

Transfusion Considerations- Patients with Liver Disease

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Nadia Gabarin, MD MSc FRCPC DRCPSC
Transfusion Medicine Specialist, University Health Network
Assistant Professor, University of Toronto



Disclosures

- Speaking Honorarium: Octapharma
- Acknowledgement: A few slides have been adapted from the Transfusion Camp Plasma lecture (developed by Dr. Callum, Dr. Khandelwal, and myself)

LEARNING OBJECTIVES



Review the pathophysiology of hemostatic changes in liver disease

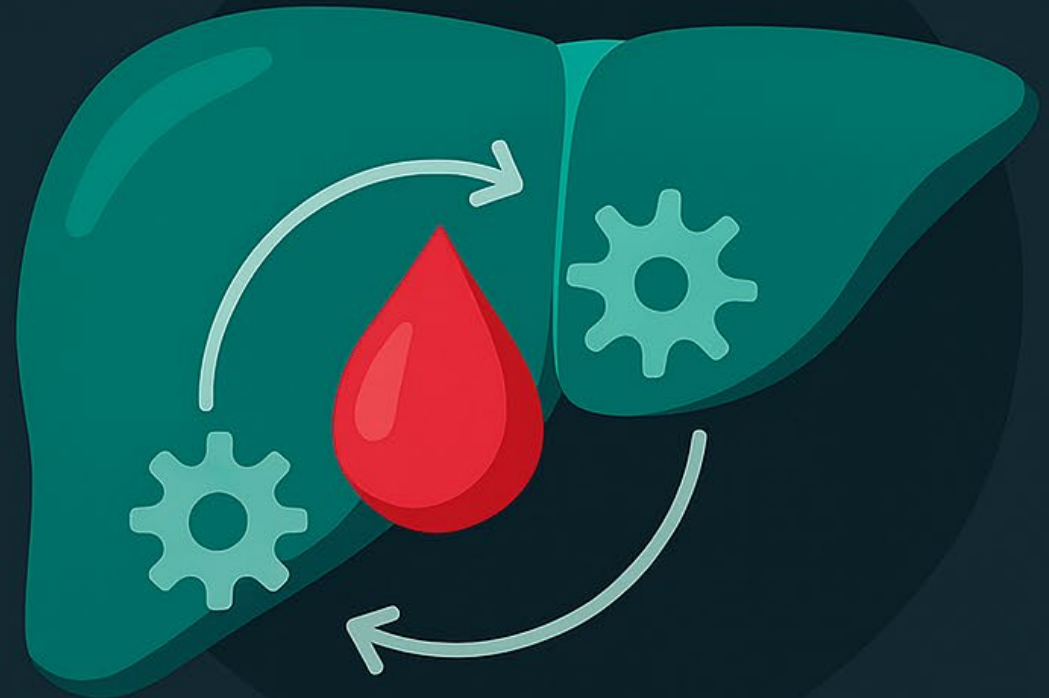


Describe the limitations of conventional coagulation tests in predicting bleeding risk in this patient population



Evaluate the available evidence on transfusion thresholds for patients with liver disease and peri-procedural management

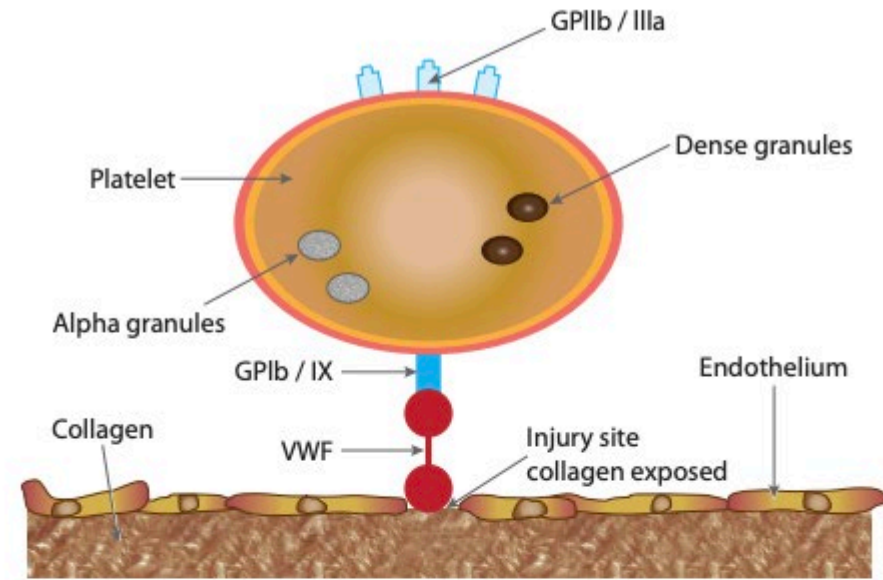
Review the pathophysiology of hemostatic changes in liver disease



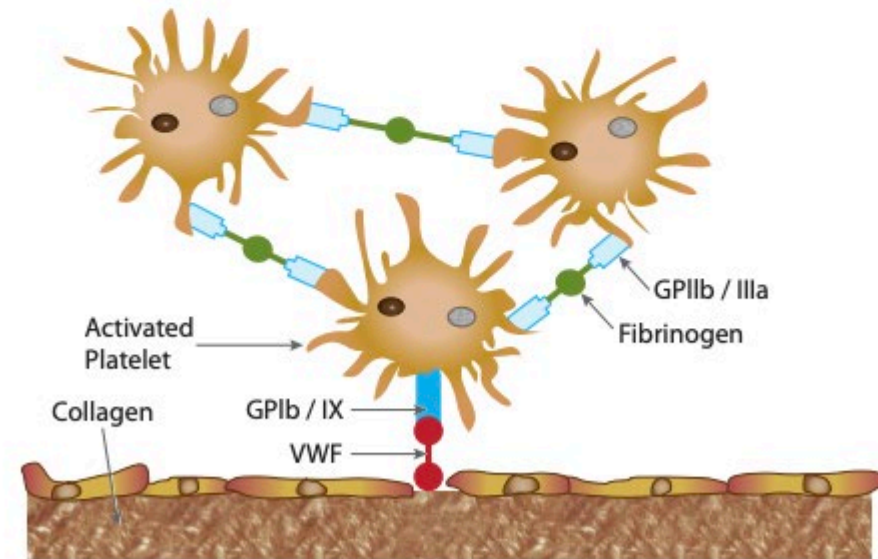
Which of the following best describes hemostasis in compensated cirrhosis?

- A. Patients have a predominantly thrombotic phenotype due to a reduction in natural anticoagulants
- B. Patients have a predominantly bleeding phenotype due to a reduction in coagulation factors
- C. There is a rebalanced hemostasis with a concurrent risk of bleeding and thrombosis
- D. Fibrinolysis is normal in compensated cirrhosis

