

MANAGEMENT OF HEMOPTYSIS IN EMERGENCY ROOM

A.N. Venkatesh¹, H. Rajanna²

¹Apollo Hospital, Karnataka Region, India

²Apollo Hospital, Bengaluru, India

ЛЕЧЕНИЕ КРОВОХАРКАНИЯ В ОТДЕЛЕНИИ ЭКСТРЕННОЙ МЕДИЦИНСКОЙ ПОМОЩИ

А.Н. Венкатеш¹, Х. Раджанна²

¹Больница Апполо, Карнатака, Индия

²Больница Аполло, Бангалор, Индия

We present a case of 21y old man who had presented to our hospital with hemoptysis and breathing difficulty. He was previously been diagnosed as having pulmonary Koch's and had received treatment for same. Now had presented with worsening hemoptysis. While he was waiting in ER for pulmonologist initial management was initiated. After being reviewed by specialty team they wanted to do bronchial arterial embolization. While team and theatre were preparing, patient was in emergency room (ER) and his hemoptysis was getting worse. This made me search for available options for management of severe haemoptysis in ER. Though the definitive (non-surgical) management is arterial embolization. We look for management option in ER while the definitive treatment is being arranged, or if patient needs to be transferred to place of definitive treatment, or if there is no option of arterial embolization. We learn from the review that ER can play its role in stabilizing these patients. They can also initiate management measure to transfer patient to specialty centre, where needed. In places and situation where no further care is available these additional measure could make a difference in helping manage patients with pulmonary Hemorrhage.

Learning Points:

- The initial assessment and management of patients with severe hemoptysis in ED.
- Further steps which could be undertake in ED to stop or control severe hemoptysis.

Keywords: hemoptysis, management, emergency room.

В статье представлен случай по оказанию экстренной медицинской помощи 21-летнему мужчине, который поступил в нашу больницу с кровохарканьем и затрудненным дыханием. Ранее ему был поставлен диагноз легочной болезни Коха, он проходил лечение от этого же заболевания. Теперь поступил с усиливающимся кровохарканьем. Пока он ждал в отделении неотложной помощи пульмонолога, было начато лечение. После проведенного консилиума пациенту планировали сделать эмболизацию бронхиальной артерии. Пока команда врачей готовилась, пациент находился в отделении неотложной помощи, и его кровохарканье усиливалось. Это заставило искать доступные варианты лечения сильного кровохарканья в отделении неотложной помощи, хотя окончательным (нехирургическим) лечением является эмболизация артерий. В данной статье мы ищем вариант экстренного оказания помощи в период, пока назначается окончательное лечение, или если пациента необходимо перевести в место окончательного лечения, или если нет возможности артериальной эмболизации. Из обзора мы узнаем, что неотложная помощь может сыграть свою роль в стабилизации состояния таких пациентов. Они также могут инициировать меры по переводу пациента в специализированный центр, если это необходимо. В местах и ситуациях, когда дальнейшая помощь недоступна, эти дополнительные меры могут иметь значение в лечении пациентов с легочным кровотечением.

Цель этой статьи:

- Первичная оценка и ведение пациентов с тяжелым кровохарканьем.
- Дальнейшие шаги, которые можно предпринять в отделении неотложной помощи, чтобы остановить или контролировать тяжелое кровохарканье.

Ключевые слова: кровохарканье, лечение, отделение экстренной медицинской помощи.

Case Presentation

21 year old male presented with history of hemoptysis for past 3–4 days. He had been bringing up 15–20 ml of blood every day. He had presented as it was getting progressively worse. He had history of Pulmonary Tuberculosis (TB) about three years back for which he had completed six months course of anti-TB treatment. He was seen in Emergency department. He was noted to be tachycardic with HR of 130 beats/min with a BP of 110/70 mmhg, his RR was 24 with oxygen saturation of 84% on room air and requiring 8 ltr/min of oxygen to maintain a saturation of 95%. His temperature was noted to be 98F. on examination he was lean built and was noted to have crackles diffusely on right lung fields.

He did not have any high risk features in history for COVID. In view of his presentation he was treated as a high risk of COVID while in ED. He was not on any other medication and not other risk factors for bleeding.

