (0.25 per 100 patient-periods versus 0.02, $p < 0.01$). Incidence rates were not statistically different between patients with permanent catheter, graft nor AV fistula with buttonhole.

Therefore, compared with an AV fistula without buttonhole, the incidence rate with a temporary catheter was 305.0 [88.9 ; 1046.6] times greater, with a permanent catheter, 18.5 [6.0 ; 58.9] times greater, with a graft 10.7 [2.6 ; 44.8] times greater and with an AV fistula with a buttonhole, the incidence rate was 12.3 [3.6 ; 41.5] times greater (all p values < 0.01). The incidence rate with a temporary catheter was 16.3 [9.7 ; 27.5] times higher than with a permanent catheter (< 0.01).

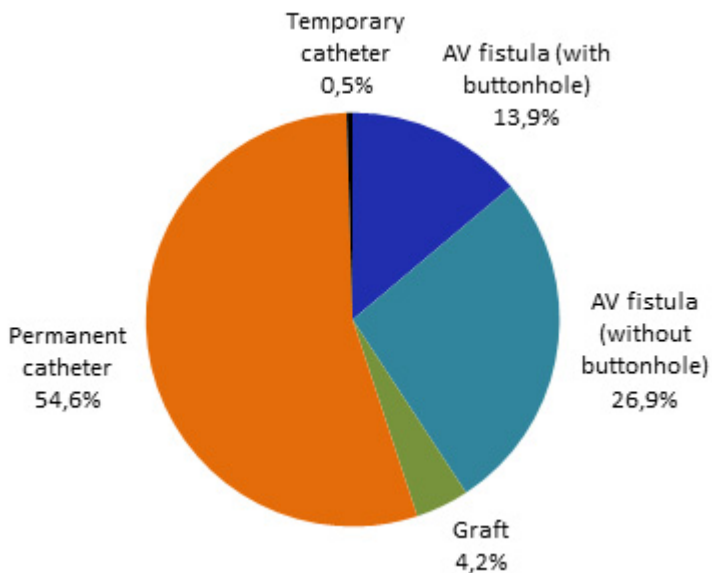
Figure 1 - VARBSI Incidence Rate by Type of Vascular Access, Québec, 2013-2014 (Incidence Rate per 100 Patient-periods [95% CI])



95% CI: 95% confidence interval

Permanent catheters are the most commonly used type of vascular access, followed by AV fistulas without the use of the buttonhole technique (Figure 2).

Figure 2 - Breakdown of Patient-periods by Type of Vascular Access, Québec, 2013-2014 (%)



Incidence Rate Time Trends

In 2013-2014, the incidence rates for patients with a graft and patients with a temporary catheter were comparable to 2009-2013 rates (Table 2 and Figures 3 and 4). However, the incidence rate for patients with AV fistula decreased significantly ($p < 0.01$) just as for patients with permanent catheter ($p < 0.01$). This decrease, observed with the two most frequently used types of vascular access, must be viewed in parallel with the sharp drop of VARBSI cases reported in 2013-2014 (Tables 2 and 3).

Figure 3 - VARBSI Incidence Rates by Type of Vascular Access, Québec, 2009-2013 and 2013-2014 (Incidence Rate per 100 Patient-periods [95% CI])

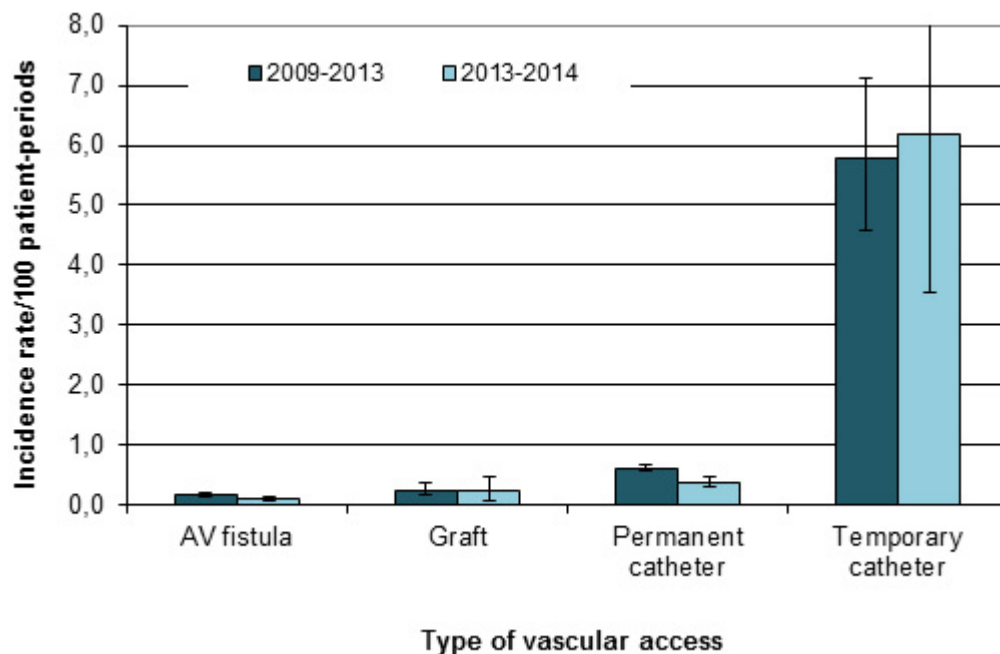
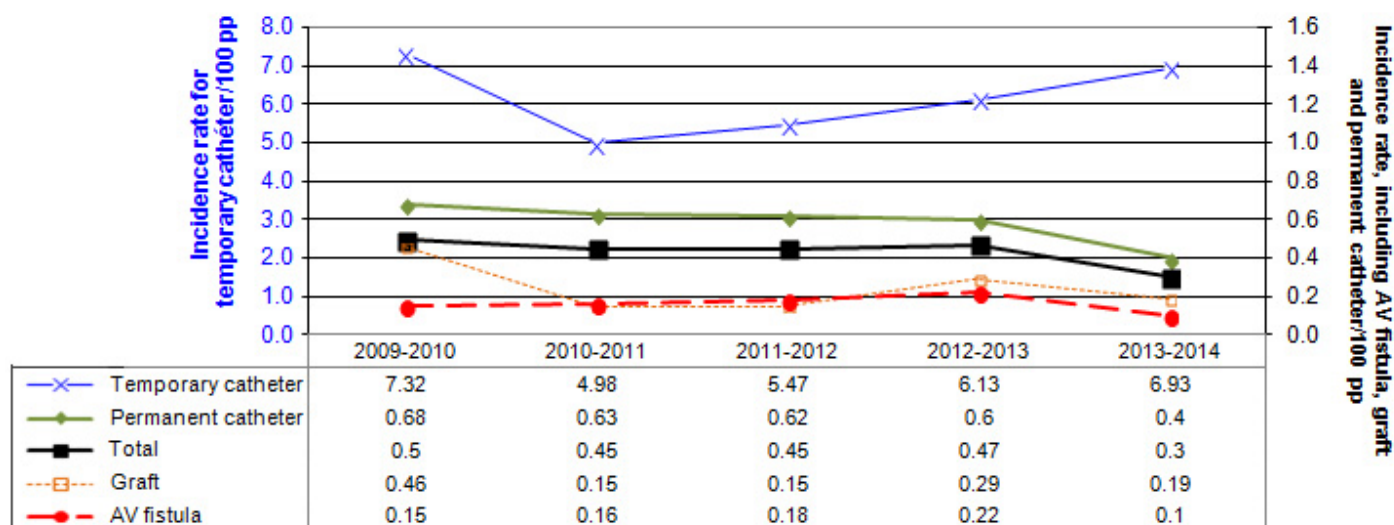