Primary Hemostasis

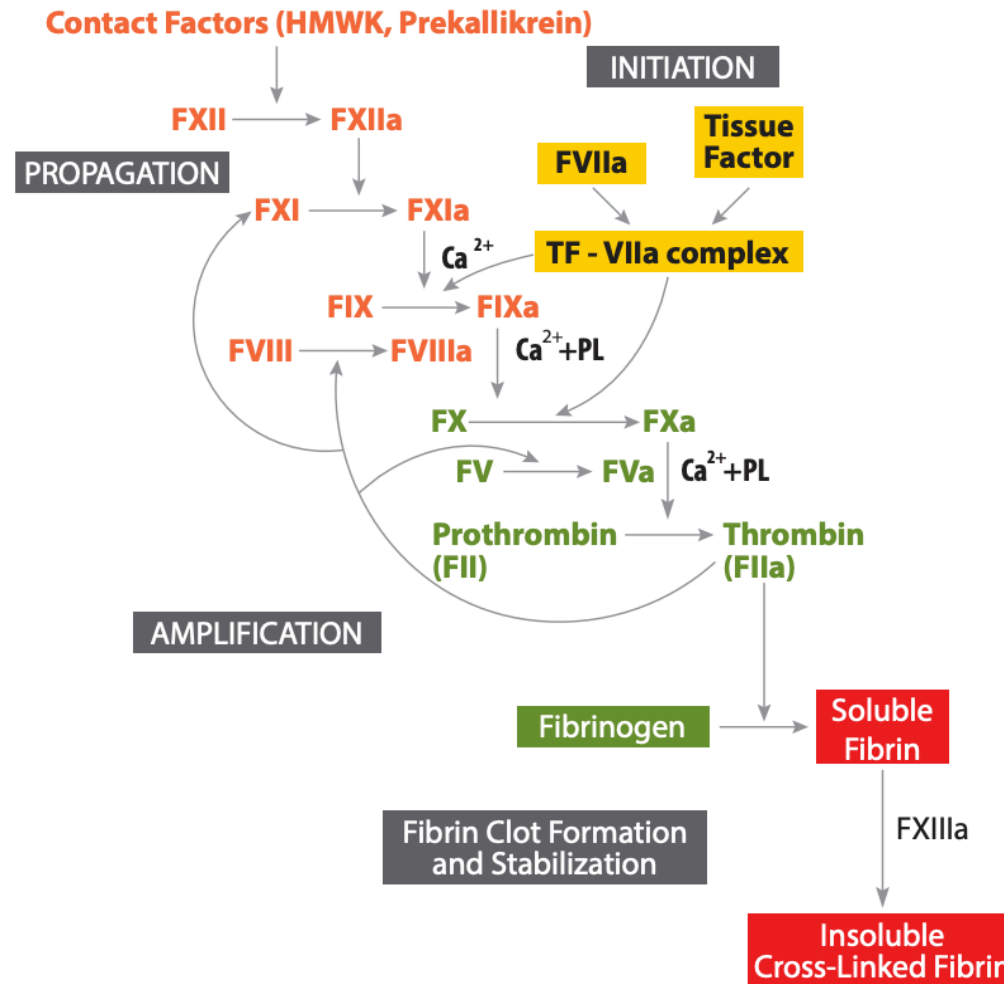


ECAT
FOUNDATION

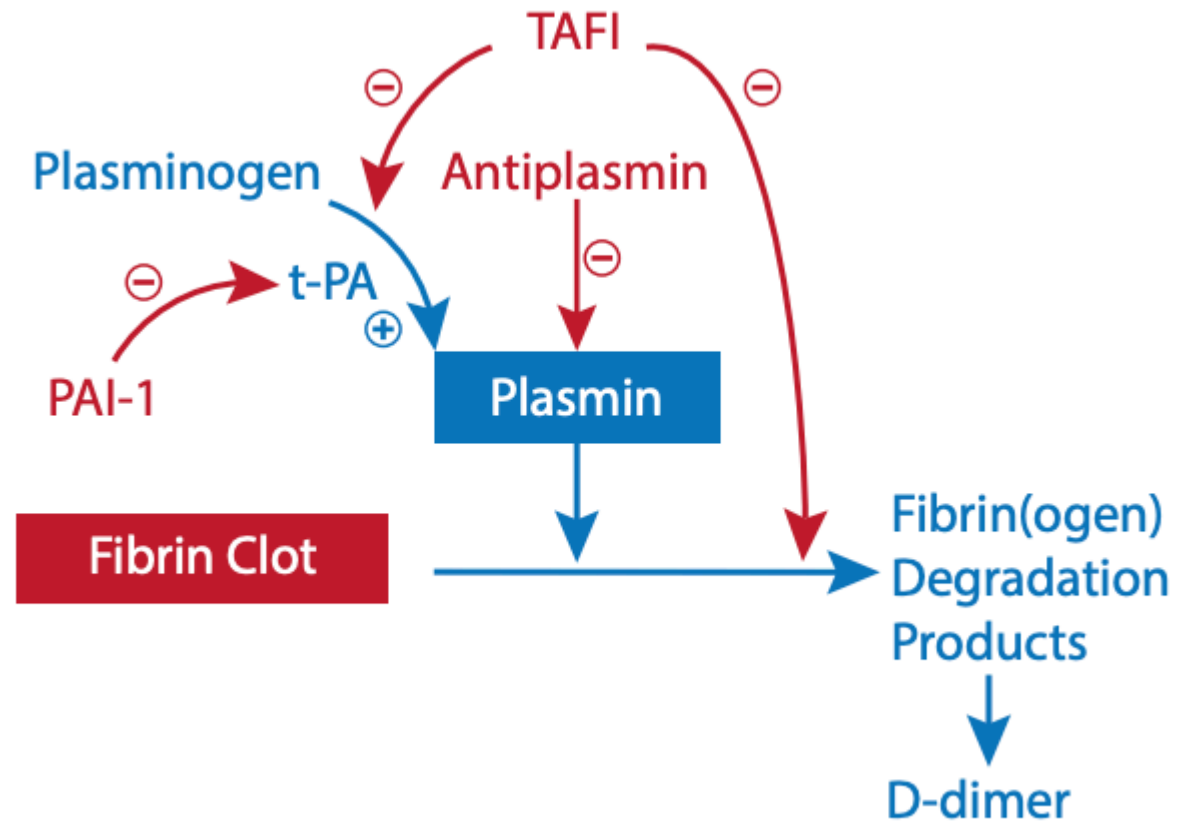


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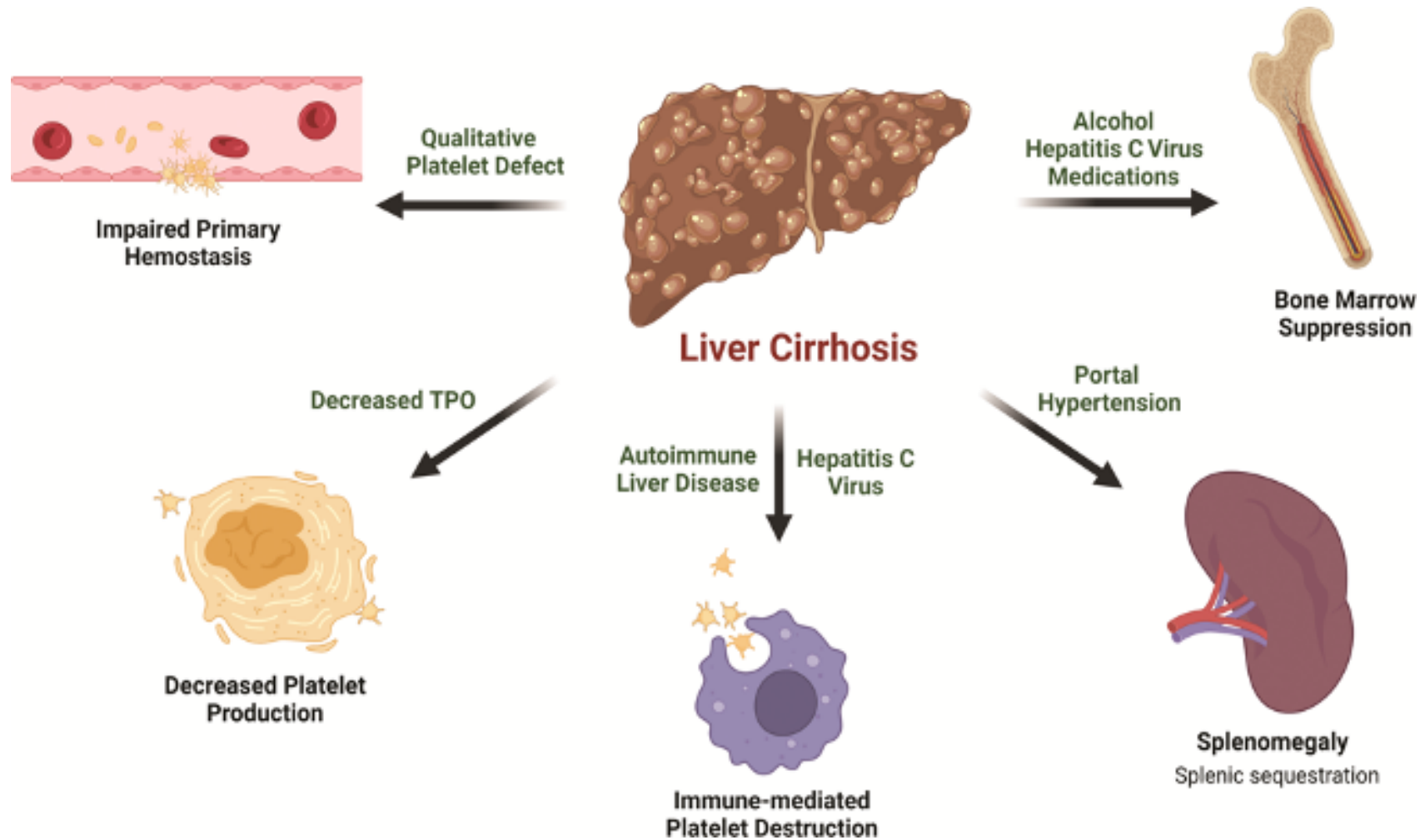
Secondary Hemostasis (Coagulation)



