ORIGINAL ARTICLE

Predictive factors of hemoptysis recurrence after hospital discharge

Facteurs prédictifs de la récidive de l'hémoptysie après la sortie de l'Hôpital

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Abstract

Introduction: Hemoptysis is a potentially life-threatening symptom that requires prompt evaluation and management. Its recurrence can be as distressing as the initial episode and represents a significant clinical concern.
Aim: This study aimed to identify predictors of hemoptysis recurrence outside the hospital setting.
Methods: We conducted a retrospective, longitudinal, descriptive, and analytical study including all patients hospitalized for hemoptysis in the Pneumology Department of Charles Nicolle Hospital, Tunis, between January 2015 and June 2022. The follow-up period extended from the first hospitalization to the last medical consultation, with a minimum duration of one year. Patients who experienced recurrence during follow-up were analyzed to identify clinical, etiological, and therapeutic factors associated with hemoptysis recurrence.
Results: A total of 200 patients were included, with a mean age of 52.5 ± 15.8 years (range: 18–90), and a marked male predominance (83.5%). Active smoking was reported in 83.5% of patients. Drug use was noted in 13% of cases, and 15% had high-risk behaviors. Comorbidities were present in 52% of patients, predominantly cardiovascular diseases. Five patients (2.5%) were receiving vitamin K antagonists, and eight (4%) were on antiplatelet therapy.
Multivariate logistic regression analysis identified cardiovascular comorbidities (OR = 2.2), bronchiectasis (OR = 9.8), and antiplatelet therapy (OR = 3) as independent predictors of hemoptysis recurrence. Additionally, markers of initial episode severity, including acute anemia requiring blood transfusion (OR = 2.5) and the need for octreotide (OR = 8.2), were significantly associated with an increased risk of out-of-hospital recurrence.
Conclusion: These findings underscore the importance of risk stratification, close follow-up, and individualized management in patients at high risk of hemoptysis recurrence. Early identification of predictive factors may help optimize preventive strategies and improve clinical outcomes.

Key words: Hémoptysis, Récidive, Facteurs

Résumé

Introduction : L'hémoptysie est un symptôme préoccupant, nécessitant une prise en charge rapide en raison de sa potentielle gravité. Sa récidive constitue une source d'angoisse supplémentaire et un défi clinique majeur.
Objectif : Identifier les facteurs prédictifs de récidive de l'hémoptysie en dehors du milieu hospitalier.
Méthodes : Il s'agit d'une étude rétrospective, longitudinale, descriptive et analytique, incluant tous les patients hospitalisés pour hémoptysie au service de pneumologie de l'hôpital Charles Nicolle de Tunis entre janvier 2015 et juin 2022. Les données cliniques et paracliniques ont été recueillies à partir des dossiers médicaux. La période de suivi s'étendait de la première hospitalisation jusqu'à la dernière consultation, avec une durée minimale d'un an. Les patients ayant présenté une récidive durant cette période ont été analysés afin d'identifier les facteurs cliniques, étiologiques et thérapeutiques associés.
Résultats : Deux cents patients ont été inclus, avec un âge moyen de 52,5 ± 15,8 ans (18–90 ans) et une prédominance masculine (83,5 %). Le tabagisme actif concernait 83,5 % des patients. Une consommation de drogues a été rapportée chez 13 % des cas et 15 % présentaient des comportements à risque. Des comorbidités étaient présentes dans 52 % des cas, dominées par les pathologies cardiovasculaires. Cinq patients (2,5 %) étaient sous antivitamine K et huit (4 %) sous antiagrégants plaquettaires.
L'analyse multivariée a identifié comme facteurs indépendants de récidive : la présence de comorbidités cardiovasculaires (OR = 2,2), la dilatation des bronches (OR = 9,8) et le traitement par antiagrégants plaquettaires (OR = 3). Par ailleurs, la sévérité de l'épisode initial, marquée par une anémie aiguë nécessitant transfusion (OR = 2,5) et le recours à l'octréotide (OR = 8,2), était également associée à un risque accru de récidive extra-hospitalière.
Conclusion : Ces résultats soulignent l'importance d'une stratification précoce du risque et d'une surveillance étroite des patients à haut risque de récidive d'hémoptysie. Une prise en charge individualisée pourrait permettre d'optimiser les stratégies préventives et d'améliorer le pronostic.

