An exploration of bloodstream infection risk factors on hospitalized hematological malignancy patient

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Background

Central venous catheter is an important method for cancer patients in the Department of Hematology and Oncology to receive chemotherapy treatment.

Objective

To explore the bloodstream infection risk factors in hospitalized hematological malignancy patients with central venous catheter.

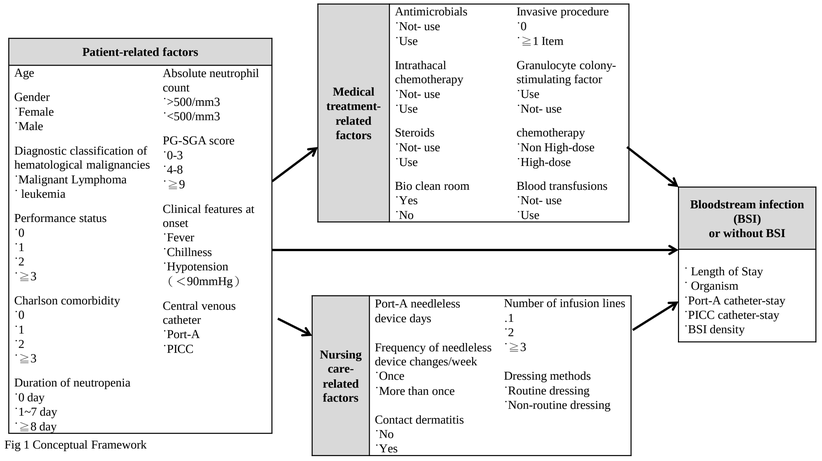

Fig 1 Conceptual Framework

Methods

Electronic medical records (EMR) from a medical center in southern Taiwan were used as the database. Self-prepared forms were used as research tools for risk factor data collection from patients in the Department of Hematology and Oncology.

Risk factors were categorized into three parts: 1.patient-related factors, including age,gender, Diagnostic classification of hematological malignancies , performance status, Charlson comorbidity, Duration of neutropenia , Absolute neutrophil count , PG-SGA score, Clinical features at onset and Central venous catheter ; 2.medical treatment-related factors, including the use of antimicrobials, Intrathacal chemotherapy , steroids, Bio clean room , Invasive procedure, Granulocyte colony-stimulating factor, chemotherapy, as well as blood transfusions ; and 3.nursing care-related factors, including Port-A needleless device days , Frequency of needleless device changes/week , Number of infusion lines ,the numbers of infusion lines and routine dressing care of CVC. Central vein catheter-related bloodstream infection (CVCRBI) patients were coded in infection group, and others were coded as control group.

The risk factors were presented with descriptive statistics, and the bloodstream infection risk factors were then established using t-test, analysis of variance (ANOVA) and logistic regression analysis

Results

According to the results of the study, there were total of 405 persons; among them, the central venous catheter-related bloodstream infection rate was 122 persons (30.1%).The bloodstream infection rate was 2.5 events/ days of stay *1000. This study showed that the absolute neutrophil count, duration of neutropenia, dressing methods , number of infusion lines would affect the central venous catheter-related bloodstream infection.

Table 1 Patient-related factors

Variable	All (N=405)	(%)	Bloodstream infection (N=122)	(%)	Non-bloodstream infection (N=283)	(%)	Chi-Square Tests χ^2	P value
Absolute neutrophil count							52.86	0.00*
0~500/mm3	266	(65.7%)	112	(42.1%)	154	(57.9%)		
500/mm3以上	139	(34.3%)	10	(7.2%)	129	(92.8%)		
Duration of neutropenia							74.16	0.00*
0 days	138	(34.1%)	10	(7.2%)	128	(92.8%)		
1~7 days	108	(26.7%)	28	(25.9%)	80	(74.1%)		
More than 8 days	159	(39.3%)	84	(52.8%)	75	(47.2%)		

Table 2 Medical treatment-related factors

Variable	All (N=405)	(%)	Bloodstream infection (N=122)	(%)	Non-bloodstream infection (N=283)	(%)	Chi-Square Tests χ^2	P value
Chemotherapy							1.32	0.25
Non High-dose	149	(36.8%)	50	(42.1%)	99	(66.4%)		
High-dose	256	(63.2%)	72	(7.2%)	184	(71.9%)		
Antimicrobials							1.06	0.30
Not- use	12	(3.0%)	2	(16.7%)	10	(83.3%)		
use	393	(97.0%)	120	(30.5%)	203	(69.3%)		
Invasive procedure							3.31	0.69
0	334	(82.5%)	107	(32.0%)	227	(68.0%)		
≧1 Item	71	(17.5)	15	(21.1%)	56	(78.9%)		

Table 3 Nursing care-related factors

Variable	All (N=405)	(%)	Bloodstream infection (N=122)	(%)	Non-bloodstream infection (N=283)	(%)	Chi-Square Tests χ^2	P value
Dressing methods							23.44	0.00*
Routine dressing	221	(54.7%)	44	(19.9%)	177	(80.1%)		
Non-routine dressing	183	(45.3%)	77	(42.1%)	106	(57.9%)		
Number of infusion lines							35.65	0.00*
1	169	(41.7%)	26	(15.4%)	143	(84.6%)		
2	193	(47.7%)	72	(37.3%)	121	(62.7%)		
More than 3	43	(10.6%)	24	(55.8%)	19	(44.2%)		

The odds ratio of bloodstream infection rate of neutropenia not exceeding 500/mm3 was 9.38times higher than that of neutropenia exceeding 500/mm3.The odds ratio of bloodstream infection rate during the period between 1 and 7 days of the absolute neutrophil count (ANC) was 4.48times higher than that of non ANC, the bloodstream infection rate during the period more than 8 days of ANC was 14.33 times higher than that of non ANC, and the odds ratio of bloodstream infection rate of non-routine dressing is 2.29 times higher than that of routine dressing.

Table 4 Logistic Regression Analysis for Predicting Bloodstream Infection

Variable	B	95% CI		P	Odds Ratio
Duration of neutropenia					
Non	—	—	—	—	—
1~7 days	1.50	2.06	9.71	0.00*	4.48
More than 8 days	2.66	7.01	29.30	0.00*	14.33
Absolute neutrophil count					
≧500/mm3	—	—	—	—	—
<500/mm3	2.23	4.71	18.66	0.00*	9.382
Dressing methods					
Routine dressing	—	—	—	—	—
Non-routine dressing	1.07	1.87	4.54	0.00*	2.92

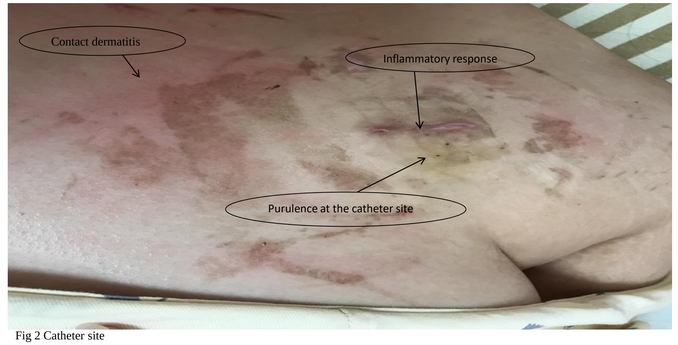

Fig 2 Catheter site

Conclusions

ANC less than 500/mm^3, neutropenia persisting for more than one week, and non-routine dressing care of CVC would increase CVCRBI.