REVIEW

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A Narrative Review on the Approach to Hospital-Acquired Venous Thromboembolism in Pediatric Trauma and Critically Ill Children

Pediatrik Travma ve Kritik Hasta Çocuklarda Hastane Kaynaklı Venöz Tromboembolizme Yaklaşıma İlişkin Bir Derleme

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Abstract

Pediatric traumas and critical illnesses are known to confer increased risk for hospital-acquired venous thromboembolism (HA-VTE) in children. The development of HA-VTE in children is associated with increased mortality and disabling co-morbidities. In this narrative review, we discuss the current literature on HA-VTE in children with severe trauma and those who are critically ill. The pediatric literature in this field continues to grow with randomized trials and guidelines actively being developed. We describe the available data related to the frequency of HA-VTE specific to these populations, as well as the pathophysiological concepts and considerations for its development and management. We outline an approach to HA-VTE in these two groups by delving into risk assessment and the identification of risk factors that accrue in these children, the need to assess for thromboprophylaxis and balance its risks and benefits, the clinical presentation and imaging modalities to confirm the diagnosis of HA-VTE, and management principles for developed HA-VTE. We use some of the currently available guidelines, including those of the Eastern Association for the Surgery of Trauma and Pediatric Trauma Society and the recently updated 2024 American Society of Hematology/International Society on Thrombosis and Haemostasis guidelines on the management of VTE in children, to aid in our discussion.

Keywords: Hospital-acquired venous thromboembolism, Trauma, Pediatric critical care

Öz

Çocuklarda travma ve kritik hastalıkların, hastanede kazanılmış venöz tromboembolizm (HA-VTE) gelişimi açısından artmış risk oluşturduğu bilinmektedir. Çocuklarda HA-VTE'nin gelişimi, artmış mortalite ve işlev kaybına yol açan eşlik eden hastalıklarla ilişkilidir. Bu derleme makalesinde, ağır travma geçiren ve kritik hastalığı bulunan çocuklarda HA-VTE ile ilgili mevcut literatür tartışılmaktadır. Bu alandaki pediatrik literatür, yürütülmekte olan randomize çalışmalar ve geliştirilen kılavuzlarla birlikte giderek genişlemektedir. Çalışmada, bu özel hasta gruplarında HA-VTE'nin görülme sıklığına ilişkin mevcut veriler ile hastalığın gelişiminde rol oynayan patofizyolojik mekanizmalar ve yönetim yaklaşımları ele alınmaktadır. Ayrıca, risk değerlendirmesi, bu çocuklarda biriken risk faktörlerinin tanımlanması, tromboprofilaksi gereksiniminin risk-yarar dengesi açısından değerlendirilmesi, HA-VTE'nin klinik bulguları ve tanıda kullanılan görüntüleme yöntemleri ile gelişmiş HA-VTE'nin tedavi prensipleri incelenmektedir. Tartışmada, Doğu Travma Cerrahisi Derneği ile Pediatrik Travma Derneği'nin kılavuzları ve 2024 yılında güncellenen Amerikan Hematoloji Derneği/Uluslararası Tromboz ve Hemostaz Derneği çocuklarda VTE yönetimi kılavuzları gibi mevcut rehberlerden de yararlanılmıştır.

Anahtar Sözcükler: Hastane kaynaklı venöz tromboembolizm, Travma, Pediatrik yoğun bakım

Introduction

Venous thromboembolism (VTE), which primarily includes deep venous thrombosis (DVT) and pulmonary embolism (PE), is a common complication with established practices in adults [1]. Its frequency in the general pediatric population is considerably lower [2,3,4]. However, the incidence of hospital-acquired (HA) VTE in children is not insignificant and is associated with increased morbidity and mortality [5,6]. Although the literature on HA-VTE prevention and management in children is not as robust as that for adults, the contemporary epidemiology of pediatric HA-VTE has been paralleled by growth in the pediatric literature over the last decade, with new efforts to better understand the approach to VTE in hospitalized children (Figure 1) [7,8].