Mots clés: Récidive de l'hémotysie, Facteurs, Récurence

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What is known on this study:

- Hemoptysis is a significant symptom requiring prompt evaluation, often linked to serious underlying conditions.
- Risk factors like bronchiectasis, tuberculosis, and use of anticoagulants increase the likelihood of recurrence.
- Managing and preventing hemoptysis recurrence remains challenging, especially in resource-limited settings.

What this article adds

- Acute anemia needing transfusion and octreotide use are significant predictors of recurrence.
- Real-world clinical data provide insights into factors influencing recurrence in hospitalized patients.
- Findings highlight the need for tailored follow-up and preventive strategies for high-risk patients.

Introduction

Hemoptysis is an alarming symptom that raises considerable attention among both patients and healthcare providers [1]. The emergency and gravity of managing hemoptysis are underscored by the potential life-threatening nature of the condition [2]. Therapeutic management in a hospital environment during the acute phase of a first episode of hemoptysis determines the immediate and long-term evolution of the underlying pathology [3]. Although this management is of capital importance, it remains of paramount importance after discharge from the hospital environment. In fact, the recurrence of hemoptysis outside the hospital environment introduces a dynamic challenge, requiring, therefore, a shift in aim from acute intervention to long-term care and prevention [4]. This transition prompts the exploration of predictive factors that could forewarn both healthcare providers and patients about the likelihood of future hemoptysis episodes [4]. Thus, it is essential to understand the factors contributing to the out-of-hospital recurrence of hemoptysis for several reasons [4]. First, recurrent episodes represent a source of ongoing anxiety for the patient and can be responsible for significant morbidity and mortality [3]. Second, these episodes are a significant source of healthcare expenditure, requiring a proactive and sustainable approach to manage this recurring aspect of the symptom [3].

Moreover, recognizing predictive factors for out-of-hospital recurrence opens doors for personalized and targeted interventions [5]. Rather than a one-size-fits-all approach, healthcare providers can follow strategies based on the specific risk profile of each patient. This approach not only enhances the effectiveness of long-term care but also empowers patients by providing them with insights into potential triggers and preventive measures [1].

As a matter of fact, this study aimed to identify and analyze predictive factors associated with the out-of-hospital recurrence of hemoptysis. Ultimately, enhancing our ability to anticipate, prevent, and manage subsequent episodes for improved patient outcomes.

Methods

This was a retrospective and descriptive study including patients, aged over 15 years, hospitalized in the Pneumology Department of Charles Nicolle Hospital in Tunis for a first confirmed episode of hemoptysis of variable abundance, ranging from blood-streaked sputum to profuse hemoptysis, between January 2015 and June 2022. Hemoptysis was confirmed clinically, and all patients underwent fiberoptic bronchoscopy. Incomplete medical records were excluded.

For the assessment of the severity of hemoptysis, there is no volume threshold consensus in guidelines, so we chose <50 mL per 24H for mild hemoptysis, between 50 and 200 mL per 24H for moderate hemoptysis, and >200 mL per 24 h for severe hemoptysis based on experience from previous reports [6].

The follow-up period was the time, in months, between the 1st hospitalization and the last medical consultation. We chose a minimum setback period of 12 months. We selected patients who recurred during this period, and looked for clinical, etiological, and therapeutic factors predictive of the hemoptysis recurrence.

Categorical variables were expressed as frequency (n, %), with Fisher's exact probability test used for comparisons. The Hazard Ratios (HRs) of factors potentially attributable to hemoptysis recurrence were calculated using univariate and multivariate regression models, specifically logistic and Cox regression analyses. All statistical analyses were performed with SPSS 20.0 statistical software, and a two-sided p-value < 0.05 was considered statistically significant.

