The NNI External Ventricular Drain Pathway

A Pragmatic Multi-site Risk Stratification Pathway to reduce Ventriculostomy-related Infection

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INTRODUCTION

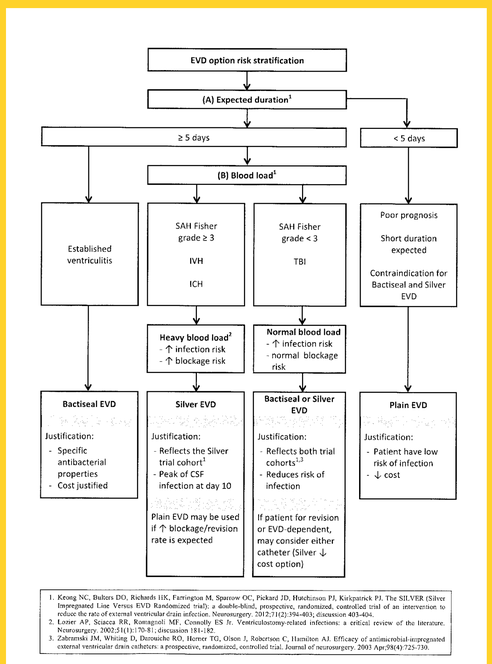
Patients with external ventricular drain (EVD), a commonly performed neurosurgical procedure, is at risk of infection. Ventriculostomy-related infection (VRI) is usually associated with serious morbidity and mortality. Studies have demonstrated that implementing protocols can reduce VRIs. However, a protocol approach is not translatable to the National Neuroscience Institute (NNI) model due to its complex sub-speciality multi-site organization and different stake holders involved.

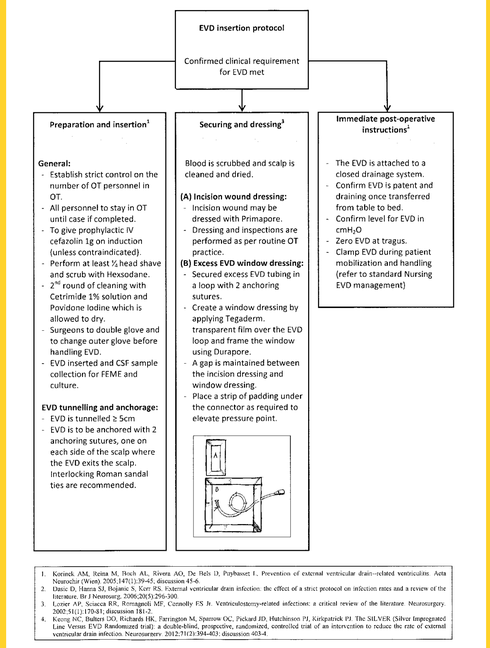
OBJECTIVE

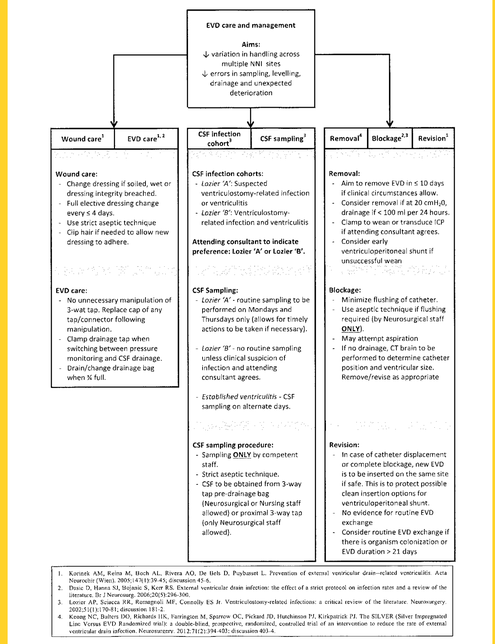
We developed a pragmatic risk stratification EVD pathway to harmonize surgical and nursing practices across all hospitals served by NNI neurosurgery department with the aim of delivering an ethos of 'fair access to best EVD practices from the point of entry' for any patient presenting to a NNI neurosurgeon regardless of their inpatient location. We examined if a pragmatic risk stratification pathway, allowing for surgical decision-making, could be as effective as an EVD protocol in reducing the rate of VRIs.

METHODS

Ethics approval was obtained from the SingHealth CIRB. We performed two studies concurrently. The first study was a formal retrospective one-year audit from January to December 2014 of VRI rates and outcomes in our units across SGH, TTSH and CGH. We also performed a prospective one-year audit from January to December 2015 during the implementation of the pathway across the three sites. The pathway was constructed using current evidences in EVD literature.