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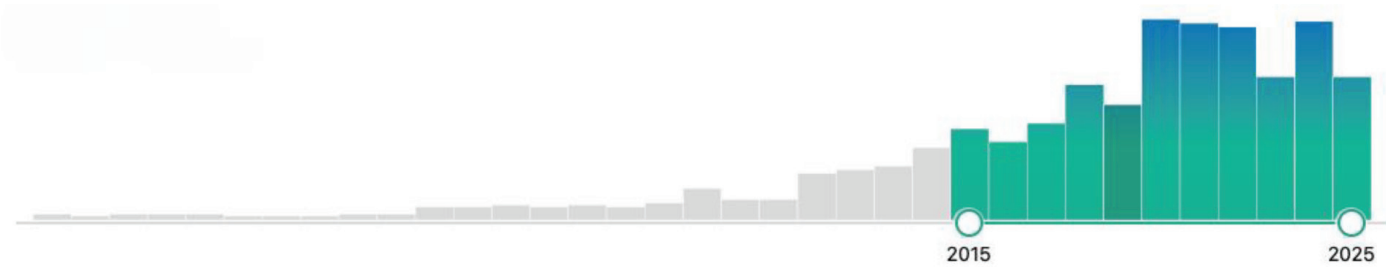

Figure 1. Histogram of studies by year obtained from a PubMed search on pediatric venous thromboembolism in 2025.

In hospitalized children, specific cohorts are known to be at high risk of HA-VTE, such as those with severe trauma and critical illness [9,10,11,12]. Pediatric patients with severe or major trauma as reflected by a higher Injury Severity Score (ISS) of ≥25 [12,13] can also be viewed as a subpopulation of children who are critically ill. The risk of HA-VTE in these two populations is related to the number of risk factors present in afflicted children, which is far greater than that of the general population. These include factors such as the presence of central venous access devices (CVADs), prolonged hospitalization, mechanical ventilation, and conditions associated with dysregulation of the inflammatory system [14,15,16]. Additionally, underlying complex chronic conditions such as congenital heart disease and malignancy have innate risk factors that carry a higher likelihood for both critical illness and HA-VTE [17,18,19,20]. In this study, we aimed to review the current pediatric literature on HA-VTE with a focus on children with severe trauma and those who are critically ill and to outline a systematic approach to guide its prevention and management based on current pediatric evidence.

Methods

We thoroughly searched all published literature in the following databases for relevant articles dating from the establishment of the database to the present related to VTE in cases of pediatric trauma and critical illness: PubMed (MEDLINE), EMBASE (Elsevier), Scopus, and the Cochrane Library including CENTRAL and CDSR. The search parameters are provided in Supplementary Material 1. We searched the concepts of "pediatrics," "venous thromboembolism," "trauma," and "critical illness." The obtained articles were manually reviewed to determine scope and inclusion. The included studies were then used to guide the writing of this review article. The reference lists of pertinent studies were also reviewed to identify additional relevant articles.

Reported Frequencies of HA-VTE in the Pediatric Literature

In the literature, the reported frequencies of pediatric HA-VTE are based on registry, database, retrospective and survey studies [21]. Its incidence has wide variability, largely due to the lack of standardization in VTE screening, diagnosis, and study design. However, it remains clear that the frequency of HA-VTE in children has been steeply and steadily rising since 2001 with a 210% increase until 2019 [5]. A bimodal pattern has consistently been observed, with the highest rates occurring during the neonatal period, followed by another peak in adolescence [3,5,6]. Specific to pediatric populations with trauma and critical illness, multiple studies with wide variability exist with reported incidence rates ranging from 0.2% to 1.1% for trauma and 0.3% to 27.8% for critical illness [21]. Majority of these studies are small to medium single-center studies with only a few reports adding perspective from larger cohorts. The incidence of VTE in adult trauma patients remains significantly higher than that among children. However, adult trends begin during the late adolescence period, with a rise beginning at the age of 16 years that continues into adulthood [22]. Hence, the higher incidence of HA-VTE in children with trauma compared to the general pediatric population is not uniform across all age groups. In critically ill children, after excluding studies that focus on specific subpopulations such as cardiac disease, CVAD-related thrombosis, and children with bacteremia, the incidence of HA-VTE is only as high as 0.9% [23]. The presence of these risk factors, however, is common in children who are critically ill or have severe trauma.