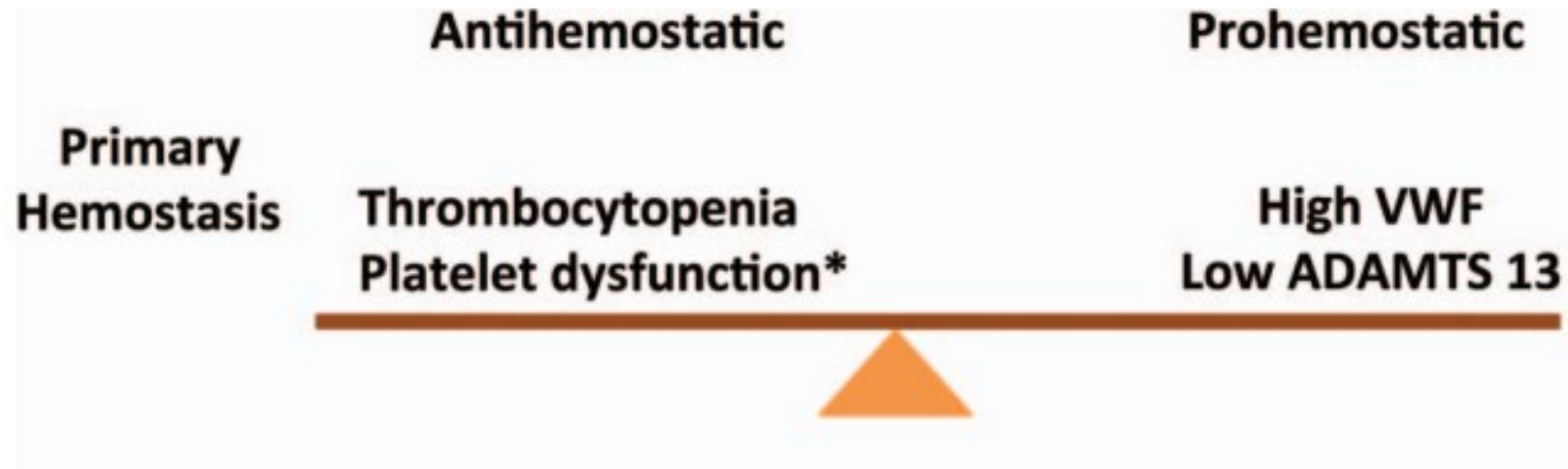
Fibrinolysis



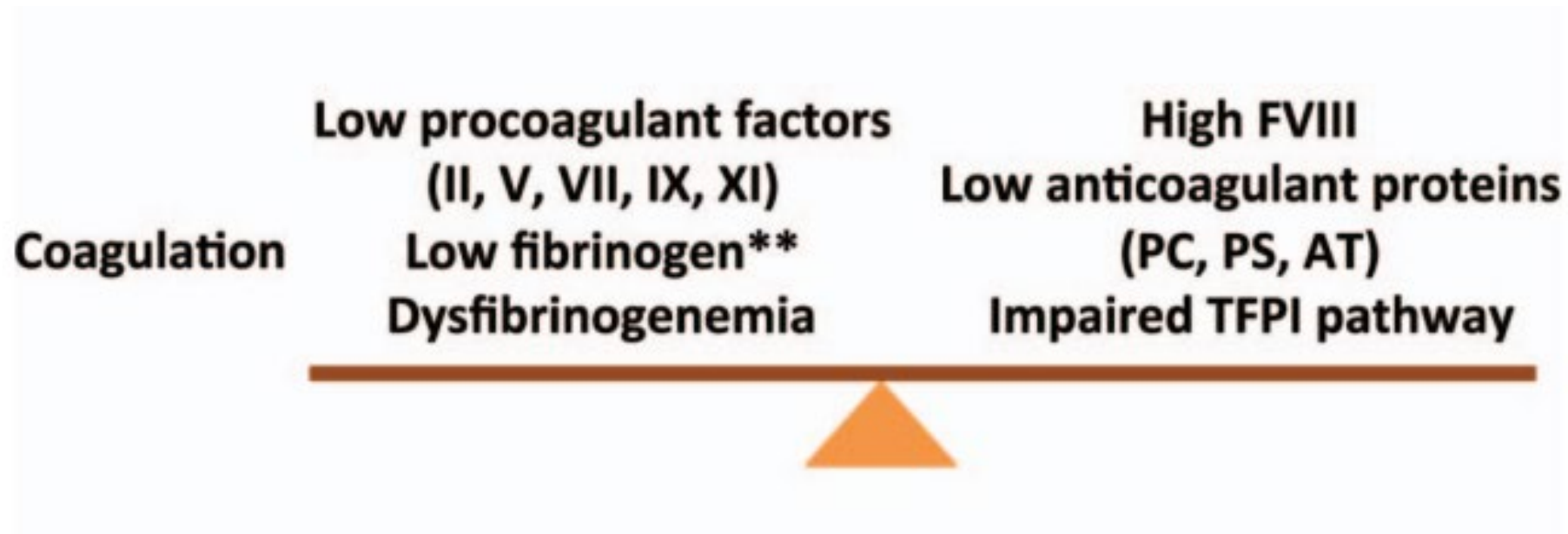
Thrombocytopenia of Liver Disease



Primary Hemostasis



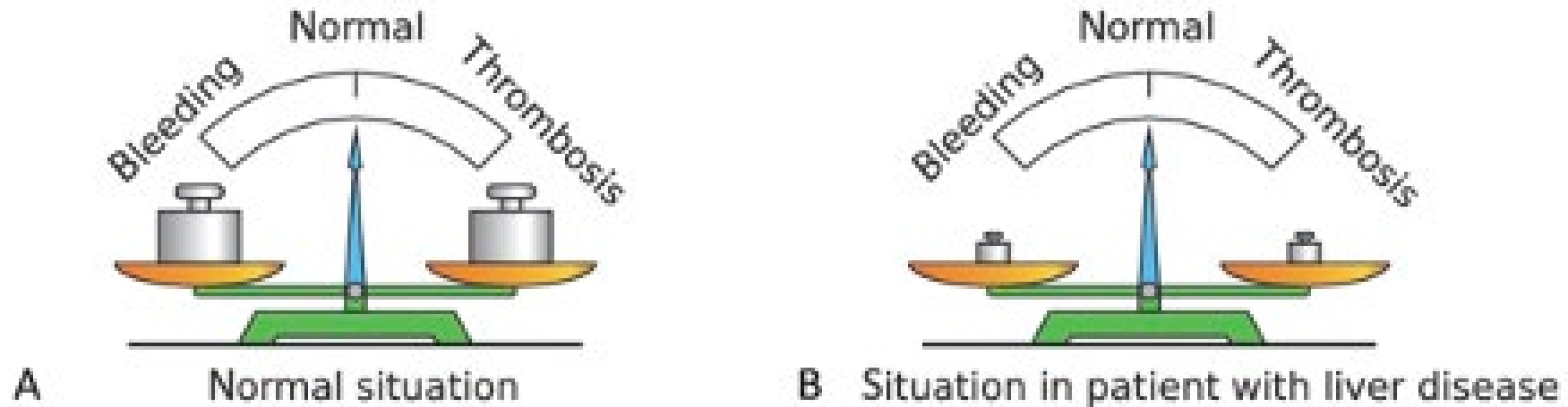
Secondary Hemostasis (Coagulation)



Fibrinolysis



Rebalanced Hemostasis of Liver Disease



Which of the following best describes hemostasis in compensated cirrhosis?

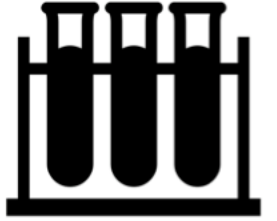
- A. Patients have a predominantly thrombotic phenotype due to a reduction in natural anticoagulants
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- C. There is a rebalanced hemostasis with a concurrent risk of bleeding and thrombosis
- D. Fibrinolysis is normal in compensated cirrhosis

Describe the
limitations of
conventional
coagulation tests
in this patient
population



Which of the following is correct with regards to laboratory testing in patients with cirrhosis?

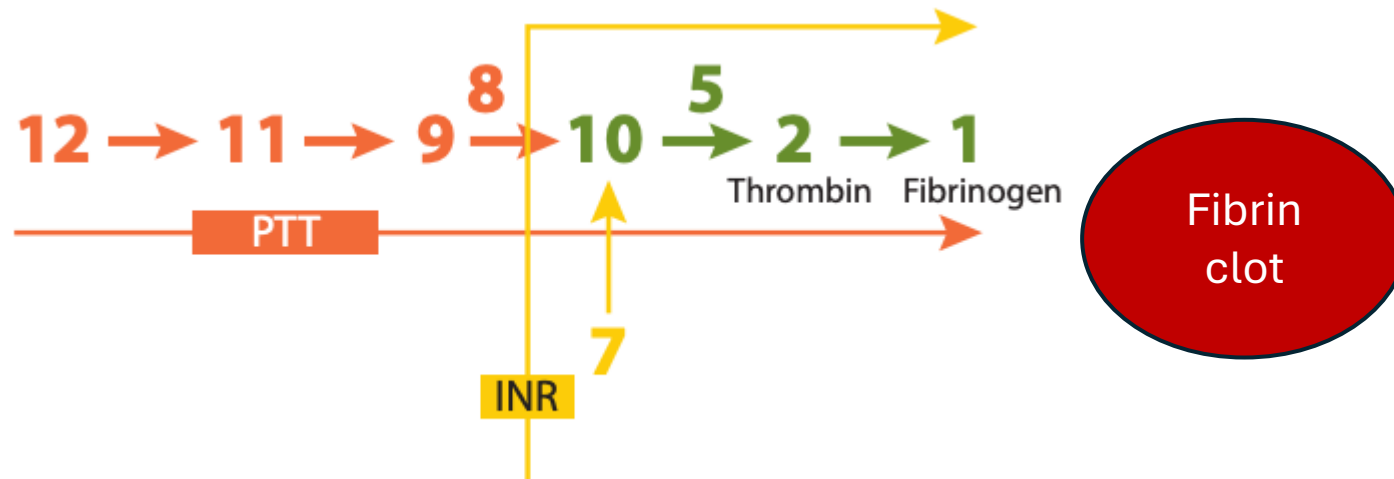
- A. The aPTT is the best test to assess bleeding risk in patients with cirrhosis
- B. Bleeding risk correlates directly with the degree of INR elevation
- C. Bleeding risk correlates directly with the platelet count
- D. The INR and aPTT do not reliably predict bleeding in patients with cirrhosis
- E. Measuring individual factor levels provides a more accurate assessment of bleeding risk than the INR or aPTT in patients with cirrhosis



PT/INR and aPTT

- PT (Prothrombin Time) has been validated for warfarin monitoring.
 - INR (International Normalized Ratio) is mathematically derived from the PT (standardizes the PT result).
- aPTT (Activated Partial Thromboplastin Time) has been validated for heparin monitoring and for screening of hemophilia in affected families.
- Even though these tests have been validated for specific clinical circumstances, they are frequently inappropriately ordered as screening tests, and often ordered together.

PT/INR and aPTT



Limitations of PT/INR and aPTT in Liver Disease

PT/INR

- Evaluates factors 7, 5, 10, prothrombin, and fibrinogen
- Does not assess anticoagulant proteins
- Reflects synthetic capacity of the liver, not hemostatic state

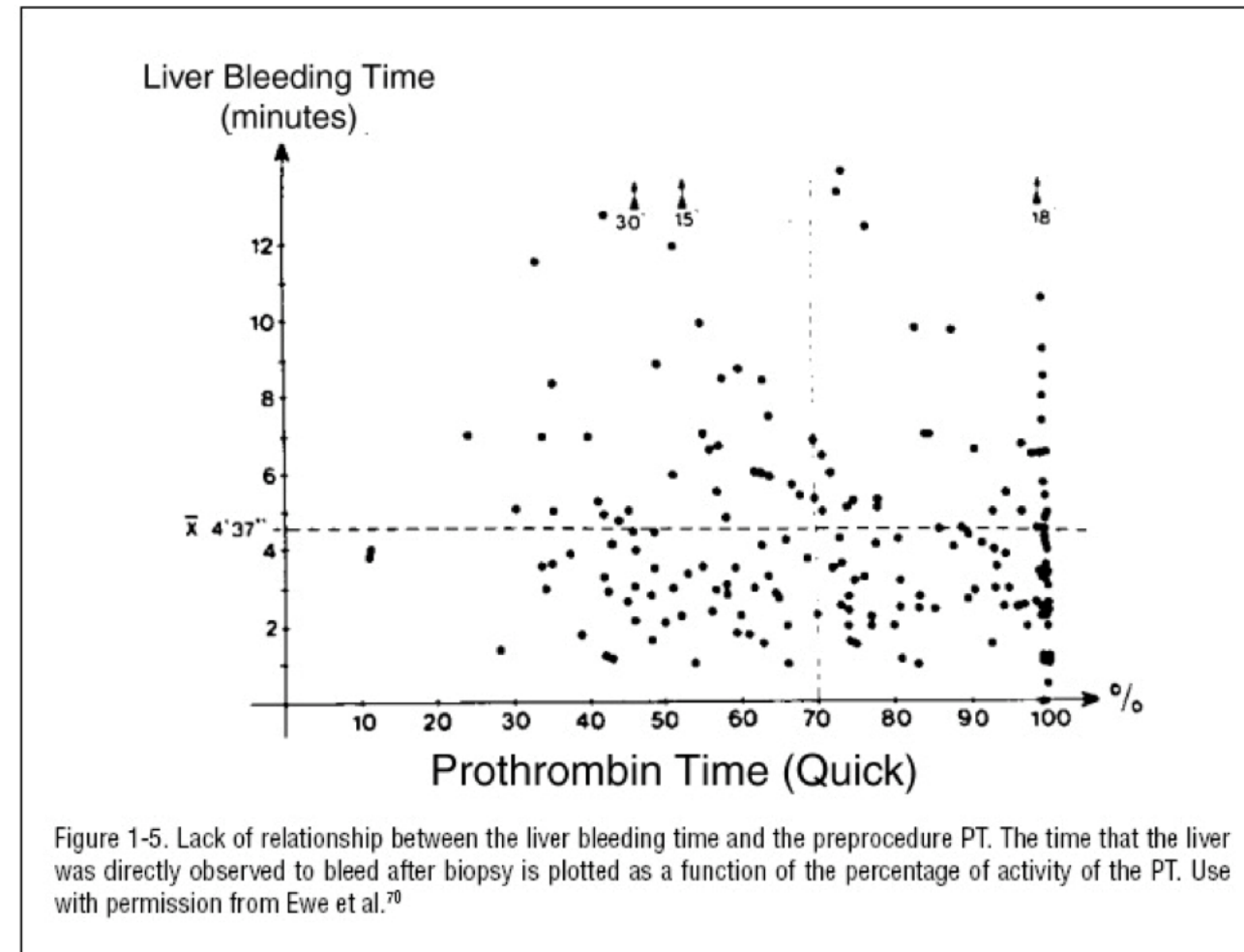
aPTT

- Evaluates prekallikrein, high-molecular weight kininogen, factors 12, 11, 9, 8, 5, 10, prothrombin, and fibrinogen
- Typically only mildly prolonged due to factor 8 elevation
- Does not assess anticoagulants and is not reflective of hemostatic state