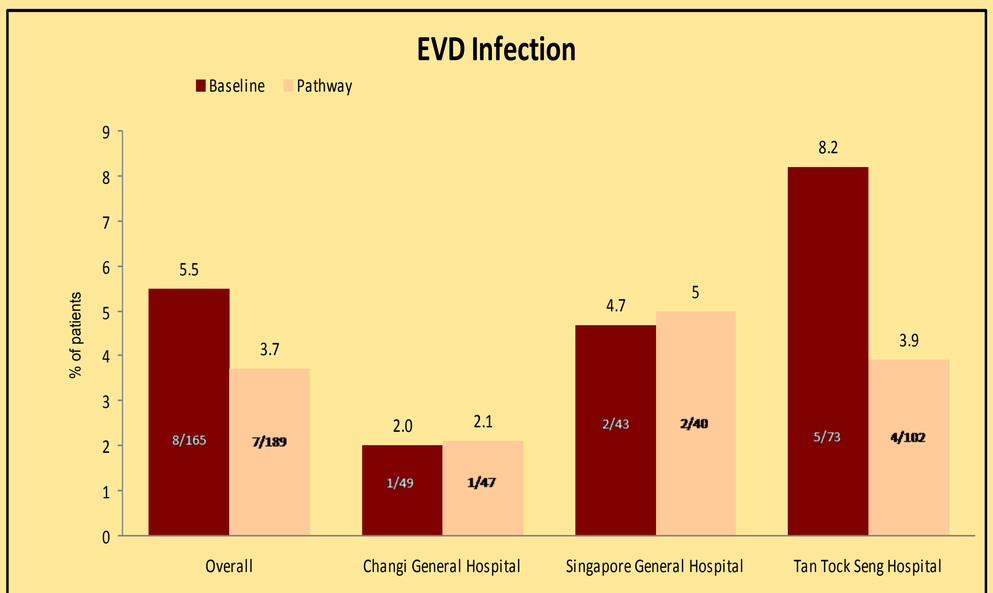




RESULTS

Patient characteristics

	CGH			SGH			TTSH		
	Baseline (n=49)	Pathway (n=47)	*P*	Baseline (n=43)	Pathway (n=40)	*P*	Baseline (n=73)	Pathway (n=102)	*P*
Age, years	57 (51-63)	57 (47-67)	0.95	56 (46-69)	62 (52-67)	0.32	59 (47-68)	56 (49-68)	0.54
Male, n (%)	35 (71.4)	24 (51.1)	0.04	24 (55.8)	23 (57.5)	0.88	37 (50.7)	62 (60.8)	0.18
Primary diagnosis, n (%)									
SAH	8 (16.3)	15 (31.9)	0.07	9 (20.9)	12 (30)	0.34	34 (46.6)	31 (30.4)	0.03
IVH	12 (24.5)	2 (4.3)	< 0.01	3 (7.0)	5 (12.5)	0.39	3 (4.1)	20 (19.6)	< 0.01
ICH	18 (36.7)	21 (44.7)	0.43	17 (39.5)	16 (40)	0.97	20 (27.4)	20 (19.6)	0.23
Tumor	2 (4.1)	2 (4.3)	0.97	7 (16.3)	6 (15)	0.87	4 (5.5)	13 (12.7)	0.11
TBI	2 (4.1)	1 (2.1)	0.58	1 (2.3)	0 (0)	0.33	1 (1.4)	3 (2.9)	0.49
Others	7 (14.3)	6 (12.8)	0.83	6 (14.0)	1 (2.5)	0.06	11 (15.1)	15 (14.7)	0.95
Type of EVD, n (%)									
Plain	7 (14.3)	5 (10.6)	0.59	12 (27.9)	4 (10)	0.04	26 (36)	9 (9)	< 0.001
Antibiotic-impregnated	42 (85.7)	36 (76.6)	0.25	14 (32.6)	29 (72.5)	< 0.001	47 (64.4)	81 (79.4)	0.03
Silver-impregnated	0 (0)	6 (12.8)	0.01	17 (39.5)	7 (17.5)	0.03	0 (0)	12 (11.8)	< 0.01



Conclusion

We designed a pathway for EVD management to reduce VRIs which was multi-disciplinary and comprehensive but allows for different EVD strategies within a structured framework without increasing infection rates. The pathway is implementable across multiple sites and different hospital stakeholders. We were able to provide all NNI neurosurgery patients 'fair access to best practices in EVD management' regardless of their location and point of entry of consulting the neurosurgical service.

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