Relevant Pathophysiology

The pathophysiology of VTE has traditionally been explained by the mechanistic framework first published in 1852 by Rudolph Virchow, which postulated that thrombus formation is caused by changes in blood flow, vessel wall integrity, and/or blood composition [24]. Identified risk factors can be classified based on the disruption of one of the components of this triad. Endothelial injury and exposure of blood to foreign material is common in the two populations addressed by this review and may be a direct result of trauma, iatrogenic effects of invasive devices needed for life-saving measures, and/or outcomes of disease states such as sepsis. Altered hemodynamics result in low flow states, especially in the acute stages of hospitalization. Additionally, both trauma and critical illness lead to extreme physiological derangement with alterations in the immune-inflammatory system, ultimately leading to a hypercoagulable milieu. Different mechanisms underlie the activation of the

coagulation cascade resulting from specific inflamed states such as those seen in trauma versus sepsis-induced disseminated intravascular coagulation (DIC), but it remains unclear if either predisposes to greater risk of VTE over the other, such as hypofibrinolytic versus hyperfibrinolytic phenotypes, as respectively seen in trauma versus sepsis-induced DIC [25].

Developmental hemostasis refers to the age-related qualitative differences and changes in the levels of hemostatic proteins throughout one's life span [26]. Neonates are born with decreased levels of both pro- and anticoagulant proteins, reaching near-adult levels at approximately 6 months of age. The levels continue to be lower than adult mean values until late adolescence, but the overall balance between hemostatic factors does not lead to abnormal hemostasis in the absence of provoking factors. Given the decreased capacity for thrombin generation and increased antithrombotic potential, it can be argued that the hemostatic systems of neonates are more protective against thrombotic complications compared to adults [27]. Knowledge regarding developmental hemostasis is important in the management of anticoagulation therapy and interpretation of laboratory investigations performed for children. The correlation and effect of developmental hemostasis is complex and continues to be an ongoing area of investigation [27,28].

Approach to VTE in Pediatric Trauma and Critical Illness

Risk Assessment: HA-VTE Risk Assessment and Consideration of Bleeding Risk

The approach to HA-VTE in pediatric trauma and critically ill children begins with an assessment of the child's individual risk of HA-VTE on admission to the hospital. Although multiple risk assessment models (RAMs) exist for the identification of critically ill children with high risk of developing HA-VTE, no available pediatric RAM is currently recommended and none are routinely used in clinical practice [29]. This is largely due to the lack of prospective validation of these RAMs. As a result, the current approach to risk assessment of HA-VTE is based on the physician's identification of risk factors and perception of the magnitude of their influence on the development of HA-VTE at any given time. Complicating matters, the assessment of bleeding risk also needs to be considered when dealing with contrasting endpoints for safety and efficacy or determining the net clinical benefit of administering pharmacologic anticoagulation for HA-VTE. However, there are currently no bleeding risk assessment tools available in pediatrics. Additionally, the presence and absence of risk factors is dynamic and new risk factors may continue to emerge during hospitalization. This must be taken into consideration as it is likely to change the calculated risks throughout a child's course of hospitalization. The Solutions for Patient Safety Network provides an outline of risk assessment for HA-VTE in children based on the presence and number of risk factors [30]. This has facilitated a framework for risk stratification, but with important limitations. While it is assumed that increasing numbers of risk factors are additive and entail higher risk, the relative weight of each risk factor is not well understood and may not be equal.

Acquired and Inherited Risk Factors Related to Pediatric Trauma and Critical Illness

Several risk factors are known to contribute to the development of VTE in children afflicted with trauma and those who are critically ill [31,32]. Most cases of HA-VTE in children are due to HA risk factors. Alternatively, severe trauma and intensive care unit (ICU) admission can also be considered as risk factors. The Eastern Association for the Surgery of Trauma and Pediatric Trauma Society (EAST/PTS) found that in cases of pediatric trauma, increasing age and ISS, particularly age of >15 years and ISS of >25, conferred higher risk of HA-VTE [9]. Although in adults an ISS of ≥15 is typically defined as severe trauma, an ISS threshold of ≥25 was found to be a more appropriate cut-off for children [13]. In subsets of children with both critical illness and trauma, an ISS of >9 confers increased risk of HA-VTE. Irrespective of other risk factors, the presence of a CVAD is the single most important and strongest risk factor for the development of DVT in children [14,23]. Inherited risk factors such as hereditary thrombophilia or innate anticoagulant deficiencies are more common in younger patients than adults and impart higher VTE recurrence rates [33,34]. Based on available single-center studies, registry studies, and a meta-analysis, we summarize the risk factors that independently increase the risk of HA-VTE in pediatric cases of trauma and critical illness (Table 1) [14,15,35,36,37]. The lack of standardization of the definition of risk factors has limited the understanding of the magnitude of effect they have on the development of HA-VTE.

