Trombolíticos para tratamento de tromboembolismo pulmonar: inventário de referências

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Potenciais conflitos de interesse: os autores declaram não haver conflito de interesse relacionado ao planejamento e à execução deste estudo.

São Paulo, 09 de novembro de 2022.

1) Sobre o inventário de referências

O inventário de referências é um produto técnico no qual é realizada uma busca ampla da literatura com o objetivo de identificar, contabilizar e categorizar as referências sobre uma tecnologia [Brasil 2022]. Este produto serve de apoio teórico para realização de produtos mais complexos, como por exemplo, os guias para prática clínica.

2) Pergunta de interesse

Qual a produção científica relacionada ao uso de trombolíticos para pacientes com tromboembolismo pulmonar?

P (pacientes): pacientes com tromboembolismo pulmonar agudo.

C (conceito): terapias trombolíticas, em qualquer via de administração, incluindo em intervenções direcionadas por cateter.

C (contexto): hospitalar.

3) Métodos

3.1 Elegibilidade de referências

Foram consideradas qualquer revisão sistemática que incluiu como intervenção ou comparador pelo menos uma estratégia de trombólise em pacientes com tromboembolismo pulmonar.

3.2 Busca por referências

Foi realizada busca ampla e sensível da literatura em 09 de novembro de 2022, nas bases de dados MEDLINE (via PubMed), Lilacs e Cochrane Library. Não foram aplicadas restrições para idioma, data e status da publicação (resumo, texto completo).

3.3 Estratégias de busca

O **Quadro 1** apresenta as estratégias de busca elaboradas para cada base de dados eletrônica.

Quadro 1. Estratégias de busca

Base de dados	Estratégia de busca
Cochrane Library	#1 MeSH descriptor: [Pulmonary Embolism] explode all trees #2 (Pulmonary Embolism) OR (Pulmonary Embolisms) OR (Embolism, Pulmonary) OR (Embolisms, Pulmonary) OR (Pulmonary Thromboembolisms) OR (Pulmonary Thromboembolism) OR (Thromboembolism, Pulmonary) OR (Thromboembolisms, Pulmonary) #3 #1 OR #2 #4 MeSH descriptor: [Thrombolytic Therapy] explode all trees #5 (Thrombolytic Therapy) OR (Thrombolytic) OR (Therapeutic Thrombolysis) OR (Therapeutic Thrombolyses) OR (Thrombolyses, Therapeutic) OR (Thrombolysis, Therapeutic) OR (Therapy, Fibrinolytic) OR (Fibrinolytic Therapies) OR (Therapies, Fibrinolytic) OR (Therapy, Thrombolytic) OR (Therapies, Thrombolytic) OR (Thrombolytic Therapies) OR (Fibrinolytic Therapy) #6 MeSH descriptor: [Fibrinolytic Agents] explode all trees #7 (Fibrinolytic Agents) OR (Fibrinolytic) OR (Fibrinolytic Drug) OR (Drug, Fibrinolytic) OR (Thrombolytic Drugs) OR (Thrombolytic Drug) OR (Drug, Thrombolytic) OR (Fibrinolytic Drugs) OR (Thrombolytic Agents) OR (Fibrinolytic Agent) OR (Agent, Fibrinolytic) OR (Thrombolytic Agent) OR (Agent, Thrombolytic) OR (Antithrombotic Agents) OR (Agents, Antithrombotic) OR (Antithrombic Drugs) OR (Drugs, Antithrombic) OR (Antithrombotic Agent) OR (Agent, Antithrombotic) OR (Antithrombic Drug) OR (Drug, Antithrombic) #8 #4 OR #5 OR #6 OR #7 #9 #3 AND #8 #10 #9 in Cochrane Library
Lilacs	#1 MH:"Embolia Pulmonar" OR MH:"Pulmonary Embolism" OR MH:"Embolia Pulmonar" OR MH:C08.381.746$ OR MH:C14.907.355.350.700$ OR (Tromboembolia Pulmonar) OR (Tromboembolismo Pulmonar) OR (Embolism, Pulmonary) OR (Embolisms, Pulmonary) OR (Pulmonary Embolisms) OR (Pulmonary Thromboembolism) OR (Pulmonary Thromboembolisms) OR (Thromboembolism, Pulmonary) OR (Thromboembolisms, Pulmonary) #2 #1 in Lilacs / side filter: Systematic reviews
MEDLINE	#1 "Pulmonary Embolism"[Mesh] OR (Pulmonary Embolism) OR (Pulmonary Embolisms) OR (Embolism, Pulmonary) OR (Embolisms, Pulmonary) OR (Pulmonary Thromboembolisms) OR (Pulmonary Thromboembolism) OR (Thromboembolism, Pulmonary) OR (Thromboembolisms, Pulmonary) #2 "Thrombolytic Therapy"[Mesh] OR (Thrombolytic Therapy) OR (Thrombolytic) OR (Therapeutic Thrombolysis) OR (Therapeutic Thrombolyses) OR (Thrombolyses, Therapeutic) OR (Thrombolysis, Therapeutic) OR (Therapy, Fibrinolytic) OR (Fibrinolytic Therapies) OR (Therapies, Fibrinolytic) OR (Therapy, Thrombolytic) OR (Therapies, Thrombolytic) OR (Thrombolytic

