

Thromboprophylaxie
Quelle place de 0 à 18 ans?

Delphine Kern

Hôpital des Enfants

CHRU Toulouse

Pas de lien d'intérêt

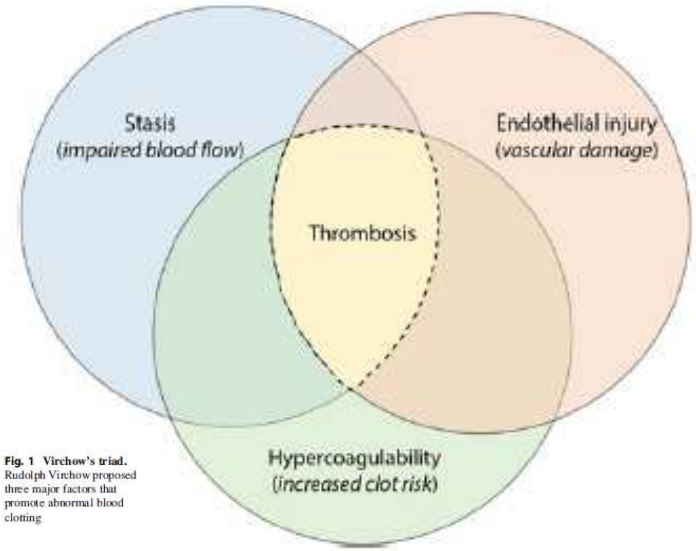


Fig. 1 Virchow's triad. Rudolph Virchow proposed three major factors that promote abnormal blood clotting

Superficiel = RAS
Profond = TVP
- immédiat = Douleur, oedème, hyperhémie
  Thrombus septique
  Embolie
- long terme = insuffisance veineuse
  sd post thrombotique (12* à 63**%)
- Mortalité

TVP = ↗ LOS et coût de 27 000 $ / TVP *

Chez l'adulte, l'anticoagulation réduit le risque de 50-75%

Table 3 Outcomes of venous thromboembolism in children on the basis of available studies

	Number of patients/number of available VTE patients (%)		
References	Pulmonary embolism	Recurrence of VTE	Mortality of VTE
Andrew *et al.* [3]	22/137 (16)	23/137 (17)	13/137 (10)
Sandoval *et al.* [5]	4/78 (5)	9/64 (14)	6/64 (9)
Sirachainan *et al.* [18]	7/24 (29)	6/23 (26)	3/23 (13)
Tuckuviene *et al.* [19]	61/331 (18)	9/57 (16)	1/55 (2)
Van Ommen *et al.* [10]	10/99 (10)	7/99 (7)	16/99 (16)
Wright and Watts [17]	20/92 (22)	20/84 (24)	20/326 (6)
Total	124/761 (16)	74/464 (16)	59/704 (8)

VTE, venous thromboembolism.

children and adolescents: a systemic review and pooled analysis
Seung-Ju Kim[a] and Sanjeev Sabharwal[b]

Est ce que c'est fréquent ? *Intro APA 2017*

	Registre	FDR	Site
Adultes	5-8 cas/10 000	50%	Mbres Inf
Enfants	0,14-0,5/10 000	80%	Inf = sup (VVC)

Age

↘ facteurs vit K dpdt
↗ x2 ά2macroglobuline (inhibiteur de la thrombine)

→ ↘ 25% capacité à former de la thrombine (1 -16 ans) vs adultes (20-45 ans)

< 2 ans
Puberté (FDR)

"Developmental hemostasis" . P Touron

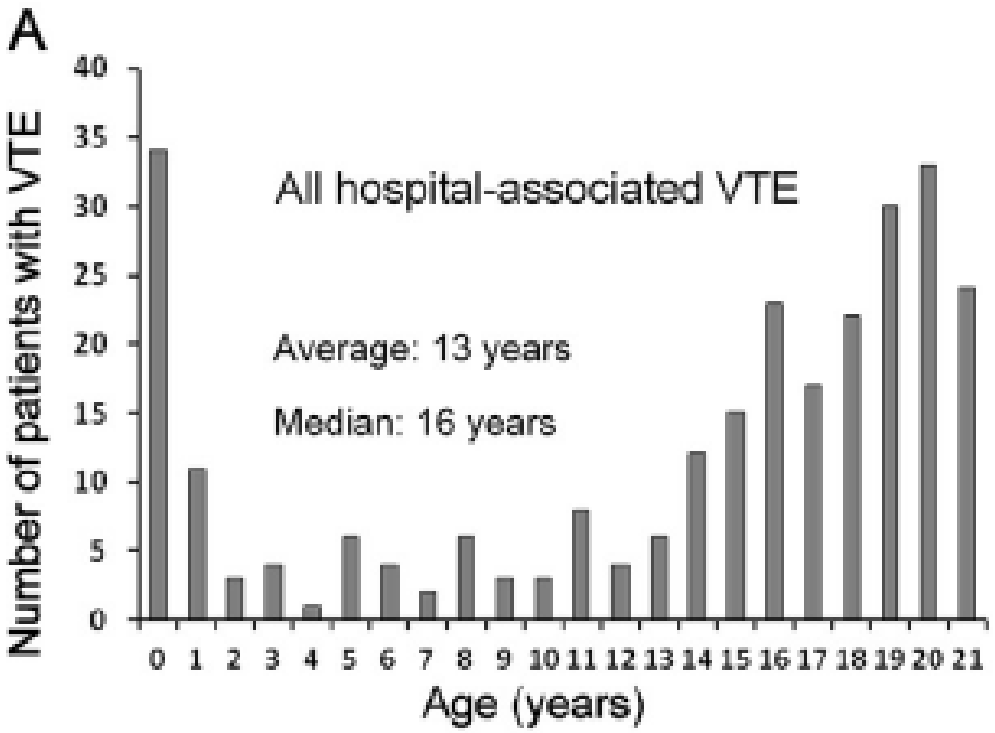
Hospital-Associated Venous Thromboembolism in Children: Incidence and Clinical Characteristics

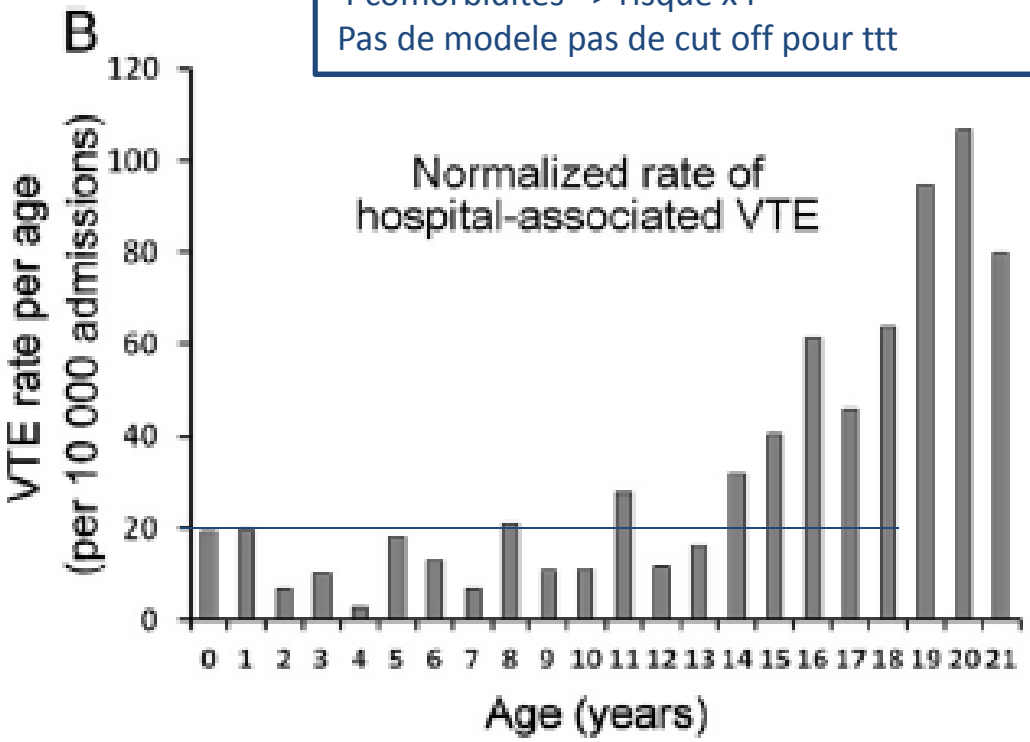
Clifford M. Takemoto, MD[1], Sajeet Sohi, MD[1], Kruti Desai, MD[1], Raman Bharaj, MD[1], Anuj Khanna, MD[1], Susan McFarland, MD[2], Sybil Klaus, MD[2], Alia Irshad, MD[2], Neil A. Goldenberg, MD, PhD[1,3], John J. Strouse, MD, PhD[1,4], and Michael B. Streiff, MD[4]

The journal of pediatrics 2014

Monocentrique USA
Rétrospectif 2004-2009 / ICD-9
<21 ans
VTE 2 jrs < entrée et >90 jrs sortie

270 / 90485 (30 / 10000 admissions)
Age > 14 ans
VVC présente chez 50% des patients
Chir chez 45% des patients
4 comorbidités => risque x4
Pas de modele pas de cut off pour ttt





Les registres

Augmentation réçente (0,58%)
Raffini Paediatrics 2009

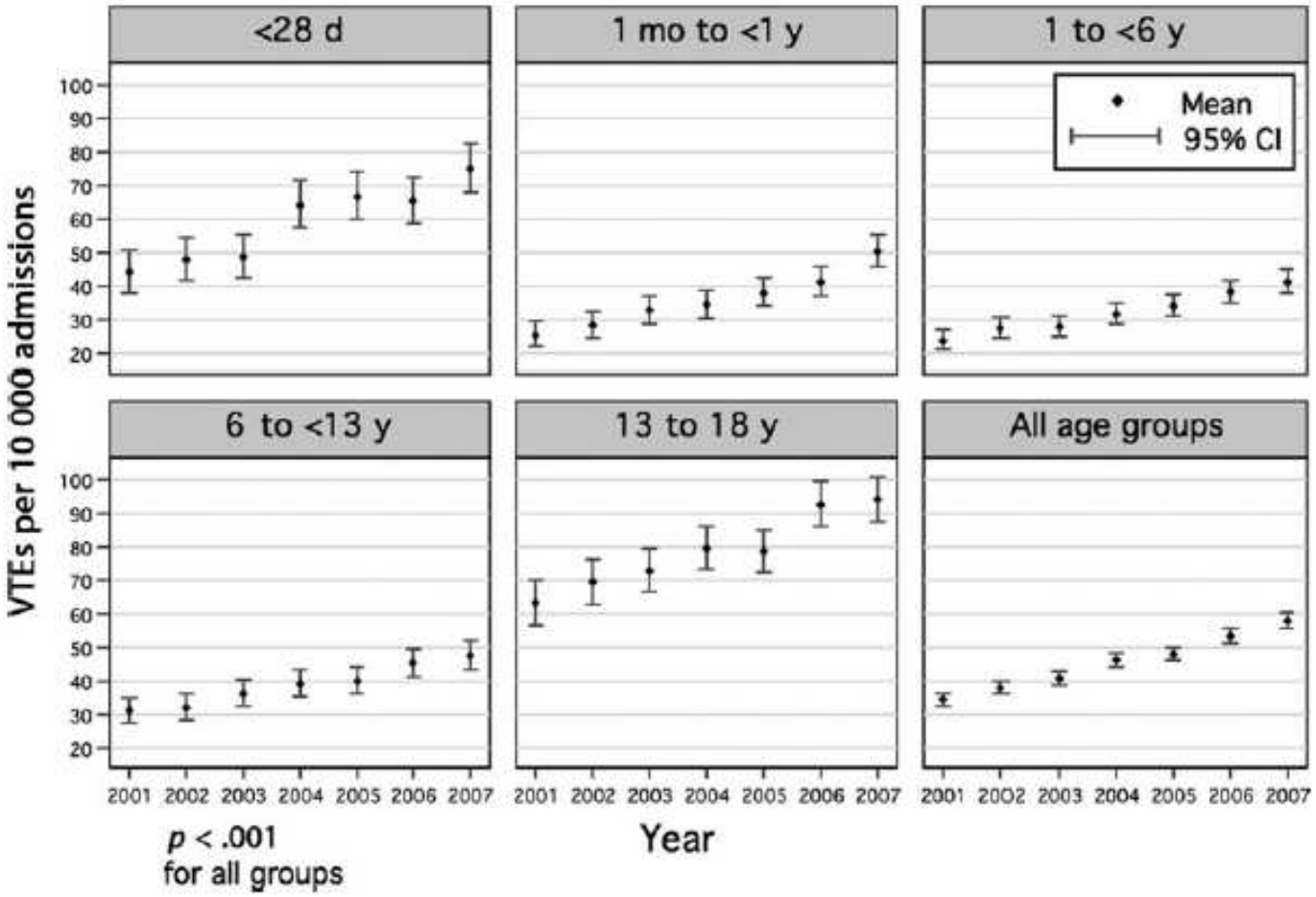


FIGURE 1
Rates of VTE diagnosis according to age group, from 2001 to 2007. CI indicates confidence interval.

Patients plus complexes
Mieux managés?
↗ détection



Comment prévenir ?

1- Dépister les FDR chez tous les patients

© 2017 John Wiley & Sons Ltd, *British Journal of Haematology*

bjh review

Advances in predicting venous thromboembolism risk in children

Frank Rühle[1] and Monika Stoll[1,2]

[1]Department of Genetic Epidemiology, Institute of Human Genetics, University of Münster, Münster, Germany and [2]Department of Biochemistry, Genetic Epidemiology and Statistical Genetics, CARIM School for Cardiovascular Diseases, Maastricht Centre for Systems Biology (MaCSBio), Maastricht University, Maastricht, The Netherlands

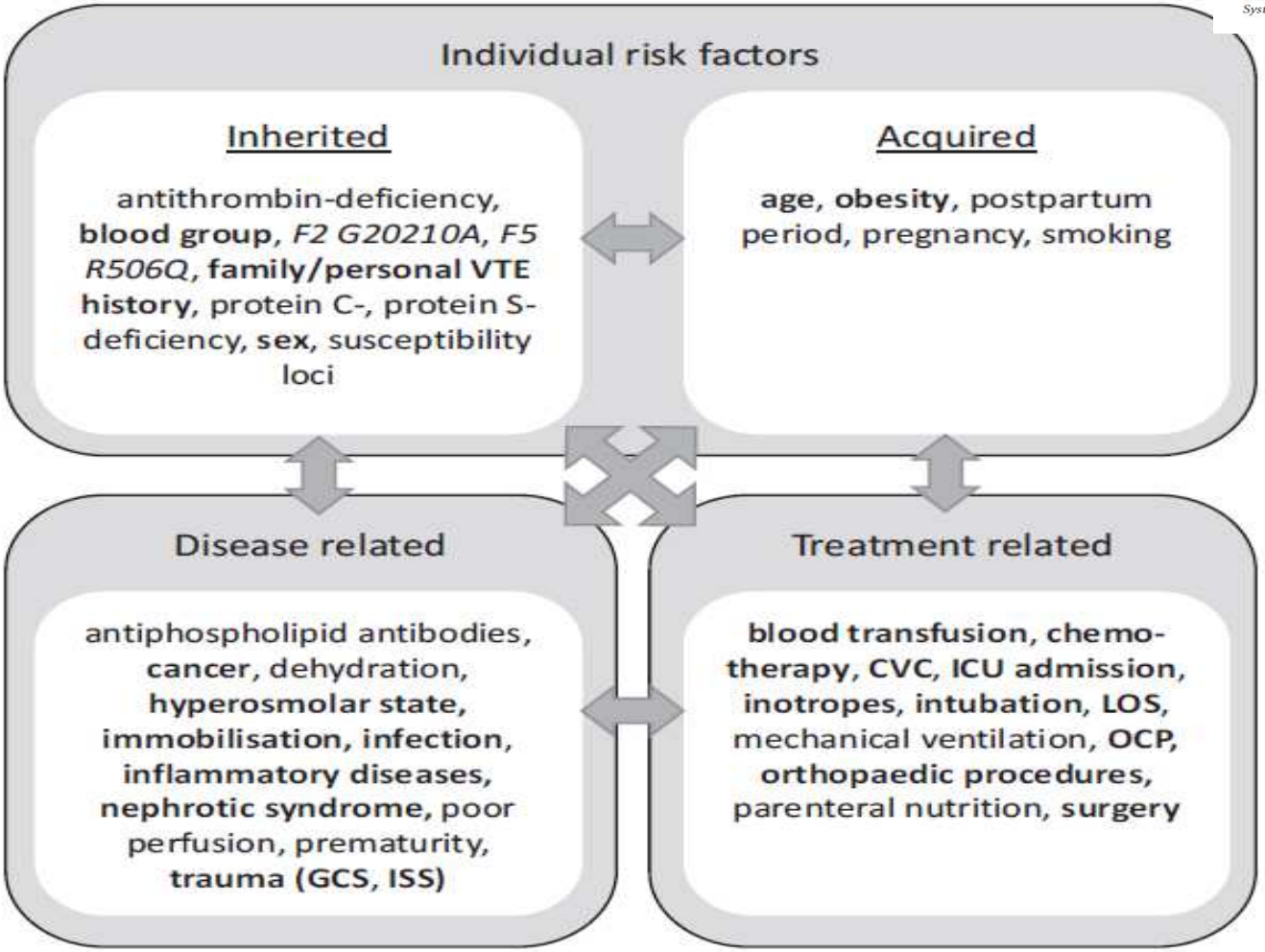


Fig 1. Risk factors for paediatric VTE. Multiple individual, disease- or treatment-related risk factors contribute to VTE. Effect sizes may be modulated by interactions of risk factors. Risk factors used as predictor variables in the presented risk assessment models are highlighted in bold. CVC, central venous catheter; GCS, Glasgow coma scale; ICU, intensive care unit; ISS, injury severity score; LOS, length of stay in hospital; OCP, oral contraceptive pill; VTE, venous thromboembolism.