Thromboprophylaxis: Mechanical, Pharmacologic, Combination, or None?

After the identification of the individual risk of HA-VTE, a decision needs to be made regarding whether to provide pharmacologic thromboprophylaxis (pTP), mechanical thromboprophylaxis (mTP), both, or neither. The net clinical benefit of pTP is established in adults, but not for children. Moreover, it is specifically established in the setting of adult trauma and critical illness [1]. Overall, there is a lack of robust data for its use in the general pediatric population. Prospective trials investigating its efficacy in specific subpopulations exist, but there is only one trial currently being performed in the critically ill pediatric population [38]. Guidelines exist for children with trauma, but with considerable paucity of evidence for recommendations [9]. In children hospitalized after trauma, pTP is conditionally recommended for consideration in children older than 15 years if the bleeding risk is low or in postpubertal children younger than 15 years if they have an ISS of >25. This

Table 1. Some acquired and innate risk factors commonly related to pediatric trauma and critical illness.

Acquired factors	Presence of CVAD
	Systemic infection
	Mechanical ventilation
	Major vascular injury
	Orthopedic surgery
	Higher ISS*
	Altered mobility from baseline
Innate factors	Age of <1 year
	Increasing age in pediatric trauma*
	Obesity
	Congenital heart disease
	Autoimmune disease
	Hereditary thrombophilia
	Cancer

*: Cut-off varies among different studies. The Eastern Association for the Surgery of Trauma and Pediatric Trauma Society guidelines define an ISS of ≥25 as the cut-off for severe injury.
CVAD: Central venous access device; ISS: Injury Severity Score.

recommendation is conditional because it is based on adult data and the relative safety of enoxaparin in children. Additionally, expert consensus statements suggest strong recommendations for pTP in pediatric trauma cases involving a personal history of VTE and weak recommendations for its consideration if the patient has a CVAD [39]. If pTP is considered, contraindications need to be identified beforehand. Baseline laboratory tests including a complete blood count, coagulation profile, and evaluation of renal function are necessary to identify some of these features. In situations where bleeding risk increases or bleeding does develop, the decision to continue pTP needs to be reevaluated. The American Society of Hematology (ASH) and International Society on Thrombosis and Haemostasis (ISTH) recently completed their recommendations for pTP in children. Specific recommendations for children after trauma and with critical illness are now eagerly awaited.

mTP, including the use of intermittent pneumatic compression devices or sequential compression devices, is commonly used in adults due to its ability to aid in the prevention of HA-VTE and avoid exposure to anticoagulants [40,41]. It presumably works by reducing venous stasis and stimulating the release of antithrombotic mediators, such as tissue plasminogen activator, from the endothelium. Overall, its use in pediatric thromboprophylaxis is low with large variation in its prescription [42]. This might reflect its lack of availability for younger patients. However, one study performed with children suggested that mTP alone is not efficacious in preventing HA-VTE versus its combination with pTP or pTP alone [43]. There are no randomized trials testing its efficacy in any pediatric population. Due to its low usage and the difficulties in studying its efficacy, there is a lack of consensus on its use in children. While we await evidence detailing its use and efficacy in children, mTP should be considered when available given its safety profile, but caution must be taken regarding perceptions of its benefits and when counseling parents and caregivers regarding its efficacy to prevent HA-VTE in children. As with pTP, the EAST/PTS guidelines made a conditional recommendation for the use of mTP alone or in combination with pTP in both hospitalized children 15 years and older and postpubertal children younger than 15 years with an ISS of >25. The consensus agreement states that mTP is appropriate in children with significant bleeding risk or contraindication to pTP.

