Vascular catheter-related infection claims to health insurance company: often preventable

A. Gagneux-Brunon[1], J. F. Timsit[2,3], A. Lepape[4] and P. Berthelot[1]

1) *Infectious Diseases Department, University Hospital of Saint-Etienne, Saint-Etienne,* 2) *Medical Polyvalent Intensive Care Unit, University Hospital Albert Michallon, Grenoble 1 University, Grenoble,* 3) *IAME UMR1137-Team 5, Decision Sciences in Infectious Disease Prevention, Control and Care, Paris Diderot University- Inserm, Sorbonne Paris Cité and* 4) *Intensive Care Unit, University Hospital of Lyon, Lyon, France*

Abstract

Using the main French health insurance company database over a 10-year period, the preventability of catheter-related infections of patients who claimed compensation after prosecution was reviewed by a panel expert. They occurred in 71 patients with few co-morbidities or risk factors for nosocomial infection and were mainly related to the use of a peripheral vascular catheter (42 cases) and due to *Staphylococcus aureus* (51 cases). Forty-two infections were considered to be preventable. Infections due to peripheral venous catheters were significantly more often preventable than those due to central ones ($p < 0.05$). We conclude that catheter-related infections perceived by patients and the justice system as not related to unforeseeable medical complications are mainly peripheral catheter infections due to *S. aureus* and might be an appropriate target for new preventive strategies.

Keywords: insurance, nosocomial infection, preventability, *Staphylococcus aureus*, venous catheter
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Corresponding author: P. Berthelot, Infectious Diseases Department, Infection Control Unit, University Hospital of Saint-Etienne, 42055 Saint-Etienne Cedex 02, France
E-mail: philippe.berthelot@univ-st-etienne.fr

Introduction

Intravenous peripheral (PVC) and central (CVC) catheters, provide necessary vascular access, but put patients at risk of infectious complications (local or systemic). Twenty-five million PVCs and one million CVCs are estimated to be inserted each year in France (1). The recently published French national survey of hospital-associated infections described a prevalence of 0.3% and below 0.1% for CVCs and PVCs, respectively (http://www.invs.sante.fr/Publications-et-outils/Rapports-et-syntheses/Maladies-infectieuses/2013/Enquete-nationale-de-prevalence-des-infections-nosocomiales-et-des-traitements-anti-infectieux-en-etablissements-de-sante-France-mai-juin-2012). Nosocomial bacteraemias were predominantly due to venous catheters (33% CVC, 8.3% PVC). Incidence surveys aiming to describe the epidemiology of hospital-onset bacteraemia showed that the burden linked to these bacteraemias is underestimated by point prevalence studies (2). In France, it has been recently estimated that 12 400 patients died due to to healthcare-associated bacteraemia (3).

The incidence of CVC-related infections and bacteraemia was, respectively, 0.84 and 0.66/1000 days in intensive care units (ICU) in the French network RAISIN (4). Assuming a stronger incidence of 1.23/1000 days in France, the additional costs for the healthcare system related to central catheter bloodstream infection (CRBSI) in ICUs was estimated to be 100 to 130 million Euros a year (5). Most often microorganisms responsible for CRBSI are coagulase-negative *Staphylococcus* (23% of cases) and *Staphylococcus aureus* (17%).

None of these sources enable the evaluation of the preventable part of intravascular catheter-related infections (CRI). Another way to investigate this topic is to refer to health insurance data. To obtain this information in France, we asked SHAM, the main insurance company of French public and private hospitals, to investigate the claimed cases of CRI. The aim of the study was to describe vascular CRI claims to SHAM, and to evaluate the preventability of these healthcare-associated infections.

Methods

Study population

This retrospective study was conducted using the database of SHAM, after approval by the local ethics committee of the University Hospital of Saint-Etienne, France. We searched the database of SHAM, during the period 2000–2010, with the following keywords: infections and catheters. A fellow,

specializing in infectious diseases, studied the medical reports of cases to confirm that each case was an intravascular CRI, and to collect the data necessary to evaluate preventability. Definitions used for CRI characterization were French ones edited by the National Technical Committee of Nosocomial Infection; they are in accordance with those described by Raad *et al.* (6).