Table 2 - VARBSI Incidence Rates by Type of Vascular Access, Québec, 2009-2013 and 2013-2014 (Incidence Rate per 100 Patient-periods and per 1,000 Vascular-Access Days [95% CI])

Type of Vascular Access	Incidence Rate/100 Patient-periods [95% CI]		Incidence Rate/1,000 Vascular-Access Days [95% CI]	
	2009-2013	2013-2014	2009-2013	2013-2014
AV fistula or graft	0.18 [0.15 ; 0.20]	0.11 [0.07 ; 0.16]	---	---
AV fistula	0.17 [0.14 ; 0.20]	0.10 [0.06 ; 0.14]	---	---
Graft	0.25 [0.16 ; 0.36]	0.22 [0.07 ; 0.45]	---	---
Permanent or temporary catheter	0.68 [0.63 ; 0.73]	0.43 [0.36 ; 0.51]	0.24 [0.22 ; 0.26]	0.15 [0.13 ; 0.18]
Permanent catheter	0.61 [0.56 ; 0.65]	0.38 [0.32 ; 0.46]	0.22 [0.20 ; 0.23]	0.14 [0.11 ; 0.16]
Temporary catheter	5.77 [4.57 ; 7.11]	6.20 [3.54 ; 9.61]	2.05 [1.63 ; 2.53]	2.19 [1.25 ; 3.40]
Total	0.45 [0.42 ; 0.48]	0.29 [0.24 ; 0.33]	0.24 [0.22 ; 0.26]	0.15 [0.13 ; 0.18]

Figure 4 - VARBSI Incidence Rates by Type of Vascular Access, for Units Participating Since 2009-2010 (N = 26), Québec, 2009-2010 to 2013-2014 (Incidence Rate per 100 Patient-periods)



Despite recommendations to increase the use of fistula, the proportion of patients who receive hemodialysis through a catheter, either temporary or permanent, increased in 2013-2014 compared with 2009-2013. However, the proportion of patients with a temporary catheter, which is the form of vascular access most likely to lead to a VARBSI, decreased significantly ($p < 0.01$).

Table 3 - Breakdown of Patient-periods by Type of Vascular Access, 2009-2013 and 2013-2014 (%)

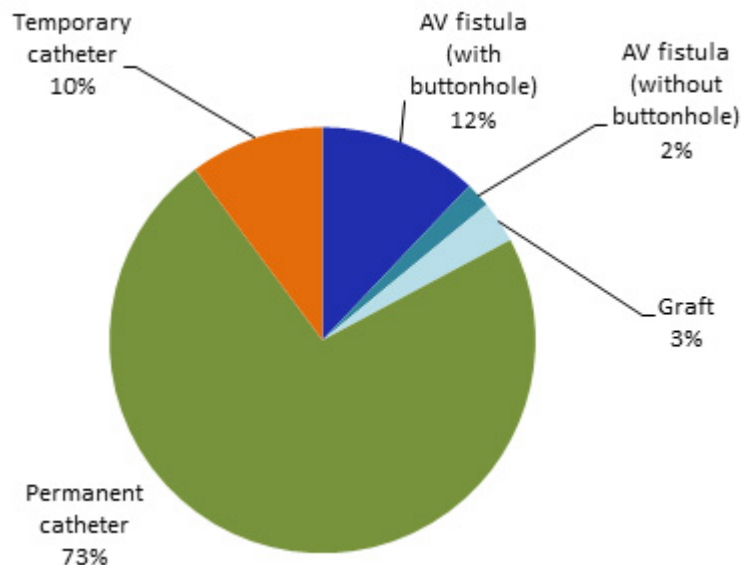
Type of Vascular Access	Québec (%)	
	2009-2013	2013-2014
AV fistula	41.2	40.8
With buttonhole		13.9
Without buttonhole		26.9
Graft	4.8	4.2
Permanent catheter	53.2	54.6
Temporary catheter	0.7	0.5
Fistule artérioveineuse ou synthétique	46.0	44.9
Cathéter permanent ou temporaire	54.0	55.1
Catheterized for < 90 days	-	-
Catheterized for \geq 90 days	-	-
Total (N)	184,699	54,662

Description of cases

Patients who developed a VARBSI were aged between 0 and 93 years, with a median age of 68 years. The vast majority (83%, or 130 cases) of VARBSIs occurred in patients who received their hemodialysis treatment via catheter, even though they represented only 55% of the patient-periods monitored (Figure 5). For most of the cases that arose in patients receiving their hemodialysis through an AV fistula,

the buttonhole technique was used (86%) even though this technique is used among 34% of patients with AV fistula.