Liver biopsy and laboratory coagulation testing

- Ewe K. Dig Dis Sci 1981;26:388-93.
 - 200 patients undergoing liver biopsy observed
 - **No correlation of liver bleeding time and laboratory test results**
 - Even patients with INR>3 and platelets <50 x 10⁹/L did not bleed more than patients with 'better' test results
- Piccinino F et al J of Hepatology 1986; 2: 165-73.
 - A very large series of 68,276 percutaneous biopsies published in 1986 found that major bleeding occurred in only 42 patients.
 - i.e. 1 in 1626 patients
 - **No correlation between PT/INR or PLT and bleeding**

Random distribution



INR and Periprocedural Bleeding in Patients with Cirrhosis

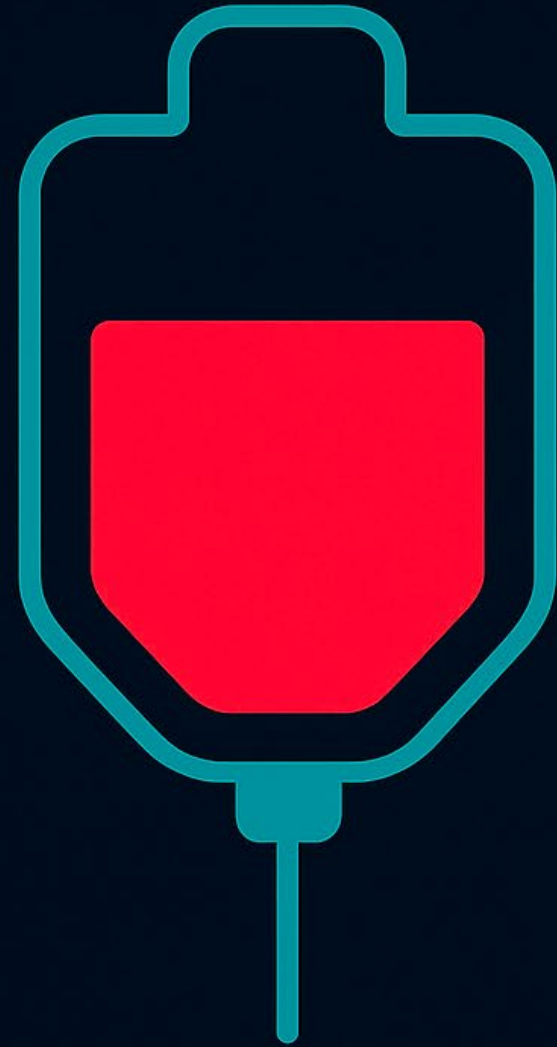
- Systematic review and meta-analysis of 29 studies including 13, 276 patients with cirrhosis undergoing procedures*
- **No significant association between periprocedural bleeding and pre-procedural INR** [pooled OR 1.52; 95% CI 0.99, 2.33; p=0.06]
- **No significant difference in mean INR upon comparison of patients who did or did not have periprocedural bleeding** [pooled mean difference 0.05; 95% CI -0.03, 0.13; P = 0.23]

*Procedures included: liver biopsy (percutaneous and transjugular), renal biopsy, endoscopic variceal ligation, paracentesis, cardiac cath, OGD, colonoscopy +/- polypectomy, dental procedures, CV cannulation)

Which of the following is correct with regards to laboratory testing in patients with cirrhosis?

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- C. Bleeding risk correlates directly with the platelet count
- D. The INR and aPTT do not reliably predict bleeding in patients with cirrhosis**
- E. Measuring individual factor levels provides a more accurate assessment of bleeding risk than the INR or aPTT in patients with cirrhosis

**Evaluate the
evidence on
transfusion
thresholds and
peri-procedural
management**

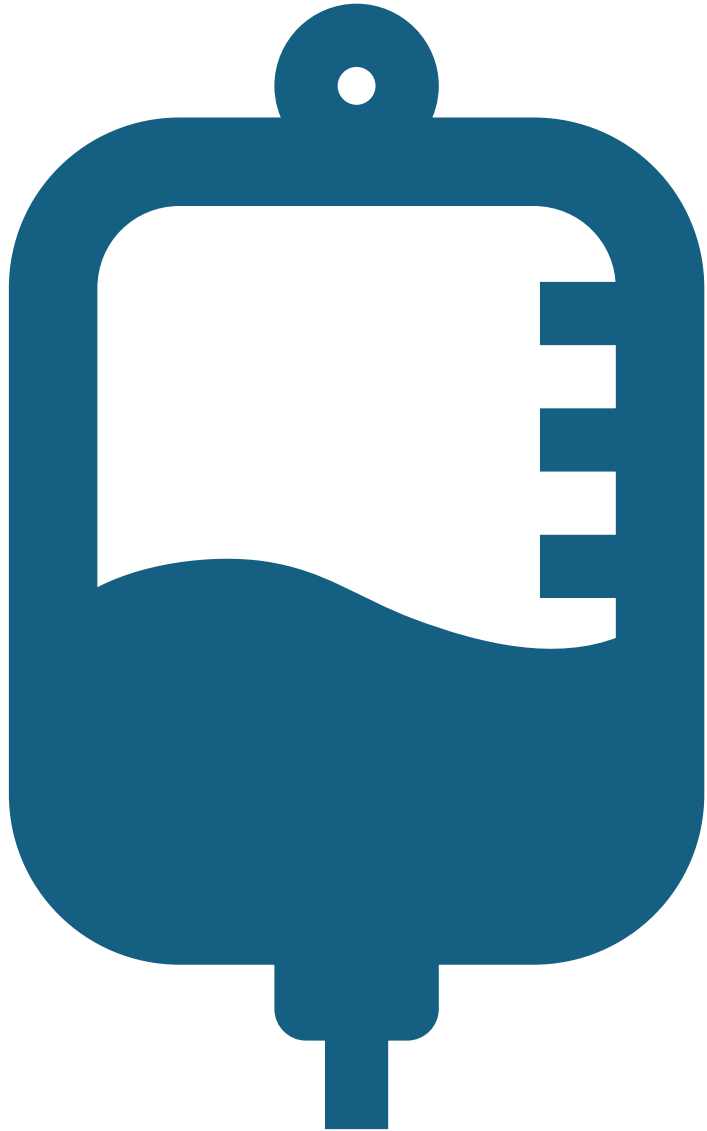


Which of the following represents the most appropriate use of plasma?

- A. A patient with cirrhosis who develops significant bleeding following a percutaneous liver biopsy, INR 2.2.
- B. A patient with cirrhosis with an INR of 2.5 admitted with hepatic encephalopathy
- C. A patient with cirrhosis with an INR of 2.1 about to undergo a paracentesis
- D. A patient with cirrhosis on warfarin for atrial fibrillation admitted with a subdural hematoma and an INR of 3.2
- E. All of the above

A patient with cirrhosis has an upper GI bleed, suspected to be variceal bleeding. They are hemodynamically stable. Which of the following is correct?

- A. Transfuse RBCs to target Hb > 60 g/L
- B. Transfuse RBCs to target Hb > 70 g/L
- C. Transfuse RBCs to target Hb > 80 g/L
- D. Transfuse RBCs to target Hb > 90 g/L
- E. Start with Tranexamic Acid 1g IV before any transfusion support



Plasma



Transfusible Plasma Inventory (CBS)



Solvent Detergent
(S/D) Plasma



Frozen Plasma
(from whole blood
or apheresis
donors)



Low Titre
Group A Plasma

Key Details

- Composed of 90% water
- Rich in proteins such as coagulation factors, albumin, immunoglobulins
- Plasma must be ABO Compatible
- The effect of plasma lasts about 6 hours
- SD plasma: kept frozen up to 4 years
- FP: kept frozen up to 1 year
- ADULT DOSE: 10-15 mL/kg = 3-5 U
- PEDIATRIC DOSE: 10-15 mL/kg 🧸

References:

1. Blood Transfus. 2016 Jul;14(4):277-286
2. Saadah NH et al. Haematologica 2020
3. Liunbruno GM et al. J Thromb Thrombolysis 2015
4. Verghese L. et al. Reprod Bio. 2017.
5. Scully M et al. Blood. 2014.
6. Camazine MN et al. Pediatr Criti Care Med. 2017.
7. Spinella PC et al. Front Pediatr. 2020.
8. Kalsi A. et al. Clin Appl Thromb Hemost. 2018.
9. Josephson CD et al. Transfusion. 2022.

What are the indications for plasma use?

Moderate to severe bleeding and INR > 1.8

To prevent peri-procedural bleeding in patients with acquired factor deficiency*

Warfarin reversal
ONLY if PCC unavailable or contraindicated

Factor replacement if factor concentrate unavailable

Plasmapheresis for Thrombotic thrombocytopenic purpura (TTP)

* Procedures with high risk of bleeding if INR > 1.8 (no liver disease) or > 2.5 in those with liver disease

Plasma is NOT indicated in...