APAGBI 2017

TABLE 1 Risk factors for venous thromboembolism (VTE) in children

Age	Incidence of VTE highest if age <1 y or >13 y
Central venous line (CVL)	Present in >90% of neonatal VTE
	Present in >33% of other cases
	Risk highest if CVL in lower limb >subclavian >jugular
	Risk may be higher for PICC lines
Surgery	Present in 10%-15% of cases
Malignancy	Present in 25% of cases
	Doubles risk of VTE
	High risk with acute lymphoblastic leukemia
Infection/sepsis	Present in >33% cases
	May be related to presence of CVL
Major trauma/burns	Present in approximately 10% of cases
Drugs	Chemotherapy, eg, aspariginase
	Estrogen contraceptive pill (3-fold increase in risk)
	Parenteral nutrition (may be related to presence of CVL)
Immobility	Present in 25% of cases of prolonged bed rest
Pregnancy	2-fold increase
Congenital thrombophilia	Factor V Leiden
	Antithrombin III deficiency
	Protein C/S deficiency
	Increased F VIII
Acquired thrombophilia	Nephrotic syndrome
	Antiphospholipid syndrome
	Connective tissue disease
Obesity	Increased incidence of VTE
Cardiac disease	Congenital heart disease and its surgery
Inflammatory bowel disease	Ulcerative colitis greater than Crohn's disease
Sickle cell disease	

5% = pas de FDR

1 FDR = quel poids ?
+srs FDR = additif?

Tabac

Sex ratio 2:1

Morgan Pediatr Anesth 2018;28:382-391



Comment prévenir ?

3 – Thromboprophylaxie =

mécanique TPm = TED / CPI

pharmacologique = TPp

MTVE – enfants – prévention mécanique

APAGBI (1)

Prévention générale

Mobilisation – Hydratation (1,2)

Information générale (2) =

- sur le risque
- sur les stratégies de prévention (B B/R)
- sur les signes cliniques de TVP et EP
- sur les effets secondaires des ttt

Stop ttt OP M-1 – contraception alternative

Prévention mécanique

Quand risque saignement inacceptable

Synergique avec prévention médicamenteuse (Nice 2017)

Venous thromboembolism in over 16s: reducing the risk of hospital-acquired deep vein thrombosis or pulmonary embolism

NICE (2)



NICE guideline
Published: 21 March 2018
nice.org.uk/guidance/ng89

Contre indications des bas de contention (2)

Pathologie artérielle
Pontage artériel
Neuropathie périphérique ou trouble de la sensibilité
Peau fragilisée, récemment greffée, dermatite, gangrène
Oedème sévère membres inf
Déformation majeure ou taille inhabituelle
Adaptation cas/cas si plaie ou ulcère veineux
+ VVP membres inf

Contre indication de la CPI
Thrombose suspectée ou démontrée

Bon usage des bas de contention (2)

Taille appropriée ajustée à la mesure
Apprendre à les mettre
Si oedeme post op => re – mesure et ré- adaptationde la taille
Compression graduée (mollet = 14-15 mmHg / cheville = 14-18 mmHg / british standard in NICE 2018)
Jour et nuit jusqu'à déambulation normale
Retirer 1 x/jr (toilette) ou plus si peau fragile ou cicatrice
Si retrait nécessaire => alternative par CPI

TABLE 3: LMWH dosing in children

Enoxaparin			
<5kg/2 months	0.75 mg/kg	subcutaneous	12 hourly
>5kg/>2 mths	0.5 mg/kg	subcutaneous	12 hourly
>45 kg	40 mg	subcutaneous	once daily
Tinzaparin			
>1 month	50 units/kg	subcutaneous	once daily

Normally prescribed at 0600 Hrs and 1800 Hrs. Administer via s/c catheter (ideally Insuflon™ to reduce dead space) to reduce the number of needle insertions

Table 3 shows the LMWH dosing in children. LMWHs are excreted via the renal system and so reduced clearance occurs with renal impairment(53). The dose and time interval will need adjusting in those patients with altered creatinine clearance and these patients should be discussed with a haematology specialist. Anti Xa levels may need closer monitoring (trough levels) to ensure clearance and therefore safety. Target range for antiXa not well defined for efficiency but taken as 0.1- 0.4 U/ml. (53)(54)

APAGBI 2017

TED + TPp ou TED + CPI améliore l'efficacité de la prophylaxie

Sauf contre indication



Comment prévenir ?

Quels terrains ?

Quels outils de screening ?

Quelles recommandations depuis CHEST 2012 ?

CHEST Supplement

ANTITHROMBOTIC THERAPY AND PREVENTION OF THROMBOSIS, 9TH ED: ACCP GUIDELINES

Perioperative Management of Antithrombotic Therapy

Antithrombotic Therapy and Prevention of Thrombosis, 9th ed: American College of Chest Physicians Evidence-Based Clinical Practice Guidelines

James D. Douketis, MD, FCCP; Alex C. Spyropoulos, MD, FCCP; Frederick A. Spencer, MD; Michael Mayr, MD; Amir K. Jaffer, MD, FHM; Mark H. Eckman, MD; Andrew S. Dunn, MD; and Regina Kunz, MD, MSc (Epi)



Thromboprophylaxie et néonatologie

Néonat

VVC = 0,5 U/Kg/h HNF (1A) ou thrombolyse intermittente (2C)
Si VVC occlue = thrombolyse locale after appropriate clinical assement (2C)
KT artériel = 0,5U/ml, 1 ml/h HNF (1A)
KT Artériel ombilical = Haut > bas (2B) - 0,25 à 1 U/ml – 25 à 200 U/kg/jr HNF (2A)

KT cardiaque via artère = bolus 100 U/kg HNF à renouveler
Procédure de Blalock = HNF per op (2C), aspirine ou rien post op (2C)

Chest 2012

APAGBI = ∅ néonat

Canada = 24 / 10 000 *(Schmidt 1995)*
USA = 58 / 10 000 *(Raffini 2009)*
Bicentrique USA = 150 / 10 000 *(Bhat JPS 2018)*
Pays bas prospectif = 14/10000 *(van ommen 2001) (inclus NNé sains)*

↗ prématurité et ↗ niveau de soins néonat

Thrombose spontanée néonat rare
Thrombose de la veine rénale = associée à FDR thrombophilie héréditaire *(Brandao 2011)*

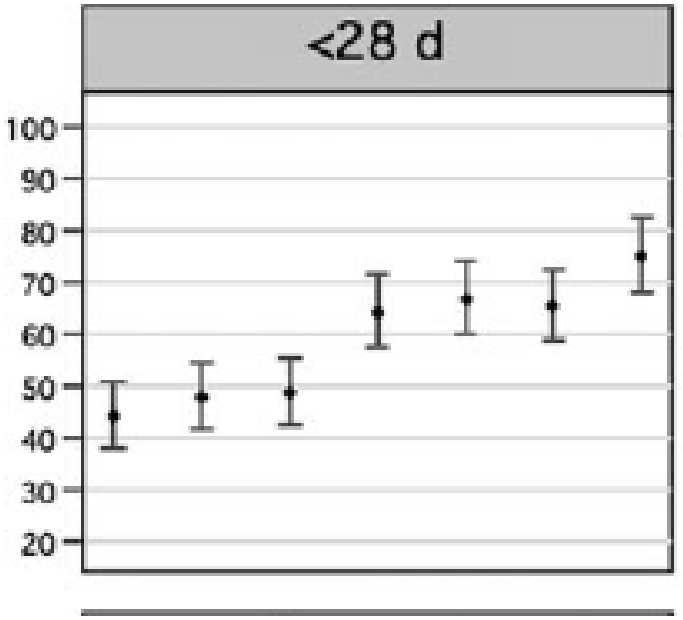


TABLE 1 | Risk factors for venous thromboembolism (VTE) development in neonates.

Maternal risk factors	Neonatal risk factors	Risk factors specific to central venous catheter (CVC)-related VTE
Infection	CVC	Low birth weight
Placental disease	Sepsis	Prematurity
Diabetes mellitus	Congenital heart disease	Prolonged catheter duration (>6 days)
Hypertension	Perinatal asphyxia	Umbilical venous catheter (UVC) mal-placement
Pre-eclampsia	Dehydration	Addition of blood products to UVC
Dyslipidemia		Mechanical ventilation
Metabolic syndrome		Surgery
Antiphospholipid antibody syndrome		
Emergent C-section		
Premature rupture of membranes		
Inherited thrombophilia		

Haley 2018

Néonat critically - ill

Amankwah J Thrombosis 2014

USI USA monocentrique
Cas controle
Retrospectif sur database 2006-2013
33 VTE / 92 contrôles (CPC[ales] exclues)

FDRs univarié
Ventilation méca
VVC
Infection
Chirurgie majeure
LOS ≥ 15 jrs

Incidence= VTE= 1,4 / 1000
VVC = OR = 29 [95%IC3,18-265]
Risque VTE pour néonat + VVC = 0,9%

Tuckuvienne 2012

Cohorte nationale

Prématurité
Apgar bas
Naissances multiples

75% - 95% des VTE ont une VVC
Patients complexes
Rapport tailles des VX / Taille des KT défavorable
KT multilumières + impliqués
Temps dépendants

Risk Factors for Neonatal Venous and Arterial Thromboembolism in the Neonatal Intensive Care Unit—A Case Control Study

Rukhmi Bhat, MD, MS[1], Riten Kumar, MD, MSc[2], Soyang Kwon, PhD[3], Karna Murthy, MD, MSc[4], and Robert I. Liem, MD, MS[1]

Bhat JPS 2018

USI USA bicentrique
Cas controle
Retrospectif sur database 2010-2014
93 A/VTE / 188/76 contrôles (CPC[ales] exclues)

15/1000 (V 10 + A5/1000)
Age gest 22-27 semaines
USI néonat > 31 jours
VVC
KT > 14 jours
Infection systémique
male

Quid des stratégies de prévention appliquées ?
Nécessité de + grosses cohortes pour valider des stratégies de thromboprophylaxie

Néonat

le risque de thrombose chez l'ancien préma persiste dans l'enfance et à l'âge adulte

Registre suédois retrospectif database
3 571 574 suédois nés entre 1973 et 2008
Fiabilité du registre sur VTE ≈ 95%

Zoller Pediatrics 2014

	Age gest[el]	< 1an	1 -5 ans	6-12 ans	13-17 ans	18-38 ans
Extr P	22-27	**47**	**-**	**1**	**2**	**2,76**
Very P	28-32	**5,5**	**3,32**	**1**	**1**	**1,53**
Late P	32-36	**3,54**	**2,53**	**1**	**1**	**1,24**
Term	37-41	**1**	**1**	**1**	**1**	**1**
Post T	>42	**2**	**1**	**1**	**1**	**1**

Thromboprophylaxie et enfant hospitalisé

FDR 0-21 ans non critically children

2006-2013 monocentrique
Rétrospectif sur database / ICD-9
50 cas de TVP symptomatiques acquises à l'hôpital

1/500 eft hospitalisé non critique

Development of a New Risk Score for Hospital-Associated Venous Thromboembolism in Noncritically Ill Children: Findings from a Large Single-Institutional Case-Control Study

The J of Pediatrics 2014

Christie M. Atchison, BS[1], Shilpa Arlikar, MD[2], Ernest Amankwah, PhD[2], Irmel Ayala, MD[3], Laurie Barrett, RN[2,3], Brian R. Branchford, MD[4], Michael Streiff, MD[5], Clifford Takemoto, MD[3,6], and Neil A. Goldenberg, MD, PhD[2,3,5,6]

Table II. Unadjusted OR and aOR for putative risk factors for development of HA-VTE in noncritically ill children from univariate and multiple logistic regression

	Unadjusted				Adjusted			
Putative risk factors	OR	95% LCL	95% UCL	*P* value	OR	95% LCL	95% UCL	*P* value
Age, y								
1-5	0.28	0.07	1.12	.07	0.38	0.05	2.75	.34
6-10	1.57	0.58	4.23	.37	2.54	0.48	13.42	.27
11-15	2.43	0.90	6.54	.08	2.21	0.40	12.32	.37
16-21	1.99	0.76	5.19	.16	2.32	0.45	11.87	.31
CVC	**31.49**	**13.97**	**71.02**	**<.001**	**27.67**	**8.40**	**91.22**	**<.0001**
Infection	**7.95**	**4.18**	**15.09**	**<.001**	**10.40**	**3.46**	**31.25**	**<.0001**
Major surgery	0.20	0.06	0.66	.008	0.34	0.07	1.62	.17
Malignancy	5.06	2.58	9.94	<.001	0.90	0.31	2.62	.85
Obesity	4.40	1.02	19.03	.047	1.95	0.21	18.20	.56
Dehydration	1.51	0.59	3.84	.39				
Chronic inflammatory disease (non-lupus)	7.67	2.14	27.52	.002	1.00	0.16	6.32	1.00
Hospital days (<4 vs ≥4)	**15.38**	**6.37**	**37.14**	**<.001**	**5.26**	**1.74**	**15.88**	**.003**
Previous hospitalization within 30 d	3.88	1.99	7.59	<.001	1.41	0.52	3.85	.50
Cardiac catheterization	14.54	1.29	163.41	.03	9.17	0.34	249.81	.19
History of prematurity	0.48	0.14	1.62	.24				
Congenital heart disease	0.49	0.06	3.81	.5				
Diabetes mellitus	1.17	0.14	9.93	.89				
Cystic fibrosis	3.66	0.89	15.13	.07	0.92	0.12	6.93	.93

LCL, lower confidence limit; *UCL*, upper confidence limit.
Independent risk factors, as determined by the results of multivariate analysis, are shown in bold type.