	Therapies) OR (Fibrinolytic Therapy) OR "Fibrinolytic Agents"[Mesh] OR (Fibrinolytic Agents) OR (Fibrinolytic) OR (Fibrinolytic Drug) OR (Drug, Fibrinolytic) OR (Thrombolytic Drugs) OR (Thrombolytic Drug) OR (Drug, Thrombolytic) OR (Fibrinolytic Drugs) OR (Thrombolytic Agents) OR (Fibrinolytic Agent) OR (Agent, Fibrinolytic) OR (Thrombolytic Agent) OR (Agent, Thrombolytic) OR (Antithrombotic Agents) OR (Agents, Antithrombotic) OR (Antithrombic Drugs) OR (Drugs, Antithrombic) OR (Antithrombotic Agent) OR (Agent, Antithrombotic) OR (Antithrombic Drug) OR (Drug, Antithrombic) #3 #1 AND #2 #4 (((systematic review[ti] OR systematic literature review[ti] OR systematic scoping review[ti] OR systematic narrative review[ti] OR systematic qualitative review[ti] OR systematic evidence review[ti] OR systematic quantitative review[ti] OR systematic meta-review[ti] OR systematic critical review[ti] OR systematic mixed studies review[ti] OR systematic mapping review[ti] OR systematic cochrane review[ti] OR systematic search and review[ti] OR systematic integrative review[ti]) NOT comment[pt] NOT (protocol[ti] OR protocols[ti])) NOT MEDLINE [subset]) OR (Cochrane Database Syst Rev[ta] AND review[pt]) OR systematic review[pt] #5 #4 AND #3