Non-bleeding patients with elevated INR with no planned procedures

Warfarin reversal if PCC can be used

Mild bleeding

Factor replacement when factor concentrates are available

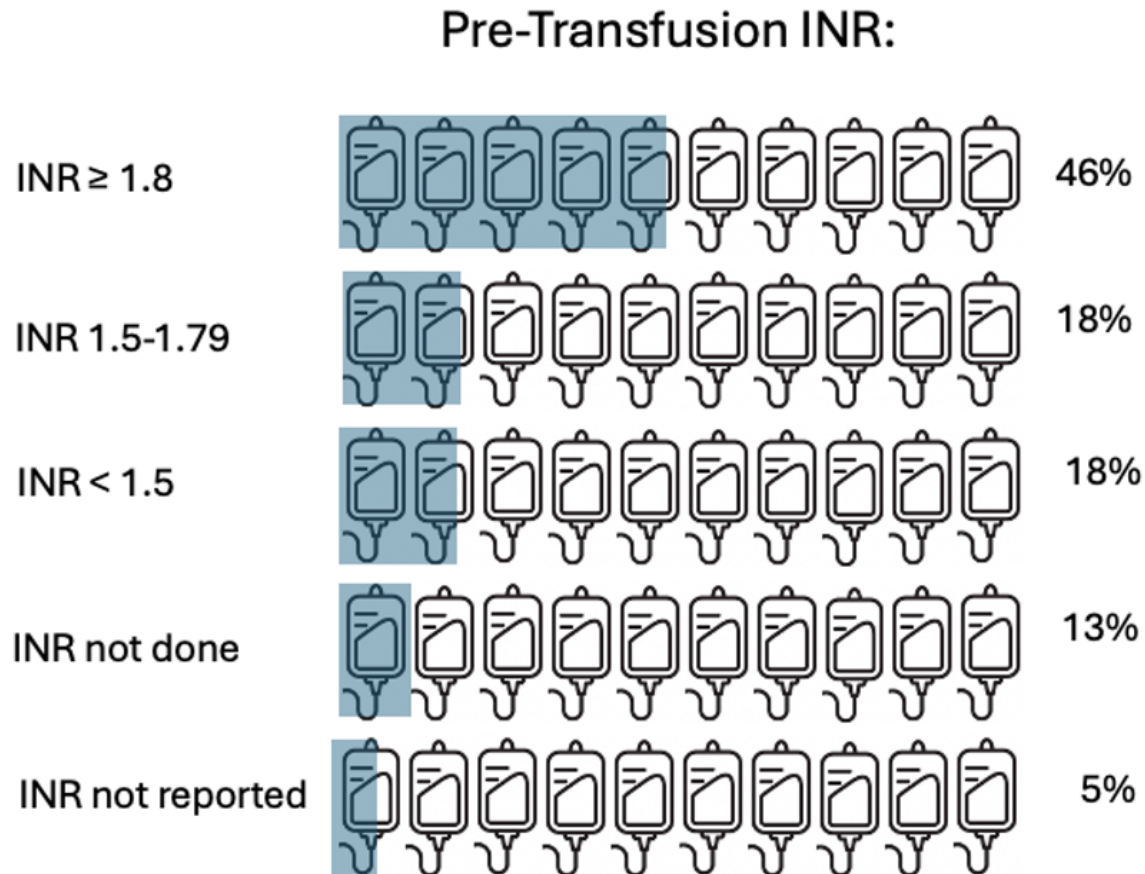
A significant proportion of plasma transfused is unnecessary

Study	Country	Number of plasma transfusion events	Patient type	Percent outside guidelines
Gabarin et al Transfusion 2025	Canada	11,163	Medical Wards and ICU	36% inappropriate 84% underdosed
Khandelwal et al Vox Sang 2022	Canada	6,088	All patients	35% inappropriate 71% under-dosed
ORBCON audit (report) audit 2015	Canada	329	All patients	52%
Shih et al Vox Sang 2015	Canada	111	ICU	45%
Tinmouth et al Transfusion 2013	Canada	559	All patients	29%
Stanworth et al Transfusion 2011	UK	4,969	All patients (included pediatric)	43% adults, 48% children, 62% neonates

Ontario Plasma Utilization

	No plasma transfusion, N = 939,577	Plasma transfusion, N = 11,163	Overall, N = 950,740
Sex			
Female	440,753 (46.9%)	4072–4076 (36.5–36.5%)	444,828 (46.8%)
Male	498,748 (53.1%)	7086 (63.5%)	505,834 (53.2%)
Age			
Mean (SD)	66.9 (18.3)	61.2 (16.4)	66.8 (18.3)
Age group			
18–40	101,267 (10.8%)	1467 (13.1%)	102,734 (10.8%)
41–60	200,980 (21.4%)	3304 (29.6%)	204,284 (21.5%)
61–80	392,470 (41.8%)	5277 (47.3%)	397,747 (41.8%)
>80	244,860 (26.1%)	1115 (10.0%)	245,975 (25.9%)
Charlson Comorbidity Index			
Median [Q1, Q3]	1 [0.0, 2.0]	2 [0.0, 4.0]	1.0 [0.0, 2.0]
Most responsible diagnosis			
Cardiac	198,570 (21.1%)	3033 (27.2%)	201,603 (21.2%)
Gastrointestinal	107,689 (11.5%)	2381 (21.3%)	110,070 (11.6%)
Infectious disease	131,582 (14.0%)	1180 (10.6%)	132,762 (14.0%)
Hematology/Oncology	67,855 (7.2%)	1020 (9.1%)	68,875 (7.2%)
Rheumatologic & musculoskeletal	40,834 (4.3%)	552 (4.9%)	41,386 (4.4%)
Neurologic	112,927 (12.0%)	549 (4.9%)	113,476 (11.9%)
Respiratory	71,631 (7.6%)	408 (3.7%)	72,039 (7.6%)
Non-malignant hematology	25,514 (2.7%)	249 (2.2%)	25,763 (2.7%)
Renal	33,314 (3.5%)	197 (1.8%)	33,511 (3.5%)
Obstetrics/Gynecology	3175 (0.3%)	147 (1.3%)	3322 (0.3%)
Endocrine	25,361 (2.7%)	90 (0.8%)	25,451 (2.7%)
Psychiatric & substance related	29,538 (3.1%)	74 (0.7%)	29,612 (3.1%)
Urologic	5150 (0.5%)	14 (0.1%)	5164 (0.5%)
ENT	4420 (0.5%)	<6 (<0.1%)	4422 (0.5%)
Ophthalmology	670 (0.1%)	<6 (<0.1%)	671 (0.1%)
Other	81,347 (8.7%)	1266 (11.3%)	82,613 (8.7%)

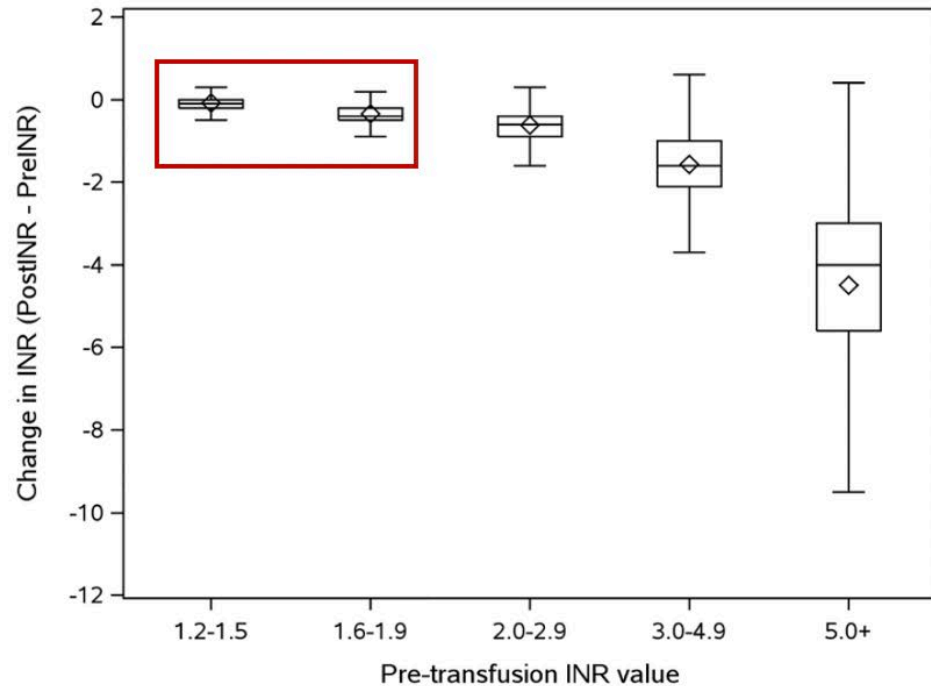
Appropriateness- Pre- Transfusion INR



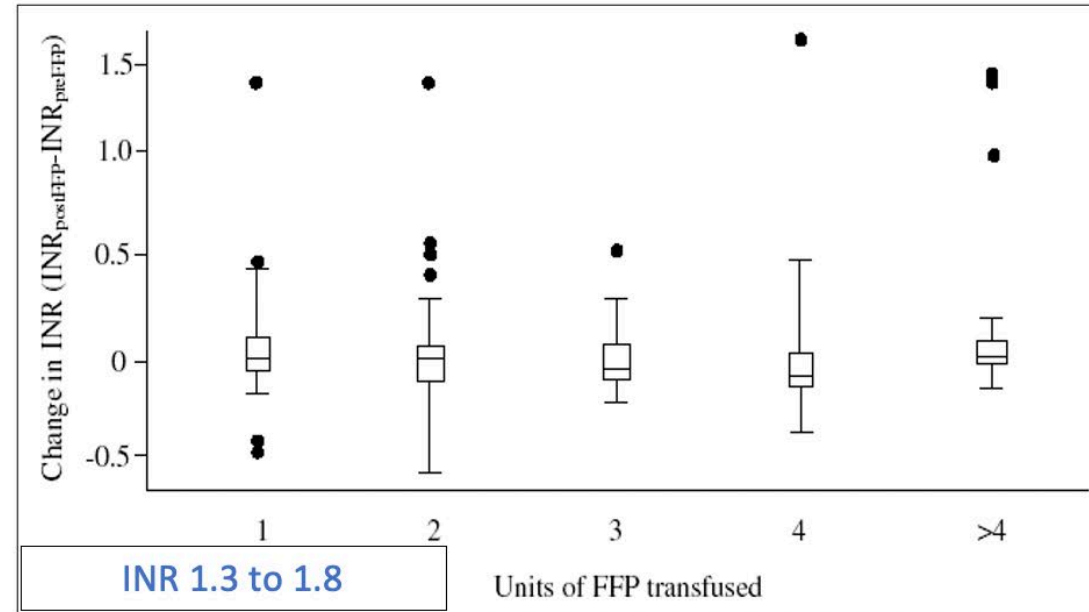
18% of plasma transfusion events did not have a pre-transfusion INR