VVC	5 pts
Infection	2 pts
LOS≥ 4jrs	1 pt

Score	Risque	Stratégie
8 pts	12,5%	HBPM dose basse*
7 pts	1,1%	Mécanique (CPI, déambulation)
≤ 6 pts	0,1%	RAS

* Si BR de saignement

FDR HA-VTE Réa USI hors Xie cardiothoracique

2006-2013 monocentrique
Rétrospectif sur database / ICD-9
Xie cardio tho exclue
KT CCV inclus
57 HA VTE / 171 controls

Development of a new risk score for hospital-associated venous thromboembolism in critically-ill children not undergoing cardiothoracic surgery☆

Shilpa J. Arlikar [a,1], Christie M. Atchison [b,1], Ernest K. Amankwah [a], Irmel A. Ayala [c], Laurie A. Barrett [a,c], Brian R. Branchford [d], Michael B. Streiff [e], Clifford M. Takemoto [c,f], Neil A. Goldenberg [a,c,e,f,*]

Thrombosis Research 136 (2015) 717–722

Table 2
Unadjusted and adjusted odds ratios for putative risk factors for development of HA-VTE in critically-ill children, from univariate and multi factors, as determined by the results of multivariate analysis, are shown in bold type.

Putative risk factor	Unadjusted				Adjusted
	OR	95%LCL	95%UCL	*P*-value	OR
Age (per each 1 y increase)	0.97	0.93	1.01	0.17	
Male gender (vs. female)	0.60	0.33	1.09	0.09	0.99
Mechanical ventilation	9.48	4.80	18.72	<0.001	1.87
CVC (any)	57.57	22.11	149.91	<0.001	**26.64**
Short term CVC	47.94	19.32	118.95	<0.001	
Long term CVC	2.91	1.22	6.92	0.016	
Significant infection	12.40	5.90	26.07	<0.001	**3.41**
Major or orthopedic surgery	1.28	0.62	2.66	0.50	
Malignancy	7.63	2.90	20.06	<0.001	0.69
Dehydration	1.32	0.48	3.61	0.59	
Chronic inflammatory disease (non-Lupus)	4.75	0.77	29.22	0.09	0.37
LOS ≥4 d	70.00	9.47	517.36	<0.001	**20.22**
Cardiac catheterization	5.82	2.01	16.83	0.001	5.49
History of prematurity	1.39	0.57	3.39	0.47	
History of VTE	5.38	1.24	23.29	0.024	3.38
Congenital heart disease	1.08	0.49	2.39	0.85	
Diabetes mellitus	1.00	0.31	3.23	1.00	
Nephrotic syndrome	3.04	0.19	49.34	0.44	
	0.63		5.50	0.26	
	7.46		**95.13**	**<0.001**	

Abbreviations: OR, odds ratio; 95%LCL, 95% lower confidence limit; 95%UCL, 95% upper confidence limit; CVC, central venous catheter; LOS, length of stay.

VVC	8 pts
Infection	1 pts
LOS≥ 4jrs	6 pts

Score	Risque	Stratégie
15 pts	8,8 %	HBPM dose basse*
7-14	1,3 %	Mécanique (CPI, déambulation)
≤ 6	0,03 %	RAS

Risk-prediction tool for identifying hospitalized children with a predisposition for development of venous thromboembolism: Peds-Clot clinical Decision Rule

A. A. SHARATHKUMAR,* A. MAHAJERIN,† L. HEIDT,† K. DOERFER,‡ M. HEINY,† T. VIK,† R. FALLON† and A. RADEMAKER§

Journal of Thrombosis and Haemostasis, **10**: 1326–1334

Retrospectif 2005-2010
Monocentrique USA
Cohorte de dérivation = 173 patients
Cas controle

FDRs	Points
Immobilisation	3
LOS > 7 jrs	2
OP	2
VVC	1
Hemoc +	1
Direct USI Rea	0,5
Total	

Score ≥ 3 points = haut risque

Cohorte de validation 100 patients
Second centre 2007-2010
AUC 0,88

Recommande HBPM si haut risque

Efficacité du ttt préventif?

FDR enfant maladie inflammatoire digestive

Risque de TVP x 3 *Bernstein et al Thromb Haemast 2001*

Stratification du risque = *Boston Children Hospital group Zitomersky J Pediatr Gatroenterol 2013*

1 majeur	+	1 mineur	=	HR MTVE Et si BR saigt

décompensation / colon
Chirurgie majeure

Atcdt perso MTVE
Atcdt familial de MTVE (1er degré)
Thrombophilie connnue
AntiPL > 12 mois
OP
Tabac
Obésité
Thalidomide
VVC

< 60 kg = 0,5mg/kg x 2
> 60 kg et pubère = 40 mg x1

PICC line ≈ Broviak *LaRusso JPS 2019*

Thromboprophylaxie et VVC

VVC

Cathéter non perméable /Thrombose intra ou extra luminale (veine thrombosée)
Augmentation du risque infectieux qd VVC non perméable
Augmentation du risque anesthésique et chirurgical pour les remplacer

Maintenir le KT perméable (2C)

Flush sérum physio
Flush héparine
Flush urokinase
Mais jamais ne rien faire

Prévention de la thrombose veineuse

Pas de thromboprophylaxie systématique (1B)
Thromboprophylaxie si nutrition PE long cours (AVK) (2C)

Chest 2012

APAGBI 2017

FDR le plus fréquent
Retirer la VVC dès que possible
Site privilégié = jugulaire interne (B)

Sur VVC - REA

Central Venous Catheter-Associated Deep Venous Thrombosis in Critically Ill Children

Edward Vincent S. Faustino, MD, MHS[1]

Semin Thromb Hemost 2017

Tran 2018,
Derderian 2018
Arlikar 2018

FDR

Age (↑ OR1 / mois)
Transfusion (OR2)
Soluté (APE?)
Chirurgie récente
Thrombophilie
Ratio ∅ KT / ∅ Vx

Hyercoagulabilité brulés, néoplasie
Durée kt > 3 jours
Infection
Age < 1 an
ventilation mécanique,
KT cardiaque,

Site

Thrombose symptomatique = **mbres inf** > mbres sup *(Higgerson pediatr critic care med 2011, Derderian JPS 2018)*
Thrombose sympt + asymptomatiques = inf = sup = vidal 2014
Position du KT (VCS-OD)

Type de kt

KTPICC < KT percut < KT tunellisés (Vidal 2014)
Résultats contradictoires

Sur VVC – REA - site

Supraclavicular catheterization of the brachiocephalic vein: a way to prevent or reduce catheter maintenance-related complications in children

Habas et al Eur J Pediatr 2018;

Femoral 0R 6,11 [95%IC, 1,77-25,6]
Infection VVC 0R 9,8 [95%IC, 2,08-43,25]

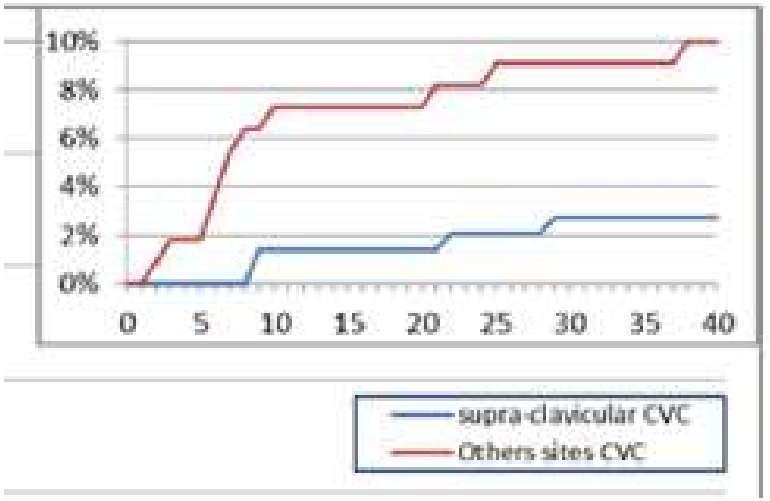
2011- 2015 retrospective, monocentrique
225 enfants – 7 mois – 7 kg
Pose sous écho – kt simples
Site à discrétion / opérateur
HNF préventif 0,5-1 U/kg/h si FDR (?)

CLAT ? Si ↗ Pression de perfusion, perte du retour veineux, infection, oedeme / territoire VVC, sd cave, chylothorax, EP, embol systemique => US

	Supraclavicular CVC ($n = 147$)	Other CVC sites ($n = 110$)	p
CLABSI and/or CLAT	8 (5.4)	18 (16.4)	0.006
CLAT	4 (2.7)	11 (10)	0.016
CLABSI	5 (3.4)	10 (9.1)	0.063
CVC length of use (days)	10 (6–17)	8 (4–14)	0.036
CVC days free of infection	1786 (99.50%)	1116 (95.22%)	< 0.001
CLABSI incidence density rate (per 1000 catheter days)	2.8	8.96	< 0.001

Values are expressed as medians (Q25-75) or numbers (%)

CVC central venous catheter, *CLABSI* central line-associated bloodstream infection, *CLAT* central line-associated deep vein thrombosis



A Multinational Study of Thromboprophylaxis Practice in Critically Ill Children*

Edward Vincent S. Faustino, MD[1]; Sheila Hanson, MD, MS[2]; Philip C. Spinella, MD[3]; Marisa Tucci, MD[4]; Sarah H. O'Brien, MD, MSc[5]; Antonio Rodriguez Nunez, MD, PhD[6]; Michael Yung, MD[7]; Edward Truemper, MD, MS[8]; Li Qin, PhD[9]; Simon Li, MD, MPH[10]; Kimberly Marohn, MD[1]; Adrienne G. Randolph, MD, MSc[11]; on behalf of the PROphylaxis against ThRombosis prACTice (PROTRACT) Study Investigators of the PALISI BloodNet

(*Crit Care Med* 2014; 42:1232–1240)

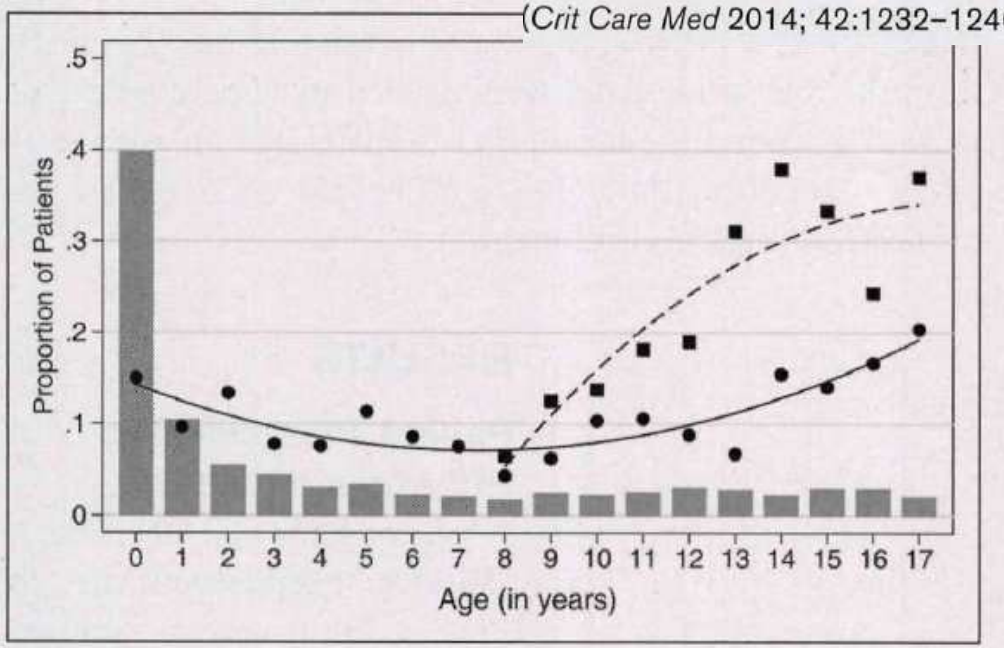


Figure 2. The frequency of pharmacologic thromboprophylaxis was highest at the extremes of age while the frequency of mechanical thromboprophylaxis initially increased but seemed to plateau at 13 years old or older. *Filled circles* represent pharmacologic thromboprophylaxis; *filled squares* represent mechanical thromboprophylaxis; *gray bars* represent proportion of patients per year; *solid line* represents fitted values (pharmacologic); and *dashed line* represents fitted values (mechanical).

Prospectif 4 jrs en 2012
Australie Canada NZ Portugal Espagne Singapour USA
2484 enfants < 18 ans

TPp =12%
34% des indications / reco Chest 2012

FDR	freq	TPp *	TPm
≥ 1	87%	14%	24% des > 8 ans Age/FDR/centre CPI + TED (11%) ou pTP (7%) CPI + SCI (OR = 8,9)
≥ 2	67%	16%	
≥ 3	50%	18%	

CC Cyanogène (OR 7,4) = aspirine
Faible adhésion / reco CHEST 2012 / CC^{ale}
VVC 17% (OR2,3)
Enoxaparine sf CC^{ale}

TPp

TPm

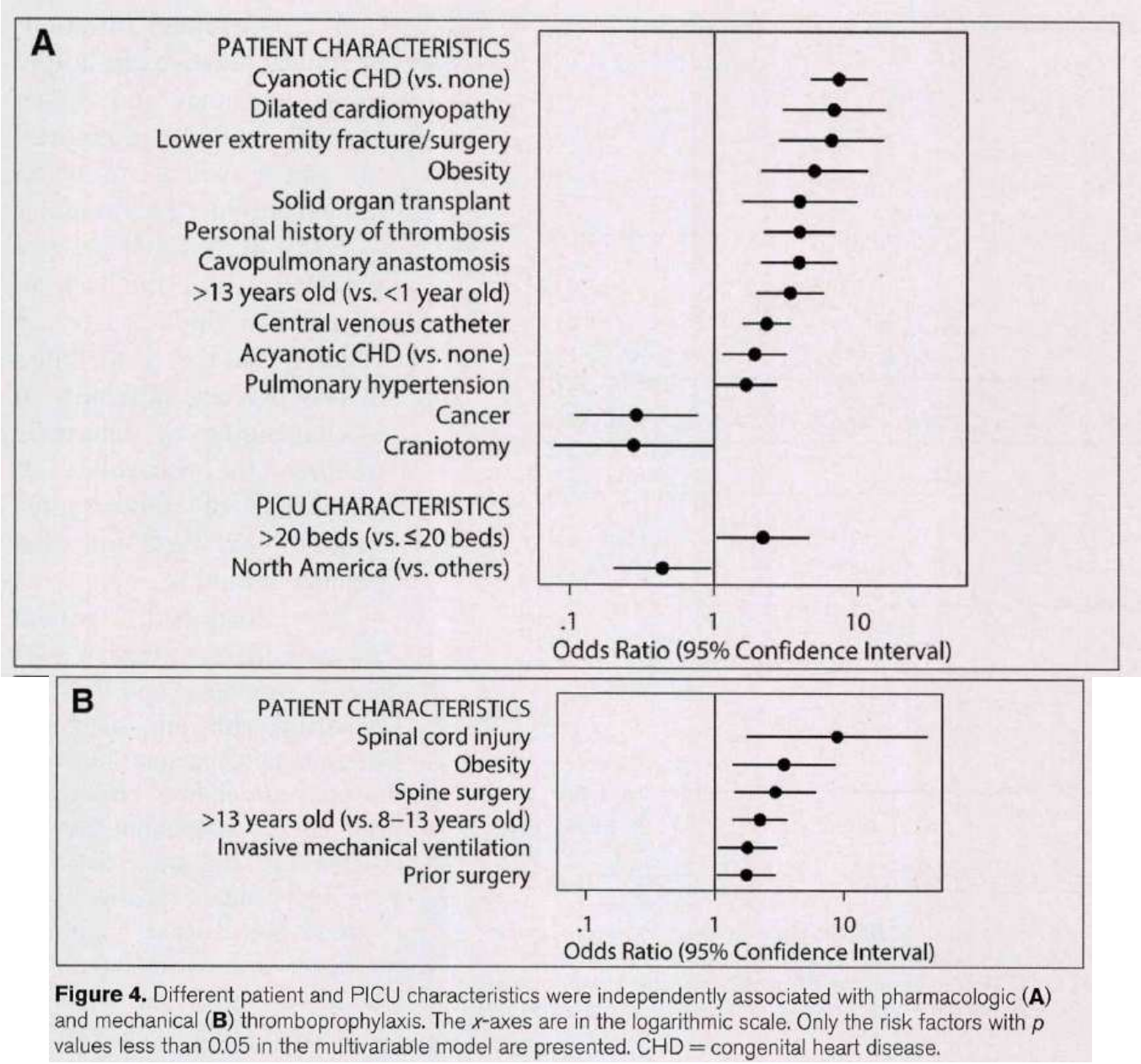


Figure 4. Different patient and PICU characteristics were independently associated with pharmacologic (**A**) and mechanical (**B**) thromboprophylaxis. The *x*-axes are in the logarithmic scale. Only the risk factors with *p* values less than 0.05 in the multivariable model are presented. CHD = congenital heart disease.