Figure 5 - Breakdown of VARBSIs by Type of Vascular Access, Québec, 2013-2014 (N = 156)

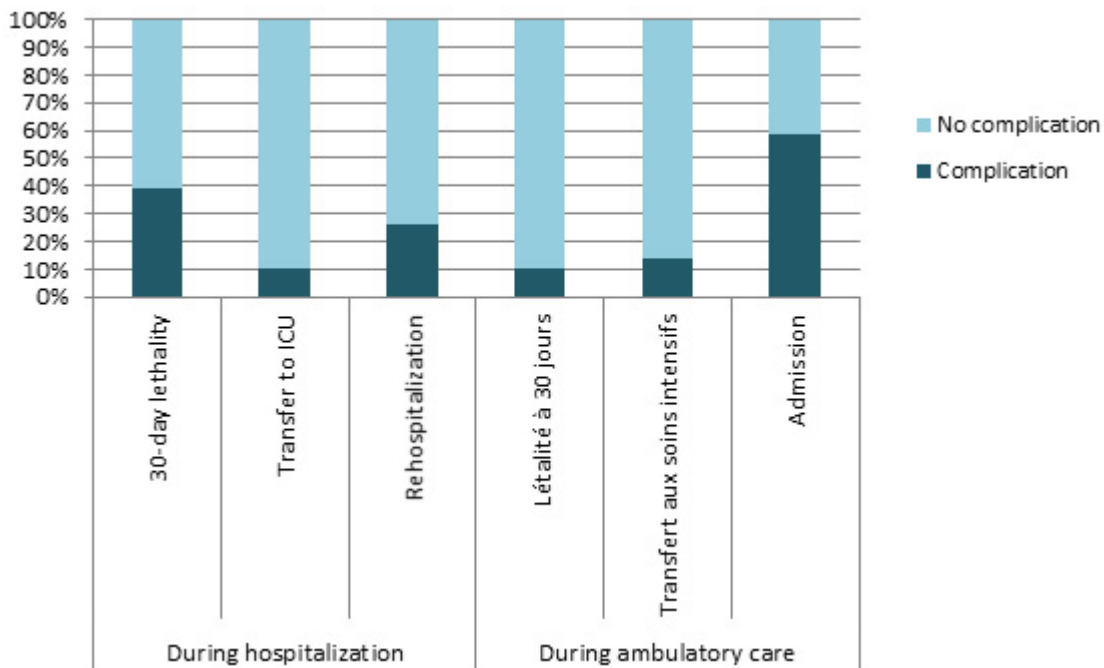


Overall, 15% of VARBSI cases resulted in death within 30 days following the onset of bacteremia. Death occurred in 39% of cases of VARBSI among hospitalized patients (Table 4 and Figure 6), compared with 11% of cases among patients receiving ambulatory care ($p = 0.003$). A total of 59% of ambulatory patients who developed a VARBSI required hospitalization.

Table 4 - 30-Day Case Fatality, Percentage of Transfers to ICU and Percentage of Hospitalizations and Rehospitalizations During a VARBSI Episode, by Origin of Acquisition, Québec, 2013-2014 (N, %)

Origin of Acquisition	Complication	Number of VARBSI Cases Monitored	Presence of complication	
			N	%
During hospitalization	Death within 10 days	23	5	22
	Death within 30 days	23	9	39
	Transfer to ICU	19	2	11
	Rehospitalization	23	6	26
During ambulatory care	Death within 10 days	134	9	7
	Death within 30 days	134	14	11
	Transfer to ICU	133	18	14
	Hospitalization	134	79	59

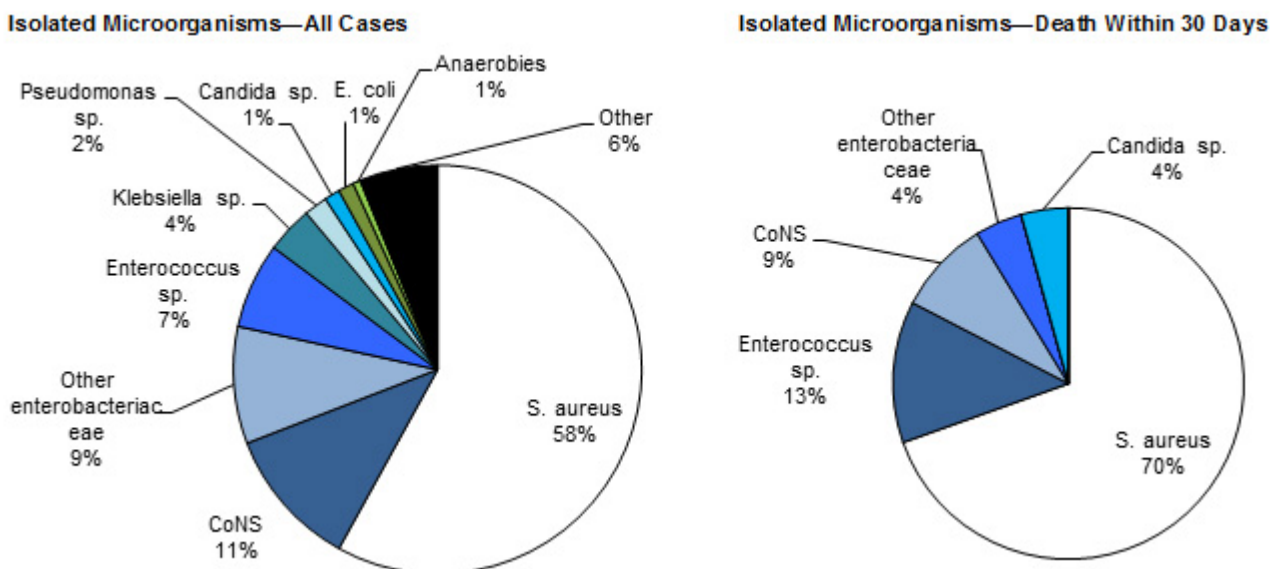
Figure 6—30-Day Case Fatality, Percentage of Transfers to ICU and Percentage of Hospitalizations and Rehospitalizations During a VARBSI Episode, by Origin of Acquisition, Québec, 2013-2014 (%)