36% of plasma transfusion events were for a pre-transfusion INR < 1.8 in the overall cohort

Impact of Plasma on INR



FP 4u given to N=6779 patients
Warner MA, et al. A & A 2018



Prospective study
321 units given to 121 patients
INR within 8 hours available

Abdel-Wahab OI, et al. Transfusion 2006; 46: 1279-85

Plasma is NOT effective in changing INR when pre-transfusion INR is <2

Plasma can be harmful

- TACO and TRALI are the leading causes of transfusion associated mortality
- Plasma has **higher risk** of both TACO and TRALI compared to other blood products¹
- TRALI risk is 7x higher with frozen plasma, compared to RBCs*
- TACO risk is higher with plasma
- Unnecessary plasma transfusions pose costs to the healthcare system and challenges to the plasma supply chain
 - Cost of plasma is \$409.62 per unit and \$1,608.37 per patient transfused
 - Annual revenue loss due to unnecessary plasma transfusions in Canada in 2017 estimated to be \$1.7 million²

*TRALI risk mitigated by SD plasma

1. Transfusion. 2009;49(3):440-52.

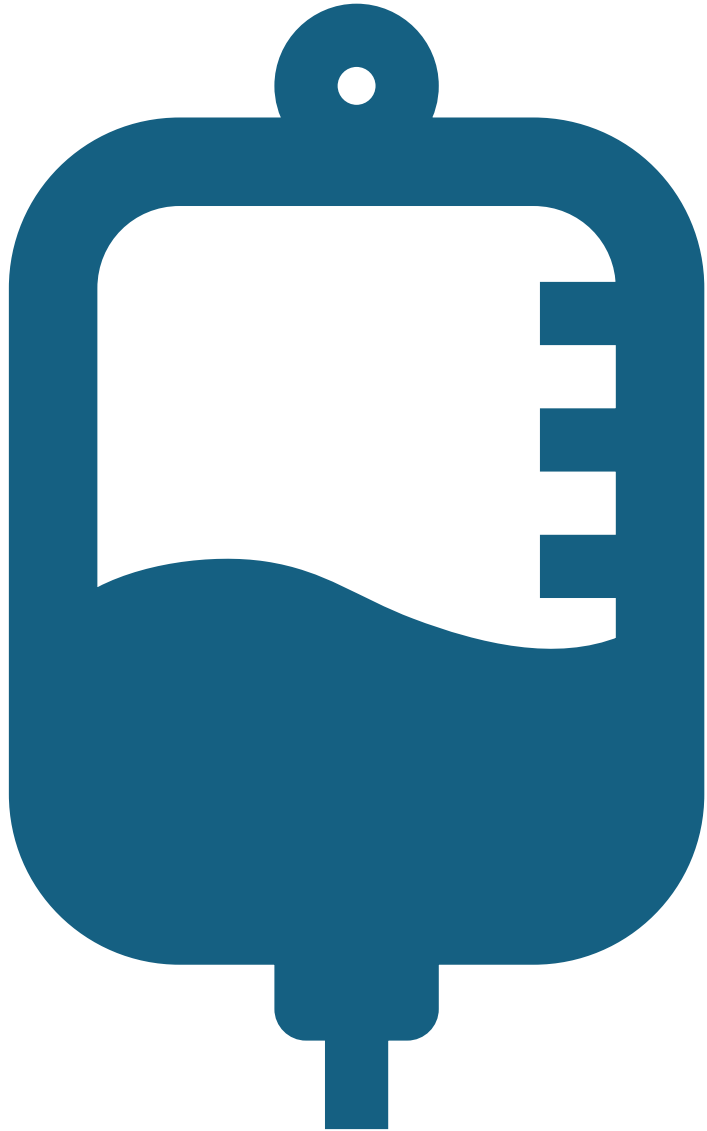
2. Blood. 2018;132(Suppl 1):5083

Don't transfuse plasma to correct mildly elevated INRs (<1.8) or PTT before a procedure

The impact of commonly used doses of plasma to correct clotting results, or to reduce the bleeding risk, is very limited particularly when the INR is 1.5–1.9 (Recommendation: 2C)

Which of the following represents the most appropriate use of plasma?

- A. A patient with cirrhosis who develops significant bleeding following a percutaneous liver biopsy, INR 2.2.
- B. A patient with cirrhosis with an INR of 2.5 admitted with hepatic encephalopathy
- C. A patient with cirrhosis with an INR of 2.1 about to undergo a paracentesis
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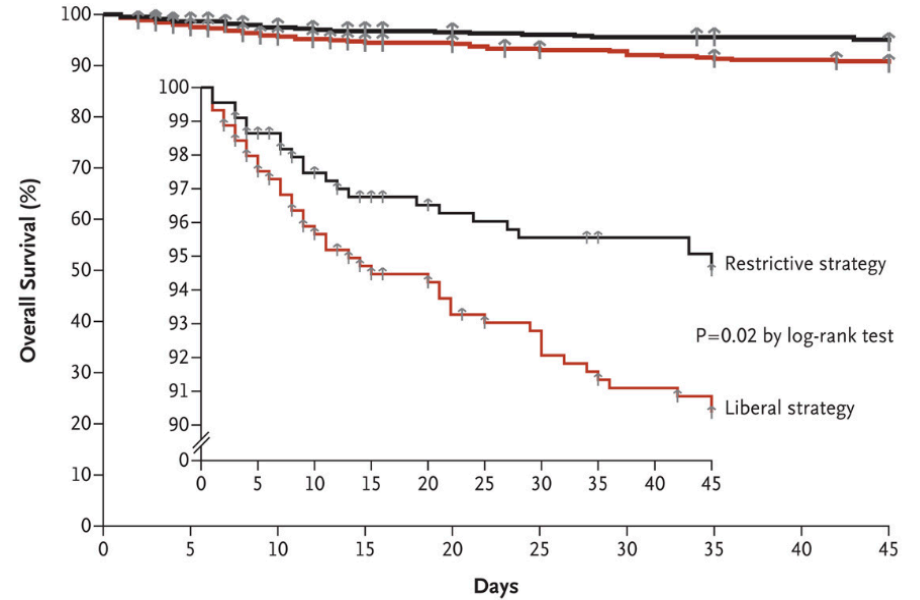
Red Blood Cells



RBC Transfusion in Upper GI Bleeding

- Villanueva et al 2013 NEJM RCT- 921 patients with severe acute upper GIB assigned to restrictive (< 70 g/L) vs liberal (<90 g/L) transfusion arms
- 31% of participants with cirrhosis
- Patients with massive exsanguinating bleeding, recent ACS, recent stroke excluded

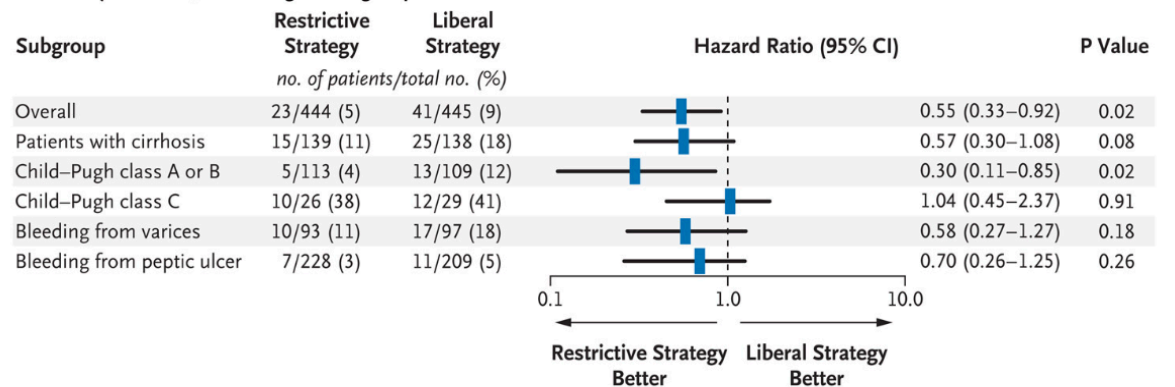
A Survival, According to Transfusion Strategy



No. at Risk

	0	5	10	15	20	25	30	35	40	45
Restrictive strategy	444	429	412	404	401	399	397	395	394	392
Liberal strategy	445	428	407	397	393	386	383	378	375	372

B Death by 6 Weeks, According to Subgroup



Red Blood Cell Transfusion

2023 AABB International Guidelines

"For hospitalized adult patients who are hemodynamically stable, the international panel recommends a restrictive RBC transfusion strategy in which the transfusion is considered when the hemoglobin concentration is less than 7 g/dL (strong recommendation, moderate certainty evidence)."

Patient Blood Management

- Identify iron deficiency and replete with iron supplementation
- Address B12/folate deficiency when present
- Address source of bleeding with local measures
- Avoid unnecessary phlebotomy
- Restrictive transfusion thresholds

Fig. 1 The three-pillar, nine-field matrix of perioperative patient blood management

	First pillar: optimize erythropoiesis	Second pillar: minimize blood loss and bleeding	Third pillar: harness and optimize physiological reserve of anaemia
Preoperative	<ul style="list-style-type: none"> Detect, investigate and treat anaemia Treat iron deficiency Treat other haematinic deficiencies 	<ul style="list-style-type: none"> Preoperative history Risk stratification Managing anticoagulation and antiplatelet therapies 	<ul style="list-style-type: none"> Optimize physiological reserve and other risk factors Formulate patient-specific plans to minimize blood loss, optimize red cell mass and reduce anaemia
Intraoperative	<ul style="list-style-type: none"> Schedule surgery with haematological optimization 	<ul style="list-style-type: none"> Cell salvage Anaesthetic blood conservation strategies Blood-sparing surgical techniques Meticulous surgery Pharmacological agents 	<ul style="list-style-type: none"> Optimize cardiac output, ventilation and oxygenation Restrictive transfusion thresholds
Postoperative	<ul style="list-style-type: none"> Stimulate erythropoiesis Be aware of drug interactions that can increase anaemia 	<ul style="list-style-type: none"> Vigilance for postoperative bleeding Maintain normothermia Manage anticoagulation Treat infection promptly Postoperative cell salvage 	<ul style="list-style-type: none"> Optimize anaemia reserve Minimize oxygen consumption Avoid unnecessary phlebotomy Restrictive transfusion thresholds

A patient with cirrhosis has an upper GI bleed, suspected to be variceal bleeding. They are hemodynamically stable. Which of the following is correct?