Sur VVC – REA - terrain

Tran Thrombosis Research 2018

Identification of a "VTE-rich" Population in Pediatrics – Critically Ill Children with Central Venous Catheters

Minh Tran M.D[1, 2]., Steven L. Shein M.D[1, 5]., Xinge Ji[3].,and Sanjay P. Ahuja M.D[4, 5].

Children's Hospitals' Solutions for Patient Safety
Every patient. Every day.

Réseau 135 centres américains
Web database
Prospectif
158 299 enfants réa + VVC
1602 Thromboses

VTE = 103 / 10 000

"VTE Rich" => ss groupe pour études ultérieures

Tunellisés << non tunellisés
PICC > VVC percut
Age < 1 an
Ventilation mécanique
KT cardiaque

VTE => mauvais pronostic
Ventilation prolongée (microthrombi?) et mortalité

Sur VVC - REA

Prévention

KT hépariné = échec (revue dans vidal 2014, Pierce 2000, Anton 2009 et Gilbert Lancet 2016 = **CATCH trial**),

HBPM

pas assez de preuve (cochrane Brandao 2014 (1 /17 études)

Massicote **PROTEKT trial** 2003 (HBPM) mais débuté tard 2,6 jours après pose du KT

Hypothèse de prévention = Timing

La thrombose se constitue dans les premiers jours après la pose du KT chez les patients de Réa du fait de l'hypercoagulabilité "temporaire", thrombose J1 = 2% - J4 quasi 100% =

Débuter thromboprophylaxie dans les 24h de la pose d'une VVC chez l'enfant en réa *?

CRETE trial NCT 03003390

Enoxaparine 0,75 mg/kg x2 / jr (eft < 2 mois)

Enoxaparine O,5 mg/kg x2 / jr (eft > 2 mois)

Ajusté sur antiXa = 0,2 – 0,5 UI/ml

**Si bas risque de saignement*

Thromboprophylaxie et enfant trauma

Original Investigation

Venous Thromboembolism After Trauma
When Do Children Become Adults?

Kyle J. Van Arendonk, MD, PhD; Eric B. Schneider, PhD; Adil H. Haider, MD, MPH; Paul M. Colombani, MD, MBA; F. Dylan Stewart, MD; Elliott R. Haut, MD

JAMA Surgery December 2013 Volume 148, Number 12

2008-2010
Database USA < 22 ans

1655 TVP / 402329 efts
0,4%

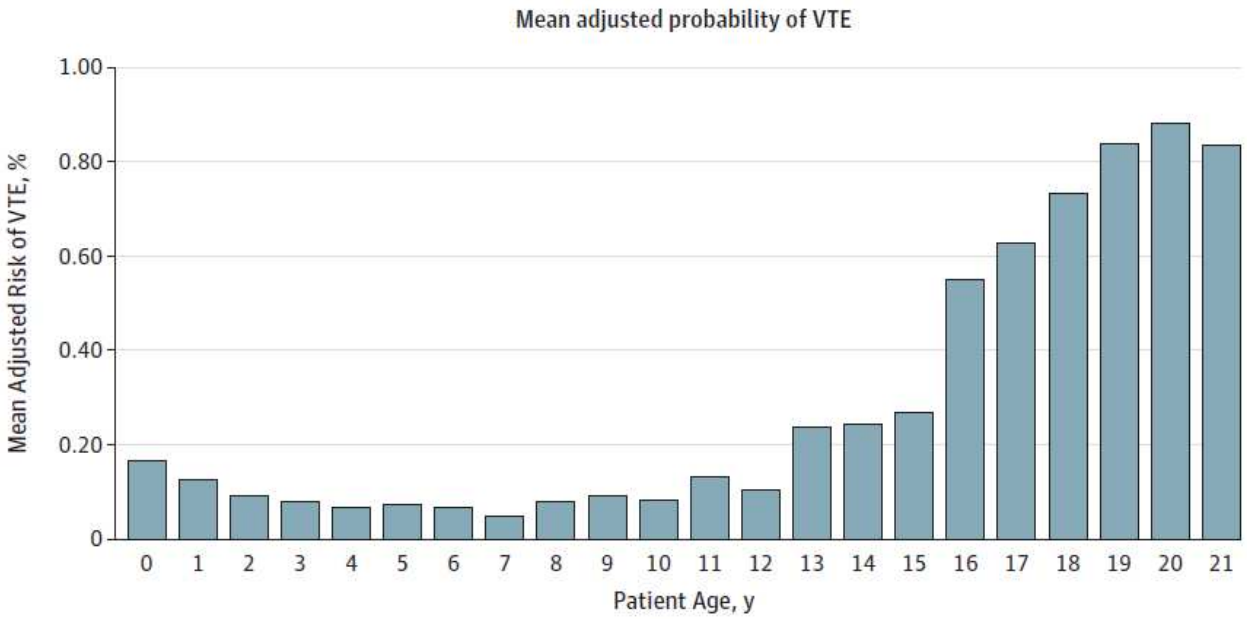


Table 3. Association of Various Patient Characteristics With the Likelihood of Developing Venous Thromboembolism (VTE) During Hospital Admission After Traumatic Injury

Characteristic	Adjusted Odds Ratio (95% CI)[a]	*P* Value
Age, y		
0-12	1 [Reference]	
13-15	1.96 (1.53-2.52)	<.001
≥16	3.77 (3.00-4.75)	<.001
Female sex	0.92 (0.83-1.03)	.10
Race/ethnicity		
White	1 [Reference]	
Black	0.98 (0.84-1.14)	.80
Other	0.68 (0.56-0.81)	<.001
Obesity	3.03 (2.25-4.08)	<.001
Injury Severity Score		
Mild, <9	1 [Reference]	
Moderate, 9-15	3.95 (3.07-5.08)	<.001
Severe, 16-24	5.94 (4.55-7.75)	<.001
Very severe, 25-75	7.19 (5.39-9.60)	<.001
Glasgow Coma Scale score		
Mild injury, 13-15	1 [Reference]	
Moderate injury, 9-12	1.34 (1.02-1.77)	.04
Severe injury, 3-8	1.31 (1.11-1.55)	.002
Mechanism of injury		
Blunt	1 [Reference]	
Penetrating	1.01 (0.86-1.17)	.90
Burn	1.11 (0.70-1.74)	.70
Other	0.79 (0.57-1.10)	.20
Insurance		
Private	1 [Reference]	
Public	1.00 (0.86-1.11)	.90
Self-pay	0.76 (0.62-0.94)	.01
Other or unknown	1.19 (0.97-1.46)	.09
Central line placement	1.33 (1.12-1.57)	.001
Blood transfusion	1.47 (1.21-1.77)	<.001
Intubation	2.54 (2.05-3.14)	<.001
Major surgery	3.84 (2.97-4.99)	<.001
Length of stay in the hospital, per day	1.03 (1.03-1.03)	<.001

[a] The adjusted odds ratios of VTE are from a multiple logistic regression model adjusting for all variables in the table.

Les outils de prédiction / trauma

Original Investigation | PACIFIC COAST SURGICAL ASSOCIATION

A Clinical Tool for the Prediction of Venous Thromboembolism in Pediatric Trauma Patients

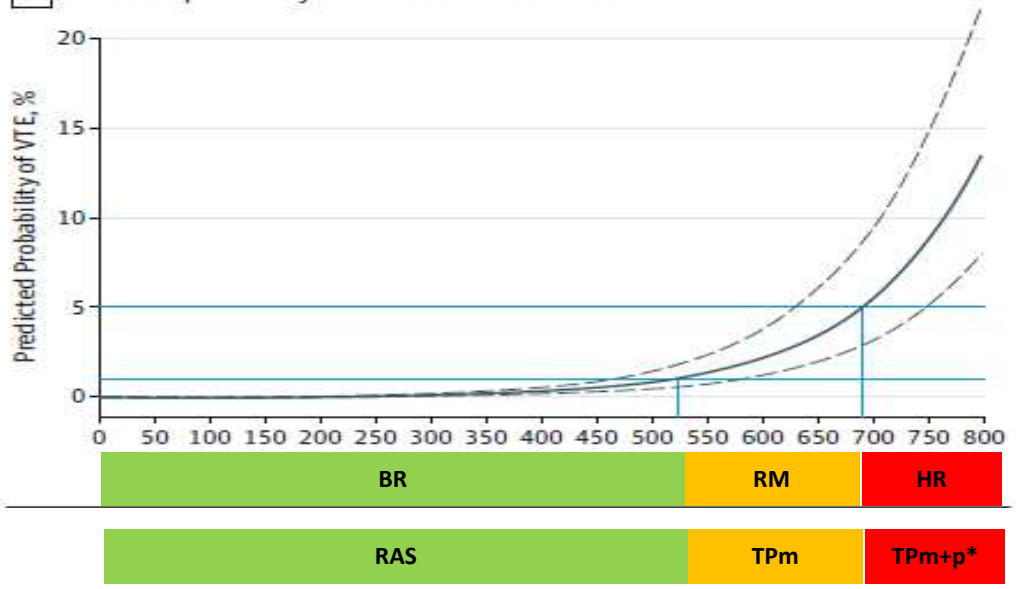
Christopher R. Connelly, MD; Amy Laird, PhD; Jeffrey S. Barton, MD; Peter E. Fischer, MD; Sanjay Krishnaswami, MD; Martin A. Schreiber, MD; David H. Zonies, MD; Jennifer M. Watters, MD

JAMA Surg. 2016;151(1):50-57. doi:10.1001/jamasurg.2015.2670

Retrospectif 2007-2012
Analyse retrospective
National trauma databank
1141 TVP / 536423 enfants
926 EP – 51 TVP+EP

risque entre 0 et 14,4%
Validation interne AUC 0,93
Validation externe nécessaire

B Predicted probability of venous thromboembolism



** = sauf contre indication*

Figure 2. Calculation of a Patient's Points Total and the Predicted Probability of Venous Thromboembolism (VTE) Given the Points Total

A Calculation of a patient's points total

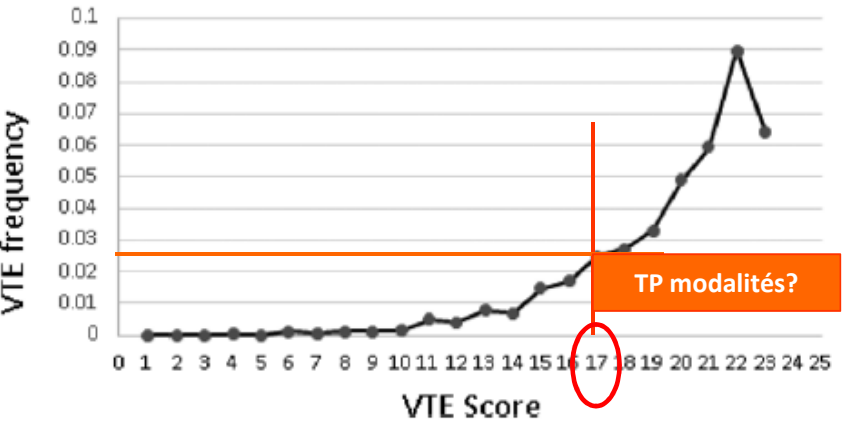
	Points	
Characteristic	**Model 3**	**Model 3I**
GCS score		
Mild, 13-15	+0	+0
Moderate, 9-12	+40	+29
Severe, 3-8	+34	+101
Age category, y		
0	+94	+94
1-9	+0	+0
10-12	+78	+78
13-15	+120	+120
16-17	+147	+146
Female sex	+4	+4
Male sex	+0	+0
Intubation	+97	+143
Admission to ICU	+171	+186
Transfusion of blood products	+58	+57
Central venous catheter placement	+61	+61
Pelvic fracture	+33	+32
Lower-extremity fracture	+36	+37
Major surgery	+150	+149
Intubation AND admission to ICU	NA	−51
GCS category moderate AND admission to ICU	NA	+10
GCS category severe AND admission to ICU	NA	−70

Les outils de prédiction / trauma

Risk Factors for Venous Thromboembolism in Pediatric Trauma Patients and Validation of a Novel Scoring System: The Risk of Clots in Kids With Trauma Score*

Yen et al PCCM 2016

Model 1



Model 2

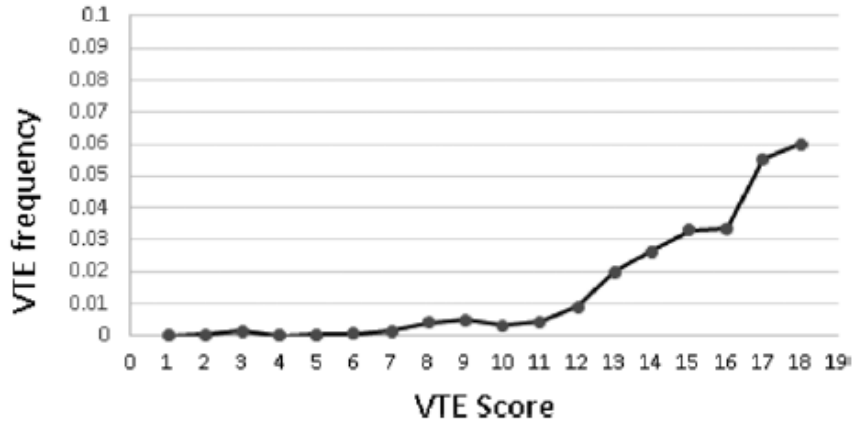


TABLE 3. Weighted Scoring Systems Based on Clinical Risk Factors to Predict Venous Thromboembolism in Pediatrics After Trauma

Clinical Factor	Adjusted ORs for Venous Thromboembolism		β-Coefficient[a]		Weighted Score (Rounded to Nearest Integer)	
	National Trauma Data Bank (2008–2010)[b]	Johns Hopkins Trauma Registry	Model 1	Model 2	Model 1	Model 2
Age (yr)						
0–12	[c]	[c]	[c]	[c]	0	0
13–15	2.0	3.8	0.65	0.64	2	1
16–21	3.8	5.2	1.31	1.36	4	2
Injury Severity Score						
0–8	[c]	[c]	[c]	[c]	0	0
9–15	4.0	4.2	1.59	1.71	5	5
16–24	5.9	10.8	1.59	1.71	5	5
25–75	7.2	15.7	2.21	2.59	7	7
Glasgow Coma Scale						
13–15	[c]	[c]	[c]	[c]	0	0
9–12	1.3	2.8	[c]	[c]	0	0
3–8	1.3	2.4	0.31	0.9	1	3
Blood transfusion						
No	[c]	[c]	[c]	[c]	0	0
Yes	1.5	2.8	0.51	0.61	2	1
Intubation						
No	[c]	NA	[c]	–	0	–
Yes	2.5	NA	1.25	–	4	–
Major surgery						
No	[c]	[c]	[c]	[c]	0	0
Yes	3.8	8.0	1.55	1.71	5	5