In the absence of robust data and the unavailability of mTP for younger age groups, a provider may choose to avoid any form of thromboprophylaxis. In these cases, the risk of HA-VTE is accepted and no iatrogenic bleeding risk from anticoagulant exposure is imparted to the child. While this may sound reasonable, the question lies in how much risk is acceptable without causing harm. Recent prospective data show that in high-risk pediatric trauma patients, delaying the initiation of pTP was associated with the development of HA-VTE and that early initiation could be beneficial [44].

Confirming the Diagnosis of HA-VTE in Children

Confirmation of a diagnosis of HA-VTE is based on risk assessment and the development of clinical signs and symptoms. Physical examination alone has poor accuracy in diagnosing DVT in children [45]. The clinical manifestations of DVT are related to pain, swelling, and discoloration from the venous congestion of affected limbs. In those with an indwelling CVAD, line dysfunction in the presence of other examination findings should also raise clinical suspicion of HA-VTE [45]. PE presents with cough, shortness of breath, tachycardia, tachypnea, and hypoxemia. Signs and symptoms of non-extremity DVT may be subtle and are typically related to underlying organ dysfunction. There are no laboratory tests to confirm the diagnosis of HA-VTE, including biomarkers such as C-reactive protein, D-dimer, and factor VIII activity, which are currently being investigated for use in risk assessment but not for diagnosis [46]. Additionally, radiographic screening for clinically unsuspected VTE is not routinely recommended [47,48,49]. The diagnosis of HA-VTE therefore requires a high index of suspicion. Imaging modality primarily depends on the anatomic location. Historically, venography was considered the gold standard for diagnosis of DVT, but it has now been replaced by minimally invasive techniques. For extremity DVT, compression limb ultrasonography is inexpensive, non-invasive, and specific; therefore, it is the most common imaging technique used [50]. For HA-VTE suspected within the central vessels (e.g., femoral vein extension into the inferior

Table 2. Examples of absolute and relative contraindications to anticoagulant exposure.
Bleeding disorder
Hemorrhage
Platelet count unable to be sustained at >50,000/mm^3
Intracranial mass
Lumbar puncture or epidural catheter removal within past 12 hours
Neurosurgical procedure
Pelvic fracture within past 48 hours
Uncontrolled hypertension

vena cava), contrast magnetic resonance venography (MRV) is recommended over computed tomography (CT) due to reduced radiation exposure and its ability to clearly define the venous system and thrombus [50]. However, its use has limitations. CT venography is more readily accessible and can be considered if MRV is unavailable. Echocardiography and ultrasound of the involved central vessels might still be a useful modality depending on the anatomic location and in the presence of contraindications to either CT or MRV. Despite the absence of data on its diagnostic utility in children, for suspected PE, CT pulmonary angiography is often the initial imaging modality of choice given the feasibility of its use [50,51]. In the presence of contraindications to the administration of intravenous contrast, a ventilation/perfusion scan can be performed as the initial imaging modality for PE, but this will likely depend on its availability and the experience of centers, with potential limitations in its interpretation.

Management Principles for HA-VTE

When HA-VTE develops during hospitalization, another assessment of the risks associated with treatment options versus the severity and clinical consequences of HA-VTE is necessary. Anticoagulation is the most common management strategy employed. Its goal is to limit propagation of the thrombus, decrease the risk of its recurrence, and avoid the potential for downstream complications, such as post-thrombotic syndrome. In certain cases, systemic or localized thrombolysis and/or thrombectomy may be indicated. The decision to provide thrombolysis for certain types of HA-VTE depends on the presence of life-threatening features such as hemodynamic compromise in PE [47]. Thrombolysis and thrombectomy in children have less support in the literature and carry a significantly higher risk of bleeding than anticoagulation alone [52]. In 2024, the ASH and ISTH updated their guidelines on the management of VTE in children [47]. Despite the updated guidance, most recommendations are conditional with low quality of evidence. Hence, it is not uncommon that an individualized approach is often taken when managing HA-VTE in children. Decision-making begins again with the identification of contraindications to anticoagulant and/or thrombolytic exposure (Table 2). Previous standard-of-care (SOC) anticoagulants that have historically been utilized include low-molecular-weight heparin (LMWH), unfractionated heparin (UFH), vitamin K antagonists, and fondaparinux. Recently, direct oral anticoagulants have been found to have a slightly better efficacy profile without a significant increase in bleeding risk, with recent guidelines suggesting their use over SOC anticoagulants [47]. However, specific to the setting of ICUs and trauma cases, the use of oral medications is limited, especially during the acute stages of admission. The LMWH enoxaparin is still the most commonly used anticoagulant in pediatrics. UFH, due to its short half-life, is particularly often used for critically ill children and those with trauma who might potentially undergo surgical procedures [53].