3.4 Seleção dos estudos

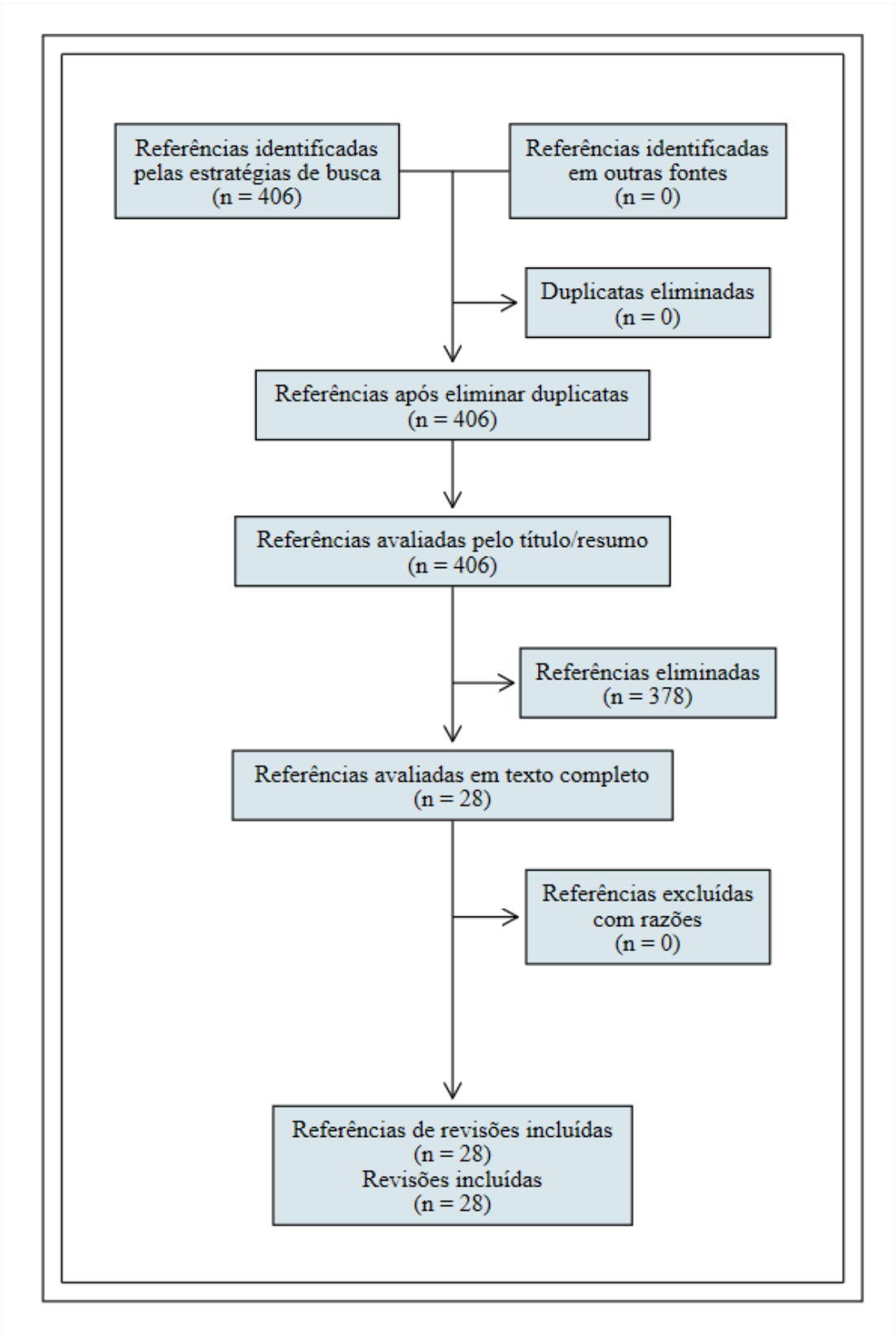
O processo de seleção dos estudos foi realizado por dois revisores (RLP e COCL) por meio da plataforma Rayyan (https://rayyan.qcri.org) [Ouzanni 2016]. Qualquer divergência foi resolvida por consenso.

4) Resultados

4.1 Resultados da busca

As estratégias de busca em base eletrônicas recuperaram um total de **406** referências. A **figura 1** representa o fluxograma do processo de seleção dos estudos.

Figura 1. Fluxograma do processo de seleção



4.2 Referências incluídas

O **Quadro 1** apresenta as 28 referências incluídas no inventário.