Efficacité des guidelines – trauma – critically ill –avant / après

Hanson J Trauma 2012

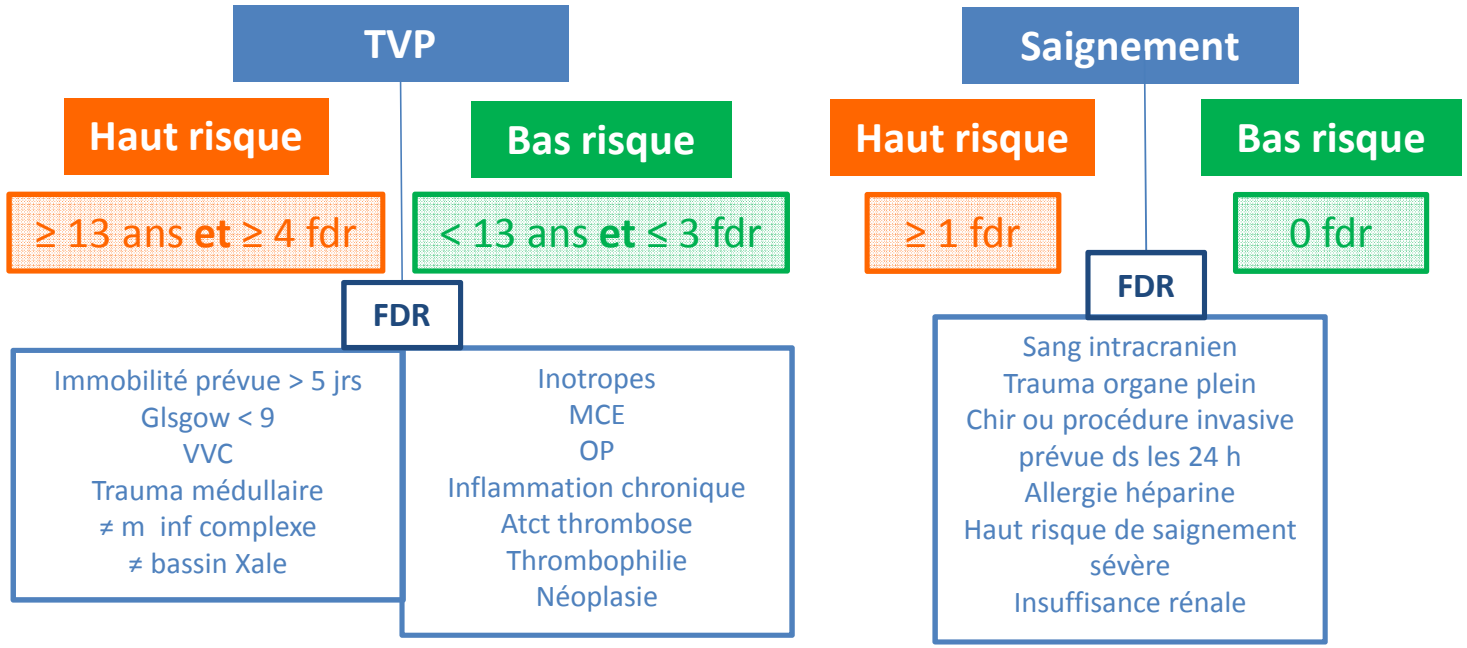
TVP	Saignement	Prévention primaire
HR	BR	HBPM 0,5 mg/kg x 2 / jr
HR	HR	CPI + echo J7 si tjrs PICU (Minf + sup si VVC) ± HBPM J7 si risque saignement bas à J7
Bas		∅

∅ prophylaxie = TVP = 6%

Adhésion
93% globale
67% qd TVP/ Haut et saignement/bas
26% echo J7

↘ TVP 5,2% à 1,8%
Echo J7 = 50% TVP infraclinique
0 saignement lié à prophylaxie

Réévaluer le risque jr/jr et débuter HBPM dès que BR de saignement
Coder en risque TVP bas les patients qui ne restent qu'un jour en PICU



Evaluation of guidelines for injured children at high risk for venous thromboembolism: A prospective observational study

Rachel M. Landisch, MD, Sheila J. Hanson, MD, MS, Laura D. Cassidy, MS, PhD, Kristin Braun, MS, RN, Rowena C. Punzalan, MD, *and* David M. Gourlay, MD, *Milwaukee, Wisconsin*

AAST 2016 Plenary Paper

J Trauma Acute Care Surg
Volume 82, Number 5

588 ICU / 4061 trauma 2010 -2015
Prospectif, monocentrique, USA
Haut risque TVP = 199 patients
TVP = 3,8% /total, 10% si HR, 14% si HRHR
56% < 13 ans
Age médian des TVP = 9,7 ans

Laparotomie de damage controle avec packing abdominal = 40% TVP

TVP

Haut risque

≥ 13 ans **et** PICU>48h
ou
< 13 ans et ≥4 fdr

Bas risque

≤ 3 fdr

TABLE 4. Multivariate Model of Age-Adjusted OR for VTE Risk

Variable	OR	95% CI	p*
CVC	5.2	1.12–24.30	0.04
Inotropes	7.7	1.92–31.09	0.00
Immobilization	5.5	1.56–19.14	0.01
GCS < 9	1.3	1.04–1.51	0.02
≥13 years old	1.6	0.61–4.13	0.34

*From multiple logistic regression analysis controlling for age dichotomized at 13 years.

TVP	Saignement	Prévention primaire
HR	BR	HBPM 0,5 mg/kg x 2 / jr dans les 24 h > admission
HR	HR	CPI + echo J7 si tjrs PICU (Minf + sup si VVC) ± HBPM dès que HRBR évalué jr/jr
BR		∅ ou CPI

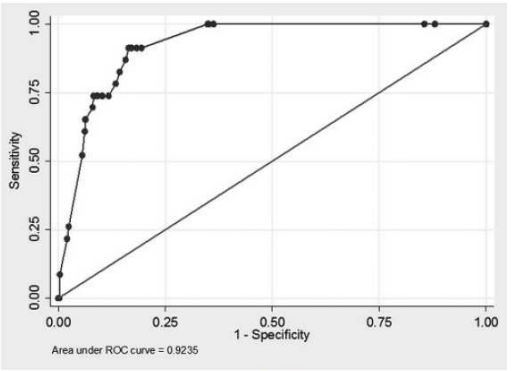


Figure 2. ROC analysis to predict VTE based on CVC, inotropes, immobilization, GCS < 9, and age. The area under ROC curve is 0.92, demonstrating its excellent predictive ability.

Venous thromboembolism prophylaxis in the pediatric trauma patient

John K. Petty, MD

Section of Pediatric Surgery, Department of General Surgery, Wake Forest School of Medicine, Medical Center Boulevard, Winston-Salem, North Carolina 27157

Seminars in Pediatric Surgery 26 (2017) 14–20

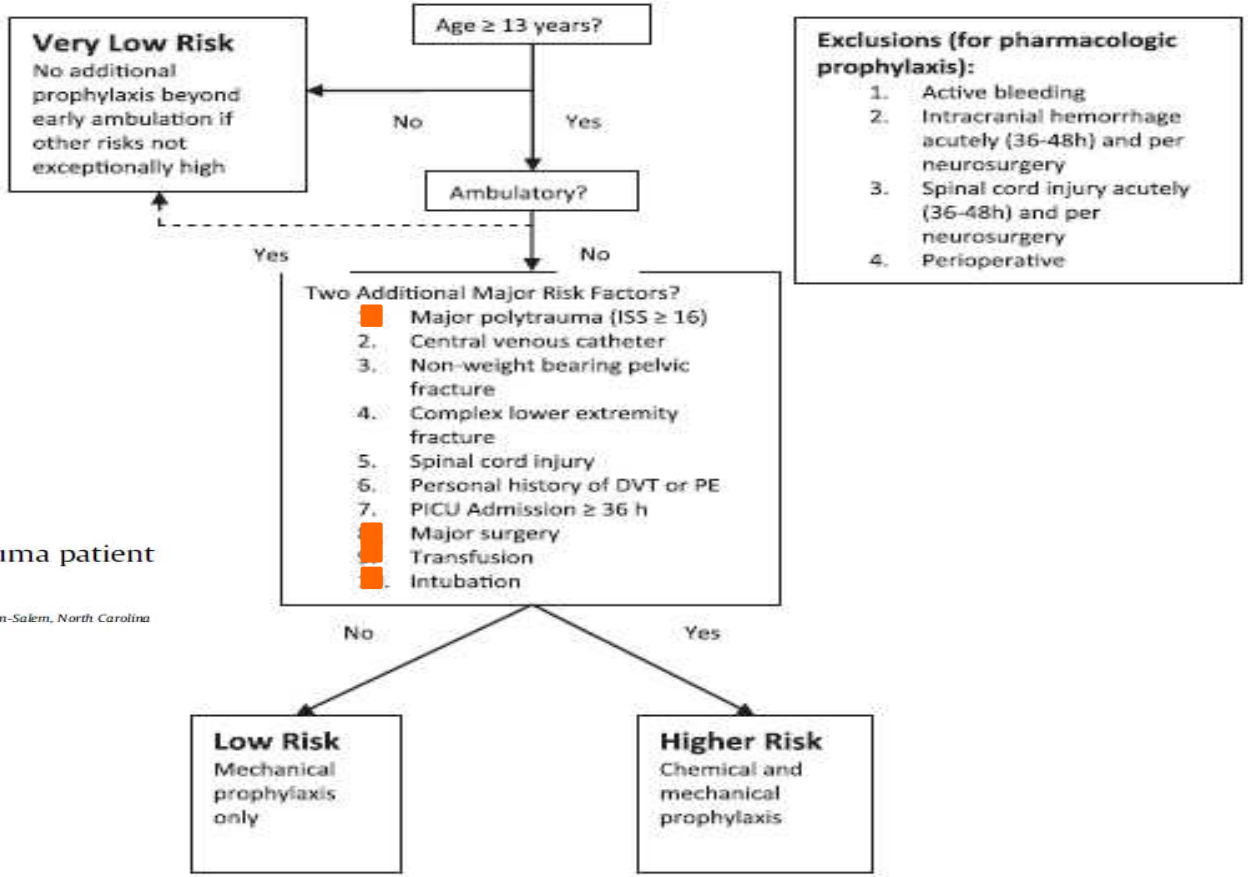


Fig. 2. VTE prophylaxis in injured children.

- Immobilité prévue > 5 jrs
- Glsgow < 9
- VVC
- Trauma médullaire
- ≠ m inf complexe
- ≠ bassin Xale

- Inotropes
- MCE
- OP
- Inflammation chronique
- Atct thrombose
- Thrombophilie
- Néoplasie

Que proposent les experts américains / enfant traumatisé ?

Etats unis - Pediatrie ≤ 15 ans
Methode delphi à 3 tours
Panel d'Experts multidisciplinaire
Consensus si agreement≥ 80%
Near consensus si 70 -79%

Recommendations for venous thromboembolism prophylaxis in pediatric trauma patients: A national, multidisciplinary consensus study

J Trauma Acute Care Surg
Volume 80, Number 5
PTS 2015 Plenary Paper

Hanson et al. J Trauma Acute Care Surg 2016

Moyens mécaniques et HBPM en attente
Si HR de saignement

Indication	Médian [range]
Xie ortho	1 jr [1-5jrs]
Xie thor Xie abdo	2 jrs [1-5jrs]
Trauma organes pleins	2 jrs [1-7jrs]
NeuroXie- Hémorragie intracranienne	3 jrs [1-14jrs]

Reco	Reco de Prophylaxie routine	FDR
Pas de reco	∅	∀ FDR associés
Reco weak	Légère	Si FDR (s) associés
Reco modéré	Modérée	
Reco forte	Forte	
Reco très forte	Forte	Même si ∅ FDR associés

Consensus
∅ prophylaxie systq ≤ 12 ans, exception possible
Prophylaxie mécanique si HR de sgnt ou CI
Indication de prophylaxie possible même si marche
Reco forte prophylaxie médicamenteuse si atcdt perso de TVP
Reco faible de prophylaxie médicamenteuse si VVC

Prophylaxis against venous thromboembolism in pediatric trauma: A practice management guideline from the Eastern Association for the Surgery of Trauma and the Pediatric Trauma Society

Arash Mahajerin, MD, MSCr, John K. Petty, MD, Sheila J. Hanson, MD, MS, A. Jill Thompson, PharmD, Sarah H. O'Brien, MD, Christian J. Streck, MD, Toni M. Petrillo, MD, *and* E. Vincent S. Faustino, MD, MHS, *Orange, California*

(*J Trauma Acute Care Surg.* 2017;82: 627–636.

Questions

P = enfants traumatisés
I = **p TP** doit elle être utilisée
C = *vs* pas de pTP
O = pour ↘ incidence des VTE

P = enfants traumatisés
I = **m TP** doit elle être utilisée
C = *vs* pas de mTP ou en association à pTP
O = pour ↘ incidence des VTE

P = enfants traumatisés
I = surveillance par **échographie**
C = *vs* examen clinique quotidien
O = pour ↘ incidence des VTE

Effet de l'âge / incidence MTVE

TABLE 2. Association of Age and VTE in Children Hospitalized After Trauma

Reference	Population	Age Group*	VTE Incidence**	Risk for VTE (95% CI)
Vavilala et al[22]	All trauma	<5	0.2	Reference group
		5–9	0.4	aRR, 2.0 (0.5–7.8)
		10–15	1.3	aRR, 5.0 (1.5–16.7)
Van Arendonk et al[7]	All trauma	<12	1	Reference group
		13–15	3	aOR, 2.0 (1.5–2.5)
		16–21	8	aOR, 3.8 (3.0–4.8)
Connelly et al[6]	All trauma	0	0.7	Reference group
		1–9	1.8	aOR, 0.4 (0.3–0.6)
		10–12	1.1	aOR, 0.9 (0.5–1.4)
		13–15	2.6	aOR, 1.3 (0.9–1.9)
		16–17	5.5	aOR, 1.7 (1.2–2.4)
O'Brien and Candrilli[19]	All trauma; >1 d in intensive care unit	<1	3.8	OR, 1.8 (1.4–2.3)
		1–4	1.8	Reference group
		5–9	1.8	OR, 1.0 (0.8–1.3)
		10–13	2.5	OR, 1.1 (0.9–1.4)
		14–17	6.2	OR, 2.3 (2.0–2.8)
		18–21	9.9	OR, 3.0 (2.5–3.6)
Harris and Lam[17]	Traumatic brain injury	<1	2.5	Reference group
		1–9	1.2	aOR, 0.8 (0.4–1.9)
		10–14	2.3	aOR, 1.5 (0.6–3.5)
		15–20	7.6	aOR, 3.7 (1.8–8.0)
Jones et al[18]	Spinal cord injury	<14	11	aOR, 0.2 (0.1–0.7)
		14–19	44	aOR, 0.7 (0.5–1.0)
		30–49	67	Reference group

*In years.
**Per 1,000 children.
aOR indicates adjusted odds ratio; ARR, adjusted risk ratio.