He was having bouts of cough bringing up 15–20 ml of blood with each bout. It was noted an approximalty 150–200 ml of blood loss in 30 mins of his arrival. An intravenous cannula was secured and bloods sent to lab. He was given codeine 45 mg (15 ml of corex-T) as anti-tussive. 1G of Tranaxamic acid [1, 11, 28] was given as slow injection over 15–20 mins. He was also started on ringers lactate 100 ml/hour. His Chest x-ray showed – right upper lobe fibrosis and bilateral diffuse ground glass appearance.

Patient seemed to be settling with his coughing bouts and thus his hemoptysis. But he still had been having bouts of cough and hemoptysis. Hence we prepared for intubation if symptoms continued as he had lost almost about 400 ml of blood in 90 mins. In view of blood loss, blood transfusion was of one unit was started. On discussing with Pulmonology team, they advised CT chest with contrast to evaluate the feasibility of Bronchial artery embolization (BAE). Patient underwent CT scan and was back in ED. While we wait for report and for further plan, we had a young patient with ongoing cough and hemoptysis (much less severe than from arrival) we had run out of further interventions and were waiting for further advice from Pulmonology team.

This made me ask myself is that all we can do in emergency for patients with hemoptysis?

Patients CT images



Patient was shifted to ICU waiting further management plan. As the CT reports was available and on review by interventional radiologist patient underwent BAE on the same evening. He continued to maintain his own airway and breathing, was hemodynamically stable and tolerated procedure well. He continued to have good recovery. He was noted to have HB of 9.9 which had dropped to 7.4 on day two of admission. He had received a further two units of blood transfusion. The next day he underwent a bronchoscopy for evaluation which showed clots in right bronchus which was cleared. No active bleed was noted. His COVID tests were negative. Patient was discharged on day 6 of his admission in a stable condition.

Learning Points:

- The aim of this article is to emphasize on;
- The initial assessment and management of patients with severe hemoptysis in ED

Further steps which could be undertake in ED to stop or control sever hemoptysis

Review:

Hemoptysis is a worrying presentation for both the doctor and patients. It can be due to a wide spectrum of cause from infective to inflammatory, from vascular to malignancy [8, 9]. Hemoptysis was associated with a high mortality of 70% [10], which has been reduced to 6.5% to 38% [10].

Etiology: Pulmonary TB is the most common cause for presentation of hemoptysis in India [2, 3, 4] followed by Pneumonia and bronchiectasis. TB is said to be cause in 27–78% in various studies across the country. This is different to presentation in European countries [5, 6] where pulmonary malignancy is a leading cause along with cryptogenic causes. In a report in 2019 WHO [7] has reported the total number of cases in India as of August 2018 was 2 690 000 which would be about 199 cases per 100,000. The incidence of TB in India is reducing by the year but in recent years there has been an increase in new and relapse cases of TB. Most cases of sever hemoptysis are due to TB [4].

Etiologies of hemoptysis: [12–21]

Pulmonary-airway	Neoplasm*
	Bronchitis*
	Bronchiectasis*
	Airway trauma
	Foreign body
	Bronchovascular fistula

Pulmonary-parenchymal	Pneumonia*
	Tuberculosis*
	Mycetomas* (aspergillosis)/fungal infections
	Lung abscess
	Parasitic diseases
	Leptospirosis
	Cocaine inhalation
	Lung contusion
	Vasculitis (Wegener, etc.)
	Systemic lupus erythematosus
	Behcet's disease
	Goodpasture syndrome
	Idiopathic pulmonary hemosiderosis
Pulmonary-vascular	Pulmonary embolism*
	Arteriovenous malformation
	Pulmonary artery pseudoaneurysm
	Dieulafoy's disease
	Pulmonary veno-occlusive disease
	Bronchial telangiectasia
Cardiac	Heart failure*
	Mitral stenosis
	Congenital heart disease
Iatrogenic	Anticoagulant and antiplatelet medications
	Pulmonary artery catheter
	Biopsy
	Bronchoscopy
	Airway stent
	Endotracheal tube erosion
Others	Bevacizumab treatment
	Idiopathic*
	Disorders of coagulation
	Thoracic endometriosis (catamenial hemoptysis)

* The most common etiologies.

In the case presented above CT scan of chest was suggestive of aspergilloma. He did have history of pulmonary TB for which he had been treated 3 years ago. There was no evidence of recurrence.