Data collection and statistical analysis

Collected data were characteristics of patients (age, sex, co-morbidities, and risk factors for infection such as diabetes mellitus, neutropenia, immunosuppressive agents, surgery and blood transfusion) and type of catheters (peripheral catheter, central venous catheter, arterial catheter, haemodialysis catheter or totally implantable catheter). Statistical analysis was performed using SPSS 20.0 (IBM, Chicago, IL, USA). We compared the proportion of preventable infections related to PVCs and CVCs using McNemar's test.

Preventability judgement

A medical committee composed of two practitioners working in ICU units and one working in an infection control unit examined the selected cases to evaluate the preventability of CRI. Adherence to guidelines for insertion, surveillance of intravascular catheters, diagnosis of intravascular-related infections and characteristics of patients were taken into account to determine the preventability of each case using a Lickert scale (7). Preventability was defined as an unintended CRI that was caused by medical management or a failure to meet the reasonably expected standard of care. The probability of preventability was graded using four categories: certainly or probably preventable, moderate preventability, not preventable, and undetermined probability. Preventable infections were those with moderate and strong probability of preventability.

Results

Characteristics of cases

In France, more than sixty per cent of the hospital beds in medicine, surgery and obstetrics are insured by SHAM (75% public and 25% private). During the time period 2000–2010, 73 322 damages claims were made to SHAM. Five hundred and eighty-three (0.8%) were classified with the keywords infections and catheters and only 75 (0.1%) of these cases were effectively intravascular CRI. Four cases were excluded because too much information was missing from the medical files. Most of the cases (74%) occurred in patients admitted as an emergency to the hospital. Thirty-four cases (48%) of CRI occurred in the medical department, 21 (30%) in the surgical department and only seven (10%) in the ICU. Characteristics of the patients are depicted in Table 1. In 42 cases (60%), infections were related to PVCs. Eight cases occurred in paediatric patients (<15 years old), particularly in newborns.

Microorganisms responsible for infection and complications associated with catheters

A microorganism was identified in 93% of cases of infection. *Staphylococcus aureus* was the most frequent microorganism, recovered in 51 cases (72%); coagulase-negative staphylococci were responsible for three (4%) infections. In 10 (19%) *S. aureus* infections, a resistance to methicillin was identified. Other documented complications were: 13 patients with osteitis or arthritis, four with spondylodiscitis, one with toe amputation, two with infected arterial aneurysms, seven with endocarditis, two with mycotic aneurysms, one with pulmonary embolism, two with venous thrombophlebitis, one with infected haematoma and 14 with thrombosis of catheters. Ten osteo-articular infections and five cases of endocarditis were related to PVC infection.

Outcomes

In 48 cases (68%), CRI induced sepsis: two (3%) were severe and 15 (21%) resulted in septic shock (five children). Surgery or an ICU stay was necessary in 23 (34%) and 22 (32%) cases, respectively. Death was attributable to CRI in eight cases (11%). When analyzing only the infections related to PVCs (42 cases), septic shock was observed in eight cases (19%). Surgery

TABLE 1. Characteristics of the patients who developed intravascular catheter-related infections (mean and SD for continuous variables, number and percentage for categorical variables)

Characteristics (*n*, %)	
Age	47 ± 22 years
Sex ratio (M/F)	2.1/1
Charlson Score at admission	1 (±1.9)
Presence of risk factors for infection[a]	29 patients (41)
Category on hospital admission	
Medicine	34 (48)
Surgery	21 (30)
Intensive care unit	7 (10)
Others (rehabilitation, obstetrics, psychiatry…)	9 (13)
Type of catheter	
Peripheral venous catheter	42 (59)
Central venous catheter	26 (37)
Other[b]	3 (4)
Bacteraemia	49 (69)
Peripheral venous catheter	31 (74)
Central venous catheter	18 (70)

[a]Septic shock, multiple organ failure, polytrauma, immunocompromised patient, cancer, major surgery, diabetes requiring insulin therapy, low birth weight (<1500 g), parenteral nutrition, prosthesis, blood transfusions.
[b]Umbilical catheters.