Microbiology

Figure 7 shows that *Staphylococcus aureus* was the most frequently isolated microorganism in all VARBSI cases (54%). This was followed by coagulase-negative *Staphylococcus* (CoNS, 11%) and Enterobacteriaceae (other than *Escherichia coli* and *Klebsiella* sp., 9%). Three of the CoNS cases (n = 18) involved *S. lugdunensis*. *S. aureus* was the most frequently isolated microorganism in cases resulting in death (70%).

Figure 7 - Categories of Isolated Microorganisms in All Reported Cases (N = 162) and Cases Resulting in Death Within 30 Days (N = 23), Québec, 2013-2014 (%)



In 2013-2014, 12% of *S. aureus* strains were oxacillin-resistant, which is not significantly different

compared with 2009-2013 mean percentage (Table 5 and Figure 8).

Table 5 - Percentage of Strains Tested and Percentage of Resistance to Antibiotics for Certain Isolated Microorganisms, Québec, 2013-2014 (N, %)

Microorganism	Antibioti	Isolated	Tested		Resistant	
		N	n	%	n	%
<i>Staphylococcus aureus</i>	Oxacillin	94	94	100.0	11	11.7
<i>Enterococcus faecium</i>	Vancomycin	2	2	100.0	0	0.0
<i>Enterococcus faecalis</i>	Vancomycin	7	7	100.0	0	0.0
<i>Klebsiella (pneumoniae-oxytoca)</i>	CSE 4	0	-	-	-	-
	Imipenem or meropenem	0	-	-	-	-
	Multiresistant 1	0	-	-	-	-
<i>Escherichia coli</i>	CSE 4	2	1	50.0	1	100.0
	Fluoroquinolones 3	2	2	100.0	1	50.0
	Imipenem or meropenem	2	0	0.0	0	-
	Multiresistant 1	2	1	50.0	0	0.0
	CSE 4	3	3	100.0	0	0.0
<i>Enterobacter sp.</i>	Imipenem or meropenem	3	3	100.0	0	0.0
	Multiresistant 1	3	3	100.0	0	0.0
	Amikacin, gentamicin or tobramycin	3	2	66.7	0	0.0
	CSE 2	3	3	100.0	0	0.0
<i>Pseudomonas sp.</i>	Fluoroquinolones 2	3	3	100.0	0	0.0
	Imipenem or meropenem	3	3	100.0	0	0.0
	Piperacillin/tazobactam	3	3	100.0	0	0.0
	Multiresistant 2	3	3	100.0	0	0.0
<i>Acinetobacter sp.</i>	Imipenem or meropenem	1	1	100.0	0	0.0
	Multiresistant 3	1	1	100.0	0	0.0

CSE 2: cefepime or ceftazidime;

CSE 4: cefepime, cefotaxime, ceftazidime or ceftriaxone;

Fluoroquinolones 2: ciprofloxacin or levofloxacin;

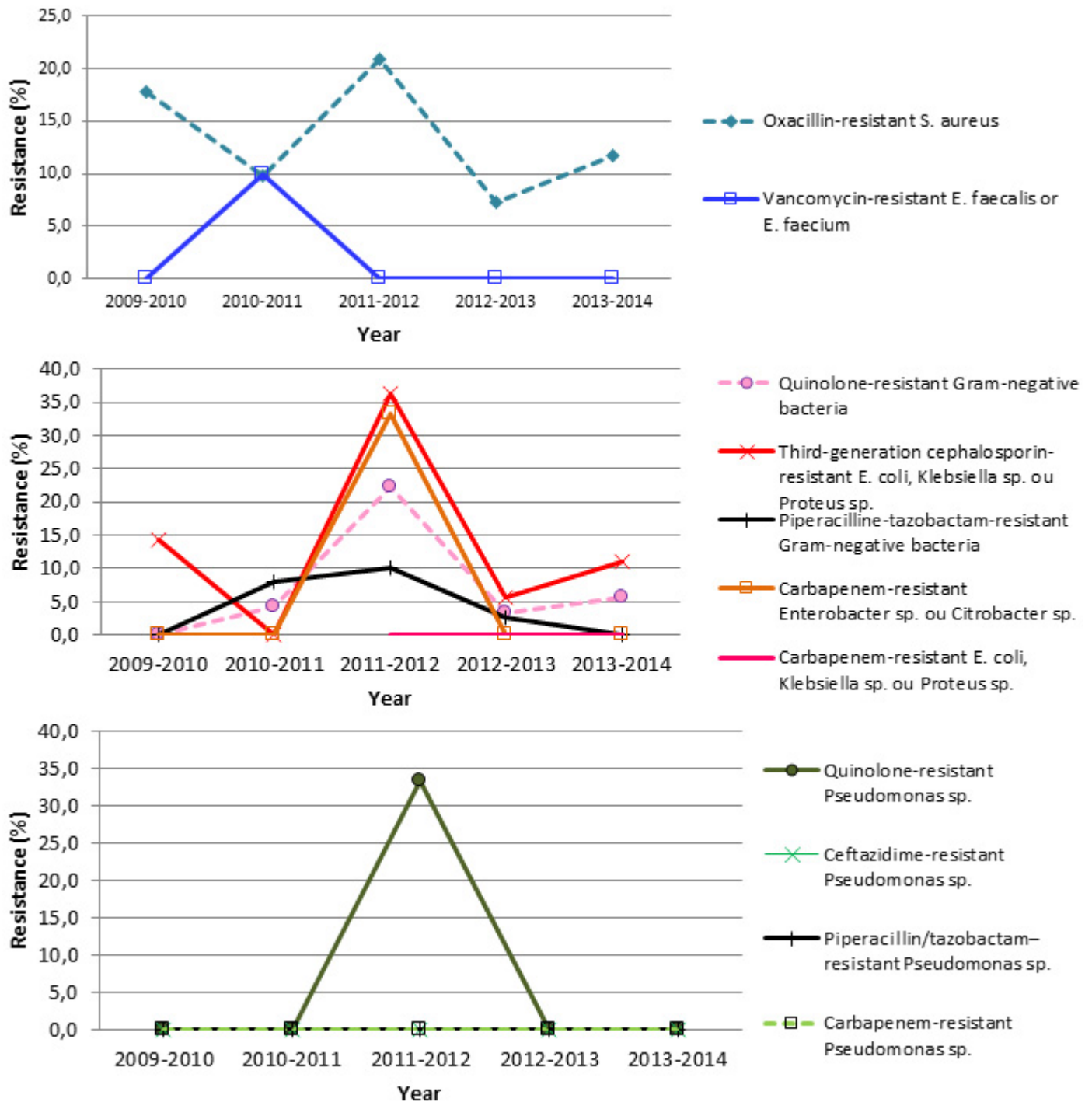
Fluoroquinolones 3: ciprofloxacin, levofloxacin or moxifloxacin;