There is still lack of consensus on severity of hemoptysis and no uniform management guidelines for management of hemoptysis. With more patients being admitted to hospitals through ED there is increased need for guidelines for management of hemoptysis. Most classification of severity noted have classified as volume of blood loss per day or over 24 hours.

For practical purposes in ED we can adopt the following classification;

Mild – specs of blood in phlegm or <50 ml in last 24 hours;

Moderate – blood noted on each bout of cough or 50–200 ml in last 24 hours;

Sever – frequent recurrent bouts of cough with hemoptysis with loss of >200 ml in last 24 hours or >50 ml blood/hour during last consecutive hours;

Life threatening – intractable cough with hemoptysis with > 100 ml/hr blood loss in last two consecutive hours or moderate to severe hemoptysis with hemodynamic instability.

Applying this classification Patient described earlier would be life threatening group.

Management in ED

Since early 20th century it has been recognized the management of hemoptysis has to be based on severity [22] and there is no one size fits all. Patients presenting with mild to moderate symptoms can be managed conservatively [23] and referred to speciality teams for further management. Patients presenting with severe or life threatening hemoptysis needs stabilization and further management in ED [24]. The Patient described above was having life threatening hemoptysis. He was managed according to principles of resuscitation guidelines.

On assessment of airway, our patient was talking comfortably and airway was clear. It should be noted that even though it is clear at time of assessment, there is a potential for impending blockage of airway with clots and hence wide bore suction should be at hand and endotracheal intubation tray should be ready to hand.

In case presented, patient was breathing spontaneously. His RR was 24–28 and he was maintaining a SaO₂ of 88–90 on RA and was requiring 2–4 ltrs O₂ to maintain SaO₂>95%. We avoided Hudson mask as he was having recurrent bouts out hemoptysis and managed on nasal cannula. This is one case where even if are able to main-

tain a clear airway patients breathing can deteriorate due to bleed into lungs. Important learning point from this is, what are the measure we can take in ED to stop or prevent further bleed.

Assessing his circulation, he was noted to be hemodynamically stable on presentation but in class 1 shock. He continued to have hemoptysis >200 ml of blood in first hour. We gained two IV line in both cubital fossa and sent bloods for cross matching 4 units. We noted we have O-ve as standby. We were ready to volume replace with blood if patient had any signs of worsening shock. We had started on ringer lactate at 100 ml/hour.

We used the other line for medications; he had been given ondasetron 4mg, Pantoprazole 40mg, cefoperazone+sulbactam 1.5 gm. He was also given 1 gm Tranaxamic acid. We gave syp codeine 10 mg and repeated 10mg after 20 mins to help suppress cough.

Patient was shifted for CT chest to radiology and had returned to ED. His trip to CT scan was uneventful.

Pulmonology team were in Department and reviewed the patient and advised the patient to be shifted to ICU for further management. Patient was planned for BAE which has been effective in treating with hemoptysis [11, 24, 26]. While waiting for ICU bed or while waiting patient being shifted to cath-lab for BAE are there any further measures which could be done in ED to address the problem?

In patients who are on anticoagulants, it is important to reverse where possible.

Adrenaline nebulization – it has been reported that topical endobronchial use of adrenaline in various concentration has shown to stop bleeding during bronchoscopy and lung biopsy [24, 29]. This is on the understanding of vasoconstrictor effect of adrenaline and hence helping halt the bleeding process. In the absence of bronchoscopy nebulized adrenaline could have vascular constricting effect and causing broncho-dilatation which could help in halting the bleeding process. Breuer et. al [30] have reported that nebulized 8 mg adrenaline is not inferior to 0.3 mg intramuscular route. Hence nebulized adrenaline can be used in patients with hemoptysis to help stop the bleed.

Cold saline bronchial lavage-application of cold to cause vaso-spasm to arrest bleed is tried in cases of epistaxis. On the same principle applying cold compresses on bronchial vessels can

reduce or halt hemoptysis. AA Conlan et. al [27] has reported in 1980 a case series of 12 patients who had undergone rigid bronchoscopy and cold saline bronchial lavage as an emergency. Four had TB and another five of them had bronchiectasis with secondary fungal infections. All the patients were reported to have stopped bleed. Two of them had re-bleed which was controlled by second cold saline lavage. There was no mortality in study group and all patients were discharged in stable condition.

As these patients would need intubation for further management of hemoptysis, They could be electively intubated in ED and use a rigid bronchoscopy for cold saline lavage.

