The impact of pre-filled saline flush syringes in reducing the incidence of peripheral venous catheter failure. A quasi-experimental multicenter study

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BACKGROUND

The unscheduled replacement of peripheral venous catheter (PVC) is common and frequently entails a new invasive procedure. Flushing the catheter before and after use, maintains patency and could prolong catheter dwell time. Although saline flushing is highly recommended, compliance in the daily routine care is uncertain.

OBJECTIVE

To determine whether there are significant differences in overall PVC failure rates before and after introduction of pre-filled flushing syringes and to assess risk factors for PVC failure.

METHODS

Methods: quasi-experimental design; before-and-after intervention study.
Intervention: Introduction of pre-filled saline syringes for flushing. Multicenter study conducted in medical and surgical units in 3 European hospitals for a period of 9 months (5 months pre-intervention, 4 months intervention).
Main outcome: Catheter failure, defined as a composite variable encompassing unscheduled withdrawal or replacement of PVC because of any of the following conditions: phlebitis, thrombosis extravasation, suspected infection.
Statistical analysis: A multivariate Cox proportional hazard ratio was used to identify factors associated with the occurrence of PVC failure.

RESULTS

Data were analysed for 3,853 PVCs in 1,915 patients. Overall, the incidence of **PVC failure was 50.1%**, mainly due to phlebitis and infiltration/extravasation. Compared to pre-intervention period, a significant decrease in PVC failure rate was observed in the intervention period (55.4% vs 44.8%, p<0.01). **Risk factors for PVC failure** were: **Charlson score ≥4** (HR:1.64;95%CI:1.069-2.527), **days of hospital stay ≥10** (HR:1.46;95%CI:1.172-1.837), and the **use of PVC “Type D”** (HR:1.75;95%CI:1.05-2.91), while **intervention period** (HR:0.76;95%CI:0.63-0.91) and **insertion of PVC at traumatology ward** (HR:0.43;95%CI:0.21-0.85) **reduced the risk of PVC failure** (Table 1).
Figure 1, shows dwell time of PVC among the period 1 and 2. By the 5th day of catheterization, only 40% of PVC in the period 1 survive without a failure, while 60% of PVC survive without any failure in the period 2.

	Non Catheter Failure N=1906	Catheter failure N=1947	P Value	Hazard ratio	CI 95%
Age ≥ 65	1176 (61.7%)	1190 (61.1%)	0.716		
Gender (Male)	1071 (56.2%)	1116 (57.3%)	0.495		
Charlson score ≥4	871 (45.7%)	1097 (56.3%)	0.000	1.644	1.069-2.527
Days of hosp ≥ 10	713 (37.4%)	1289 (66.2%)	0.000	1.468	1.172-1.837
Days of cath≥ 4	993 (52.1%)	712 (36.6%)	0.000		
Unit of Hospitalisation					
trauma	324 (17%)	86 (4.4%)	0.000	0.431	0.219-0.851
Type of catheter					
Catheter A	1587 (83.3%)	1475 (75.8%)	0.000		
Catheter B	129 (6.8%)	104 (5.3%)	0.037		
Catheter C	33 (1.7%)	75 (3.9%)	0.000		
Catheter D	157 (8.2%)	293 (15%)	0.000	1.75	1.05-2.91
Unit of catheterisation					
Hospital	1118 (58.7%)	1181 (60.7%)	0.212		
Emergency Unit	599 (31.4%)	661 (33.9%)	0.051		
Others	189 (9.9%)	105 (5.4%)	0.000		
Charlson score ≥4	871 (45.7%)	1097 (56.3%)	0.000	1.644	1.069-2.527
Intervention period	974 (51.1%)	791 (40.6%)	0.000	0.761	0.630-0.919

Table 1: Univariate and multivariate analysis of the risk factors associated with PVC failure

Figure 1:Kaplan meier curve showing the difference in the PVC dwell time between Period 1 and 2 .

CONCLUSIONS

We found that unscheduled PVC replacement was very high in study hospitals. The risk of catheter failure varied according to patient comorbidities, days of hospital stay, and type of PVC. The introduction of catheter flushing with pre-filled saline syringes had a significant impact on reducing unscheduled vascular catheter replacement.