Central Venous Catheter-Related Infections in a Moroccan Intensive Care Unit: Frequency, Microbiological Profile, and Associated Characteristics.

Abstract

Background: Central venous catheter (CVC)-related infections are an important complication in intensive care. This study assessed their frequency, microbiological characteristics, and potential associated factors in a Moroccan surgical emergency intensive care unit.

Methods: We conducted a retrospective descriptive study from January 2019 to December 2022 in the P33 surgical emergency intensive care unit at Ibn Rochd University Hospital, Casablanca. The study included 314 patients who underwent central venous catheterization.

Results: Among 314 patients, 87 had a catheter-related infection (27.7%). Mean age was 41 ± 18 years, and 78% were male. Infection frequencies were 46.2% for femoral, 28.9% for internal jugular, and 7.1% for subclavian catheter sites. Mean catheter duration was 8 ± 3 days among infected patients versus 6 ± 3 days among non-infected patients. Gram-negative bacteria accounted for 69% of isolates, including Acinetobacter baumannii (23%), Klebsiella pneumoniae (17.2%), and Raoultella terrigena (12.6%). Staphylococcus aureus accounted for 24.1%. Among infected patients, 56 (64.4%) had a favorable outcome and 31 (35.6%) died.

Conclusions: CVC-related infections were frequent in this intensive care cohort, with a predominance of Gram-negative organisms. Standardized prevention, microbiological surveillance, and daily reassessment of catheter necessity remain priorities.

Keywords: Central venous catheter; Catheter-related infection; Intensive care; Gram-negative bacteria; Morocco.

1. Introduction

Central venous catheters are essential in intensive care for vasoactive drug administration, infusion of concentrated solutions, and selected hemodynamic monitoring. However, their use carries a risk of infection, particularly among critically ill patients exposed to invasive procedures and prolonged hospital stays. Infection prevention requires attention to insertion technique, catheter maintenance, and timely removal.

The epidemiology and antimicrobial susceptibility of catheter-associated microorganisms vary between institutions. Local surveillance is therefore important for guiding prevention and empirical treatment strategies. This study aimed to describe the frequency, microbiological profile, catheter characteristics, and clinical outcomes of CVC-related infections in a surgical emergency intensive care unit in Casablanca.

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2. Materials and Methods

Study design and setting

This retrospective descriptive study was conducted in the P33 surgical emergency intensive care unit of Ibn Rochd University Hospital, Casablanca, Morocco, over four years (January 2019–December 2022). A total of 314 patients receiving a central venous catheter were included.

Eligibility and data collection

Patients hospitalized for more than 48 hours who underwent central venous catheterization were eligible. The thesis excluded hospitalizations shorter than 48 hours, polymicrobial samples with more than three organisms, fungal infections, and catheters inserted in another department. Recorded variables included demographic characteristics, admission diagnoses, insertion site, ultrasound guidance, catheter dwell time, microbiological findings, treatment, and hospital outcome.

Microbiological assessment

Catheter tips were sent for quantitative microbiological culture using the Brun-Buisson method after removal; peripheral blood cultures were obtained when infection was suspected. The thesis described positive catheter cultures using Maki (≥15 colony-forming units) or Brun-Buisson (≥1,000 CFU/mL) thresholds together with clinical evidence of infection. These operational criteria should not be assumed equivalent to a confirmed catheter-related bloodstream infection.

Statistical analysis

Results are presented as counts, percentages, and means ± standard deviations as reported in the source thesis. No adjusted risk estimates or significance tests are reported here because patient-level data were not available for reanalysis.

3. Results

Infection frequency and patient characteristics

Of 314 catheterized patients, 87 had an infection (27.7%). Annual frequencies reported in the thesis were 43% in 2019, 21% in 2020, 21% in 2021, and 20% in 2022. Mean age was 41 ± 18 years; 245 patients (78%) were male. Trauma was the main reason for admission (66%), followed by neurological (20%) and digestive conditions (8%).

Catheter insertion site and dwell time

Insertion site	Catheters (n)	Infections (n)	Frequency
Internal jugular	273	79	28.9%
Subclavian	28	2	7.1%
Femoral	13	6	46.2%
Total	314	87	27.7%

Femoral catheters had the highest observed infection frequency, although the small denominator limits comparisons. For internal jugular catheters, the reported infection frequencies were 25.5% with ultrasound guidance and 31.3% without guidance. Mean dwell time was 8 ± 3 days in the infected group and 6 ± 3 days in the non-infected group.

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Organism	Number	Percentage
Acinetobacter baumannii	20	23.0%
Staphylococcus aureus	21	24.1%
Klebsiella pneumoniae	15	17.2%
Raoultella terrigena	11	12.6%
Pseudomonas aeruginosa	4	4.6%
Other bacteria	16	18.4%

Gram-negative organisms represented approximately 69% of isolates. The thesis reported resistance among A. baumannii isolates, including 60% to gentamicin and 38% to imipenem; these susceptibility figures should be verified against the original microbiology tables before journal submission.

Treatment and outcomes

Among 87 infected patients, 18 (20.7%) underwent catheter removal without antibiotics, 23 (26.4%) received empirical antibiotics, and 46 (52.9%) received culture-directed antibiotics. Imipenem and amikacin were frequently used; mean antibiotic duration was 8 ± 5 days. Mean hospital stay was 19 ± 5 days in infected patients versus 13 ± 3 days in non-infected patients. Favorable outcomes were reported in 56 infected patients (64.4%), while 31 (35.6%) died; 27 of the deceased patients also had other infections.

4. Discussion

This four-year single-center study found CVC-related infection in approximately one-quarter of catheterized patients. The estimate represents the proportion meeting the thesis definition and should not be compared directly with surveillance rates of catheter-related bloodstream infection expressed per 1,000 catheter-days. The distinction between catheter colonization, clinically suspected catheter infection, and microbiologically confirmed bloodstream infection is important.

The highest observed infection frequency occurred at the femoral site, while the lowest occurred at the subclavian site. However, the small number of femoral and subclavian catheters, possible selection bias, and lack of adjustment for illness severity or dwell time prevent causal conclusions. Longer catheter duration in infected patients is consistent with greater exposure but does not establish an independent risk factor.

The predominance of Gram-negative organisms, particularly A. baumannii and K. pneumoniae, is relevant for local antimicrobial stewardship. Resistance patterns should be interpreted in light of the number of isolates tested and the unit-specific antibiogram. The high observed mortality among infected patients reflects the severity of this intensive care population; because many deceased patients had additional infections, the mortality cannot be attributed solely to catheter infection.

Key limitations include the retrospective, single-center design, the absence of catheter-day denominators, potential diagnostic misclassification, and the lack of multivariable analyses. Prospective surveillance with standardized bloodstream infection definitions and catheter-day reporting would improve comparability and guide targeted quality improvement.

5. Conclusion

In this Moroccan surgical emergency intensive care cohort, CVC-related infections were frequent and predominantly associated with Gram-negative microorganisms. Reinforcing insertion and maintenance bundles, monitoring local antimicrobial susceptibility, and reassessing catheter necessity every day are

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practical priorities. Further standardized prospective studies are needed to establish incidence density and independent risk factors.

Declarations

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Source and editorial note

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