Tamponade by pneumothorax – The principle of halting the bleed by Tamponade effect was written by William MacLennan in 1908 [22]. He had written that by inducing a iatrogenic pneumothorax with oxygen we can cause tamponade effect and on affected lung. The oxygen would be gradually absorbed as the lung re-expands. There is no case reports of studies reported about this procedure. FH Young [31] has described same and has also stated that inducing a pneumoperitonium can also be beneficial in managing severe hemoptysis.

In centers where BAE or cardio-thoracic surgeons are readily available these additional measures

may not be of much in practical terms. These measures can be invaluable in centers or situations where BAE or Cardio-thoracic team are not readily available for further intervention. Further data on use of these measure can help guide further ED management.

These measures may not be an alternative to BAE but when instituted diligently could buy time till patient is prepared for further definitive treatment.

Conclusion

Pulmonary haemorrhage, massive pulmonary haemorrhage is not a common presentation ER. But it is one of those case that when presents itself can be very challenging and demanding of ER skills and management. ER have now established their place in resuscitating such patients with initial management with blood and fluids as needed. In this review we learn that there is more ER can offer to such patient that initial stabilisation and can give a better fighting chance for patients with pulmonary haemorrhage at their recovery.

The aim of this article is to emphasize on;

The initial assessment and management of patients with severe hemoptysis in ED

Further steps which could be undertake in ED to stop or control severe hemoptysis

References

1. Kinoshita T., Ohbe H., Matsui H., Fushimi K., Ogura H., Yasunaga H. Effect of tranexamic acid on mortality in patients with haemoptysis: a nationwide study. *Crit Care*. 2019; 23(1):347. doi: 10.1186/s13054-019-2620-5.
2. Naveed Sh., Manzoor W., Syed Kh., Rakesh B., Zuber A., Khurshid D., Altaf B. Etiology of Hemoptysis in India Revisited. *Int J of Med Health Sciences*. 2016:5.
3. Talwar D., Chudiwal J., Jain R.C., Kumar S. Hemoptysis: Causes, interventions and outcomes – Indian single centre experience. *Eur Resp J* 2012, 40 (56):3491.
4. Singh S.K., Tiwari K.K. Etiology of hemoptysis: A retrospective study from a tertiary care hospital from northern Madhya Pradesh, India. *Indian J of Tuberculosis*. 2016;63(1): 44–47.
5. Fartoukh M., Khoshnood B., Parrot A., Khalil A., Carette M., Stoclin A., Mayaud C., Cadranet J., Ancel P.Y. Early Prediction of In-Hospital Mortality of Patients with Hemoptysis: An Approach to Defining Severe Hemoptysis. *Respiration* 2012;83:106-114. doi: 10.1159/000331501.
6. Mondoni M., Carlucci P., Job S., Parazzini E-M., Cipolla G., Pagani M., Tursi F., Negri L., Fois A., Canu S., Arcadu A., Pirina P., Bonifazi M., Gasparini S., Marani S., Comel A-C., Ravenna F., Dore S., Alfano F., Papa G.F., DiMarco F., Centanni S., Sotgiu G. Observational, multicentre study on the epidemiology of haemoptysis. *Eur Resp J* 2018, 51 (1) 1701813. doi: 10.1183/13993003.01813-2017.
7. WHO Tuberculosis profile: India. 05.02.2021. Worldhealthorg.shinyapps.io/tb_profiles/?_inputs_&lan=%22EN%22&iso2=%22IN%22&main_tabs=%22est_tab%22.
8. Domingos-Grando R., Zanetti G., Marchiori E. Hemoptysis en tuberculosis: la importancia de la tomografía computarizada con contraste. *Arch Bronconeumol*. 2016; 52:173–174. doi: 10.1016/j.arbr.2015.10.014.