In the presence of trauma or critical illness, the incidence of bleeding is typically higher than that of the general population [54]. If the severity or risk of bleeding is high enough, multidisciplinary decision-making and communication with other teams and specialists involved in the acute care of children at high risk for or with the concomitant development of HA-VTE and bleeding should be pursued. This typically includes a pediatric intensivist, pediatric hematologist, pediatric surgeon, and interventional radiologist if indicated. Such conversations are necessary to be able to prioritize and discuss treatment options in complex cases. In the pediatric ICU, it is not uncommon for situations to arise where both devastating HA-VTE and hemorrhage present together.

Conclusion

Pediatric HA-VTE is common in children after trauma or with critical illness due to an accrual of risk factors. Although knowledge gaps exist, research on pediatric HA-VTE is growing. The translation of RAMs into clinical tools that can help guide the prescription of pTP and the evaluation of practices such as the use of mTP are urgently needed. Overall, we have outlined an approach to HA-VTE in children based on the current literature. However, it must be noted that the difficulty in standardizing HA-VTE practices in children is largely due to the lack of robust evidence. In the era of precision medicine, individualization of care with consideration of HA-VTE and bleeding risk is an important guiding principle when caring for children with trauma or critical illness.

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Footnotes

Authorship Contributions

Concept: R.M.T.H., E.V.S.F.; Design: R.M.T.H., E.V.S.F.; Literature Search: R.M.T.H., E.V.S.F.; Writing: R.M.T.H., E.V.S.F.

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Supplementary Material 1. Search parameters used for the literature review and numbers of studies obtained.

PubMed Searches

General Search - 1741

(((((“venous thromboembolism”[Title/Abstract]) OR (“VTE”[Title/Abstract])) OR (“deep vein thrombosis”[Title/Abstract] OR “DVT”[Title/Abstract])) OR (“pulmonary embolism”[Title/Abstract] OR “emboli”[Title/Abstract] OR “clot”[Title/Abstract])) OR ((“Venous Thromboembolism”[Mesh]))) AND (((“Critical Illness”[Mesh]) OR (“trauma”[Title/Abstract] OR “critical illness”[Title/Abstract] OR “critical condition”[Title/Abstract] OR “intensive care”[Title/Abstract] OR “ICU”[Title/Abstract] OR “high risk”[tiab])) OR ((“Intensive Care Units, Pediatric”[Mesh]) OR ((“Critical Care”[Mesh]) OR “Intensive Care Units”[Mesh] AND (allchild[Filter]))))) AND (allchild[Filter])

Bleeding Risk in Peds Critical Care and Trauma Pt Search - 400

((((((“venous thromboembolism”[Title/Abstract]) OR (“VTE”[Title/Abstract])) OR (“deep vein thrombosis”[Title/Abstract] OR “DVT”[Title/Abstract])) OR (“pulmonary embolism”[Title/Abstract] OR “emboli”[Title/Abstract] OR “clot”[Title/Abstract])) OR ((“Venous Thromboembolism”[Mesh]))) AND (((“Critical Illness”[Mesh]) OR (“trauma”[Title/Abstract] OR “critical illness”[Title/Abstract] OR “critical condition”[Title/Abstract] OR “intensive care”[Title/Abstract] OR “ICU”[Title/Abstract] OR “high risk”[tiab])) OR ((“Intensive Care Units, Pediatric”[Mesh]) OR ((“Critical Care”[Mesh]) OR “Intensive Care Units”[Mesh] AND (allchild[Filter])))) AND (allchild[Filter])) AND (“Hemorrhage”[Mesh] OR “bleeding”[tiab] OR “hemorrhage”[tiab])