Quadro 1. Referências identificadas

ID	PMID	Título	Referência
1	29909859	A meta-analysis of outcomes of catheter-directed thrombolysis for high- and intermediate-risk pulmonary embolism	Avgerinos ED, Saadeddin Z, Abou Ali AN, Fish L, Toma C, Chaer M, Rivera-Lebron BN, Chaer RA. A meta-analysis of outcomes of catheter-directed thrombolysis for high- and intermediate-risk pulmonary embolism. **J Vasc Surg Venous Lymphat Disord. 2018** Jul;6(4):530-540. doi: 10.1016/j.jvsv.2018.03.010. PMID: 29909859.
2	35845061	Association Between the Use of Pre- and Post-thrombolysis Anticoagulation With All-Cause Mortality and Major Bleeding in Patients With Pulmonary Embolism	Tan JS, Liu N, Hu S, Wu Y, Gao X, Guo TT, Yan XX, Peng FH, Hua L. Association Between the Use of Pre- and Post-thrombolysis Anticoagulation With All-Cause Mortality and Major Bleeding in Patients With Pulmonary Embolism. **Front Cardiovasc Med. 2022** Jun 30;9:880189. doi: 10.3389/fcvm.2022.880189. PMID: 35845061; PMCID: PMC9279684.
3	29175770	Catheter-based therapies in acute pulmonary embolism	Schultz J, Andersen A, Kabrhel C, Nielsen-Kudsk JE. Catheter-based therapies in acute pulmonary embolism. **EuroIntervention. 2018** Feb 20;13(14):1721-1727. doi: 10.4244/EIJ-D-17-00437. PMID: 29175770.
4	19875060	Catheter-directed therapy for the treatment of massive pulmonary embolism: systematic review and meta-analysis of modern techniques	Kuo WT, Gould MK, Louie JD, Rosenberg JK, Sze DY, Hofmann LV. Catheter-directed therapy for the treatment of massive pulmonary embolism: systematic review and meta-analysis of modern techniques. **J Vasc Interv Radiol. 2009** Nov;20(11):1431-40. doi: 10.1016/j.jvir.2009.08.002. PMID: 19875060.
5	27481877	Catheter-Directed Treatment of Pulmonary Embolism: A Systematic Review and Meta-Analysis of Modern Literature	Tafur AJ, Shamoun FE, Patel SI, Tafur D, Donna F, Murad MH. Catheter-Directed Treatment of Pulmonary Embolism: A Systematic Review and Meta-Analysis of Modern Literature. **Clin Appl Thromb Hemost. 2017** Oct;23(7):821-829. doi: 10.1177/1076029616661414. Epub 2016 Aug 1. PMID: 27481877.
6	35959626	Comparison of Efficacy and Safety between Thrombolysis plus Anticoagulation vs Anticoagulation Alone for the Treatment of	Pan Q, Gao H, Wang Y, Chen Q. Comparison of Efficacy and Safety between Thrombolysis plus Anticoagulation vs Anticoagulation Alone for the Treatment of Acute Submassive

		Acute Submassive Pulmonary Embolism: A Systematic Review and Meta-analysis	Pulmonary Embolism: A Systematic Review and Meta-analysis. **Curr Vasc Pharmacol. 2022** Aug 11. doi: 10.2174/1570161120666220811155353. Epub ahead of print. PMID: 35959626.
7	35938605	Catheter-directed therapies for the treatment of high risk (massive) and intermediate risk (submassive) acute pulmonary embolism	Harvey JJ, Huang S, Uberoi R. Catheter-directed therapies for the treatment of high risk (massive) and intermediate risk (submassive) acute pulmonary embolism. **Cochrane Database Syst Rev. 2022** Aug 8;8(8):CD013083. doi: 10.1002/14651858.CD013083.pub2. PMID: 35938605; PMCID: PMC9358724.
8	34463919	Catheter directed compared to systemically delivered thrombolysis for pulmonary embolism: a systematic review and meta-analysis	Pasha AK, Siddiqui MU, Siddiqui MD, Ahmed A, Abdullah A, Riaz I, Murad MH, Bjarnason H, Wysokinski WE, McBane RD 2nd. Catheter directed compared to systemically delivered thrombolysis for pulmonary embolism: a systematic review and meta-analysis. **J Thromb Thrombolysis. 2022** Feb;53(2):454-466. doi: 10.1007/s11239-021-02556-7. Epub 2021 Aug 31. PMID: 34463919.
9	33665765	Clinical outcomes of very elderly patients treated with ultrasound-assisted catheter-directed thrombolysis for pulmonary embolism: a systematic review	Castillo-Perez M, Jerjes-Sánchez C, Rodríguez D, Paredes-Vazquez JG, Panneflek J, Vazquez-Guajardo M. Clinical outcomes of very elderly patients treated with ultrasound-assisted catheter-directed thrombolysis for pulmonary embolism: a systematic review**. J Thromb Thrombolysis. 2021** Jul;52(1):260-271. doi: 10.1007/s11239-021-02409-3. Epub 2021 Mar 4. PMID: 33665765.
10	29133351	Efficacy and safety outcomes of recanalisation procedures in patients with acute symptomatic pulmonary embolism: systematic review and network meta-analysis	Jimenez D, Martin-Saborido C, Muriel A, Zamora J, Morillo R, Barrios D, Klok FA, Huisman MV, Tapson V, Yusen RD. Efficacy and safety outcomes of recanalisation procedures in patients with acute symptomatic pulmonary embolism: systematic review and network meta-analysis. **Thorax. 2018** May;73(5):464-471. doi: 10.1136/thoraxjnl-2017-210040. Epub 2017 Nov 13. PMID: 29133351.
11	25910837	Extracorporeal membrane oxygenation in acute massive pulmonary embolism: a systematic review	Yusuff HO, Zochios V, Vuylsteke A. Extracorporeal membrane oxygenation in acute massive pulmonary embolism: a systematic review. **Perfusion. 2015** Nov;30(8):611-6. doi: 10.1177/0267659115583377. Epub 2015 Apr 24. PMID: 25910837.
12	24412030	Lower dosage of recombinant tissue-type plasminogen activator (rt-PA) in the treatment of acute pulmonary embolism: a systematic review and meta-analysis	Zhang Z, Zhai ZG, Liang LR, Liu FF, Yang YH, Wang C. Lower dosage of recombinant tissue-type plasminogen activator (rt-PA) in the treatment of acute pulmonary embolism: a systematic review and meta-analysis. **Thromb Res. 2014** Mar;133(3):357-63. doi: 10.1016/j.thromres.2013.12.026. Epub 2013 Dec 23. PMID: 24412030.