9. Singh A, Singhal S, Jain N, Talwar D. Managing hemoptysis: What to do or what not to do? Lung India [serial online] 2018; 35:449-452. Available from: <https://www.lungindia.com/text.asp?2018/35/5/449/239881>.
10. Radchenko C, Alraiyes A.H., Shojaee S. A systematic approach to the management of massive hemoptysis. Journal of thoracic disease. 2017; 9(10):1069-1086. <https://doi.org/10.21037/jtd.2017.06.41>.
11. Gagnon S, Quigley N, Dutau H, Delage A, Fortin M. Approach to Hemoptysis in the Modern Era. Canadian Resp J. 2017, 1565030. <https://doi.org/10.1155/2017/1565030>.
12. Gagnon S, Quigley N, Dutau H, Delage A, Fortin M. Approach to Hemoptysis in the Modern Era. Canadian Resp J. 2017, 1565030. <https://doi.org/10.1155/2017/1565030>.
13. Tsiligianni I, Maltezas G, Siafakas N.M., Tzanakis N., Tsoumakidou M., Chrysosfakis G. A prospective analysis of 184 hemoptysis cases—diagnostic impact of chest X-ray, computed tomography, bronchoscopy. Respiration. 2006; 73(6):808-814. doi: 10.1159/000091189.
14. McGuinness G, Beacher J.R., Harkin T.J., Garay S.M., Rom W.N., Naidich D.P. Hemoptysis: prospective high-resolution CT bronchoscopic correlation. Chest. 1994;105(4):1155-1162. doi: 10.1378/chest.105.4.1155.
15. Vizcaya S.M., Jiménez L.J., Tornero M.A. Etiology of hemoptysis: prospective analysis of 752 cases. Rev Clín Esp. 2001;201(12):696-700. doi: 10.1016/s0014-2565 (01) 70953-70958.
16. Sakr L, Dutau H. Massive hemoptysis: an update on the role of bronchoscopy in diagnosis and management. Respiration. 2010;80(1):38. doi: 10.1159/000274492.
17. Vanni S, Bianchi S, Bigiarini S. Management of patients presenting with haemoptysis to a Tertiary Care Italian Emergency Department: the Florence Haemoptysis Score (FLHASc). Int and Emer Med. 2017 doi: 10.1007/s11739-017-1618-8.
18. Stebbings A.E., Lim T.K. Cause, treatment and outcome of patients with life-threatening haemoptysis. Singapore Med J. 1999; 40(2):67-69.
19. Unsal E, Köksal D., Cimen F., TaciHoca N., Sipit T. Analysis of patients with hemoptysis in a reference hospital for chest diseases. Tuberk Toraks. 2006; 7(2):44.
20. Hirshberg B, Biran I, Glazer M, Kramer M.R. Hemoptysis: etiology, evaluation, and outcome in a tertiary referral hospital. Chest. 1997; 112(2):440-444. doi: 10.1378/chest.112.2.440.
21. Jones R, Charlton J, Latinovic R, Gulliford M.C. Alarm symptoms and identification of non-cancer diagnoses in primary care: cohort study. BMJ 2009; 339: b3094. doi: 10.1136/bmj.b3094.
22. MacLennan W. On the Management and Treatment of Hæmoptysis. Hospital (Lond 1886). 1908 16; 44(1133):169-171. PMID: 29818884; PMCID: PMC5211132.
23. Ittrich H, Bockhorn M, Klose H, Simon M. The Diagnosis and Treatment of Hemoptysis. Deutsches Arzteblatt international. 2017; 114(21):371-381. <https://doi.org/10.3238/arztebl.2017.0371>.
24. Radchenko C, Alraiyes A.H., Shojaee S.A. systematic approach to the management of massive hemoptysis. J of thoracic disease. 2017; 9(10):1069-1086. <https://doi.org/10.21037/jtd.2017.06.41>.
25. Farkas J. Severe Hemoptysis The Internet Book of Critical Care. 2016. emcrit.org/ibcc/hemoptysis.
26. Kathuria H, Hollingsworth H.M., Vilvendhan R, Reardon C. Management of life-threatening hemoptysis. J int care, 2020; 8:23. <https://doi.org/10.1186/s40560-020-00441-8>.
27. Conlan A.A., Hurwitz S.S. Management of massive haemoptysis with the rigid bronchoscope and cold saline lavage. Thorax. 1980; 35(12):901-904. doi: 10.1136/thx.35.12.901.
28. Prutsky G, Domecq J.P., Salazar C.A., Accinelli R. Antifibrinolytic therapy to reduce haemoptysis from any cause. Cochrane Database Syst Rev 2012; (4):CD008711. doi: 10.1002/14651858.CD008711.pub2. Update in: Cochrane Database Syst Rev. 2016; 11:CD008711.
29. Mall W, Abel H. Topical application of epinephrine during bronchoscopy in barbiturate-halothane-anaesthesia and its influence on cardiac action. Bronchopneumologie. 1978; 28(4):311-6. PMID: 92354.
30. Breuer C, Wachall B, Gerbeth K, Abdel-Tawab M, Fuhr U. Pharmacokinetics and pharmacodynamics of moist inhalation epinephrine using a mobile inhaler. Eur J Clin Pharmacol 2013;69(6), 1303-1310. <https://doi.org/10.1007/s00228-012-1465-5>.
31. Young F.H. Treatment of Severe Haemoptysis. BMJ 1955; 2(4932):192-194. <https://doi.org/10.1136/bmj.2.4932.192>.