Multiresistant 1: intermediate or resistant to an agent in three of the following five categories: cephalosporins 4, fluoroquinolones 3, aminoglycosides, carbapenems, piperacillin or piperacillin/tazobactam.

Multiresistant 2: intermediate or resistant to an agent in three of the following five categories: cephalosporins 2, fluoroquinolones 2, aminoglycosides, carbapenems, piperacillin or piperacillin/tazobactam.

Multiresistant 3: intermediate or resistant to an agent in three of the following six categories: cephalosporins 2, fluoroquinolones 2, aminoglycosides, carbapenems, piperacillin or piperacillin/tazobactam, ampicillin/sulbactam.

Figure 8 - Percentage of Antibiotic Resistance in Certain Gram-Positive Bacteria, Certain Gram-Negative Bacteria and *Pseudomonas* sp., Québec, 2013-2014 (%)



Results per Healthcare Facility

Figures 9 and 10 show the breakdown of patient-periods monitored in 2013-2014, by type of vascular access and by healthcare facility. In 2013-2014, the percentage of fistulas decreased in 15 healthcare facilities and increased in 6 (Table 6). Twelve facilities reported a rate of 0 VARBSI per 100 patient-

periods, and only one reported a rate higher than the 90th-percentile mark for 2009-2013 (Figure 11 and Table 7). Facilities with an incidence rate of 0 had small dialysis units of 4 to 12 chairs.

Figure 9 - Breakdown of Patient-periods Monitored by Type of Vascular Access and by Healthcare Facility, Québec, 2013-2014 (N)

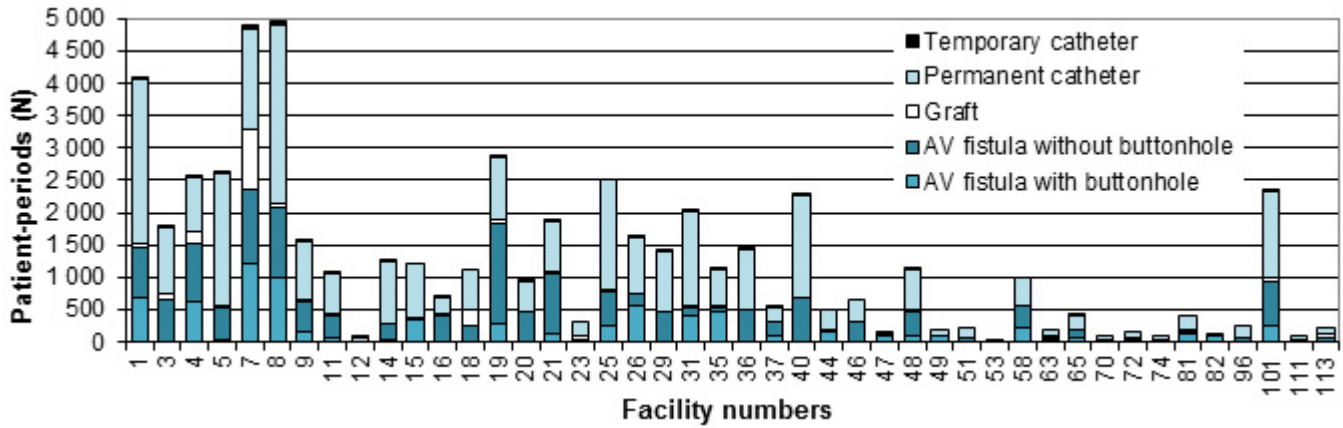


Figure 10 - Percentage of Patient-periods Involving a Fistula, by Healthcare Facility, Québec, 2013-2014 (%)