13	17261856	Management of venous thromboembolism: a systematic review for a practice guideline	Segal JB, Streiff MB, Hofmann LV, Thornton K, Bass EB. Management of venous thromboembolism: a systematic review for a practice guideline. **Ann Intern Med. 2007** Feb 6;146(3):211-22. doi: 10.7326/0003-4819-146-3-200702060-00150. Epub 2007 Jan 29. Erratum in: Ann Intern Med. 2007 Mar 6;146(5):396. Hoffman, Lawrence V [corrected to Hofmann, Lawrence V]. PMID: 17261856.
14	35778309	Meta-Analysis Comparing Catheter-Directed Thrombolysis Versus Systemic Anticoagulation Alone for Submassive Pulmonary Embolism.	Ismayl M, Machanahalli Balakrishna A, Aboeata A, Gupta T, Young MN, Altin SE, Aronow HD, Goldsweig AM. Meta-Analysis Comparing Catheter-Directed Thrombolysis Versus Systemic Anticoagulation Alone for Submassive Pulmonary Embolism. **Am J Cardiol. 2022** Sep 1;178:154-162. doi: 10.1016/j.amjcard.2022.06.004. Epub 2022 Jun 29. PMID: 35778309.
15	35487534	Optimal reperfusion strategy in acute high-risk pulmonary embolism requiring extracorporeal membrane oxygenation support: a systematic review and meta-analysis.	Chopard R, Nielsen P, Ius F, Cebotari S, Ecarnot F, Pilichowski H, Schmidt M, Kjaergaard B, Sousa-Casasnovas I, Ghoreishi M, Narayan RL, Lee SN, Piazza G, Meneveau N. Optimal reperfusion strategy in acute high-risk pulmonary embolism requiring extracorporeal membrane oxygenation support: a systematic review and meta-analysis**. Eur Respir J. 2022** Nov 3;60(5):2102977. doi: 10.1183/13993003.02977-2021. PMID: 35487534.
16	35926347	Optimal management, prevalence, and clinical behavior of saddle pulmonary embolism: A systematic review and meta-analysis.	Ata F, Ibrahim WH, Choudry H, Shams A, Arshad A, Younas HW, Bilal ABI, Ikram MQ, Tahir S, Mogassabi WW, Errayes NM. Optimal management, prevalence, and clinical behavior of saddle pulmonary embolism: A systematic review and meta-analysis. **Thromb Res. 2022** Sep;217:86-95. doi: 10.1016/j.thromres.2022.07.013. Epub 2022 Jul 29. PMID: 35926347.
17	35974889	Safety and outcomes of thrombolytic therapy in patients with pulmonary embolism and thrombocytopenia: A systematic review	Ata F, Hamad Ibrahim W, Nasser Affas M, Ahmad Khan H, Younas HW, Maat Z, Ali Mohamed SE, Daoudi B. Safety and outcomes of thrombolytic therapy in patients with pulmonary embolism and thrombocytopenia: A systematic review. **Qatar Med J. 2022** Aug 5;2022(3):33. doi: 10.5339/qmj.2022.33. PMID: 35974889; PMCID: PMC9372479.
18	24611003	Systematic review and meta-analysis for thrombolysis treatment in patients with acute submassive pulmonary embolism	Cao Y, Zhao H, Gao W, Wang Y, Cao J. Systematic review and meta-analysis for thrombolysis treatment in patients with acute submassive pulmonary embolism. **Patient Prefer Adherence. 2014** Feb 28;8:275-82. doi: 10.2147/PPA.S56280. PMID: 24611003; PMCID: PMC3945048.
19	31477311	Systematic Review: The Role of Thrombolysis in Intermediate-Risk Pulmonary Embolism	Pillus D, Bruno E, Farcy D, Vilke GM, Childers R. Systematic Review: The Role of Thrombolysis in Intermediate-Risk Pulmonary Embolism. **J Emerg Med. 2019** Oct;57(4):517-522. doi: 10.1016/j.jemermed.2019.06.014. Epub 2019 Aug 30. PMID: 31477311.