ШОШИЛИНЧ ТИББИЙ ЁРДАМ БЎЛИМИДА ҚОН ТУФЛАШНИ ДАВОЛАШ

А.Н. Венкатеш¹, Х. Раджанна²

¹Апполо шифохонаси, Карнатака, Ҳиндистон

²Аполло шифохонаси, Бангалор, Ҳиндистон

Қон туфлаш ва нафас олиш қийинлашуви билан шифохонамизга ётқизилган 21 ёшли эркак беморга кўрсатилган шошилинч тиббий ёрдам жараёни келтирилган. Беморга аввал Кох ўпка касаллиги диагнози қўйилган бўлиб, ушбу касаллик бўйича даволаниб юрган. Қон туфлаш билан бизнинг шифохонага мурожаат қилган. Шошилинч тиббий ёрдам бўлимида пульмонологнинг маслаҳатини кутиш давридаёқ даво муолажалари бошлаб юборилган. Беморга тегишли консилиум ўтказилгач, бронхиал артериянинг эмболизациясини ўтказиш режалаштирилган эди. Эмболизацияга тайёрлаш жараёнида бемор шошилинч тиббий ёрдам бўлимида бўлган ва бу ерда қон туфлаш кучайиб борган. Бу ҳолатда тўғизмасдан даволашнинг охири чораси артериялар эмболизацияси бўлишига қарамай, қон туфлашнинг кескин кучайиши шошилинч тиббий ёрдам бўлимида мавжуд бўлган даволаш усуллари қўллашга тўғри келди. Ушбу мақолада эмболизация ўтказилгунча ёки шифохонада эмболизация ўтказиш имкони бўлмаган тақдирда беморни бошқа шифохонага кўчириш зарурияти туғилганда шошилинч тиббий ёрдам кўрсатиш вариантлари кўриб чиқилган. Оқилона бажарилган шошилинч тиббий ёрдам чоралари бундай таҳликали беморларнинг аҳволини стабиллаштиришга ёрдам бериши муаллифлар томонидан ўтказилган адабиёт шарҳидан маълум бўлади. Шошилинч тиббий ёрдам бўлимида беморнинг аҳволи яхшилангач, беморни ихтисослаштирилган бўлимга ёки шифохонага ўтказилиниши масаласи қўйилади. Ихтисослаштирилган ёрдам кўрсатиш иложи бўлмаган ҳолатларда ва жойларда шошилинч тиббий ёрдам кўрсатиш чоралари асосий аҳамият касб этиши таъкидланган.

Шошилинч тиббий ёрдам бўлимидаги даво чораларининг мақсадлари:

- кучли қон туфлашларда беморнинг аҳволига бирламчи баҳо бериш ва бирламчи ёрдамни кўрсатиш;
- оғир қон туфлашни тўхтатишга ва назорат қилишга йўналтирилган шошилинч тиббий ёрдам бўлимида кўрсатилиниши мумкин бўлган кейинги даво чораларини белгилаш.

Калит сўзлар: қон туфлаш, даволаш, шошилинч тиббий ёрдам бўлими.

Information about authors:

Dr. A.N. Venkatesh – Senior Consultant & Head, Emergency Medicine, Apollo Hospitals, Karnataka Region, India.

Dr. H. Rajanna – Consultant Emergency room, Apollo Hospital, Bengaluru, India

Сведения об авторах:

А.Н. Венкатеш – старший консультант и руководитель отделения экстренной медицины, больница Аполло – Карнатака, Индия

Х. Раджанна – консультант по экстренной медицинской помощи, больница Аполло, Бангалор, Индия.

Поступила в редакцию 02.01.2021