Results

Two hundred patients were included in the study. The mean age was 52.5±15.8 years, ranging from 18 to 90 years, with a gender-ratio M/F equal to 10,13. Thirteen percent of the population was drug addicted (mostly cannabis) (24 men and two women), and 15% had a risky behavior. Comorbidities were found in 52% of all cases, dominated by cardiac diseases (Table 1). Five patients (2.5%) received treatment with a vitamin K antagonist for arrhythmia, while eight (4%) were prescribed antiplatelet agents.

Hemoptysis was mild in 53.5% of cases, moderate in 37% and severe in 9.5% of cases. Upon admission to the hospital, 14.5% of the patients presented with acute anemia, and among them, seven individuals necessitated at least one transfusion during their hospitalization. Tuberculosis was the most important etiology for hemoptysis (Table 2). In 23% of cases, the etiology wasn't determined.

Table 1. Patients' medical history

Comorbidities	N	%
Hypertension	33	16,5
Diabetes	25	12,5
COPD	24	12
Dyslipidemia	23	11,5
Rhinitis	14	7
Arrhythmia	13	6,5
Asthma	4	2
Hypothyroidism	1	0,5

Table 2. Hemoptysis' etiologies

Etiologies	N	%
Tuberculosis	53	26,5
Pulmonary neoplasia	42	21
Bronchiectasis	22	11
Pulmonary embolism	11	5,5
Intra-alveolar hemorrhage	9	4,5
Pulmonary abscess	4	2
Hypertensive urgency	4	2
Pulmonary metastasis of extrapulmonary neoplasia	2	1
Vitamin K antagonist overdose	2	1
Lung's hydatid cyst	2	1
Pulmonary aspergillus infection	2	1
Arteriovenous malformation	1	0,5
Undetermined causes	46	23

All patients received medical treatment during their hospitalization, 8% of whom underwent surgery. Two patients underwent arterial embolization.

The mean follow-up period was 48 ± 31 months, with a minimum of 6 months and a maximum of 99 months. After the 1st hospitalization, 22 patients were referred to oncology for management of their neoplasia, and 16 patients were lost to follow-up. A total of 161 patients (80.5%) were followed up at the outpatient consultations. Hemoptysis recurred in 68% of cases, with a mean number of recurrence episodes of 1.23 ± 0.53.

We included 161 patients with outpatient follow-up, whom we divided into two groups: 30 patients (19%) hospitalized for recurrent hemoptysis (R+) and 131 patients (81%) without recurrence during follow-up (R-). We compared demographic, clinical, paraclinical, and therapeutic data during the first hospitalization for hemoptysis to determine predictive factors for extra-hospital recurrence.

In the logistic regression analysis, it was observed that patients with cardiovascular comorbidities (odds ratio=2.2), individuals suffering from bronchiectasis (odds ratio=9.8), and those under antiplatelet agents (odds ratio=3) exhibited a higher likelihood of hemoptysis recurrence. During the first hospitalization, patients with acute anemia requiring transfusion (odds ratio=2.5) and those who required octreotide (odds ratio=8.2) to manage hemoptysis were at higher risk of extra-hospital recurrence (Table 3).

Table 3. Univariate and multivariate analysis of the variables associated with recurrence of hemoptysis in patients after hospital discharge

Variables	Univariate		Multivariate
	p-value	OR (95% CI)	p-value
Age	0.4		
Sex	0.1		
Active smoking	0.2		
Drug addiction	0.7		
Risky behavior	0.3		
Cardiovascular comorbidities	0.02	2.2 [0.8–6.3]	0.03
└ Hypertension	0.4		
└ Diabetes	0.7		
└ arrythmia	0.1		
└ Dyslipidemia	0.6		
Respiratory comorbidities	0.5		
└ COPD	0.5		
└ Asthma	0.7		
Anticoagulation	0.4		
└ Vitamin K antagonist	0.7		
└ Antiplatelet agent	0.04	3.3 [0.5–18]	0.2
Hemoptysis abundance	0.7		
Acute anemia	0.04	2.5 [0.8–8]	0.01
Chest X-ray findings	0.1		
Chest angio-CT	0.1		
Blood group	0.6		
Etiologies (overall)	0.05	2.9 [0.3–4.6]	0.07
└ Bronchiectasis	0.001	9.8 [2.5–39]	0.001
└ Tuberculosis	0.001		
└ Pulmonary neoplasia	0.2		
Medical treatment with octreotide	0.03	8.2 [0.7–29.2]	0.05
Surgical treatment	0.6		
Transfusion	0.09		
Embolization	0.2		