- A. Transfuse RBCs to target Hb > 60 g/L
- B. Transfuse RBCs to target Hb > 70 g/L**
- C. Transfuse RBCs to target Hb > 80 g/L
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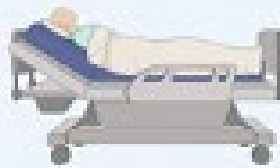


Periprocedural Management



Risk factors for procedural bleeding in patients with chronic liver disease

Patient/disease factors



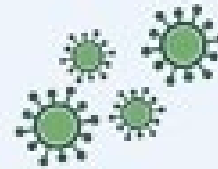
Severity of liver disease



Portal hypertension



Anemia



Infection



Renal impairment



Anticoagulants
Antiplatelets

Procedural factors



Procedural bleeding risk



Imaging guidance



Proceduralist experience

CAIR endorsed SIR Guidelines 2019



STANDARDS OF PRACTICE

Society of Interventional Radiology Consensus Guidelines for the Periprocedural Management of Thrombotic and Bleeding Risk in Patients Undergoing Percutaneous Image-Guided Interventions—Part II: Recommendations

Endorsed by the Canadian Association for Interventional Radiology and the Cardiovascular and
Interventional Radiological Society of Europe

Indravadan J. Patel, MD, Shiraz Rahim, MD, Jon C. Davidson, MD, Sue E. Hanks, MD,
Alda L. Tam, MD, T. Gregory Walker, MD, Luke R. Wilkins, MD, Ravi Sarode, MD, and
Ido Weinberg, MD

Procedure related risk

Bleeding risk	Low (<1%)	Moderate to Severe
Vascular procedures	<ul style="list-style-type: none"> Central line removal Dialysis access IVC filter placement PICC placement Transjugular liver biopsy Subcutaneous port placement Tunneled drainage catheter Venography Venous catheter 	<ul style="list-style-type: none"> Ablation Arterial interventions (sheath >7 Fr) Catheter directed thrombolysis Chemoembolization Complex venous interventions CNS and Spine procedures incl epidural Radioembolization Tunneled venous catheter Urinary tract interventions Uterine fibroid embolization
Non-vascular procedures <div data-bbox="216 913 726 1021" style="border: 1px solid black; background-color: #0070C0; color: white; padding: 5px; display: inline-block;"> Not discussed in the SIR guidelines </div>	<ul style="list-style-type: none"> Arthrocentesis + joint injection Catheter exchange Dental extraction (up to 2) Endoscopy without biopsy Lumbar puncture Pacemaker insertion Paracentesis Peripheral nerve block Superficial aspiration, drainage, skin biopsy Thoracentesis Thyroid biopsy 	<ul style="list-style-type: none"> Ablation Biliary interventions Bone marrow biopsy Complex dental procedures Deep abscess drainage Solid organ biopsy Endoscopy with biopsy Gastrostomy/gastrojejunostomy placement Lymph node biopsy Percutaneous enteric tube (new tract) Spinal procedures




Pre-procedure Laboratory Targets

Parameter	Individuals WITHOUT chronic liver disease		Individuals WITH liver disease	
	Low Risk	High Risk	Low Risk	High Risk
INR	Not routinely recommended If on Warfarin, ensure within therapeutic range	< 1.8	N/A	<2.5
PTT (s)	Not recommended	Not recommended	Not recommended	Not recommended
Platelet count (x10⁹/L)	If checked, transfuse if <20	Transfuse if <50, <70 for neuraxial anesthesia	>20 >30 for liver biopsy	>30
Fibrinogen (g/L)	Not recommended	Not recommended	>1	>1

AASLD Guidelines 2020

PRACTICE GUIDANCES

Vascular Liver Disorders, Portal Vein Thrombosis, and Procedural Bleeding in Patients With Liver Disease: 2020 Practice Guidance by the American Association for the Study of Liver Diseases

 Northup, Patrick G.^{*1};  Garcia-Pagan, Juan Carlos^{2,3,4}; Garcia-Tsao, Guadalupe^{5,6}; Intagliata, Nicolas M.¹; Superina, Riccardo A.⁷; Roberts, Lara N.⁸;  Lisman, Ton⁹; Valla, Dominique C.^{10,11}

[Author Information](#) 

Hepatology 73(1):p 366-413, January 2021. | DOI: 10.1002/hep.31646



TABLE 3 - Bleeding Risk Stratification of Common Procedures in Patients With Cirrhosis

	Low Risk	High Risk
Percutaneous	<ul style="list-style-type: none"> Paracentesis Thoracentesis Drainage catheter exchange 	<ul style="list-style-type: none"> Biliary intervention (cholecystostomy or percutaneous biliary drain) Liver biopsy Tumor ablation Nonliver intraabdominal solid-organ biopsy Intrathoracic organ biopsy Nephrostomy tube placement Central nervous system procedures Intraocular procedures/injections Intra-articular injections
Vascular	<ul style="list-style-type: none"> Peripherally inserted central catheter line placement Central venous catheter placement Central line removal IVC filter placement Diagnostic venography Coronary angiography and right heart catheterization (diagnostic) 	<ul style="list-style-type: none"> TIPS Angiography or venography with intervention Transjugular liver biopsy Transhepatic arterial chemoembolization or radioembolization Therapeutic coronary angiography
Endoscopic	<ul style="list-style-type: none"> Diagnostic esophagogastroduodenoscopy and routine variceal band ligation Enteroscopy Colonoscopy (including mucosal biopsy) Endoscopic retrograde cholangiopancreatography without sphincterotomy Capsule endoscopy Endoscopic ultrasound without fine-needle aspiration Transesophageal echocardiogram Diagnostic bronchoscopy without biopsy 	<ul style="list-style-type: none"> Endoscopic polypectomy Endoscopic stricture dilation or mucosal resection Balloon-assisted enteroscopy Percutaneous endoscopic gastrostomy placement Endoscopic retrograde cholangiopancreatography with sphincterotomy Endoscopic ultrasound with fine-needle aspiration Cystgastrostomy Therapeutic bronchoscopy or diagnostic bronchoscopy with biopsy
Other	<ul style="list-style-type: none"> Skin biopsy Dental cleaning and nonextraction procedures 	<ul style="list-style-type: none"> Dental extraction

A procedure is considered high risk if major bleeding is expected in >1.5% of procedures or if even minor bleeding is likely to result in permanent organ damage or death.^(28-30,32)

AASLD Guidelines 2020

Guidance Statements

- Determining procedural bleeding risk is complex and requires collaboration between specialists to determine the level of bleeding risk before procedures and aid in periprocedural hemostasis management.
- Because of conflicting data in the literature, there is no data-driven specific INR or platelet cutoff in which procedural bleeding risk is reliably increased.
- Identification and correction of modifiable risk factors for bleeding before performing procedures, particularly high-risk elective procedures, is recommended. Such risk factors include the use of antithrombotic drugs, AKI, and infection.



AASLD Guidelines 2020

Guidance Statements

- The INR should not be used to gauge procedural bleeding risk in patients with cirrhosis who are not taking vitamin K antagonists (VKAs).
- Measures aimed at reducing the INR are not recommended before procedures in patients with cirrhosis who are not taking VKAs.
- FFP transfusion before procedures is associated with risks and no proven benefits.



AASLD Guidelines 2020

Guidance Statements

- Given the low risk of bleeding of many common procedures, potential risks of platelet transfusion, lack of evidence that elevating the platelet count reduces bleeding risk, and ability to use effective interventions, including transfusion and hemostasis if bleeding occurs, it is reasonable to perform both low- and high-risk procedures without prophylactically correcting the platelet count.
- An individualized approach to patients with severe thrombocytopenia before procedures is recommended because of the lack of definitive evidence for safety and efficacy of interventions intended to increase platelet counts in patients with cirrhosis.



AASLD Guidelines 2020

TABLE 4 - Recommendations of Selected Professional Societies for Minimum Threshold Values of Common Coagulation and Bleeding Parameters in Patients With Cirrhosis Before Invasive Procedures With a High Risk of Bleeding

Organization	Platelet Count ($\times 1,000/\mu\text{L}$)	INR	Fibrinogen Level (mg/dL)
AASLD (this document)	No routine preprocedure correction	No routine preprocedure correction	No routine preprocedure correction
Society of Interventional Radiology 2019 ⁽²⁸⁾	>30	<2.5*	>100
American Gastroenterological Association 2019 ⁽⁸¹⁾	>50	No correction	>120
American College of Gastroenterology 2020 ⁽³⁾	>50	No correction	>120-150



British Society for Hematology

- We endorse the liver society recommendations that prophylactic transfusion of FFP and cryoprecipitate is not given in low bleeding risk procedures, such as paracentesis (1C).
- There is no good evidence to support a role for prophylactic FFP to reduce the risk of bleeding from percutaneous liver biopsy. An alternative procedure with a lower bleeding risk, (e.g. transjugular liver biopsy), should be considered instead (2C).

