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Rétrospective Analysis of Hospitalizations in the Cardiac Intensive Care Unit (CICU) Sens General Hospital

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Abstract | **Original Research Article**

Objective: The aim of this study was to identify the population of patients admitted to the Coronary Care Unit (CCU) of the Centre Hospitalier de Sens and to describe their main characteristics (age, length of stay, mortality, etc.). ***Methods:*** We conducted a retrospective study of all hospitalizations in the CCU over a 12-month period, from January 2023 to January 2024. No exclusion criteria were applied; all patients admitted during this period were included. Data were collected using the SILLAGE software. The primary diagnosis for admission was defined at a later stage, while associated diagnoses were not considered. Cardiogenic shock was defined according to stage C of the SCAI classification (requiring vasoactive drugs to maintain adequate cardiac output). Patient follow-up was available between 6 and 18 months after discharge. ***Results:*** All admissions, regardless of cause or duration of stay, were analyzed in order to assess outcomes and mortality. The analysis focused on admission reasons, hospital stay characteristics, and in-hospital and post-discharge mortality rates. ***Conclusion:*** This retrospective study provides insights into the specific characteristics of CCU patients in a non-university hospital. It highlights the main reasons for admission and death, both during and after CCU stay, and underlines the impact of inappropriate patient orientation on prognosis.

Keywords: Coronary Care Unit, Cardiac Intensive Care Unit, Myocardial Infarction, Cardiogenic Shock, Mortality, Retrospective Study.

INTRODUCTION

The first description of what would later be called the coronary care unit was presented to the British Thoracic Society in July 1961 [1]. This unit aimed to bring together patients suffering from myocardial infarction and to train staff to administer electrical shock therapy and manage arrhythmias. These concepts were well received by Drs. Malcolm Whyte and Gaston Bauer's team at Sydney Hospital, who provided the beds, equipment, and staff training required. The benefit of this consolidation of patients and training of doctors and nurses in electrical shock therapy was demonstrated in a 1967 study [2], showing a reduction in the mortality rate of patients admitted to the coronary care unit, around 15%. The evolution of coronary reperfusion techniques, first thrombolysis and then angioplasty, has further reduced myocardial infarction mortality. Today, acute coronary syndrome (ACS) can be considered a condition with a low risk of mortality. The improvement of acute myocardial infarction treatments, the development of pacing and defibrillation techniques, and the management of heart failure have not only reduced the mortality associated with this condition but also expanded the capabilities of cardiac intensive care units to include the management of other cardiac diseases (valvular heart disease, arrhythmias, and conduction disorders…). Our objective is to identify the patient population in the Cardiac Intensive Care Unit (CICU) and to describe their characteristics (age, mortality, etc.). To address this question, we conducted a retrospective study over a 12-month period in the cardiology department of the Centre Hospitalier de Sens. We analyzed all hospitalizations in the CICU, regardless of the reason for admission or length of stay, and assessed patient outcomes and mortality with a follow-up of 6 to 18 months.

METHODOLOGY

We analyzed all hospitalizations in the CICU of Sens Hospital over a 12-month period, from January 2023 to January 2024. No exclusion criteria were

applied; all patients admitted to the CICU during this period were included in the study.

In our study, cardiogenic shock was defined according to stage C of the SCAI classification (requiring the administration of vasopressors to maintain adequate cardiac output). Patient information was collected using the SILLAGE software.

We defined several reasons for admission to the CICU, with the primary diagnosis specified as the main reason. Associated diagnoses were not considered in our analysis.

OBJECTIVE OF THIS STUDY

This retrospective analysis of hospitalizations in the CICU at Centre Hospitalier de Sens aimed to better understand patient characteristics: reasons for admission, length of stay, and mortality rates, as well as to identify the main causes of death during and after the CICU stay. A specific objective was to highlight cases of inappropriate patient allocation and their impact on prognosis.

RESULTS

In this study, 800 patients were directly admitted to the CICU between January 2023 and January 2024, representing 12% of hospitalizations through the emergency department.

Table 1: Distribution of patients by age group and sex

Age range	F	%	M	%	Overall total
19-28	4	50%	4	50%	8
29-38	4	29%	10	71%	14
39-48	11	33%	22	67%	33
49-58	14	23%	46	77%	60
59-68	42	33%	85	67%	127
69-78	46	30%	108	70%	154
>79	202	49%	202	51%	404
Overall total	323	**40%**	**477**	**60%**	800

The median age was 79 years, with 50% of patients aged 80 years or older. Sixty percent of admissions were men.
Admissions were classified into four major categories.