Discussion

Hemoptysis recurrence refers to the reappearance of the symptom of coughing up blood after an initial episode [7]. Recurrent hemoptysis can pose significant challenges in clinical management and requires a comprehensive approach to understand and address potential contributing factors. Recurrent hemoptysis may be associated with a variety of underlying causes [8]. It's essential to investigate and identify the primary condition responsible for the symptom, such as pulmonary tuberculosis, bronchiectasis, lung cancer, or bronchitis. Thorough diagnostic evaluations, including imaging studies and laboratory tests, are crucial for pinpointing the specific cause [9].

In our investigation, tuberculosis emerged as the predominant cause of hemoptysis, identified in 53 patients.

This finding aligns with a study conducted at the emergency department of Post Graduate Institute of Medical Education and Research (PGIMER) in India, involving 110 patients, pulmonary tuberculosis (active/ sequel) was identified as the principal etiology in 65% of cases, followed by community-acquired pneumonia (10.9%), bronchiectasis (9.3%), lung carcinoma (7.18%), and miscellaneous causes (8.6%)[10].

Anticipating the recurrence of hemoptysis beyond the confines of a hospital setting is integral to the comprehensive management of patients with respiratory conditions [4]. Such foresight is crucial not only for the individual's well-being but also for the efficient allocation of healthcare resources[3,4]. In this regard, several factors emerge as key predictors for the potential recurrence of hemoptysis in non-hospital settings [4,5,11]. The severity and progression of the underlying respiratory disease also significantly contribute to the likelihood of hemoptysis recurrence [12]. Patients in advanced stages of their respiratory conditions may face a higher risk, necessitating vigilant monitoring and timely therapeutic adjustments.

In some cases, recurrent hemoptysis may be indicative of disease progression or complications related to the underlying respiratory condition. Monitoring the progression of the primary disease is essential to adapt treatment strategies accordingly and prevent further episodes [13]. Evaluating the effectiveness of the initial treatment is crucial when addressing hemoptysis recurrence [14]. If the underlying cause is not adequately treated or if there are complications arising from the initial therapy, adjustments may be necessary to optimize patient outcomes [14]. Indeed, in our study, the univariate analysis indicated that receiving medical treatment alone (etamsylate) emerged as the only significant factor associated with recurrent hemoptysis. This finding underscores the potential impact of medical interventions in influencing the likelihood of hemoptysis recurrence. In a retrospective analysis conducted at the departments of Cardiothoracic Surgery and the Respiratory Unit of the University of Stellenbosch and Tygerberg Hospital, South Africa, encompassing 120 consecutive patients experiencing life-threatening hemoptysis (exceeding 200ml of discharge per 24 hours), the overall hospital mortality rate stood at 10%. Notably, this mortality rate exhibited similarity between patients undergoing pulmonary resection (7.1%) and those managed medically (11.5%), with no statistically significant difference ($p>0.05$).

However, upon further examination of hospital survivors with available 6-month follow-up data, a distinct pattern emerged. Among those treated medically, 36.4% experienced recurrent massive hemoptysis, signifying a considerable recurrence rate. In contrast, none of the patients who underwent surgical management encountered a recurrence of massive hemoptysis, and this difference was statistically significant ($p< 0,001$). This outcome underscores the potential effectiveness of surgical intervention in preventing the recurrence of life-threatening hemoptysis when compared to medical management [15].