Platelet and INR Thresholds and Bleeding Risk in Ultrasound Guided Percutaneous Liver Biopsy: A Before-After Implementation of the 2019 Society of Interventional Radiology Guidelines Observational Quality Improvement Study

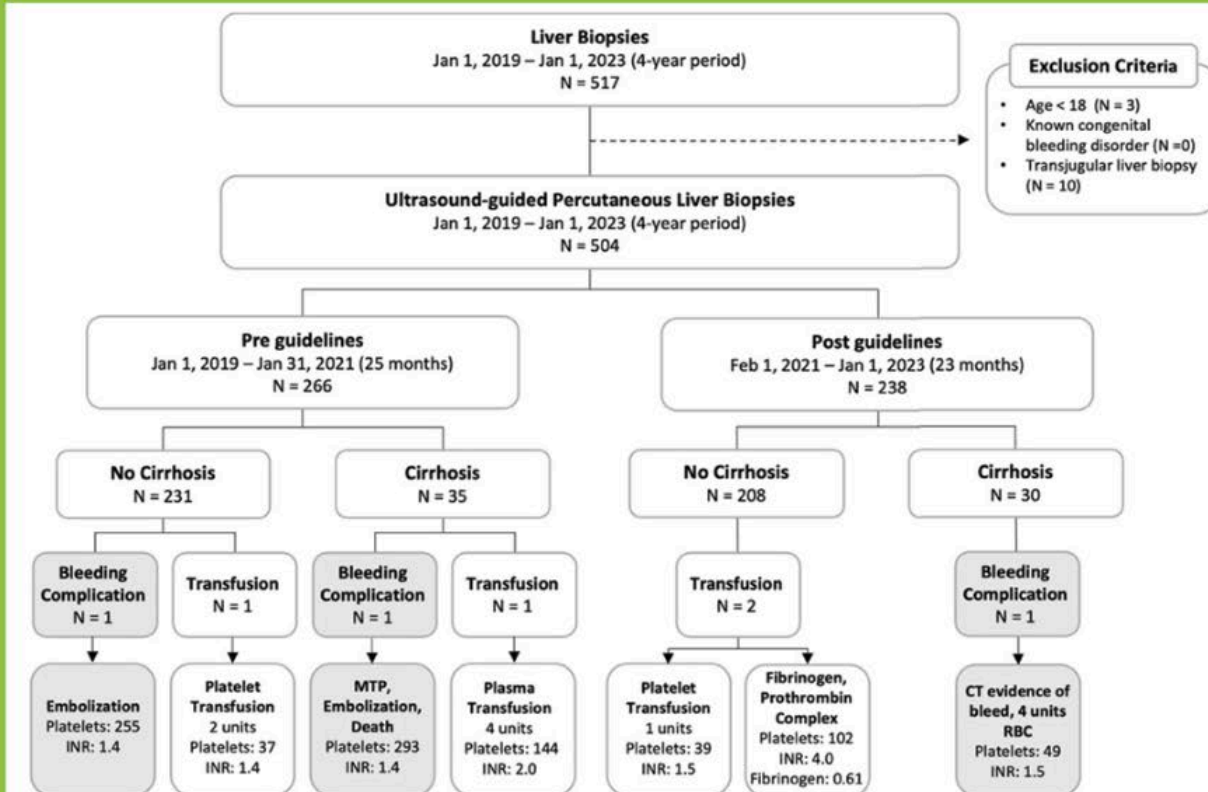


Figure 1. Flow chart of liver biopsies done before and after the implementation of the SIR 2019 guidelines in patients with and without cirrhosis demonstrating number of bleeding complications and prophylactic transfusion (platelet and plasma) done prior to biopsy.

- The 2019 Society of Interventional Radiology periprocedural guidelines which recommend restrictive use of preprocedural transfusions can be safely implemented.
- There was no change in bleeding complications in percutaneous liver biopsies pre and post guidelines.



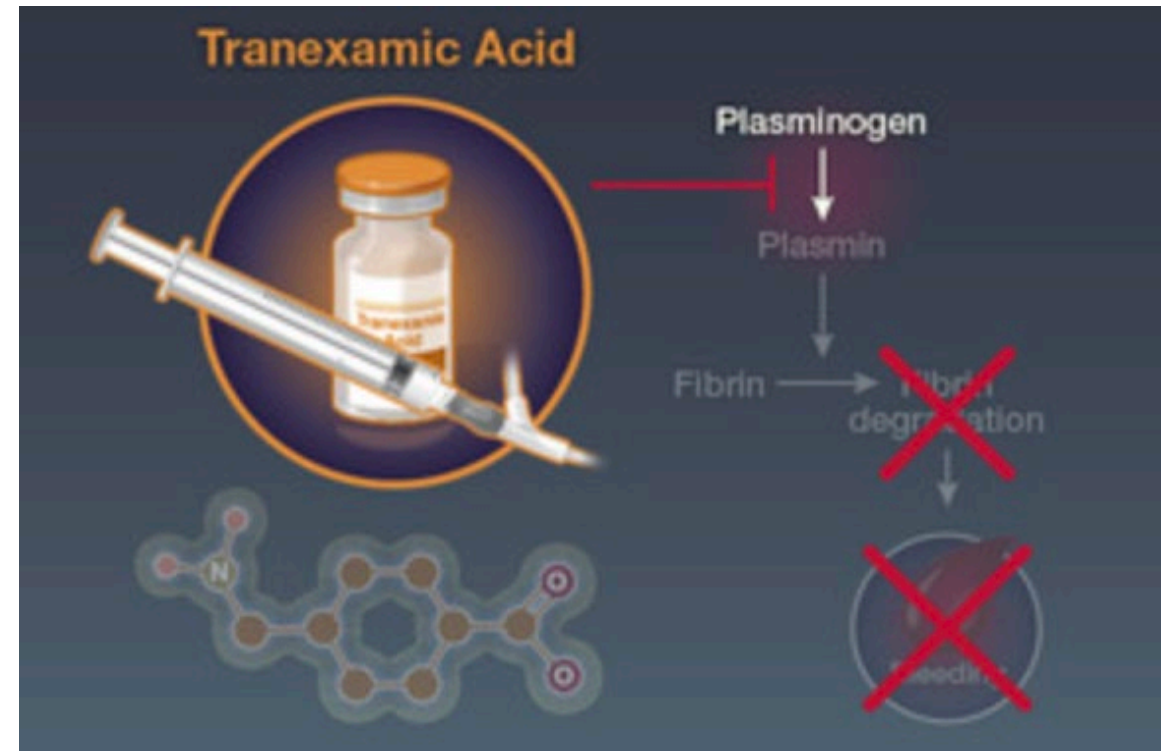
Other Therapies



Tranexamic Acid (TXA)

HALT-IT Trial:

- International multicentre RCT evaluating TXA vs placebo in patients with upper and lower GI bleeding (n= 12 009)
- Primary outcome death due to bleeding
- TXA did not reduce death from GI bleeding (RR 0.99, 95% CI 0.82–1.18) but was associated with an increased risk of VTE (1.85, 1.5–2.98) and seizures (1.73, 1.03–2.93).

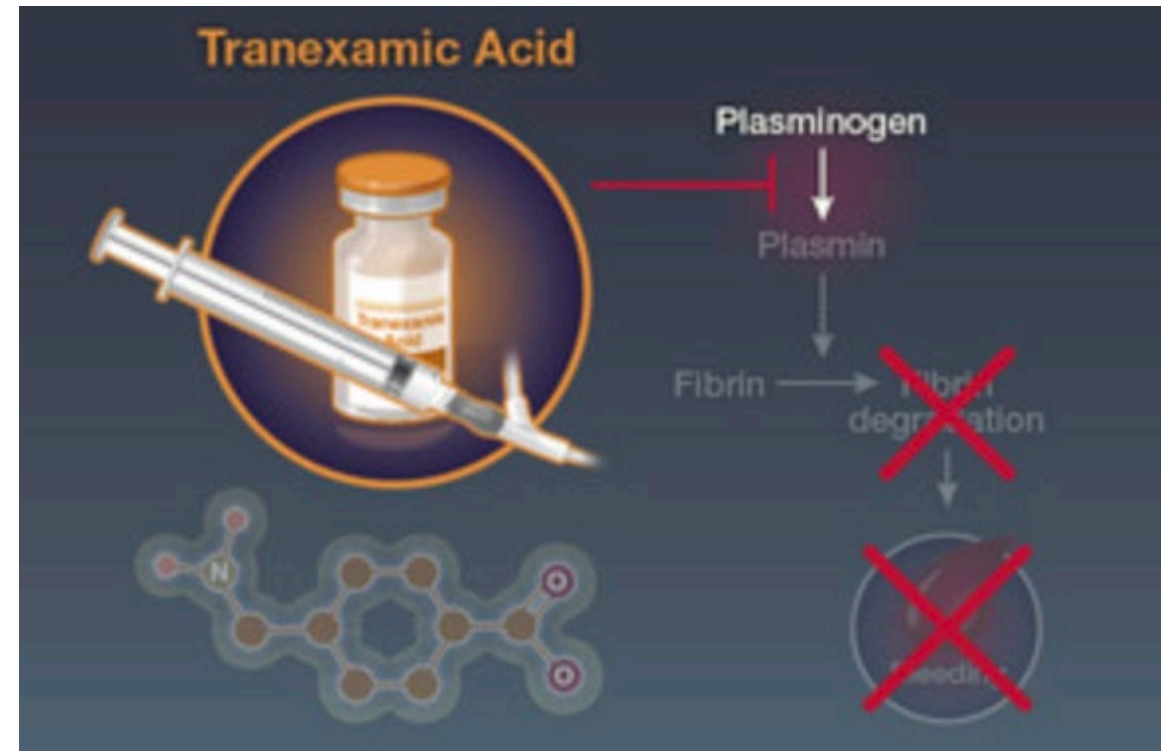


Devereaux, P J et al. Tranexamic Acid in Patients Undergoing Noncardiac Surgery. NEJM vol. 386,21 (2022): 1986-1997

Tranexamic Acid

HALT-IT Trial:

- 42% of patients in the trial had suspected variceal bleeding due to liver disease
- In an exploratory subgroup analysis, the risk of VTE was higher in these patients
 - Acutely ill patients with cirrhosis have a mixed fibrinolytic phenotype
- Hypofibrinolysis in context of critical illness may explain ↑VTE



Devereaux, P J et al. Tranexamic Acid in Patients Undergoing Noncardiac Surgery. NEJM vol. 386,21 (2022): 1986-1997

Vitamin K

- No evidence that routine use of Vitamin K to correct coagulopathy of liver disease is beneficial
- May play a role if there are concurrent risk factors for Vitamin K deficiency:
 - Cholestasis
 - Malnutrition
 - Broad-spectrum antibiotics



Prothrombin Complex Concentrate (PCC)

- 2022 systematic review evaluating PCC versus plasma for preprocedural management of liver disease coagulopathy
- 9 studies included, no RCTs comparing PCC and plasma identified , most studies small sample size (n<30)
- PCC appeared to have slightly better INR correction; major and minor bleeding unchanged
- Volume overload reported in plasma arm
- Rare thrombotic events in PCC arm
- ***Insufficient data to draw conclusions; high quality RCT evidence is needed***

Summary

- Hemostasis is rebalanced in chronic liver disease
- INR, aPTT, and platelet count are poor predictors of bleeding in this patient population
- Treat the patient, not the lab abnormality
- Plasma is not indicated to treat an elevated INR in the absence of bleeding or a planned procedure
- Use restrictive transfusion thresholds and remember PBM principles
- Adjuncts (TXA, vitamin K, PCC) have a limited role here

Thank you!