Effet de l'ISS / incidence MTVE

TABLE 3. Association of ISS and VTE in Children Hospitalized After Trauma

Reference	Population	Score	VTE Incidence*	Risk for VTE (95% CI)
Candrilli[3]	All trauma	<9	0.9	Reference group
		9–15	4	aOR, 2.1 (1.5–3.1)
		16–25	5	aOR, 2.5 (1.6–3.7)
		>25	16	aOR, 3.5 (2.0–6.2)
Vavilala et al[22]	All trauma	<9	0.2	Reference group
		9–15	1.5	aRR, 5.8 (2.4–13.6)
		16–24	2.2	aRR, 7.4 (2.5–21.4)
		≥25	8.1	aRR, 21.4 (8.4–54.3)
Van Arendonk et al[7]	All trauma	<9	0.4	Reference group
		9–15	3	aOR, 4.0 (3.1–5.1)
		16–24	6	aOR, 5.9 (4.6–7.8)
		25–75	26	aOR, 7.2 (5.4–9.6)
Connelly et al[6]	All trauma	<9	0.3	Not reported
		9–15	1.4	Not reported
		16–24	5.3	Not reported
		25–75	19	Not reported
Cyr[15]	Severe injury admitted to intensive care unit or length of stay >72 h	<9	Not reported	Reference group
		≥9	Not reported	OR, 5.3 (1.6–17.3)
O'Brien and Candrilli[19]	Trauma >1 d in intensive care unit	<9	0.9	Not reported
		9–15	2.9	Not reported
		16–24	5.8	Not reported
		≥25	14	Not reported

*Per 1,000 children.
aOR indicates adjusted odds ratio; ARR, adjusted risk ratio.

Effet des autres FDRs / incidence MTVE

TABLE 4. Association of Other Putative Risk Factors and VTE in Children Hospitalized After Trauma

Putative Risk Factor	No. of Studies (With Odds Ratios)	Range of Odds Ratios	GRADE Quality Level
Central venous catheter[7,13,15–17,19,20,22]	8 (7)	1.3–64.0	C
Major surgery*[7,19,20,22]	4 (3)	0.8–5.0	C
Acute spinal cord injury[7,15,16,19,20,22]	6 (3)	1.8–37.4	C
Pelvis fracture[7,13,19,20,22]	5 (2)	1.2–1.6	C
Femur fracture[7,13,16,19,20,22]	6 (3)	1.0–3.3	C
Head injury[7,19,20,22]	4 (2)	1.3–4.8	C
Abdominal injury[7,15,22]	3 (1)	7.7	C
Chest injury[7,15,22]	3 (2)	2.7–6.9	C
Obesity[7]	1 (1)	3.0	C
Mechanical ventilation[7,17,19,20]	4 (3)	0.9–2.5	C
Recombinant factor VIIa[16]	1 (0)	—	D
Immobilization**[16]	1 (1)	0.8–10	C

Reco américaines / enfant traumatisé - 2017

Age	TPp	TPm	Echo active
> 15 ans	Considérer	Considérer	NR
< 15 ans pubère	Considérer si ISS > 25	Considérer si ISS>25 et si taille adaptée	NR
Pré pubère	Pas en routine même si ISS >25	-	NR
P = stade 2 tanner + pilosité pubienne (9-10 ans /ethnie) Impact des FDRs +++	Pas assez de preuve de l'efficacité de la pTP chez l'enfant Prudence des soignants	Très bas niveau de preuve de l'efficacité mais B B/R favorable et compliance des soignants	Dc de TVE + précoce (3 jrs) Cout +++

Besoin urgent d'essais randomisés grands effectifs pour valider efficacité et la sécurité de la stratégie de TP chez l'enfant traumatisé

Reco APAGBI – enfant traumatisé - 2017

Trauma

- There is little evidence in the literature to support VTE prophylaxis in preadolescent children irrespective of their ISS and current opinion supports this.
- The incidence of VTE in adolescents remains much lower than adults, there are reports in the literature suggesting a relation to ISS, there is however no consensus on the level of ISS which should trigger prophylaxis. This ambiguity which exists in the literature is reflected by the apparent uncertainty in current practice. It would seem reasonable to consider prophylaxis with an ISS > 9, and administer it when the ISS is >25. Specific detail of the injuries contributing to the ISS and the coexistent treatment may lower the threshold for instigating prophylaxis. (D)

Age	TPp	TPm
Pubère	Considérer si ISS > 9 Recommandé si ISS > 25 Abaisser le seuil si FDRs	Oui ? > 13 ans > 40 kg > 1h
Pré adolescent	NR	Non précisé

Reco APAGBI – Traumatisé cranien- 2017

Age	TPp	TPm
Pubère	Pas recommandé mais envisagé si FDRs (ventilation prolongée, immobilisation, polyT) Et ∅ saignement intracranien	Oui ? > 13 ans > 40 kg > 1h
Pré adolescent	Non en routine	Non précisé

Risk of deep venous thrombosis in elective neurosurgical procedures: a prospective, Doppler ultrasound–based study in children 12 years of age or younger

Andrea G. Scherer, MD, Ian K. White, MD, Kashif A. Shaikh, MD, Jodi L. Smith, PhD, MD, Laurie L. Ackerman, MD, and Daniel H. Fulkerson, MD

J Neurosurg Pediatr May 5, 2017

100 patients > 12 ans
∅ mTP ∅ pTP
∅ TVP

Enfant différent de l'adulte / reco EJA 2017 / neuroXie adulte?

Reco APAGBI – Spinal cord injury- 2017

Age	TPp	TPm
si ∅ paralysie ou cause d'↗ l'immobilité	NR	Oui ? > 13 ans > 40 kg > 1h

Filtre cave non évoqué dans APAGBI
Non recommandé dans les reco NICE

↗ filtres cave prophylactiques chez les adolescents traumatisés

IVC filter placements in children: nationwide comparison of practice patterns at adult and children's hospitals using the Kids' Inpatient Database

Ped radiol 2017

Vibhor Wadhwa[1] · Premal S. Trivedi[2] · Sumera Ali[3] · Robert K. Ryu[4] · Amir Pezeshkmehr[1]

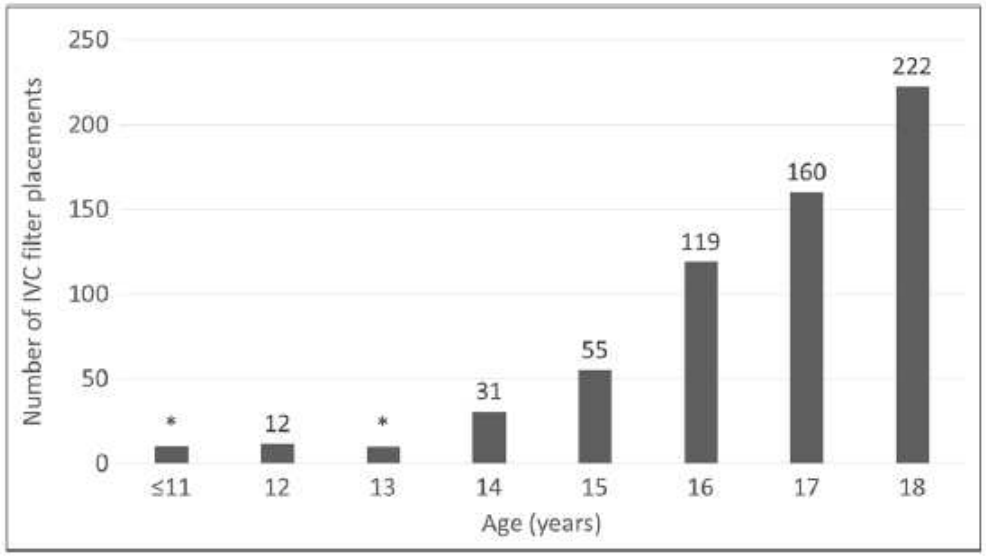


Fig. 1 Number of IVC filter placements in children in 2012 stratified by age. (*cell size ≤10)

Kids Inpatient database + ICD-9
USA 2012 < 18 ans
Qui fait quoi chez qui ?

618 enfants , 60% garçons,
IVC Prophylactiques (54%) / hop adultes / trauma
IVC Thérapeutiques (46%) / hop enfant

Limites +++
Codage administratif, étude rétrospective
Filtre temporaires ou définitifs?
Devenir à long terme?
Analyse cout / bénéfice ?

Reco APAGBI – fractures - 2017

- VTE prophylaxis is not required in isolated limb fractures in either prepubertal or adolescent children.(D)
- There is little support for the use of VTE prophylaxis in multiple limb fractures in prepubertal children.
- Uncertainty exists with regard to VTE prophylaxis in multiple limb fractures in adolescents with a tendency to avoiding it in the absence of any additional risk factors.

Age	pTP
Fracture simple ∀ âge	NR
Fractures multiples	
- Pubère	Plutôt non si ∅ FDR
- Pré adolescent	NR

Reco APAGBI – Brûlé - 2017

Age	pTP
Pubère	Discuter si SCB > 20% FDRs VVC infection, obésité
Pré adolescent	NR



Thromboprophylaxie péri - opératoire enfant

APAGBI 2017 - 2018

Recommandations NICE > 16 ans actualisation mars 2018

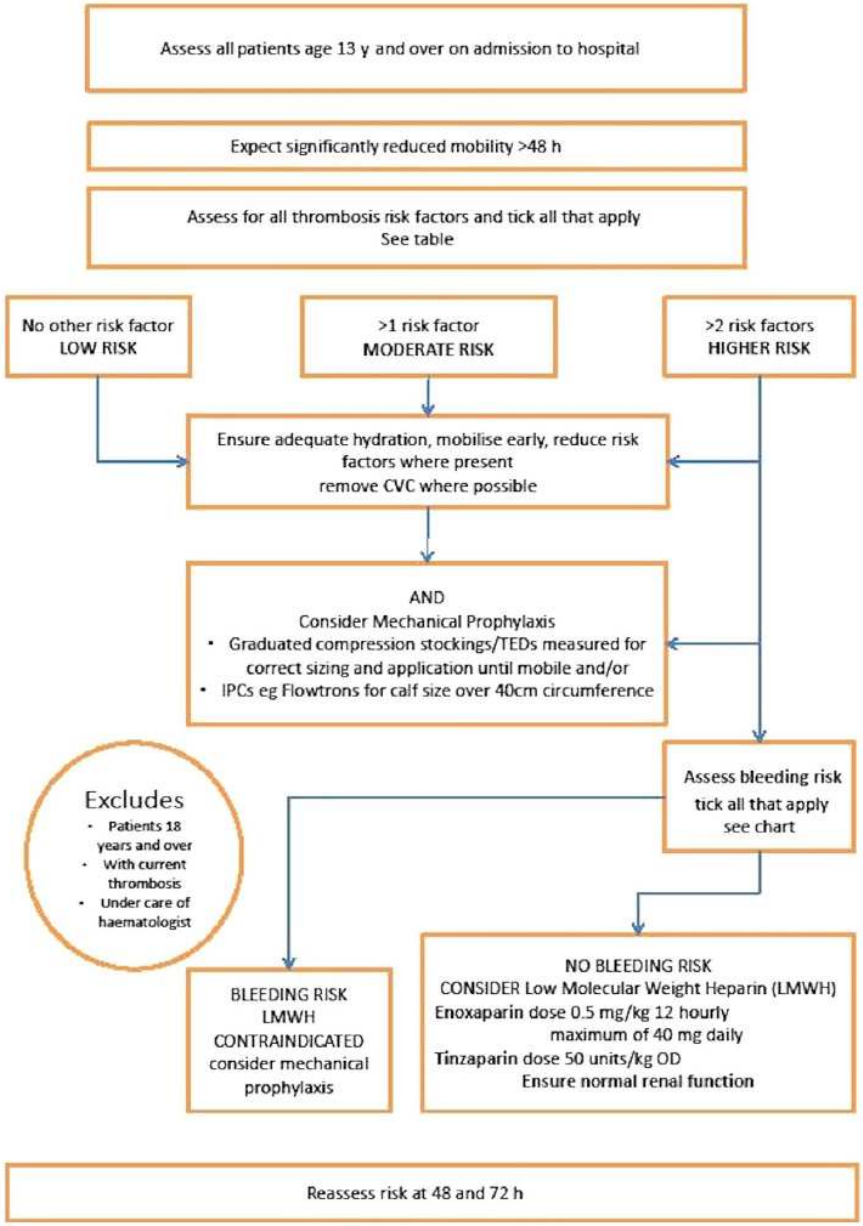


FIGURE 1 Decision-making algorithm for thromboprophylaxis in children

TABLE 5 Risk assessment form for venous thromboembolism (VTE) for adolescents age 13 years +

RISK ASSESSMENT FOR VENOUS THROMBOEMBOLISM (VTE) FOR ADOLESCENTS AGE 13 YEARS +			
Date of admission		PLEASE AFFIX PATIENT LABEL HERE	
Risk assessed by			
Designation			
Signature			
Date			
Review the patient related factors shown on the assessment sheet for thrombosis risk, ticking each and any box that applies. Clinicians may consider further risks apply in addition to those listed.			
Bleeding risk			
Patient related	**Tick**	**Admission Related**	**Tick**
Acquired bleeding disorders (such as acute liver failure)		Neurosurgery, spinal surgery or eye surgery	
Untreated inherited bleeding disorders (such as haemophilia and von Willebrand's disease)		Neurosurgery, spinal surgery or eye surgery	
Concurrent use of anticoagulants known to increase the risk of bleeding (such as warfarin with INR >2)		Lumbar puncture/epidural/spinal anaesthesia expected within the next 12 hours	
Thrombocytopenia		Lumbar puncture/epidural/spinal anaesthesia within the previous 4 hours	
Uncontrolled systolic hypertension (>230/120 mmHg)		Active bleeding	
Thrombosis Risk			
Patient related	**Tick**	**Admission Related**	**Tick**
Central venous Catheter		Significantly reduced mobility for 3 days or more	
Active cancer or cancer treatment		Severe Trauma with ISS score >9	
Dehydration		Spinal cord injury with paralysis	
Known thrombophilias		Total anaesthetic + surgical time > 90 minutes	
Obesity (BMI> 30kg/m2)		Acute severe sepsis	
One or more significant medical comorbidities (e.g. congenital or low output heart disease, sickle cell disease, metabolic or inflammatory conditions)		Surgery involving pelvis or lower limb with a total anaesthetic + surgical time > 60 minutes	
Personal history of VTE first-degree relative with a history of VTE age <40 years		Critical care admission intubated and ventilated	
Use of oestrogen-containing contraceptive therapy		Severe burns	
Pregnancy or < 6 weeks post partum (see NICE guidance for specific risk factors)			
If an increased risk of bleeding is documented on the risk assessment – thromboprophylaxis with LMWH is relatively contraindicated			
Prescribe the appropriate intervention if required and complete all the prescription chart documentation			
Outcome *(tick any that apply)*			
No Thromboprophylaxis			
Mechanical Thromboprphylaxis			
LMWH			
Completed by : **Date :**			

