Burden of Hospital Candidemia in France: Diagnostic Performance of an Administrative Hospital Database for Case Identification in a French University Hospital

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INTRODUCTION AND OBJECTIVES

• Candidemia and invasive candidiasis (C/IC) are serious fungal infections associated with high mortality rates.¹ C/IC annually affects over 1.5 million people worldwide, including 6,000 people in France where 2,300 have confirmed blood infections (candidemia) and approximately 3,700 have infections that cannot be

RESULTS

• The total population of interest comprised 123 patients who had 128 hospital admissions (Figure 1).

Figure 1. Flowchart for selection of patients

Step 1 Step 2

Table 2. Patient demographics/characteristics and use of healthcare resources

Characteristic	All 123 PTS / 128 stays	PMSI-coded 97 PTS / 101stays	Missing PMSI code 26 PTS/ 27 stays
Age			
Mean (SD), years	58.1 (16.7)	59.3 (16.4)	53.3 (17.4)
<65 years, %	62.6	57.7	80.8
Female Sex, %	39.0	42.3	26.9
Hospital LoS, Days			
Median	34	32	45
Q1; Q3	19; 63	15; 59	36; 67.5
Minimum/maximum	1/276	1/224	22/276
Admission to ICU, n (%)	99 (77.0)	75 (74.3)	24 (88.9)
ICU LoS, Days			
Median	27	22	44.5
Q1; Q3	12; 52	8.5; 45.5	25.5; 58.5
Minimum/maximum	1/276	1/199	9/276
Mechanical ventilation, %	55.0	47.5	81.5
Continuous monitoring, %	62.0	59.4	74.1

- detected in blood cultures (e.g. deep-seated invasive candidiasis, false negatives).¹
- The associated economic burden of C/IC is largely due to prolonged length of stay (LoS) in hospital and intensive care unit (ICU) treatment.²
- C/IC events are routinely recorded in the French national discharge database, Programme hospital de Médicalisation des Systèmes d'Information (PMSI), using the International Classification of Diseases 10th revision (ICD-10) coding system. Any misclassification bias within the PMSI will impact the accuracy of those data used to inform health economic models for diseases. such as C/IC.
- This study explores the relevance and accuracy of PMSI-reported data for C/IC events at a large tertiary hospital and the associated implications when quantifying the economic burden of disease.

METHODS

- A retrospective, observational, single-center study, conducted between 2018–2020 (before the COVID-19 outbreak), collected PMSI data and patient-level data from a large, tertiary hospital in France.
- Due to the complexity of the chart review, a single



Abbreviations: ICD-10: International Statistical Classification of Diseases and Related Health Problems; PD: primary diagnosis; PMSI: Programme de Médicalisation des Systèmes d'Information; RD: relied diagnosis; SAD: associated diagnosis.

- Mean age was 58 years and 39% were female. The most prevalent Candida species detected were C. albicans (65%), C. glabrata (19%), C. tropicalis (5%) and C. parapsilosis (5%)
- Antifungal regimens included echinocandin + azole (34.4%), azoles only (23.4%) or echinocandins only (21.1%). Overall, 5.5% had no recorded antifungal

Note: quantitative variables are presented median (with minimum, maximum, 25th; 75th percentile) as their distribution is not normal

Abbreviations: ICU: intensive care unit; LoS: length of stay; PMSI: Programme de Médicalisation des Systèmes d'Information; PTS: patients; Q: quartile; SD: standard deviation.

Figure 2. Median LoS across populations



ICD-10 code (B37.7 Candida sepsis) was used to identify patients with candidemia.