Prevention of VTE/Emboli/Clot in Peds Critical Care and Trauma Pt Search - 353

(((“Critical Illness”[Mesh]) OR (“trauma”[Title/Abstract] OR “critical illness”[Title/Abstract] OR “critical condition”[Title/Abstract] OR “intensive care”[Title/Abstract] OR “ICU”[Title/Abstract])) OR ((“Intensive Care Units, Pediatric”[Mesh]) OR ((“Critical Care”[Mesh]) OR “Intensive Care Units”[Mesh] AND (allchild[Filter])))) AND (((“venous thromboembolism”[Title/Abstract] OR “VTE”[Title/Abstract] OR “deep vein thrombosis”[Title/Abstract] OR “DVT”[Title/Abstract] OR “pulmonary embolism”[Title/Abstract] OR “emboli”[Title/Abstract] OR “clot”[Title/Abstract]) AND (prevent*[tiab] OR control[tiab])) OR (“Venous Thromboembolism/prevention and control”[Mesh])) AND (allchild[Filter])

Diagnosis of VTE in Peds Critically Ill and Trauma Pt Search - 149

(((“Critical Illness”[Mesh]) OR (“trauma”[Title/Abstract] OR “critical illness”[Title/Abstract] OR “critical condition”[Title/Abstract] OR “intensive care”[Title/Abstract] OR “ICU”[Title/Abstract])) OR ((“Intensive Care Units, Pediatric”[Mesh]) OR ((“Critical Care”[Mesh]) OR “Intensive Care Units”[Mesh] AND (allchild[Filter])))) AND (((“venous thromboembolism”[Title/Abstract] OR “VTE”[Title/Abstract]) AND (diagnos*[tiab])) OR (“Venous Thromboembolism/diagnosis”[Mesh])) AND (allchild[Filter]) AND (allchild[Filter])

Therapy of VTE in Peds Critically Ill and Trauma Pt Search - 269

(((“Critical Illness”[Mesh]) OR (“trauma”[Title/Abstract] OR “critical illness”[Title/Abstract] OR “critical condition”[Title/Abstract] OR “intensive care”[Title/Abstract] OR “ICU”[Title/Abstract])) OR ((“Intensive Care Units, Pediatric”[Mesh]) OR ((“Critical Care”[Mesh]) OR “Intensive Care Units”[Mesh] AND (allchild[Filter])))) AND (((“venous thromboembolism”[Title/Abstract] OR “VTE”[Title/Abstract]) AND (treat*[tiab] OR “therapy”[tiab] OR “intervention”[tiab] OR “prophyla*”[tiab])) OR (“Venous Thromboembolism/therapy”[Mesh])) AND (allchild[Filter]) AND (allchild[Filter])

EMBASE Searches

General Search - 1818

(((‘critical illness’/exp OR (‘intensive care’/exp OR ‘intensive care unit’/exp) OR (‘critical illness’:ti,ab OR ‘trauma’:ti,ab OR ‘critical condition’:ti,ab OR ‘intensive care’:ti,ab OR ‘icu’:ti,ab OR ‘high risk’:ti,ab)) AND (‘venous thromboembolism’/de OR (‘venous thromboembolism’:ti,ab OR ‘vte’:ti,ab OR ‘deep vein thrombosis’:ti,ab OR ‘dvt’:ti,ab OR ‘pulmonary embolism’:ti,ab OR ‘emboli’:ti,ab OR ‘clot’:ti,ab))) AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim OR [preschool]/lim OR [school]/lim)) AND (‘article’/it OR ‘article in press’/it OR ‘preprint’/it OR ‘review’/it)