20	24917641	Systemic thrombolytic therapy for acute pulmonary embolism: a systematic review and meta-analysis	Marti C, John G, Konstantinides S, Combescure C, Sanchez O, Lankeit M, Meyer G, Perrier A. Systemic thrombolytic therapy for acute pulmonary embolism: a systematic review and meta-analysis. **Eur Heart J. 2015** Mar 7;36(10):605-14. doi: 10.1093/eurheartj/ehu218. Epub 2014 Jun 10. PMID: 24917641; PMCID: PMC4352209.
21	35844995	The net benefit of thrombolysis in the management of intermediate risk pulmonary embolism: Systematic review and meta-analysis	Alcedo PE, García-Perdomo HA, Rojas-Hernandez CM. The net benefit of thrombolysis in the management of intermediate risk pulmonary embolism: Systematic review and meta-analysis. **EJHaem. 2020** Sep 3;1(2):457-466. doi: 10.1002/jha2.97. PMID: 35844995; PMCID: PMC9176023.
22	33857326	Thrombolytic therapy for pulmonary embolism	Zuo Z, Yue J, Dong BR, Wu T, Liu GJ, Hao Q. Thrombolytic therapy for pulmonary embolism. **Cochrane Database Syst Rev. 2021** Apr 15;4(4):CD004437. doi: 10.1002/14651858.CD004437.pub6. PMID: 33857326; PMCID: PMC8092433.
23	35755853	Thrombolytic therapy in cardiac arrest caused by cardiac etiologies or presumed pulmonary embolism: An updated systematic review and meta-analysis.	Alshaya OA, Alshaya AI, Badreldin HA, Albalawi ST, Alghonaim ST, Al Yami MS. Thrombolytic therapy in cardiac arrest caused by cardiac etiologies or presumed pulmonary embolism: An updated systematic review and meta-analysis. **Res Pract Thromb Haemost. 2022** Jun 17;6(4):e12745. doi: 10.1002/rth2.12745. PMID: 35755853; PMCID: PMC9204396.
24	32347509	Thrombolysis in massive and submassive pulmonary embolism during pregnancy and the puerperium: a systematic review	Rodriguez D, Jerjes-Sanchez C, Fonseca S, Garcia-Toto R, Martinez-Alvarado J, Panneflek J, Ortiz-Ledesma C, Nevarez F. Thrombolysis in massive and submassive pulmonary embolism during pregnancy and the puerperium: a systematic review. **J Thromb Thrombolysis. 2020** Nov;50(4):929-941. doi: 10.1007/s11239-020-02122-7. PMID: 32347509.
25	32289164	Thrombolytics for venous thromboembolic events: a systematic review with meta-analysis	Izcovich A, Criniti JM, Popoff F, Lu L, Wu J, Ageno W, Witt DM, Jaff MR, Schulman S, Manja V, Verhamme P, Rada G, Zhang Y, Nieuwlaat R, Wiercioch W, Schünemann HJ, Neumann I. Thrombolytics for venous thromboembolic events: a systematic review with meta-analysis. **Blood Adv. 2020** Apr 14;4(7):1539-1553. doi: 10.1182/bloodadvances.2020001513. PMID: 32289164; PMCID: PMC7160254.
26	28805341	Treatment options for severe pulmonary embolism during pregnancy and the postpartum period: a systematic review	Martillotti G, Boehlen F, Robert-Ebadi H, Jastrow N, Righini M, Blondon M. Treatment options for severe pulmonary embolism during pregnancy and the postpartum period: a systematic review. **J Thromb Haemost. 2017** Oct;15(10):1942-1950. doi: 10.1111/jth.13802. Epub 2017 Sep 12. PMID: 28805341.