Assess all patients age 13 y and over on admission to hospital

Expect significantly reduced mobility >48 h

Assess for all thrombosis risk factors and tick all that apply
See table

Limites =
Les patients de moins de 13 font aussi des thromboses

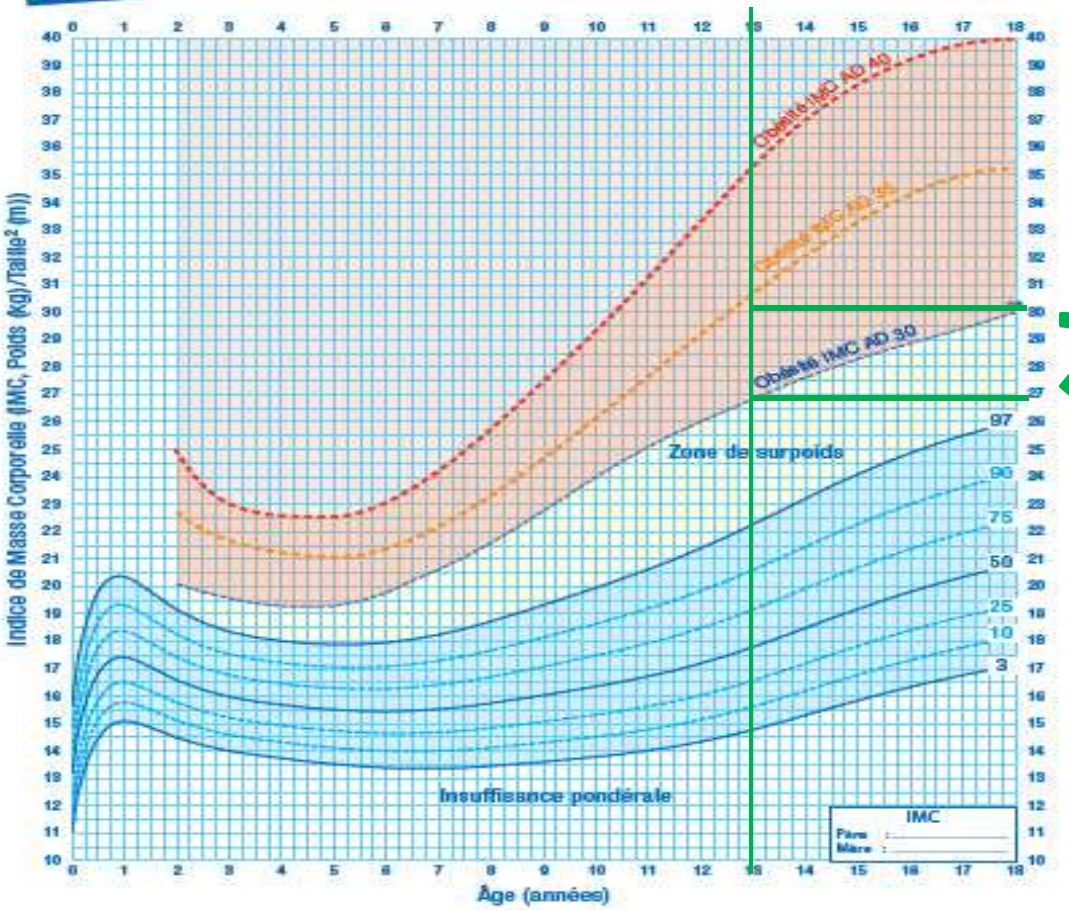
FDR =

Thrombosis Risk			
Patient related	**Tick**	**Admission Related**	**Tick**
Central venous Catheter		Significantly reduced mobility for 3 days or more	
Active cancer or cancer treatment		Severe Trauma with ISS score >9	
Dehydration		Spinal cord injury with paralysis	
Known thrombophilias		Total anaesthetic + surgical time > 90 minutes	
Obesity (BMI> 30kg/m2)		Acute severe sepsis	
One or more significant medical comorbidities (e.g. congenital or low output heart disease, sickle cell disease, metabolic or inflammatory conditions)		Surgery involving pelvis or lower limb with a total anaesthetic + surgical time > 60 minutes	
Personal history of VTE first-degree relative with a history of VTE age <40 years		Critical care admission intubated and ventilated	
Use of oestrogen-containing contraceptive therapy		Severe burns	
Pregnancy or < 6 weeks post partum (see NICE guidance for specific risk factors)			

Programme National Nutrition Santé

Courbe de Corpulence chez les garçons de 0 à 18 ans*

Nom : _____ Prénom : _____ Date de naissance : _____



Courbe graduée en percentiles disponible sur www.sante.fr (Ministère → les dossiers → N → Nutrition), établie en collaboration avec Mlle Rolland-Cachera (INSERM) et l'Association pour la Prévention et la prise en charge de l'Obésité en Pédiatrie (APCOP) et validée par le Comité de Nutrition (CN) de la Société Française de Pédiatrie (SFP) ; modifiée par l'équipe de l'hôpital Robert-Debré à partir des courbes validées par le PNNS (www.sante.fr) et de la distribution de l'IMC calculée par la méthode LMS (Rolland-Cachera et al, Eur J Clin Nutr 1991).

* Données de l'étude séquentielle française de la croissance du Centre International de l'Enfance (Fr Michel Sempé) - Rolland-Cachera et coll. Eur J Clin Nutr 1991;45:13-21

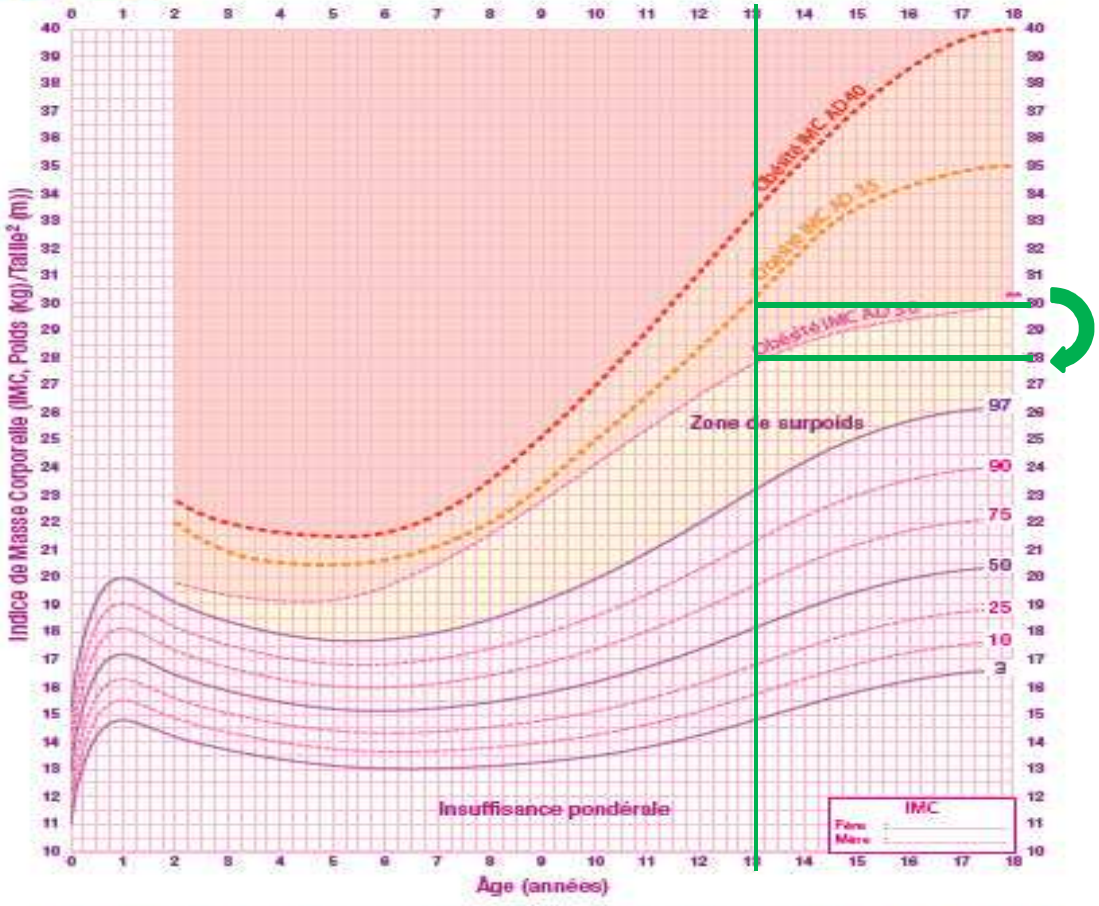
** Seuil établi par l'International Obesity Task Force (IOTF) - Cole et coll. BMJ 2000;320:1240-3

www.sante.fr

Programme National Nutrition Santé

Courbe de Corpulence chez les filles de 0 à 18 ans*

Nom : _____ Prénom : _____ Date de naissance : _____

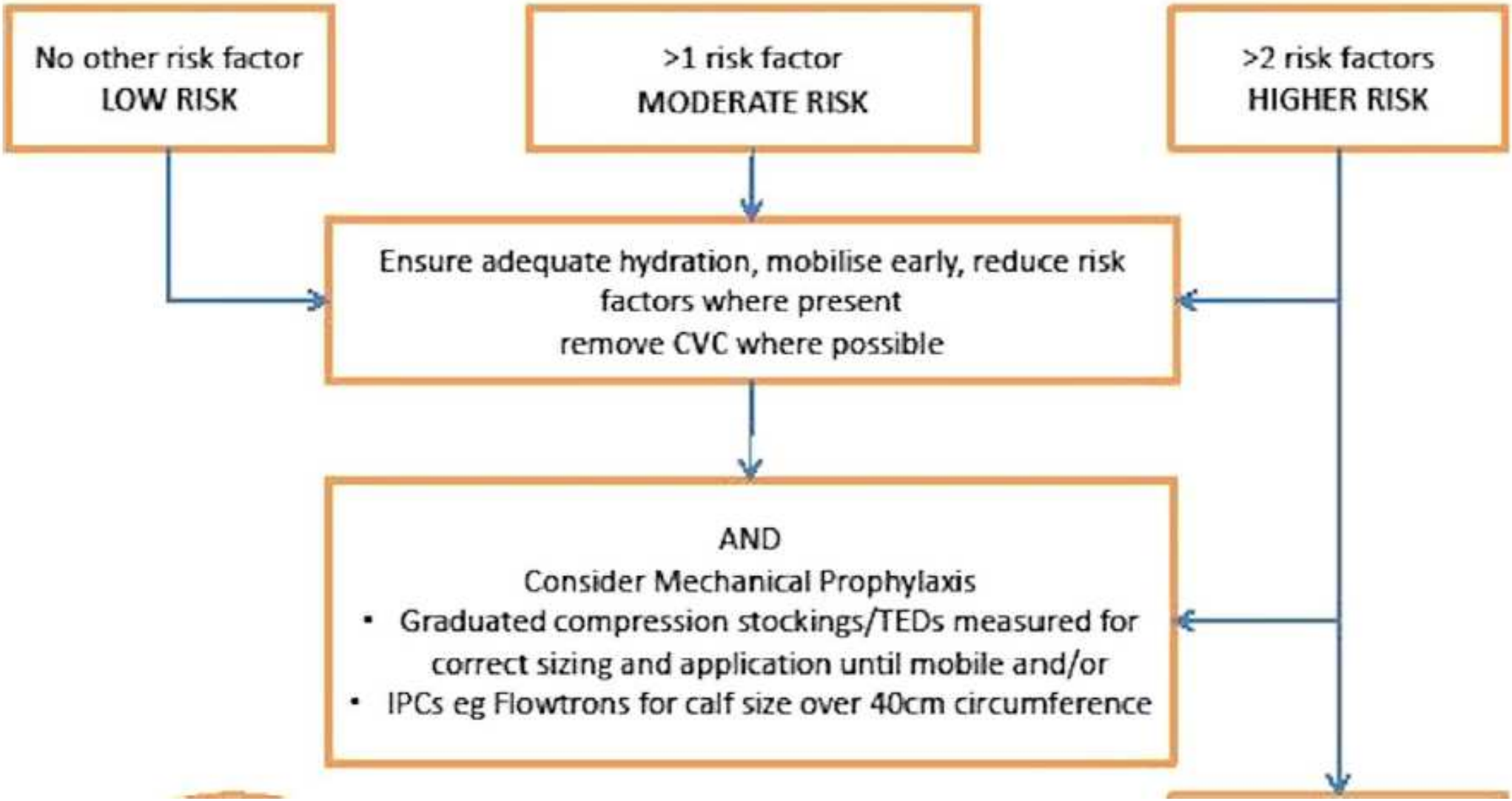


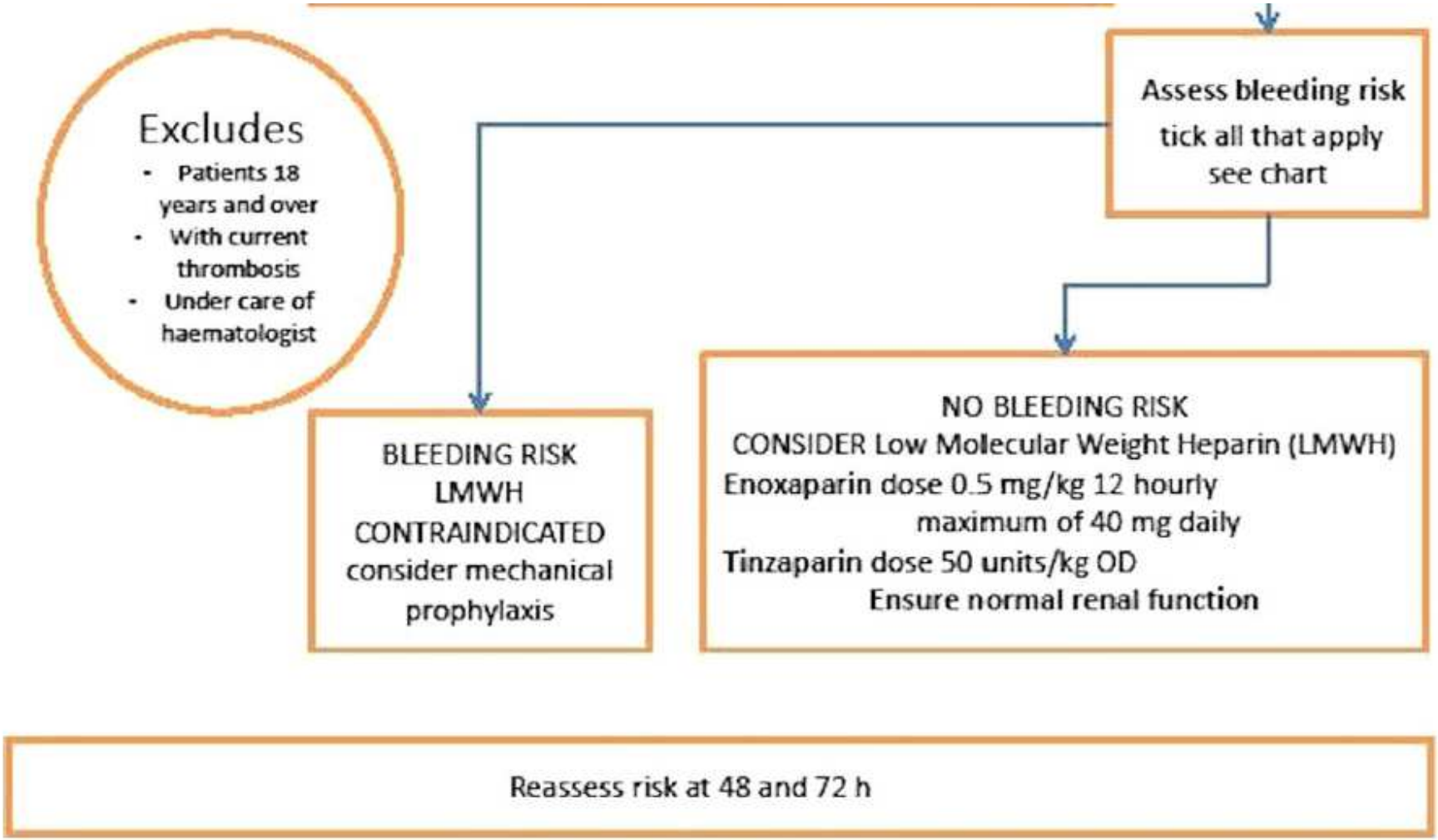
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** Seuil établi par l'International Obesity Task Force (IOTF) - Cole et coll. BMJ 2000;320:1240-3

www.sante.fr


No other risk factor
LOW RISK
>1 risk factor
MODERATE RISK
>2 risk factors
HIGHER RISK
Ensure adequate hydration, mobilise early, reduce risk factors where present
remove CVC where possible
AND
Consider Mechanical Prophylaxis
• Graduated compression stockings/TEDs measured for correct sizing and application until mobile and/or
• IPCs eg Flowtrons for calf size over 40cm circumference


Excludes
- Patients 18 years and over
- With current thrombosis
- Under care of haematologist
Assess bleeding risk
tick all that apply
see chart
BLEEDING RISK
LMWH
CONTRAINDICATED
consider mechanical prophylaxis
NO BLEEDING RISK
CONSIDER Low Molecular Weight Heparin (LMWH)
Enoxaparin dose 0.5 mg/kg 12 hourly
maximum of 40 mg daily
Tinzaparin dose 50 units/kg OD
Ensure normal renal function
Reassess risk at 48 and 72 h

Review the patient related factors shown on the assessment sheet for thrombosis risk, ticking each and any box that applies. Clinicians may consider further risks apply in addition to those listed.			
Bleeding risk			
Patient related	**Tick**	**Admission Related**	**Tick**
Acquired bleeding disorders (such as acute liver failure)		Neurosurgery, spinal surgery or eye surgery	
Untreated inherited bleeding disorders (such as haemophilia and von Willebrand's disease)		Neurosurgery, spinal surgery or eye surgery	
Concurrent use of anticoagulants known to increase the risk of bleeding (such as warfarin with INR >2)		Lumbar puncture/epidural/spinal anaesthesia expected within the next 12 hours	
Thrombocytopenia		Lumbar puncture/epidural/spinal anaesthesia within the previous 4 hours	
Uncontrolled systolic hypertension (>230/120 mmHg)		Active bleeding	

Reco APAGBI – Chirurgie générale – orthopédie - trauma

Pré pubère ∅ FDR => pas de prophylaxie

Hanche, scoliose, pelvis – Adolescent - ∅ FDR => pas de prophylaxie en routine (méca systématique ?)

