Critical Care

RESEARCH LETTER

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Factors influencing local signs at catheter insertion site regardless of catheter-related bloodstream infections

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To the editor,

Little is known on the role of local signs at the catheter exit site [1–3]. Using a large cohort with high-quality data from four randomized-controlled trials we recently showed that local signs at insertion site (*i.e.*, a composite endpoint including redness, pain, purulent and non-purulent discharge) were significantly associated with catheter-related bloodstream infections (CRBSI) [4]. However, a question remains open: Which factors may influence local signs regardless of CRBSI? To our knowledge, no data in the recent literature are available.

We therefore re-analyzed our large cohort with 6976 patients and 14,590 short-term catheters, and we used as a primary endpoint "≥ 1 local sign." We used multivariable logistic regression in order to identify variables associated with ≥ 1 local sign. Logistic models were stratified for the different centers included in the analysis.

Importantly, patients over 75 years (OR 0.82, 95% CI 0.72–0.94, $p=0.0044$), with high SOFA score (OR 0.66, 95% CI 0.55–0.79, $p<0.001$), immunosuppression (OR 0.72, 95% CI 0.59–0.88, $p=0.0014$), catheter duration ≤ 7 days (OR 0.30, 95% CI 0.27–0.34, $p<0.001$), and jugular (OR 0.62, 95% CI 0.49–0.80, $p=0.0001$) or femoral (OR 0.76, 95% CI 0.64–0.90, $p=0.0012$) sites significantly decreased the risk to develop local signs (Table 1) regardless of CRBSI. Clinicians should deserve particular attention to these specific populations of critically ill patients, who may decrease the risk of developing local signs. Among patients with CRBSI ($n=114$), severely injured patients (*i.e.*, with high SOFA score or under vasoactive medications), immunosuppressed patients and femoral catheters had fewer local signs (data not shown).

In our previous analysis, we found that local signs observed within the first 7 catheter-days are predictive for intravascular catheter infections [4]: We are convinced that especially in this subgroup clinicians should be aware of the frequent absence of local signs in elderly, severe, immunosuppressed patients, and jugular/femoral catheters in the decision-making process.

Interestingly, pathological temperature (body temperature ≥ 38.5 °C or ≤ 36.5 °C), catheter type, and severity of illness in the presence of local signs did not help clinician in predicting intravascular catheter infections [4]. In light of all these considerations, we summarized in Table 2 practical clinical implications that may help ICU specialists when dealing with local signs and suspicion of intravascular catheter infections.

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Table 1 Risk factors of having ≥ 1 local sign (multivariable logistic regression)

	OR	95% CI	*p* value	
CRBSI	**4.242**	**2.811**	**6.402**	**< 0.0001**
Male sex	1.093	0.981	1.218	0.11
Age > 75 years*	**0.823**	**0.719**	**0.941**	**0.0044**
*SOFA score**				
SOFA 12–14	0.777	0.665	0.908	0.0015
SOFA 9–11	0.852	0.742	0.977	0.022
SOFA > 14	**0.660**	**0.552**	**0.790**	**< 0.0001**
Immunosuppression	**0.719**	**0.587**	**0.881**	**0.0014**
Vasopressor at inclusion	1.043	0.916	1.187	0.52
Catheter days ≤ 7	**0.303**	**0.273**	**0.336**	**< 0.0001**
Catheter type, CVC (*versus* AC)	1.057	0.875	1.277	0.57
Experience of the operator < 50 procedures	0.945	0.842	1.062	0.34
Insertion site				
Jugular	**0.623**	**0.488**	**0.796**	**0.0001**
Subclavian	1.018	0.801	1.292	0.89
Femoral	**0.755**	**0.637**	**0.895**	**0.0012**
Vasopressor at insertion	0.961	0.853	1.083	0.52
Antibiotic at insertion	**1.271**	**1.138**	**1.420**	**< 0.0001**

Bold: statistically significant

*The log linearity was not respected for SOFA and age, and therefore, we created two qualitative variables.

CRBSI: catheter-related bloodstream infection. OR: odds ratio. CI: confidence interval. IQR: interquartile range. ICU: intensive care unit. SOFA: Sequential Organ Failure Assessment. CVC: central venous catheter. AC: arterial catheter.

Table 2 Practical clinical implications

Factors that independently decreased local signs at insertion site:	Older age Severe ill patients Immunosuppression Catheter maintenance ≤ 7 days Jugular and femoral sites
Factors that decreased local signs in patients with CRBSI	Severe ill patients Immunosuppression Femoral site
Factors influencing the management of catheter*	Redness, non-purulent discharge, and purulent discharge are significantly associated with CRBSI Local signs are absent in almost 60% of CRBSI Local signs observed within the first 7 days are highly predictive for intravascular catheter infections Pathological temperature (body temperature ≥ 38.5 °C or ≤ 36.5 °C), catheter type, and severity of illness in the presence of local signs do not help clinician in predicting intravascular catheter infections

*see reference [4]

CRBSI: catheter-related bloodstream infection.

Abbreviations

CRBSI: Catheter-related bloodstream infections; CVC: Central venous catheter; ICU: Intensive care unit; OR: Odds ratio; SOFA: Sequential organ failure assessment.

Authors' contributions

NB, SR, and JFT analyzed and interpreted the data. OM, BS, JCL, OM were responsible for the data collection. NB and JFT were the major contributors in writing the manuscript. All authors read and approved the final manuscript.

Funding

NB is currently receiving a Mobility grant from the Swiss National Science Foundation (Grant Number: P4P4PM_194449). This grant supports his fellowship in Geneva.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate
All studies were approved by the national ethics committees.

Consent for publication
Not applicable.

Competing interests
The authors have disclosed that they do not have conflict of interest. JFT received fees for lectures to 3 M, MSD, Pfizer, and Biomerieux. JFT received research grants from Astellas, 3 M, MSD, and Pfizer. JFT participated to advisory boards of 3 M, MSD, Bayer Pharma, Nabriva, and Pfizer. OM received fees for lectures for 3 M and BD. OM received research grants from BD.

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Received: 13 January 2021 Accepted: 4 February 2021
Published online: 17 February 2021

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