27	24497337	Ultrasound-assisted thrombolysis for acute pulmonary embolism: a systematic review	Engelberger RP, Kucher N. Ultrasound-assisted thrombolysis for acute pulmonary embolism: a systematic review. **Eur Heart J. 2014** Mar;35(12):758-64. doi: 10.1093/eurheartj/ehu029. Epub 2014 Feb 3. PMID: 24497337.
28	16244331	When should we thrombolyse patients with pulmonary embolism? A systematic review of the literature.	Harris T, Meek S. When should we thrombolyse patients with pulmonary embolism? A systematic review of the literature. **Emerg Med J. 2005** Nov;22(11):766-71. doi: 10.1136/emj.2003.011965. PMID: 16244331; PMCID: PMC1726594.

5) Conclusão

Foram identificadas 28 revisões sistemáticas que avaliaram o uso terapêutico de trombolíticos em pacientes com tromboembolismo pulmonar agudo. Dentre as referências incluídas, duas são revisões Cochrane atualizadas:

- Harvey JJ, Huang S, Uberoi R. Catheter-directed therapies for the treatment of high risk (massive) and intermediate risk (submassive) acute pulmonary embolism. Cochrane Database Syst Rev. 2022 Aug 8;8(8):CD013083. doi: 10.1002/14651858.CD013083.pub2. PMID: 35938605; PMCID: PMC9358724.
- Zuo Z, Yue J, Dong BR, Wu T, Liu GJ, Hao Q. Thrombolytic therapy for pulmonary embolism. Cochrane Database Syst Rev. 2021 Apr 15;4(4):CD004437. doi: 10.1002/14651858.CD004437.pub6. PMID: 33857326; PMCID: PMC8092433

O processo de elaboração de um guia para prática clínica pode começar com a utilização destas revisões sistemáticas.

6) Referências

Brasil. Ministério da Saúde. Secretaria de Ciência, Tecnologia, Inovação e Insumos Estratégicos em Saúde. Departamento de Ciência e Tecnologia. Serviço de produção de evidências para apoio à tomada de decisão: portfólio de produtos [recurso eletrônico] / Ministério da Saúde. Secretaria de Ciência, Tecnologia, Inovação e Insumos Estratégicos em Saúde. Departamento de Ciência e Tecnologia. – Brasília: Ministério da Saúde, 2019. 34 p.: il. Disponível em http://bvsms.saude.gov.br/bvs/publicacoes/servico_producao_apoio_evidencias_tomada_decisao_portifolio_produtos.pdf . Acessado em 09 de novembro de 2022.

Ouzzani M, Hammady H, Fedorowicz Z, Elmagarmid A. Rayyan — a web and mobile app for systematic reviews. Systematic Reviews (2016) 5:210, DOI: 10.1186/s13643-016-0384-4.