Chirurgie very majeure – adolescent => prophylaxie mécanique

Multiples FDR autres => discuter HBPM

≥ 13 ans ≥ 40 kg - Xie > 1,5h => CPI ± TED dès le per opératoire

Qui le pratique déjà, combien çà coute ?

HBPM qd FDR ajoutés

Stop OP M-1

Thromboprophylaxie / scoliose idiopathique

Etude préliminaire sur 40 SCLIO = 2 thrombus transitoires non traités asymptomatiques echo J3 J7 J15

2 TVP – 1 EP / 58197 AIS *(Coe Spine 2006)*

Registres américains
Rétrospectifs

NIS 2001- 2010 = Complications MTVE /21955 scolioses
(Jain Spine 2014) *(Thromboembolic complications in children after spinal fusion surgery)*
incidence de 0,1 à 0,4%
FDR = âge (↗OR1,4/année),scoliose neuro, congénitale, fractures

pas d'info sur prophylaxie

NIS 2002-2011 = complications = 36335 scolioses
(De la Garza Ramos JNS pediatrics 2016)
TVP <0,3% EP <0,3% -

Protocole GRACE 2017 = prévention recommandée si pilosité pubienne, modalités non précisées

Qui prescrit des HBPM en post op de scoliose idiopathique pubère sans FDR ajouté ?
Qui a changé sa CAT après APAGBI 2018 ?

Thromboprophylaxis Guideline

The Royal Children's Hospital Melbourne

https://www.rch.org.au/haematology/anticoagulaton_service/thromboprophylaxis/

All Victorian Hospitals must have a formal thromboprophylaxis plan and RCH is no exception.

Primary Prophylactic anticoagulation recommended
Prosthetic Valves
Pulmonary Hypertension
Cardiomyopathy
Post-Fontan surgery and patients with artificial conduits
Children with long term CVLs for infusion of TPN
Children admitted with major (>30%) burns who have a central venous line *insitu.*

All children requiring such primary thromboprophylaxis for the above indications should be referred to the Clinical Haematology department for management

Pour les autres patient cf protocoles pour définir qui bénéficiera d'une prévention primaire mais la dose d'enoxaparine (clexane) et bien inférieure à celle proposée par apagbi
Ici c'est clexane 20 mg *1/jr (< 50 kg) - 40 mg * 1 /jr (> 50 kg)

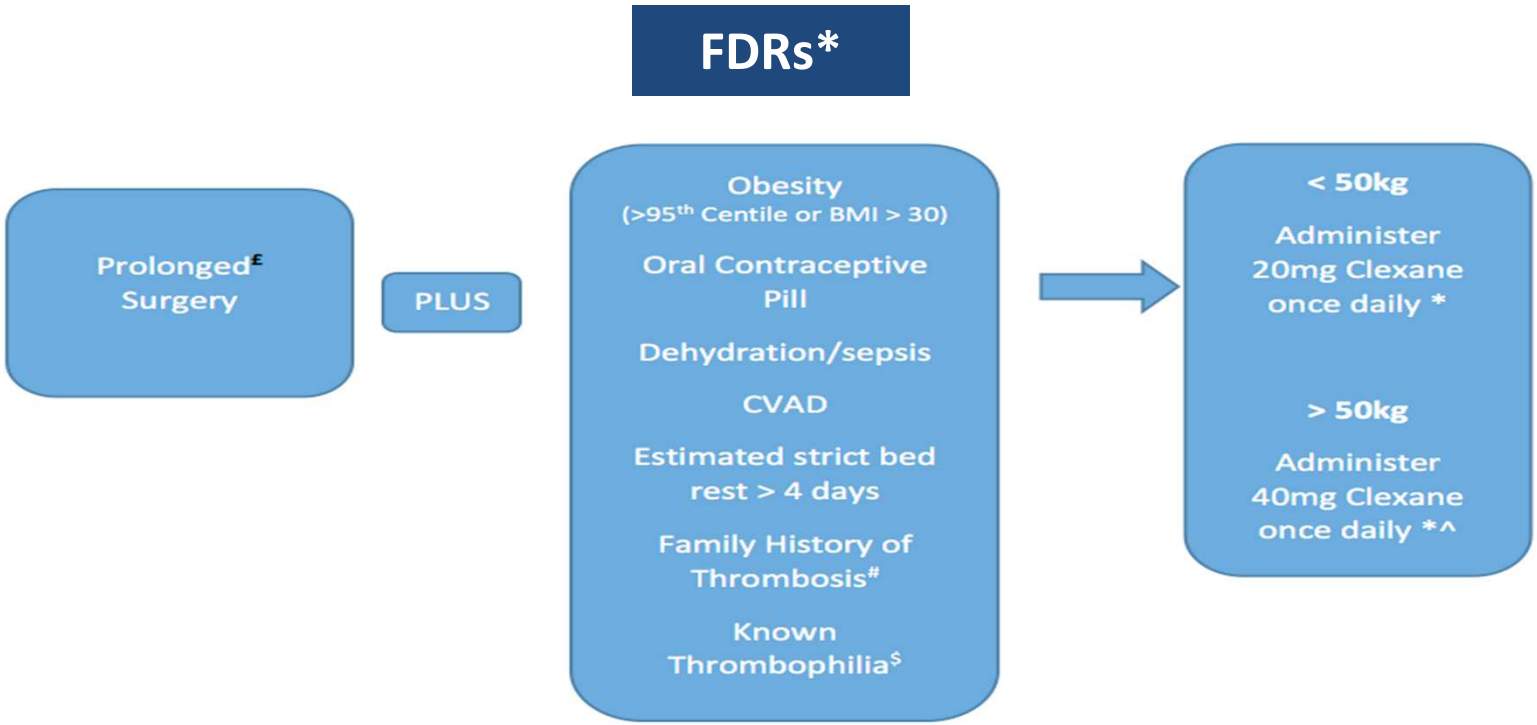
Pas d'HBPM avec KT APD en place

Standart = puberté cut off
Cas particuliers
USI
Chir prolongée (> 4h)

Chirurgie prolongée (>4h) (ou cas particulier Xie thrombogène)

Pré pubère = >Prévention et mécanique
Post pubère ∅ FDR* => prévention et mécanique
Post pubère + FDR*(s) =>mécanique + HBPM

Avis hémato facile+

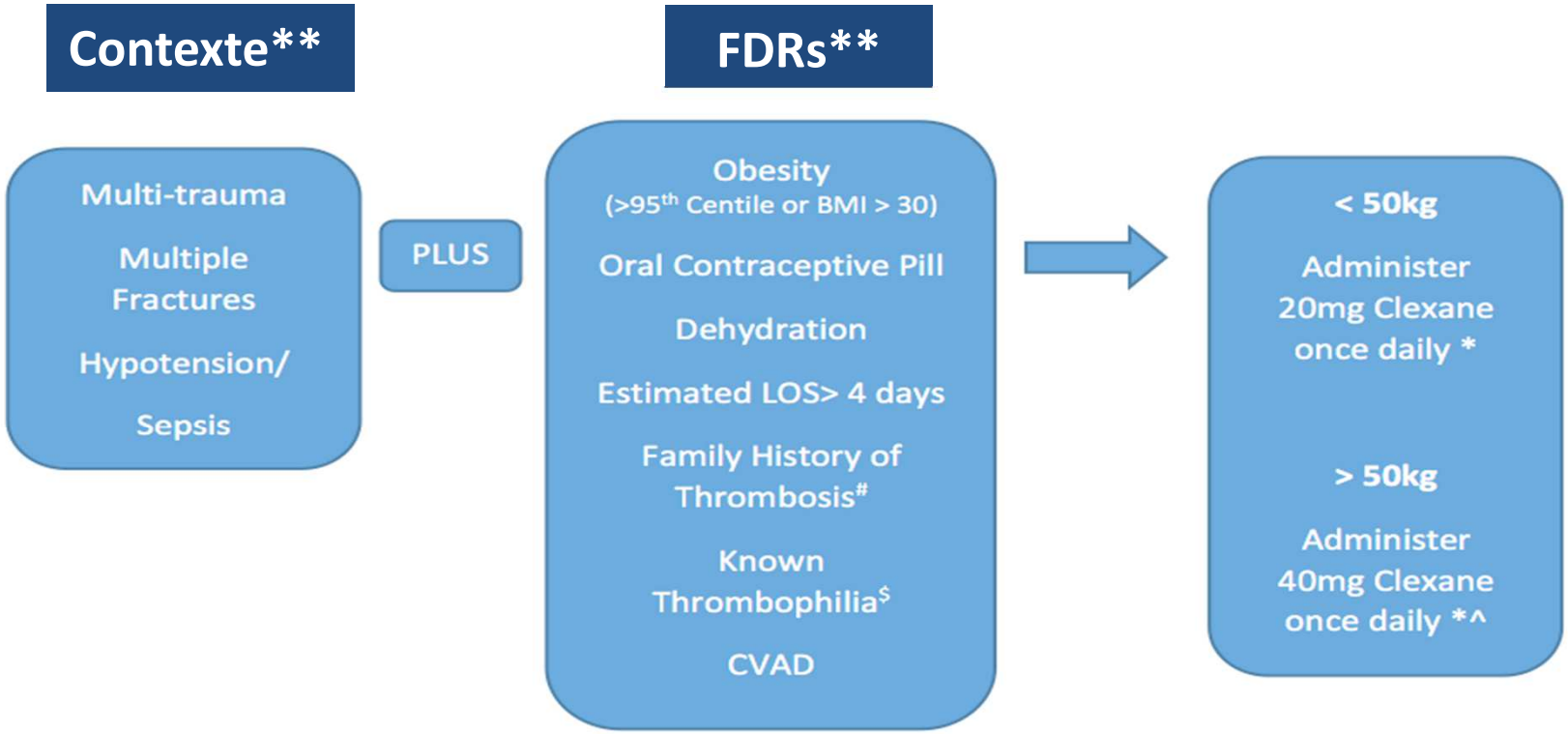


Nb Pas de néonat

Soins Intensif réanimation

Pré pubère = >Prévention et mécanique, rares indications d'HBPM
Post pubère sans contexte** => prévention et mécanique
Post pubère + contexte** + 1 FDR**(s) =>mécanique + HBPM

ou



Chirurgie abdomino pelvienne

Risk Factor	Odds Ratio (95% C.I.)	P-value	Log Odds Ratio	Score Assigned
Intercept	-9.97 (-11.95, -8.00)	< 0.001		
Age in years				
≤ 15 years old	Reference	---	---	0
> 15 years old	1.52 (0.92, 2.11)	< 0.001	0.42	1
Duration of Anesthesia in hours				
≤ 2 hours	Reference	---	---	0
> 2 or ≤ 4 hours	0.82 (0.19, 1.45)	0.01	-0.20	1
> 4 or ≤ 6 hours	1.36 (0.60, 2.13)	< 0.001	0.31	2
> 6 or ≤ 8 hours	1.75 (0.76, 2.75)	< 0.001	0.56	3
American Society of Anesthesiology Physical Status Classification				
ASA Class 1	Reference	---	---	0
ASA Class 2	2.16 (0.12, 4.20)	0.04	0.77	1
ASA Class 3	3.63 (1.60, 5.66)	< 0.001	1.29	2
ASA Class 4	4.68 (2.61, 6.75)	< 0.001	1.54	3
ASA Class 5	4.33 (1.97, 6.68)	< 0.001	1.47	3
Renal Failure				
No	Reference	---	---	0
Yes	1.72 (0.60, 2.85)	0.003	0.54	1
Sepsis				
None	Reference	---	---	0
Septic Shock	2.12 (1.32, 2.92)	< 0.001	0.75	1
Maximum Score				9

If TOTAL SCORE is ≥ 5, patient is at high risk of having VTE (> 0.4% risk), consider VTE prophylaxis
If TOTAL SCORE is 1 – 5, patient is at slightly increased risk of having VTE

Risk factors for venous thromboembolic events in pediatric surgical patients: Defining indications for prophylaxis☆,☆☆

Sarah B. Cairo [a,*,1], Timothy B. Lautz [b,2], Beverly A. Schaefer [c,d,e,3,4,5], Guan Yu [f,5], Hibbut-ur-Rauf Naseem [a,1], David H. Rothstein [a,g,1,5]

Journal of Pediatric Surgery 53 (2018) 1996–2002

USA 2012 – 2015
Database rétrospectif *
218 432 patients < 19 ans = TVP = 0,1%
34813 xie abdomino pelvienne = TVP = 0,2%

Considérer prophylaxie si score ≥ 5 car risque = 0,4%

Méca ± HBPM qd risque MTVE > risque de la prophylaxie

Nombreux FDR ∅ indépendants analyse multivariée (transfusion)
Pas d'info sur stratégies de prévention ni VVC / database

Vs APAGBI

AGE et durée de chir >
Insuffisance rénale et ASA ne sont pas ds APAGBI

Children's Hospitals' Solutions for Patient Safety
Every patient. Every day.

≥ 12 ans AG > 1 h
CPI en PER op
Et TPp si ≥ 2 FDR

SPS Recommended Interventions

- **Anticoagulation**: Strongly consider prophylactic anticoagulation of high risk patients if the patient has altered mobility and 2 or more VTE risk factors present (see VTE intervention based on risk assessment unless contraindicated).



Pour conclure ….

Screener les FDR chez tous les enfants mêmes < 12 – 13 – 15 ans

VVC

Ré évaluer régulièrement le risque

Place majeure de la CPI = APA et USA

L'expérience n'est pas suffisante / incidence faible

Balance entre le risque de thrombose et le risque de saignement

Seuils différents de l'adulte ?

Urgence à réaliser des ERC sur les populations ciblées les plus à risque

RAAC

Merci …