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From Management to Survival: Evaluating Intermediate and High-Risk Pulmonary Embolism in Cameroon's Referral Hospitals

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Abstract

Background: Pulmonary embolism (PE) is a life-threatening cardiovascular emergency associated with significant morbidity and mortality, particularly in intermediate- and high-risk presentations. Outcomes of PE vary widely across healthcare settings, influenced by patient characteristics, comorbidities, available diagnostic, proper management and therapeutic resources.

Methods: We conducted a retrospective descriptive study in two tertiary referral hospitals in Yaoundé, Cameroon, including patients aged ≥20 years admitted with confirmed intermediate- or high-risk PE between January 2015 and December 2020. Sociodemographic data, comorbidities, preclinical findings, treatment modalities, and in-hospital outcomes were extracted from medical records. The primary outcome was all-cause in-hospital mortality, while secondary outcomes included bleeding complications, recurrent PE, and length of hospital stay. Factors associated with mortality were assessed using univariate analysis.

Results: Eighty-six patients were included, with a female predominance (62.8%) and a mean age of 52.5 ± 15.9 years. Hypertension (45.3%) and obesity (34.9%) were the most frequent comorbidities. The mean length of hospital stay was 8.8 ± 3.1 days. Overall, 80.2% of patients achieved complete clinical recovery. Anticoagulation with low molecular weight heparin was administered to 97.7% of patients, while systemic thrombolysis was used in only 14%. Minor bleeding complications occurred in 8.1% of patients, with no major or fatal bleeding events. One patient (1.2%) developed recurrent PE during hospitalization. The overall in-hospital mortality rate was 18.6%. Previous pulmonary embolism (OR 5.27; 95% CI 1.56–18.06; p = 0.007) and atrial fibrillation on electrocardiography (OR 15.92; 95% CI 1.87–336.16; p = 0.020) were significantly associated with mortality.

Conclusion: The management of intermediate and high-risk PE relies almost exclusively on anticoagulation, with systemic thrombolysis used in a minority of cases in this setting. Intermediate- and high-risk pulmonary embolism is associated with substantial in-hospital mortality in this setting. Prior pulmonary embolism and atrial fibrillation emerged as important factors associated with poor outcomes, underscoring the need for careful risk assessment and optimized management of high-risk patients.

BACKGROUND

Pulmonary embolism (PE) is a life-threatening cardiovascular condition with a substantial global burden. It results from the abrupt obstruction of the pulmonary arterial circulation by thrombotic material, causing acute hemodynamic and respiratory compromise. As one of the most frequent cardiovascular diseases worldwide ranking after coronary artery disease and stroke PE is associated with significant rates of adverse outcomes, including high morbidity and mortality, particularly in severe and complicated forms.

In 2020 in the USA, the incidence of PE was estimated at approximately 1–2 cases per 1,000 adults with an age-adjusted mortality rate of about 2.5 deaths per 100,000 populations [1]. In Africa, the prevalence of PE in hospitalized medical patients varies among studies from 0.14% to 61.5%, with a mortality rate between 13.7% and 69.5% [2].

In sub–Saharan Africa, the diagnosis and management of PE remains sub optimal with few patients receiving timely thrombolysis due to limited diagnostic and therapeutic facilities. One study from the region reported that only 8.7% of high-risk PE patients received thrombolysis [3]. This leads to poor outcomes and increased mortality. This current study aims to describe the outcomes and factors associated with poor outcomes of patients with intermediate and high-risk PE in two tertiary centers in Cameroon.

METHODS

Study design and setting

This was a retrospective descriptive study conducted over 6 months (February to June 2022) in two tertiary hospitals in Yaoundé, Cameroon: The Yaoundé General Hospital and the University Teaching Hospital of Yaoundé. Data were collected from the emergency, intensive care, and cardiology departments.

Study population

We included all patient files aged 20 years and above with confirmed PE and risk stratification as intermediate (low to high risk) or high risk, admitted between January 2015 and December 2020. Only complete medical files were analyzed.

Inclusion criteria:

- Age ≥ 20 years
- Confirmed diagnosis of intermediate or high-risk PE
- Complete medical records

Exclusion criteria

- Missing or incomplete files

Our primary outcome was all cause in hospital mortality while hemorrhage, recurring PE and length of hospital stay were the secondary outcomes.

Sampling:

Convenient sampling was used, including all eligible files found during the study period. The minimum sample size calculated was 59 cases.

Data collection

After obtaining ethical and administrative approvals, patient registers and archives were reviewed to identify eligible cases. Data on sociodemographics, preclinical findings, treatment and outcome were extracted.