The first category concerned chest pain. Patients admitted for this reason had as their primary diagnosis: STEMI (ST-elevation myocardial infarction), NSTEMI (non-ST-elevation myocardial infarction), pulmonary embolism, and myopericarditis.

The second category included hemodynamic failure. Patients admitted for this reason had as their primary diagnosis: global heart failure, cardiogenic shock, and endocarditis.

The third category included rhythm disorders. Patients admitted for this reason had as their primary diagnosis: syncope and presyncope, atrioventricular block, sinus node dysfunction, and sustained ventricular tachycardias.

Finally, the fourth category concerned respiratory distress. Patients admitted for this reason had as their primary diagnosis: pulmonary edema (PE), acute respiratory distress syndrome (ARDS), chronic obstructive pulmonary disease (COPD), and pneumonia.

Table 2: Main categories of hospitalization and their percentage

Reason for hospitalization	Number of patients	Percentage (%)
Chest pain	280	35%
Rhythm disorder	248	31%
Hemodynamic failure	136	17%
Respiratory distress	136	17%
Total	800	100%

We chose to classify patients according to these categories of functional signs in order to highlight misclassifications of conditions that were not exclusively cardiac.

Table 3: Reasons for hospitalization due to chest pain and their percentage distribution

Reason for hospitalization	Number of patients	Percentage (%)
NSTEMI (Non–ST-elevation Myocardial Infarction)	192	24%
Pulmonary Embolism	63	8%
STEMI (ST-elevation Myocardial Infarction)	16	2%
Myopericarditis	9	1%
Total	280	35%

The second major reason for hospitalization is supraventricular tachycardia, which accounts for 17% of all hospitalizations. The vast majority of these cases were atrial fibrillation, followed by atrial flutter and a few cases of junctional tachycardia (JT).

Patients admitted for syncope or presyncope accounted for 6% of all hospitalizations. This group also included patients who experienced syncope or presyncope without an identifiable cause during their stay in the CICU.

Table 4: Reasons for hospitalization due to hemodynamic failure and their percentage distribution

Reason for hospitalization	Number of patients	Percentage (%)
Global heart failure	117	15%
Cardiogenic shock	12	1,5%
Endocarditis	7	0,9%
Total	136	17%

Hemodynamic failures accounted for 17% of hospitalizations in the CICU. Among these, global heart failure was the most common (15%), followed by cardiogenic shock (1.5%) and endocarditis (0.9%).

Table 5: Reasons for hospitalization due to respiratory distress and their percentage distribution

Reason for hospitalization	Number of patients	Percentage (%)
Pulmonary edema (PE)	122	15%
ARDS (Acute Respiratory Distress Syndrome)	8	1%
COPD (Chronic Obstructive Pulmonary Disease)	4	0,5%
Pneumonia	2	0,3%
Total	136	17%

Respiratory distress accounted for 17% of CICU hospitalizations. Acute pulmonary edema (PE) was the most frequent, representing 15% of cases. Other respiratory distress cases initially involved a component of left heart failure, characterized by elevated left ventricular filling pressures (LVFP); however, the course of these patients revealed a primary pulmonary component, such as pneumonia or COPD. ARDS, COPD, and pneumonia were less common, representing 1%, 0.5%, and 0.3% of admissions, respectively.

The median length of stay in the CICU was 5 days, with more than half of the patients hospitalized for less than 6 days.

Table 6: Length of stay in the CICU

Length of stay (days)	Number of patients
1-3	267
4-6	211
7-10	146
>10	176
Grand total	800

Table 7: Length of stay by pathology

Reason for hospitalization	Average length of stay
ARDS (Acute Respiratory Distress Syndrome)	19,3
Cardiogenic shock	10,9
Global heart failure	10,1
Sinus node dysfunction	9,9
Pulmonary edema (PE)	8,5
Pulmonary Embolism	7,8
AV block (Atrioventricular block)	7,5
COPD (Chronic Obstructive Pulmonary Disease)	6,3
Supraventricular tachycardia (SVT)	5,9
Endocarditis	5,8
Sustained ventricular tachycardia (VT)	5,5
Acute Coronary Syndrome (ACS)	5,4
Myopericarditis	4,6
Pneumonia	4,5
Syncope/Presyncope	3,8
Overall total	7,0

ARDS required an average hospital stay of 19 days, whereas patients with Acute Coronary Syndrome (ACS) stayed an average of 5 days. The longest average hospital stay was observed in endocarditis cases, with 35 days, following an average CICU stay of 5 days.

Of the 736 patients who survived to hospital discharge, 22 (3%) were readmitted to the cardiac intensive care unit within 30 days. Most readmissions involved heart failure (50%). Mortality was higher among men, accounting for 65.2% of deaths.