Bleeding Risk in Peds Critical Care and Trauma Pt Search - 401

((((‘critical illness’/exp OR (‘intensive care’/exp OR ‘intensive care unit’/exp) OR (‘critical illness’:ti,ab OR ‘trauma’:ti,ab OR ‘critical condition’:ti,ab OR ‘intensive care’:ti,ab OR ‘icu’:ti,ab OR ‘high risk’:ti,ab)) AND (‘venous thromboembolism’/de OR (‘venous thromboembolism’:ti,ab OR ‘vte’:ti,ab OR ‘deep vein thrombosis’:ti,ab OR ‘dvt’:ti,ab OR ‘pulmonary embolism’:ti,ab OR ‘emboli’:ti,ab OR ‘clot’:ti,ab))) AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim OR [preschool]/lim OR [school]/lim)) AND (‘article’/it OR ‘article in press’/it OR ‘preprint’/it OR ‘review’/it)) AND (‘bleeding’/de OR (‘bleeding’:ti,ab OR ‘hemorrhage’:ti,ab))

Prevention of VTE/Emboli/Clot in Peds Critical Care and Trauma Pt Search - 256

((((‘critical illness’/exp OR (‘intensive care’/exp OR ‘intensive care unit’/exp) OR (‘critical illness’:ti,ab OR ‘trauma’:ti,ab OR ‘critical condition’:ti,ab OR ‘intensive care’:ti,ab OR ‘icu’:ti,ab OR ‘high risk’:ti,ab)) AND (‘venous thromboembolism’/de OR (‘venous thromboembolism’:ti,ab OR ‘vte’:ti,ab OR ‘deep vein thrombosis’:ti,ab OR ‘dvt’:ti,ab OR ‘pulmonary embolism’:ti,ab OR ‘emboli’:ti,ab OR ‘clot’:ti,ab))) AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim OR [preschool]/lim OR [school]/lim)) AND (‘article’/it OR ‘article in press’/it OR ‘preprint’/it OR ‘review’/it)) AND (‘prevention’/de OR (‘prevention’:ti,ab OR ‘control’:ti,ab))

Diagnosis of VTE in Peds Critically Ill and Trauma Pt Search - 246

((((‘critical illness’/exp OR (‘intensive care’/exp OR ‘intensive care unit’/exp) OR (‘critical illness’:ti,ab OR ‘trauma’:ti,ab OR ‘critical condition’:ti,ab OR ‘intensive care’:ti,ab OR ‘icu’:ti,ab OR ‘high risk’:ti,ab)) AND (‘venous thromboembolism’/de OR (‘venous thromboembolism’:ti,ab OR ‘vte’:ti,ab))) AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim OR [preschool]/lim OR [school]/lim)) AND (‘article’/it OR ‘article in press’/it OR ‘preprint’/it OR ‘review’/it)) AND ‘diagnosis’/exp

Therapy of VTE in Peds Critically Ill and Trauma Pt Search - 551

((((‘critical illness’/exp OR (‘intensive care’/exp OR ‘intensive care unit’/exp) OR (‘critical illness’:ti,ab OR ‘trauma’:ti,ab OR ‘critical condition’:ti,ab OR ‘intensive care’:ti,ab OR ‘icu’:ti,ab OR ‘high risk’:ti,ab)) AND (‘venous thromboembolism’/de OR (‘venous thromboembolism’:ti,ab OR ‘vte’:ti,ab))) AND ([adolescent]/lim OR [child]/lim OR [infant]/lim OR [newborn]/lim OR [preschool]/lim OR [school]/lim)) AND (‘article’/it OR ‘article in press’/it OR ‘preprint’/it OR ‘review’/it)) AND (‘therapy’/exp OR ‘therapy’:ti,ab OR ‘intervention’:ti,ab OR ‘treatement’:ti,ab)

Scopus

General Search - 1170

(TITLE-ABS-KEY (“venous thromboembolism” OR “VTE”)) AND (TITLE-ABS-KEY (“critical illness” OR “critically ill” OR “trauma” OR “critical condition” OR “ICU” OR “high risk” OR “intensive care unit” OR “Critical care”)) AND (TITLE-ABS-KEY (“child*” OR “pediatric*” OR “teen*” OR “adolescen*” OR “infant” OR “baby” OR “babies” OR “toddler”)) AND PUBYEAR > 2009 AND PUBYEAR < 2026 AND (LIMIT-TO (DOCTYPE,”ar”) OR LIMIT-TO (DOCTYPE,”re”)) AND (LIMIT-TO (LANGUAGE,”English”))

Cochrane Library - 12

https://www.cochranelibrary.com/advanced-search/search-manager?search=7796545