Data analysis:

Data were entered and analyzed using SPSS v18. Continuous variables were presented as means ± SD and categorical variables as frequencies and percentages. Associations were tested with Chi-square or Fisher's exact tests; $p < 0.05$ was considered significant.

Ethical considerations:

Ethical clearance was obtained from the University of Yaoundé I ethics committee and hospital administrations. Patient confidentiality was strictly maintained by anonym zing all data.

RESULTS

Sociodemographic Characteristics

In our study, we found a female predominance with 54 cases (62.8%) being female and 32 males (37.2%) giving a sex ratio of 0.59. The age of the population ranged from 23years to 89 years, with a mean age of 52.49 ±15.92 years. The most represented age group was 45 to 65 years, (41.86%) follow by the age group 20 to 45 years representing 36.0% of cases (Table 1).

Comorbidities and Risk factors in the study Population

As regards comorbidities and risk factors, the most frequent comorbidity was hypertension; 39 (45.3%) followed by obesity in 30 patients (34.9%). Transient risk factors like being bed ridden, use of oral contraceptives and immobilization from long travels were seen in 11.6%, 22.1% and 14% of patients (Table 2).

Table 1: Sociodemographic Characteristics

Sociodemographic Characteristics	Total	Percentages (%)
Age Ranges		
20 – 45	31	36.0
46 – 65	36	41.9
66 – 89	19	22.1
Sex		
Male	32	37.2
Female	54	62.8
Employment status		
Public Sector	26	30.2
Private Sector	18	20.9
House wife	20	23.3
Retired	22	25.6

Table 2: Comorbidities and risk factors in study population

PE risk factors/ comorbidities	Frequency(n)	(%)
Hypertension	39	45.3
Obesity	30	34.9
Diabetes mellitus	27	31.4
Oral contraception	19	22.1
Previous VTE disease	16	18.6
Heart failure	16	18.6
Increasing age	13	15.1
Immobility due to car travel	12	14
Bed rest >3days	10	11.6
Chronic infections (HIV and TB)	12	14
Blood transfusion	9	10.5
Cancer	2	2.3

Management of Patients in study population

Site of Management: All patients were initially admitted through the emergency units. Subsequently, the majority of cases 51 (59.3%) were managed in the ICU, while 35 cases (40.7%) received treatment in the internal medicine wards.

Management Strategies: Management was categorized into non-specific supportive measures and specific pharmacological treatment. As regards nonspecific treatment, all patients received hydration while oxygen therapy was administered to 74 patients (86%). Mechanical prophylaxis with compression stockings was used in 25 patients (29.1%).

Concerning specific treatment, systemic anticoagulation with low molecular weight heparin (enoxaparin) was given to 84 patients (97.7%). Systemic thrombolysis with streptokinase was performed in 12 patients (14%). Following initial treatment with enoxaparin, 46 patients (53.5%) were transitioned to rivaroxaban 20 mg once daily for 3 to 6 months with monthly follow-up. Meanwhile, 34 patients (39.5%) were switched to acenocoumarol (4 mg once daily) for 3 to 6 months, with regular monitoring of international normalized ratio (INR) targeting 2.0–3.0. Anticoagulation monitoring included measurement of prothrombin time every 2 to 3 days after treatment initiation. Notably, no patients received unfractionated heparin, surgical or catheter-directed embolectomy, or inferior vena cava (IVC) filter placement (Table 3).

OUTCOMES

The length of hospital stay ranged from 5 to 16 days, with a mean duration of 8.8 ± 3.1 days.

Bleeding complications occurred in 7 patients (8.1%), all of which were minor. These included hemarthrosis of the knee (n = 3), menorrhagia (n = 2), and petechial (n = 2). No major or fatal bleeding events were recorded.

Overall, 69 patients (80.2%) achieved complete clinical recovery. The overall in-hospital mortality rate was 18.6% (n = 16), with 6 deaths directly attributable to pulmonary embolism and 10 deaths related to associated comorbidities, including HIV infection, chronic heart failure, cervical cancer, and renal insufficiency. One patient experienced recurrent pulmonary embolism on day 6 of hospitalization (Table 4).

Factors Associated with Mortality in Study Population

Statistically significant associations with poor outcomes (mortality) were identified for two risk factors: a prior history of pulmonary embolism and the presence of atrial fibrillation on electrocardiographic evaluation (Table 5).