Table 8: Mortality by sex

Sex	Number of patients
F	16
M	42
Total	64

Reason for hospitalization	Total deceased	In-hospital mortality	Post-discharge mortality
Chest pain	14 (21%)	7 (21%)	7 (22%)
Rhythm disorder	10 (15%)	5 (15%)	5 (16%)
Hemodynamic failure	22 (33%)	12 (35%)	10 (31%)
Respiratory distress	20 (30%)	10 (29%)	10 (31%)
Total	66	34	32

Overall mortality in the CICU was 60 patients, representing 8% of all hospitalizations. Among the different conditions, hemodynamic and respiratory failures were the most lethal during hospitalization, while chest pain, which includes ACS, was the least lethal.

Table 9: Mortality by pathology

Reason for hospitalization	Number of patients	In-hospital mortality	Post-discharge mortality	12-month mortality
AV block (Atrioventricular block)	36	0	1	1 (2.78%)
COPD (Chronic Obstructive Pulmonary Disease)	4	0	0	0
Cardiogenic shock	12	10	0	9 (83.33%)
Sinus node dysfunction	11	1	0	1 (9.09%)
Endocarditis	7	1	0	1 (14.29%)
Pulmonary embolism (PE)	67	1	1	2 (2.99%)
Global heart failure	115	1	8	9 (7.83%)
Myopericarditis	10	0	0	0
Pulmonary edema (PE)	112	12	7	19(16.96%)
Pneumonia	2	0	0	0
NSTEMI (Non–ST-elevation Myocardial Infarction)	203	2	8	10 (4.93%)
STEMI (ST-elevation Myocardial Infarction)	17	0	1	1 (5.88%)
ARDS (Acute Respiratory Distress Syndrome)	7	1	0	1 (14.29%)
Sustained ventricular tachycardia (VT)	5	0	0	0
Supraventricular tachycardia (SVT)	140	2	5	7 (5,00%)
Syncope / Presyncope	54	4	1	5(9.26%)
Overall total	800	34	32	**66 (8.25%)**

Table 10: Mortality by age group

Age group	Survival	Post-discharge mortality	In-hospital mortality	Overall total
19-33	10	0	0	10
34-48	43	0	0	43
49-63	121	1	0	122
64-78	213	4	6	223
>79	347	27	28	402
Overall total	734	32	34	800

During the study, 34 patients died during their stay in the CICU, representing approximately 4.25% of admissions. Among these deaths, 17 were of cardiac origin, accounting for 50% of the fatalities. Specifically, 11 patients (32.35% of deaths) died from cardiogenic shock, and 6 patients (17.65% of deaths) died from end-stage heart failure.

Additionally, 12 deaths (35.29%) were of pulmonary origin, including 6 patients (17.65% of deaths) who died from pneumonia, 3 patients (8.82% of deaths) from COPD decompensation, and 3 patients (8.82% of deaths) from pulmonary neoplasms.

The remaining 5 deaths (14.7%) included 1 patient with metastatic cancer, 2 patients with

uncontrolled sepsis, and 2 patients with multi-organ failure.

Table 11: Summary of in-hospital deaths

Cause of death	Number of patients	Percentage (%)
Cardiogenic shock	11	32,35%
End-stage heart failure	6	17,65%
Pneumonia	6	17,65%
COPD (Chronic Obstructive Pulmonary Disease)	3	8.82%
Pulmonary neoplasm	3	8.82%
Metastatic endometrial cancer	1	2.94%
Uncontrolled sepsis	2	5.88%
Multi-organ failure	2	5.88%
Total	34	**100%**

DISCUSSION

The retrospective analysis of hospitalizations in the Cardiac Intensive Care Unit (CICU) at Sens Hospital over a 12-month period provides significant insights into reasons for admission, length of stay, mortality, and the epidemiological characteristics of patients. These results should be compared with existing literature to understand their relevance and clinical implications.

Epidemiology: Sex and Age

The median age of our cohort was 79 years, with a significant proportion of patients aged 80 years or older, and a male predominance (60%). This demographic profile aligns with the findings of Katz *et al.,* (2010), who also reported an aging and predominantly male population in modern CICUs. These observations are consistent with general trends, where cardiovascular diseases are more frequent and severe in older men.

Women accounted for 40% of admissions. Although this percentage is lower than that of men, it is important to note that women admitted to the CICU tend to be older than their male counterparts. This is consistent with observations by Morrow *et al.,* (2012), indicating that women develop cardiovascular diseases later in life compared to men [4].