• The population of interest was selected via two independent stepwise processes:

- **Step 1:** PMSI-reported data were extracted for all Ο adults (aged \geq 18 years) with a primary, related or associated diagnosis coded as B37.7 (Candida sepsis).
- Step 2: a specific search algorithm (based on Ο textual features) identified all adults with confirmed, unconfirmed and possible Candida sepsis, using chart information (limitation of this approach may be attributed to breadth and precision of textual search).
- In addition to hospital stays for confirmed candidemia cases, this approach allowed the identification of:
 - False negatives: hospital stays if clinical evidence of Ο candidemia was recorded but case was not reflected in the PMSI database (missing PMSI code).
 - False positives: hospital stays that were reflected in Ο the PMSI database but no clinical evidence of candidemia was found in the chart.
- Analyses compared patient demographics, antifungal treatment and healthcare resources, including LoS and cost per stay.

treatment.

- PMSI-reported data showed that the majority of B37.7-coded cases were associated diagnoses and just 9% had a primary diagnosis of B37.7 (Candida sepsis), highlighting the clinical complexity of those patients.
- In the entire population, 22% (27/123) of patients had hospital stays that were missing the relevant PMSI code.
- False positives accounted for 9% (9/101) of PMSI-coded hospital stays and 5% (9/123) of stays in the total population (Table 1).

Table 1. Summary of hospital stays

Population	Clinical dete	Tatal		
Fopulation	Confirmed	Possible	Not confirmed	ΤΟται
PMSI-coded	75	17	9	101
Missing PMSI code (charts)	10	17	0	27

Abbreviations: ICD-10: International Statistical Classification of Diseases and Related Health Problems; PMSI: Programme de Médicalisation des Systèmes d'Information.

Health-care resource use

• Despite being younger, chart review patients (Step 2) appeared to be more complex (Table 2). These patients consumed more resources associated with intensity of care, compared with PMSI-coded (Step 1) patients:

Abbreviations: ICU: intensive care unit; LoS: length of stay; PMSI: Programme de Médicalisation des Systèmes d'Information.

Table 3. Calculated healthcare cost per patient

Min	Q1	Median	Q3	Max
€1,530	€12,676	€23,386	€34,654	€96,327
€6,472	€33,488	€41,716	€82,518	€96,327
€1,530	€13,129	€25,101	€41,994	€96,327
	Min €1,530 €6,472 €1,530	MinQ1€1,530€12,676€6,472€33,488€1,530€13,129	MinQ1Median€1,530€12,676€23,386€6,472€33,488€41,716€1,530€13,129€25,101	MinQ1MedianQ3€1,530€12,676€23,386€34,654€6,472€33,488€41,716€82,518€1,530€13,129€25,101€41,994

Abbreviations: ICU: intensive care unit; LoS: length of stay; Max: maximum; Min: minimum; PMSI: Programme de Médicalisation des Systèmes d'Information; Q: quartile.

CONCLUSIONS

Analysis of PMSI-reported and chart review data from a large tertiary hospital identified coding inconsistencies that could result in underestimation of hospital admission costs for candidal sepsis, if economic calculations were

- LoS in the ICU was based upon critical care supplement reporting (intensive care, continuous care, mechanical ventilation).
- Cost per stay was calculated using French DRG Ο (Diagnosis Related Group) tariffs specified by the l'information technique de Agence sur l'hospitalisation (ATIH) for the year 2020.
- Descriptive analyses were employed specifying the proportion of missing data. No imputation was made for missing data.
- Hospital stays for patients who had refused consent for their data to be used for research purposes were excluded (referred to as "refusals").
- Median hospital LoS for chart review only (missing \bigcirc PMSI code) patients was 13 days longer than PMSIcoded patients (Figure 2).
- Duration of ICU stay was 22.5 days longer for chart \bigcirc review only (missing PMSI code) compared with PMSI-coded cases.
- A larger proportion of chart review only (missing PMSI code) patients required mechanical ventilation.
- Observed differences between the populations translated into noticeable variations in total cost per stay. The median cost per chart review only (missing PMSI code) patient was €18,330 more expensive than the cost per PMSI-coded patient (Table 3).

based only on PMSI-coded cases.

Multicenter research is required to fully evaluate how missing data or coding limitations/omissions may impact understanding of the incidence, costs and trends in candidal sepsis as well in other invasive Candida infections.

References

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Disclosures

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