Table 3: Management of patients in study population

Treatment	Frequency (n)	Percentage (%)
Supportive care		
Oxygen therapy (target $SaO_2 \geq 95\%$)	74	86.0
Hydration (normal saline)	86	100.0
Compression stockings (mechanical)	25	29.1
Analgesics	59	68.6
Specific Treatment		
Initial anticoagulation		
Enoxaparin (LMWH)	84	97.7
Oral anticoagulant maintenance		
Rivaroxaban (NOAC)	48	55.8
Acenocoumarol (VKA)	34	39.5
Reperfusion therapy		
Streptokinase	12	14.0

Table 4: Outcomes of Patients after management

Outcomes	Frequency (n)	Percentages (%)
Recovery	69	80.2
Death	16	18.6
PE reoccurrence	01	1.2
Bleeding	07	8.1

Table 5: Factors Associated with poor outcome (mortality)

Factors	Odd ratio	95% CI	*p* value
Previous PE	5.27	1.56 – 18.06	**0.0071**
Atrial Fibrillation	15.92	1.87 – 336.16	**0.0204**
RV Dysfunction	1.57	0.48 – 6.07	0.4769
RV Hypokinesia	2.40	0.71 – 7.67	0.142
Age	1.03	0.99 – 1.07	0.0718
Elevated Troponins I	3.21	0.80 – 21.55	0.14
Elevated Troponins T	5.98	1.50 – 39.34	0.33

DISCUSSION

In our study, we found a female predominance with 62.8% being female while the mean age of our patients was 52.49 ± 15.92 years. A large multicentric European cohort reported a similar trend with women being the majority (54%) but found a higher mean age of 68±16 years compared to our study [4]. These findings differed significantly from those of a cohort from the same country that included only patients with severe PE (high-risk PE), which may explain the difference. That cohort reported a male predominance of 60% and a lower mean age of 48 ± 12 years [5]. A systematic review from the sub region reported that there was a female predominance in PE patients across several studies and found a mean age of 40.8 – 64.4 years [6]. These results are in line with the findings of our current study.

The most frequent comorbidity was hypertension; 39 (45.3%) followed by obesity, diabetes, oral contraceptive use and previous PE. A systematic review of some African studies reported immobilization, obesity, smoking, DVT, recent surgery, malignancy, and recent hospitalization as the main risk factors of PE [6]. Contrary to our study, hypertension was not a top risk factor while malignancy was frequent in contrast to our study where only 2 cases of known malignancy were seen.

Concerning treatment, the specific (pharmacological) treatment was through systemic anticoagulation with LMWH (enoxaparin 1mg/kg/12 SC) in 84 cases (97.7%), overlapping with oral anticoagulant non vitamin-k (Acenocoumarol 4mg INR 2-3) oral anticoagulants (NOACs) rivaroxaban 15mg/20mg in 48 cases (55.8%), or vitamin k antagonist (acenocoumarol) in 34 cases (39.5%). Systemic thrombolysis with streptokinase (250 000 UI loading dose dose over 30mn-100 000 UI/h over 12-24h) was used in 12 cases (14%) despite the inclusion of high-risk PE patients. Following initial parenteral anticoagulation, most patients were transitioned to oral anticoagulants, predominantly rivaroxaban (53.5%) or acenocoumarol (39.5%), for a duration of 3 to 6 months. This therapeutic pattern reflects both adherence to guideline-based management and the influence of drug availability and cost considerations in our setting.

In comparison, the PERT-POZ cohort reported a more heterogeneous treatment approach, with 75% of patients receiving anticoagulation alone and a lower proportion undergoing systemic thrombolysis (7.5%). The availability of advanced reperfusion strategies in that setting was evident, as catheter-directed thrombectomy, surgical embolectomy, extracorporeal membrane oxygenation, and pharmaco-mechanical thrombectomy were employed in selected cases, modalities that were not utilized in our study [7].

These differences likely reflect disparities in resource availability, institutional organization, and access to specialized PE response teams. While thrombolytic therapy was used more frequently in our study than in the PERT-POZ cohort, the absence of catheter-based or surgical alternatives may have contributed to reliance on systemic thrombolysis in selected high-risk patients.

Furthermore, a systematic review of studies on PE in Africa reported that treatment practices primarily involved anticoagulation therapy, with thrombolytics and vena cava filters used in selected cases. However, there was an inconsistent reporting of treatment specifics across the studies indicating disparities in healthcare resources and practices in the subregion [6].

As regards outcomes, the length of hospital stay ranged from 5 to 16 days, with a mean duration of 8.8 ± 3.1 days. A US study reported that the length of hospitalization from 1998 – 2005 while on the decline is between 8.6-9.4 days which is similar to our finding [7]. Bleeding complications occurred in 8.1% of patients, all of which were minor including hemarthrosis of the knee, menorrhagia, and petechiae (n = 2). This was higher than the bleeding rates reported in the PERT-POZ series which reported a bleeding rate of 3.8% [8]. This could be because of lower thrombolysis rates in their series with surgical options in case of high risk of bleeding. A previous study in Cameroon amongst HR-PE patients reported a 15% major non fatal bleeding all in the thrombolysis group [5]. This high bleeding rate could be explained by the fact that safer revascularization methods were lacking and the best treatment option available was thrombolysis. Besides the fact that the fact that some patients presented with prior medical history of PE and an ongoing atrial fibrillation with previous anticoagulation associated with particular conditions like chronic renal disease in some patients.