Reasons for Hospitalization and Length of Stay

Acute coronary syndromes (ACS) and rhythm disorders (SVT) accounted for 26% and 18% of hospitalizations, respectively. These rates are consistent with trends observed in other studies, where ACS and rhythm disorders are frequently the primary reasons for CICU admission. Specifically, Katz *et al.,* (2010) documented a similar predominance of ACS in coronary intensive care admissions, highlighting the continued importance of this condition despite advances in coronary reperfusion and angioplasty.

We considered the initial reason for admission to the CICU for each patient. Therefore, if the diagnosis evolved or another condition was identified during hospitalization, these changes were not included in our analysis.

The median length of stay was 5 days, with the majority of patients (56%) hospitalized for less than 6 days. ARDS required the longest hospital stay (19.3 days). Patients with endocarditis had an average hospital stay of 35 days, with an average CICU stay of 5 days, reflecting the complexity and severity of this condition, which requires multiple investigations and prolonged antibiotic therapy. In contrast, patients with ACS had an average stay of 5.4 days, indicating efficient and rapid management due to advances in coronary reperfusion and angioplasty.

This disparity aligns with the clinical demands and treatment protocols specific to each condition, as shown by Katz *et al.,* (2010), who also observed a significant reduction in hospitalization duration for ACS due to progress in intensive cardiac care.

Mortality and Readmissions

Mortality was higher among men, accounting for 65.2% of deaths. Overall mortality in the CICU was 8%, with significant variations depending on the reason for hospitalization. Hemodynamic failures and respiratory distress presented the highest in-hospital mortality rates, accounting for 38.23% of deaths. In contrast, acute coronary syndromes (ACS) showed the lowest in-hospital mortality, at only 5.8%.

Post-discharge mortality remained high for patients with global heart failure and pulmonary edema (PE), with rates of 31% for both. This reflects progress in the treatment of ACS and the persistent challenges associated with heart failure, despite an increasingly sophisticated therapeutic arsenal, including guideline-directed medications, resynchronization therapies, and cardiac rehabilitation techniques.

Our study data indicate that a large portion of deaths occurring during CICU hospitalization were not due to purely cardiac causes. Indeed, the most frequent causes of mortality included non-cardiac conditions such as uncontrolled pneumonia and severely decompensated

COPD. Additionally, it is important to note that the majority of post-discharge deaths occurred in other hospital departments and were also due to non-cardiac causes.

Analysis of survival and mortality by age group revealed that both in-hospital and post-discharge mortality increased significantly with age. For example, among patients aged 64–78 years, in-hospital mortality was 17.64% and post-discharge mortality 12.5%, whereas for patients over 79 years, these rates rose to 82.2% and 84.37%, respectively.

Regarding readmissions, 3% of patients who survived to hospital discharge were readmitted to the CICU within 30 days. Most readmissions (50%) involved heart failure cases, emphasizing the importance of continuous management and post-hospitalization monitoring for these high-risk patients.

Historical studies, such as those by Julian (1961) and Killip & Kimball (1967), demonstrated a significant reduction in patient mortality through the establishment of coronary care units and advances in myocardial infarction treatment techniques. The ACS mortality rate in our study (5%) is consistent with contemporary observations, indicating ongoing improvements in cardiac intensive care.

PATIENT TRIAGE

The triage of patients presenting with respiratory distress to the CICU poses specific challenges. The cardiac component is difficult to assess during the first hours of admission. In our unit, therapeutic trials with diuretics and response to non-invasive ventilation (NIV) are the main tools used to guide patient orientation.

Indeed, conditions such as pneumonia, COPD, and other pulmonary diseases often represent differential diagnoses for left ventricular failure (LVF). Admitting these patients to the CICU may worsen their prognosis, as management in a cardiac-focused unit does not always optimally address complex respiratory needs.

Although a cardiac component may be present, it is often minimal and resolves quickly, leaving the pulmonary condition as the main contributor to morbidity and mortality. Therefore, better triage of these patients to an intensive care or specialized respiratory unit could improve outcomes by providing care more appropriately tailored to their pulmonary needs.

CONCLUSION

The retrospective analysis of hospitalizations in the CICU at Centre Hospitalier de Sens demonstrates that mortality remains particularly high among elderly patients, especially those over 79 years of age. Although acute coronary syndromes (ACS) have become conditions with low mortality risk due to medical advances, hemodynamic and respiratory failures continue to pose major challenges. Patients with heart failure show increased mortality, highlighting the need for improved management and preventive strategies.

These findings emphasize the importance of continuous and optimized care for complex cardiac conditions. In particular, better triage of patients—especially those with predominant pulmonary issues—could improve prognosis by providing care more appropriately tailored to their respiratory needs, ultimately contributing to further reductions in CICU mortality, particularly among the elderly.

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