Patients with recurrent hemoptysis may have comorbidities that contribute to the persistence of the symptom. Addressing these additional health concerns is essential for a holistic approach to patient care. Identifying and addressing risk factors that may exacerbate hemoptysis recurrence is important [16]. Indeed, our study, utilizing both univariate and multivariate analyses, consistently demonstrated a significant association between the presence of cardiovascular comorbidities and the recurrence of hemoptysis in the months following the patient's discharge from the hospital. These findings highlighted the lasting influence of comorbid health conditions on the probability of recurrent hemoptysis, underscoring the significance of incorporating these factors into post-hospitalization management and follow-up care for patients [17]. It includes considerations like smoking, exposure to environmental factors, and the presence of comorbid cardiovascular conditions. Nevertheless, our study did not reveal any significant association between recurrent hemoptysis in outpatient settings and active smoking, drug use, or risky behavior.

In our logistic regression study, we explored factors associated with hemoptysis recurrence, conducting both univariate and multivariate analyses. In the univariate analysis, three notable factors showed an increased likelihood of recurrence: the presence of cardiovascular comorbidities, individuals diagnosed with bronchiectasis, and those under antiplatelet agents. These factors each exhibited an odds ratio greater than 1, suggesting an elevated risk of hemoptysis recurrence.

Further investigation through multivariate analysis, which accounts for potential confounding variables, reinforced the significance of this factor. Patients suffering from bronchiectasis continued to exhibit heightened odds ratios, affirming their independent association with an increased risk of hemoptysis recurrence.

Examining factors at the time of the initial hospitalization, the univariate and multivariate analyses singled out acute anemia and the use of octreotide as significant risk factors, emphasizing their standalone impact in predicting recurrence.

This refined analysis emphasizes the intricate interplay of these factors and their collective influence on the recurrence of hemoptysis beyond the individual contributions identified in the univariate assessment. The crucial aspect of managing hemoptysis recurrence involves educating patients about potential triggers and preventive measures. Empowering patients to recognize and respond to early signs can contribute to better self-management and improved overall outcomes [18]. Establishing a structured and long-term follow-up plan is essential to monitor patients with a history of hemoptysis [19]. Regular assessments and imaging studies can help detect any signs of recurrence or disease progression early on [20].

Indeed, in a comprehensive study, a predictive model was developed to anticipate hemoptysis recurrence following Bronchial Artery Embolization (BAE) for non-cancer-related hemoptysis [21].

The study encompassed 487 patients who underwent BAE for hemoptysis unrelated to cancer between January 2015 and December 2019. Model variables were derived from both univariate and multivariate Cox regression analyses. The recurrence rates at various intervals were as follows: 94.5% at one month, 88.0% at one year, 81.4% at two years, 76.2% at three years, and 73.8% at five years. Identified risk factors for recurrence included underlying lung diseases and the presence of systemic arterial-pulmonary circulation shunts.

This risk prediction model, featuring two key risk factors, exhibited favorable performance metrics. The discrimination capability was robust, as evidenced by an area under the curve of 0.69 (95% confidence interval, 0.62–0.76). Additionally, the model demonstrated a lower prediction error, as indicated by the integrated Brier score of 0.143. These findings suggest the model's utility in effectively identifying patients at higher risk for recurrence following BAE for non-cancer-related hemoptysis, offering valuable insights for clinical decision-making and patient management [21].

In summary, managing hemoptysis recurrence requires a thorough understanding of the underlying causes, close monitoring of disease progression, and a multidisciplinary approach to patient care. Addressing potential risk factors and ensuring effective communication with patients are integral components of a comprehensive strategy to minimize the impact of recurrent hemoptysis on both patient well-being and healthcare resources [3,9,15].

Conclusion

In conclusion, our study highlights key factors associated with hemoptysis recurrence, particularly cardiovascular comorbidities, acute anemia, and etiologies such as tuberculosis and bronchiectasis. These findings, together with the referenced predictive model, help refine risk stratification and guide more individualized management. By improving the identification of patients at higher risk of recurrence, our results support more targeted and effective clinical decision-making.

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