

External ventricular drain infection: a quality improvement intervention can make a difference

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Introduction:

- Ventriculitis associated with the use of external ventricular drains (EVDs) to drain cerebrospinal fluid (CSF) causes significant morbidity and mortality in neurosurgical patients.
- Factors such as drainage duration and frequency of device access increase infection risk.
- The aim of this project was to reduce rates of EVD-associated ventriculitis at a national neurosurgical referral centre.

Materials/methods:

- Data from laboratory and clinical records were used to obtain information on EVD-associated ventriculitis cases retrospectively from January 2009 to November 2013.
- A protocol for inserting and accessing EVDs was introduced in November 2013. This intervention included minimising EVD manipulation and maximising strict aseptic technique while accessing EVDs.
- Post-intervention data on EVD-associated ventriculitis was prospectively collected from December 2013 to May 2014, using the surveillance form in **Figure 2**.

Figure 1.

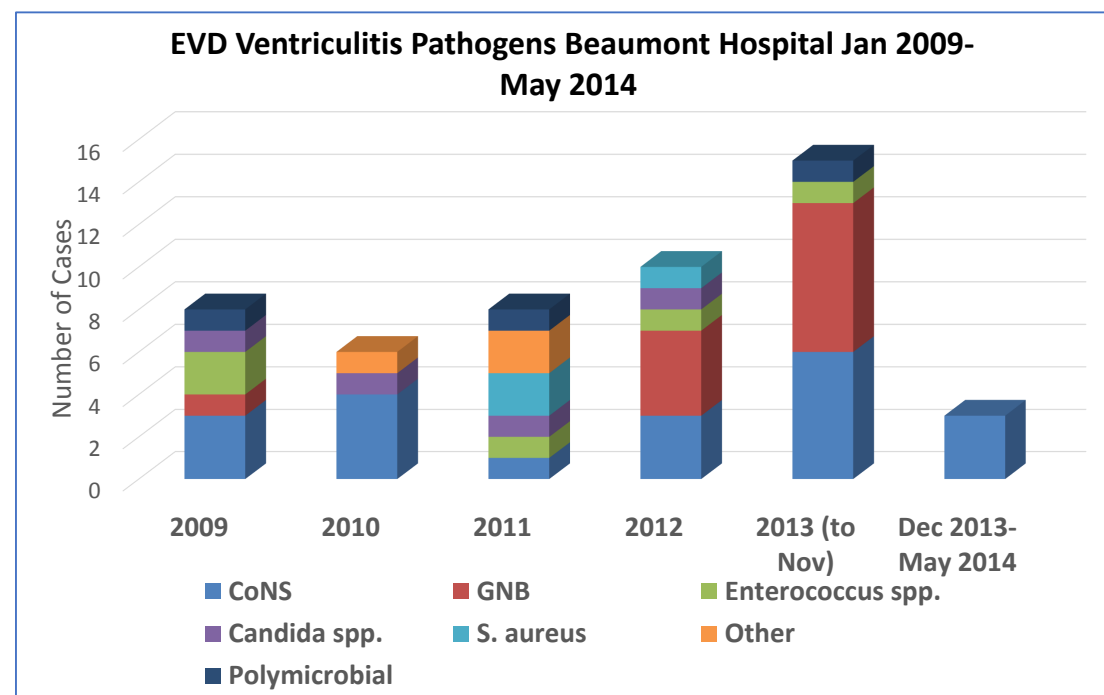


Table 1. EVD Ventriculitis Pre- and Post- Care Protocol Introduction, Beaumont Hospital 2009- 2014

	Pre-intervention (Jan 09- Nov 13)	Post-intervention (Dec 13- May 14)
Duration of Study (months)	59	6
Total EVDs	500	62
Ventriculitis Cases	47 (9.4%)	3 (4.7%)
No. Female	22 (53.7%)	1 (33%)
Mean Age (years)	45 (Range: 13- 72)	63 (Range: 54- 74)
Median Days to Infection	12 (Range: 1- 28)	12 (Range 10- 14)
Median Manipulations Pre-infection	1 (Range: 0- 6)	1 (Range 0-1)
Device Disruption Pre-infection	11 (23.9%)	1 (33%)
Pathogen:		
- Coagulase-negative staphylococci	17 (36%)	3 (100%)
- Gram-negative bacilli	12 (26%)	-
- Enterococcus spp.	5 (11%)	-
- Candida spp.	4 (9%)	-
- S. aureus	3 (6%)	-
- Other	3 (6%)	-
- Polymicrobial	3 (6%)	-
Indication for EVD:		
- Intracranial haemorrhage	18 (38%)	2 (66%)
- Tumour	18 (38%)	1 (33%)
- Infection	6 (13%)	-
- Trauma	3 (7%)	-
- VPS Malfunction	2 (4%)	-

Figure 2.