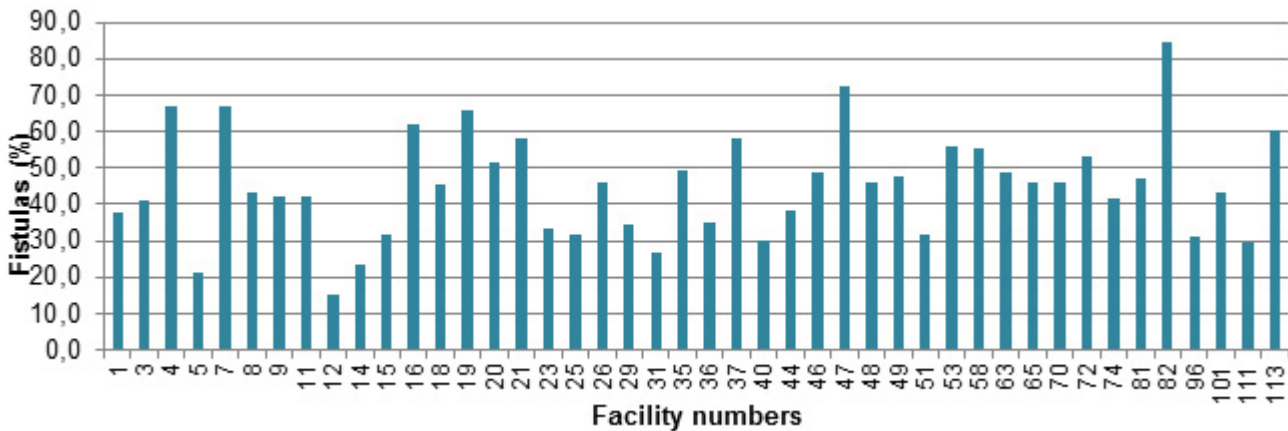


Figure 11 - VARBSI Incidence Rate per Healthcare Facility (2013-2014) and Incidence Rate Percentile (2009-2010 to 2012-2013), Québec, 2013-2014 (Incidence Rate per 100 Patient-periods)

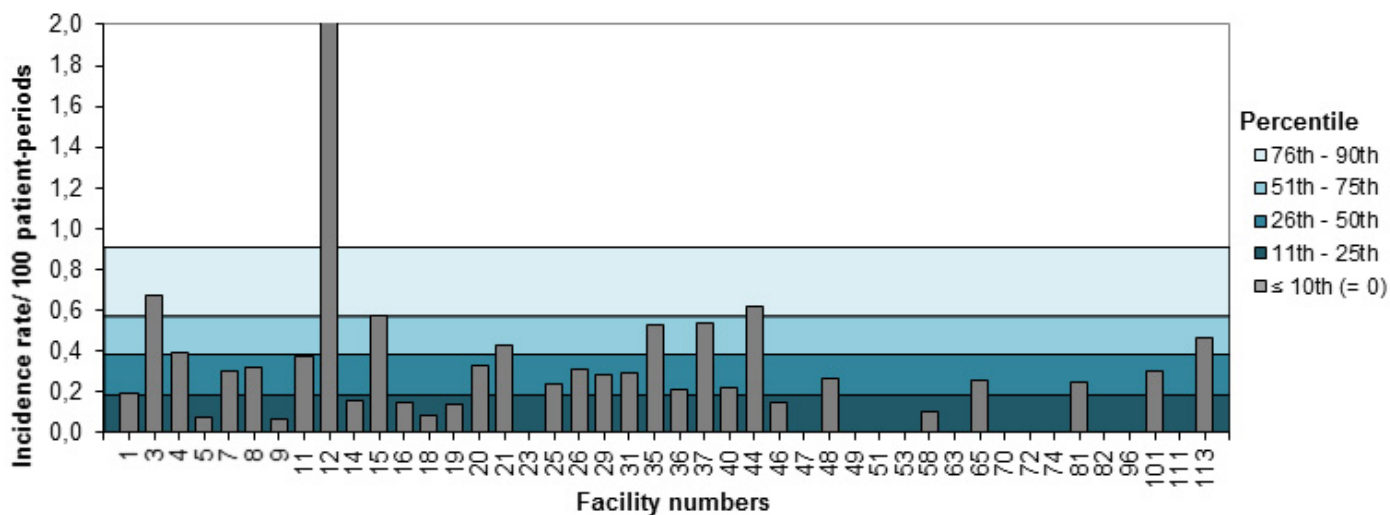


Table 6 - Number of Patient-periods Monitored and Percentage of Fistulas, by Healthcare Facility, Québec, 2009-2013 and 2013-2014 (N, % [95% CI])

Facility	2009-2013		2013-2014		Variations (p < 0.05)
	Patients-periods (n)	% with fistula	Patients-periods (n)	% with fistula	
1 HÔPITAL CHARLES LEMOYNE	15,278	53 [52 ; 54]	4,061	38 [36 ; 39]	diminution
3 HÔPITAL ROYAL VICTORIA	7,570	43 [41 ; 44]	1,789	41 [39 ; 44]	
4 HÔPITAL NOTRE-DAME DU CHUM	8,522	62 [61 ; 63]	2,553	67 [65 ; 69]	augmentation
5 HÔPITAL GÉNÉRAL JUIF	4,808	28 [26 ; 29]	2,614	21 [20 ; 23]	diminution
7 PAVILLON L'HÔTEL-DIEU DE QUÉBEC	14,241	51 [50 ; 51]	4,897	67 [66 ; 68]	augmentation
8 PAV. MAISONNEUVE/PAV. MARCEL-LAMOUREUX	18,927	50 [49 ; 51]	4,954	43 [42 ; 45]	diminution
9 HÔPITAL DU HAUT-RICHELIEU	5,046	44 [43 ; 46]	1,554	42 [40 ; 45]	
11 HÔPITAL PIERRE-LE GARDEUR	4,148	45 [43 ; 46]	1,055	42 [39 ; 45]	
12 CENTRE HOSPITALIER UNIVERSITAIRE SAINTE-JUSTINE	160	24 [18 ; 31]	80	15 [7 ; 23]	
14 CENTRE HOSPITALIER RÉGIONAL DE LANAUDIÈRE	4,544	27 [26 ; 28]	1,235	23 [21 ; 26]	diminution
15 HÔPITAL FLEURIMONT	6,315	34 [32 ; 35]	1,222	32 [29 ; 34]	