Overall, 80.2% of our patients achieved complete clinical recovery which is in line with results from a systematic

review of studies in the region with discharge rates being over 80% in most studies [6]. We recorded an in-hospital mortality of 18.6%. This finding was much higher than in the PERT-POZ research reporting an in-hospital mortality of 8.8% [8]. This probably reflects the preparedness and timely intervention of the multidisciplinary team created to manage PE cases in this Polish study, a setup which our current study lacked. The African systematic review reported variable mortality rates from 2% to 41% portraying variability in management in the sub region [6].

Finally, two factors emerged as predictors of mortality on univariate analysis being; a previous PE and atrial fibrillation on ECG. These findings are in line with existing evidence linking cardiac arrhythmias to worse PE outcomes, as demonstrated by Akolbire et al., who found arrhythmia significantly increased in-hospital mortality risk [9]. Atrial fibrillation may contribute to hemodynamic instability, compounding PE severity. Furthermore, prior PE likely indicates a predisposition to recurrent thromboembolism with underlying pathologies like cancer contributing to a more complex clinical course, consistent with elevated comorbidity burdens reported to worsen prognosis.

CONCLUSION

In this Cameroonian cohort, limited by its small size and its retrospective frame management of intermediate and high-risk pulmonary embolism relied almost exclusively on anticoagulation, with systemic thrombolysis used in a minority of cases and no utilization of catheter-directed thrombectomy or surgical embolectomy due to resource limitations and this is associated with substantial in-hospital mortality in this setting. Bleeding complications occur at a higher rate than in some comparable cohorts, though they remain predominantly minor. Prior pulmonary embolism and atrial fibrillation emerged as important factors associated with poor outcomes, underscoring the need for careful risk assessment and optimized management of high-risk patients.

REFERENCES

1. Eikermann GM, Tam C, Eyth A, Ludeke CM, Grimme AM, Ramishvili T, et al. Sex, Racial/Ethnic, and Regional Disparities in Pulmonary Embolism Mortality Trends in the USA, 1999–2020. J Racial Ethn Health Disparities. 2024; 12: 4023-4032.
2. Pessinaba S, Atti YDM, Baragou S, Pio M, Afassinou Y, Kpélafia M, et al. L'embolie pulmonaire au centre hospitalier universitaire Campus de Lomé (Togo) : étude rétrospective à propos de 51 cas. Pan Afr Med J. 2017; 27.
3. Bifouna CRI, Nomo SVN, Njeunji AGK, Bikoi C, Jemea B. Management of Severe Pulmonary Embolism in Intensive Care: A 10-Year Retrospective on Thrombolysis Utilization at a referral hospital in Sub-Saharan Africa. OAEM. 2025; 13: 62-74.
4. Becattini C, Agnelli G, Lankeit M, Masotti L, Pruszczyk P, Casazza F, et al. Acute pulmonary embolism: mortality prediction by the 2014 European Society of Cardiology risk stratification model. Eur Respir J. 2016; 48:780-786.
5. Bifouna CRI, Nomo SVN, Njeunji AGK, Bikoi C, Jemea B. Management of Severe Pulmonary Embolism in Intensive Care: A 10-Year Retrospective on Thrombolysis Utilization at a referral hospital in Sub-Saharan Africa. Open Journal of Emergency Medicine. 2025; 13: 62-74.
6. Okeke CC, Amadi ES, Ebiliekwe OE, Ekeocha IR, Okoro EN, Nduji OJ, et al. Risk factors and outcomes of acute pulmonary embolism in African patients: a systematic review. Cureus. 2024; 16: e74673.
7. Sławek-Szmyt S, Jankiewicz S, Smukowska-Gorynia A, Janus M, Klotzka A, Puślecki M, et al. Implementation of a regional multidisciplinary pulmonary embolism response team: PERT-POZ initial 1-year experience. Kardiologia Polska. 2020; 78: 300-310.
8. Park B, Messina L, Dargon P, Huang W, Ciocca R, Anderson FA. Recent trends in clinical outcomes and resource utilization for pulmonary embolism in the United States: findings from the nationwide inpatient sample. Chest. 2009; 136: 983-990.
9. D Akolbire, DA. Akolbire, AD. Boampong, B Arhinful, G Osei-Poku, AN Thomas, and S Aziz. Predictors of Mortality in Hospitalized Patients With Primary Diagnosis of Pulmonary Embolism Using US National Inpatient Sample Data, 2018 – 2021.