External Ventricular Drainage Device - Infection Surveillance Form			
Patient name			
Date of birth	___/___/___		
Gender	<input type="checkbox"/> M <input type="checkbox"/> F	Date of admission	___/___/___
Date EVD inserted	___/___/___	Ward/unit	
Type of EVD	Tunnelled	Emergency procedure	<input type="checkbox"/> Yes <input type="checkbox"/> No
<input type="checkbox"/> Standard	<input type="checkbox"/> Yes <input type="checkbox"/> No		
<input type="checkbox"/> Silver coated			
<input type="checkbox"/> Antimicrobial			
<input type="checkbox"/> Other _____			
Surgeon	Reason for EVD		
<input type="checkbox"/> Consultant	ASA score	<input type="checkbox"/> Intracranial haemorrhage	
<input type="checkbox"/> Trainee	<input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> 5	<input type="checkbox"/> Tumour	
	<input type="checkbox"/> Unknown	<input type="checkbox"/> VP shunt malfunction	
		<input type="checkbox"/> Trauma	
		<input type="checkbox"/> Infection	
		<input type="checkbox"/> Other _____	

Figure 3.

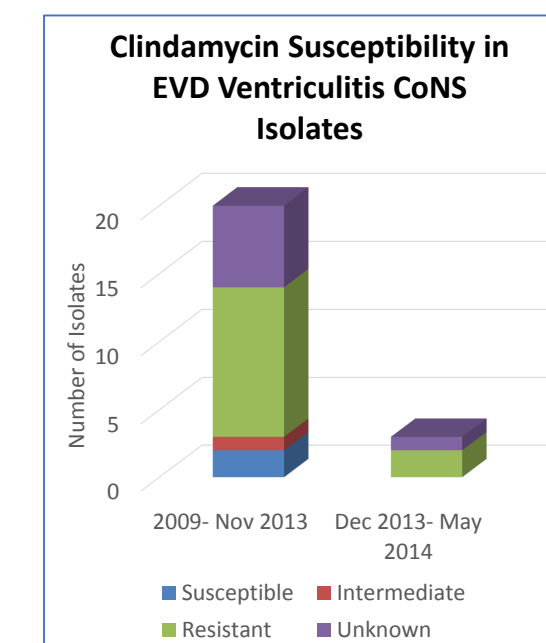
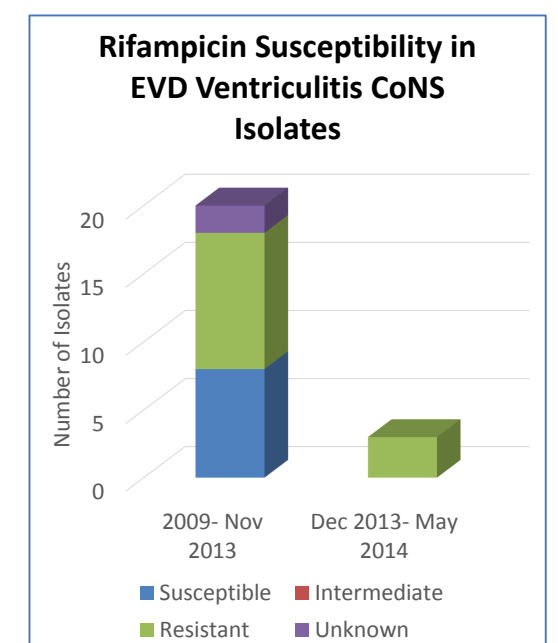


Figure 4.



Results:

- The rate of EVD-associated ventriculitis fell from 9.4% (47 of 500 EVDs; 41 patients) during the pre-intervention period to 4.8% (3 of 62 EVDs; 3 patients) following introduction of the care protocol. (**Table 1**)
- The median interval from device placement to onset of infection was 12 days in both groups.
- Coagulase-negative staphylococci (CoNS) were the predominant pathogens in both groups, accounting for 17/47 cases (36.2%) in the retrospective group and all three cases in the prospective group. (**Figure 1**)
- A large proportion of CoNS in both pre- and post-intervention groups were resistant to clindamycin and/ or rifampicin, which may reflect the routine use of antibiotic-coated EVDs. (**Figure 3, Figure 4**)

Conclusions:

- A lower rate of EVD-associated ventriculitis was observed following the introduction of an EVD care protocol.
- Further follow up and ongoing education and training, with investment in the necessary resources, are needed to promote continued best practice and to confirm reduced infection rates.