16	HÔPITAL RÉGIONAL DE RIMOUSKI	1,985	59 [57 ; 61]	687	62 [58 ; 65]
18	HÔTEL-DIEU DE LÉVIS	3,768	47 [45 ; 48]	1,123	46 [43 ; 49]
19	HÔPITAL CITÉ DE LA SANTÉ	5,647	68 [67 ; 69]	2,869	66 [64 ; 68] diminution
20	HÔPITAL DE CHICOUTIMI	4,005	65 [63 ; 66]	922	51 [48 ; 55] diminution
21	HÔPITAL SAINT-LUC DU CHUM	7,281	62 [60 ; 63]	1,868	58 [56 ; 60] diminution
23	HÔTEL-DIEU D'ARTHABASKA	1,487	39 [36 ; 41]	296	33 [28 ; 39]
25	HÔPITAL DU SACRÉ-COEUR DE MONTRÉAL	7,538	26 [25 ; 27]	2,517	32 [30 ; 33] augmentation
26	HÔPITAL DE VERDUN	6,416	51 [50 ; 52]	1,610	46 [44 ; 49] diminution
29	HÔPITAL GÉNÉRAL DE MONTRÉAL	6,558	29 [28 ; 30]	1,390	35 [32 ; 37] augmentation
31	PAVILLON SAINT-JOSEPH	8,352	28 [27 ; 29]	2,027	27 [25 ; 29]
35	HÔPITAL HONORÉ-MERCIER	1,889	53 [50 ; 55]	1,125	49 [47 ; 52]
36	HÔPITAL GÉNÉRAL DU LAKESHORE	3,314	40 [38 ; 42]	1,428	35 [33 ; 38] diminution
37	HÔTEL-DIEU DE SOREL	2,499	52 [50 ; 54]	560	58 [54 ; 62] augmentation
40	HÔPITAL DE HULL	9,297	33 [32 ; 34]	2,281	30 [28 ; 32] diminution
44	HÔPITAL SAINTE-CROIX	2,038	42 [40 ; 44]	483	38 [34 ; 43]
46	HÔPITAL DE GRANBY	1,477	60 [58 ; 63]	665	49 [45 ; 53] diminution
47	HÔPITAL DE ROUYN-NORANDA	854	64 [61 ; 68]	138	72 [65 ; 80]
48	CENTRE HOSPITALIER DE ST. MARY	2,973	44 [42 ; 46]	1,113	46 [43 ; 49]
49	CSSS MEMPHRÉMAGOG	374	48 [43 ; 53]	192	47 [40 ; 54]
51	HÔPITAL DE MANIWAKI	394	39 [34 ; 44]	230	32 [26 ; 38]
53	HÔPITAL DE CHANDLER	-	-	25	56 [37 ; 75]
58	HÔPITAL DU SUROÛT	4,012	59 [57 ; 60]	1,009	55 [52 ; 58] diminution
63	HÔPITAL DE SAINT-GEORGES	245	53 [46 ; 59]	199	49 [42 ; 56]

65	HÔPITAL ET CLSC DE VAL-D'OR	810	54 [51 ; 58]	394	46 [41 ; 51]	diminution
70	CENTRE DE SOINS DE COURTE DURÉE LA SARRE	240	67 [61 ; 73]	94	46 [36 ; 56]	diminution
72	HÔPITAL ET CENTRE D'HÉBERGEMENT DE SEPT-ÎLES	138	48 [39 ; 56]	143	53 [45 ; 61]	
74	HÔPITAL DE DOLBEAU-MISTASSINI	-	-	96	42 [32 ; 52]	
81	HÔPITAL DE MONT-LAURIER	1,448	48 [45 ; 50]	409	47 [42 ; 52]	
82	PAVILLON SAINTE-FAMILLE	234	60 [54 ; 66]	102	84 [77 ; 91]	augmentation
96	CENTRE DE SANTÉ DE CHIBOUGAMAU	490	40 [35 ; 44]	239	31 [25 ; 37]	diminution
101	HÔPITAL RÉGIONAL DE SAINT-JÉRÔME	9,048	45 [44 ; 46]	2,322	43 [41 ; 45]	
111	HÔPITAL DE PAPINEAU	-	-	95	29 [20 ; 39]	
113	HÔPITAL DE THETFORD MINES	329	58 [53 ; 64]	213	60 [54 ; 67]	

Table 7 - Number of VARBSI Cases and Incidence Rate by Healthcare Facility, and Percentile Ranking, Québec, 2009-2013 and 2013-2014 (Incidence Rate per 100 Patient-periods [95% CI])

Facility	2009-2013*			2013-2014		
	Number of cases	Mean Number of cases per year	Rate/100 pp	Number of cases	Rate/100 pp	
1	HÔPITAL CHARLES LEMOYNE	41	10.3	0.27 [0.19 ; 0.36]	8	0.20 [0.08 ; 0.36]
3	HÔPITAL ROYAL VICTORIA	49	12.3	0.65 [0.48 ; 0.84]	12	0.67 [0.34 ; 1.10]
4	HÔPITAL NOTRE-DAME DU CHUM	33	8.3	0.39 [0.27 ; 0.53]	10	0.39 [0.19 ; 0.67]
5	HÔPITAL GÉNÉRAL JUIF	12	6.0	0.25 [0.13 ; 0.41]	2	0.08 [0.01 ; 0.22]
7	PAVILLON L'HÔTEL-DIEU DE QUÉBEC	59	14.8	0.41 [0.32 ; 0.53]	15	0.31 [0.17 ; 0.48]
8	PAV. MAISONNEUVE/PAV. MARCEL-LAMOUREUX	85	21.3	0.45 [0.36 ; 0.55]	16	0.32 [0.18 ; 0.50]

9	HÔPITAL DU HAUT- RICHELIEU	45	11.3	0.89 [0.65 ; 1.17]	1	0.06 [0.00 ; 0.25]
11	HÔPITAL PIERRE-LE GARDEUR	26	6.5	0.63 [0.41 ; 0.89]	4	0.38 [0.10 ; 0.84]
12	CENTRE HOSPITALIER UNIVERSITAIRE SAINTE- JUSTINE	5	1.7	3.13 [0.99 ; 6.46]	7	8.75 [3.47 ; 16.43]
14	CENTRE HOSPITALIER RÉGIONAL DE LANAUDIÈRE	24	6.0	0.53 [0.34 ; 0.76]	2	0.16 [0.02 ; 0.46]
15	HÔPITAL FLEURIMONT	34	8.5	0.54 [0.37 ; 0.73]	7	0.57 [0.23 ; 1.08]
16	HÔPITAL RÉGIONAL DE RIMOUSKI	6	1.5	0.30 [0.11 ; 0.59]	1	0.15 [0.00 ; 0.57]
18	HÔTEL-DIEU DE LÉVIS	13	3.3	0.35 [0.18 ; 0.56]	1	0.09 [0.00 ; 0.35]
19	HÔPITAL CITÉ DE LA SANTÉ	16	8.0	0.28 [0.16 ; 0.44]	4	0.14 [0.04 ; 0.31]
20	HÔPITAL DE CHICOUTIMI	16	4.0	0.40 [0.23 ; 0.62]	3	0.33 [0.06 ; 0.80]
21	HÔPITAL SAINT-LUC DU CHUM	48	12.0	0.66 [0.49 ; 0.86]	8	0.43 [0.18 ; 0.78]
23	HÔTEL-DIEU D'ARTHABASKA	5	1.3	0.34 [0.11 ; 0.70]	0	0.00
25	HÔPITAL DU SACRÉ- COEUR DE MONTRÉAL	43	10.8	0.57 [0.41 ; 0.75]	6	0.24 [0.09 ; 0.47]
26	HÔPITAL DE VERDUN	24	6.0	0.37 [0.24 ; 0.54]	5	0.31 [0.10 ; 0.64]
29	HÔPITAL GÉNÉRAL DE MONTRÉAL	35	8.8	0.53 [0.37 ; 0.73]	4	0.29 [0.07 ; 0.64]
31	PAVILLON SAINT-JOSEPH	25	6.3	0.30 [0.19 ; 0.43]	6	0.30 [0.11 ; 0.58]
35	HÔPITAL HONORÉ- MERCIER	10	5.0	0.53 [0.25 ; 0.91]	6	0.53 [0.19 ; 1.05]
36	HÔPITAL GÉNÉRAL DU LAKESHORE	6	2.0	0.18 [0.07 ; 0.35]	3	0.21 [0.04 ; 0.52]
37	HÔTEL-DIEU DE SOREL	19	4.8	0.76 [0.46 ; 1.14]	3	0.54 [0.10 ; 1.31]
40	HÔPITAL DE HULL	40	10.0	0.43 [0.31 ; 0.57]	5	0.22 [0.07 ; 0.45]
44	HÔPITAL SAINTE-CROIX	6	1.5	0.29 [0.11 ; 0.58]	3	0.62 [0.12 ; 1.52]
46	HÔPITAL DE GRANBY	4	1.3	0.27 [0.07 ; 0.60]	1	0.15 [0.00 ; 0.59]
47	HÔPITAL DE ROUYN- NORANDA	3	0.8	0.35 [0.07 ; 0.86]	0	0.00
48	CENTRE HOSPITALIER DE ST. MARY	6	2.0	0.20 [0.07 ; 0.40]	3	0.27 [0.05 ; 0.66]

49	CSSS MEMPHRÉMAGOG	1	0.5	0.27 [0.00 ; 1.05]	0	0.00
51	HÔPITAL DE MANIWAKI	3	1.5	0.76 [0.14 ; 1.87]	0	0.00
53	HÔPITAL DE CHANDLER	-	-	-	0	0.00
58	HÔPITAL DU SUROÎT	10	2.5	0.25 [0.12 ; 0.43]	1	0.10 [0.00 ; 0.39]
63	HÔPITAL DE SAINT-GEORGES	1	0.5	0.41 [0.00 ; 1.60]	0	0.00
65	HÔPITAL ET CLSC DE VAL-D'OR	4	2.0	0.49 [0.13 ; 1.10]	1	0.25 [0.00 ; 1.00]
70	CENTRE DE SOINS DE COURTE DURÉE LA SARRE	0	0.0	0.00	0	0.00
72	HÔPITAL ET CENTRE D'HÉBERGEMENT DE SEPT-ÎLES	1	0.5	0.72 [0.00 ; 2.84]	0	0.00
74	HÔPITAL DE DOLBEAU-MISTASSINI	-	-	-	0	0.00
81	HÔPITAL DE MONT-LAURIER	1	0.3	0.07 [0.00 ; 0.27]	1	0.24 [0.00 ; 0.96]
82	PAVILLON SAINTE-FAMILLE	0	0.0	0.00	0	0.00
96	CENTRE DE SANTÉ DE CHIBOUGAMAU	0	0.0	0.00	0	0.00
101	HÔPITAL RÉGIONAL DE SAINT-JÉRÔME	62	15.5	0.69 [0.53 ; 0.87]	7	0.30 [0.12 ; 0.57]
111	HÔPITAL DE PAPINEAU	-	-	-	0	0.00
113	HÔPITAL DE THETFORD MINES	2	1.0	0.61 [0.06 ; 1.74]	1	0.47 [0.00 ; 1.84]
10 th				0.00		0.00
25 th				0.19		0.00
50 th				0.39		0.21
75 th				0.57		0.32
90 th				0.91		0.54

* Changes in rates within individual facilities were not subjected to statistical analysis, given the small number of cases involved

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[1] <http://www.fistulafirst.org/AboutFistulaFirst/FisultaFirstCatheterLastFFCLData.aspx>

[2] http://cclin-sudest.chu-lyon.fr/Reseaux/DIALIN/Resultats/rapport_annuel_2011_V2.pdf

[3] <https://www.inspq.qc.ca/en/file/10881/download?token=mFuMliBK>