



SHOT及相关问题

广西医科大学第一附属医院输血科

周吉成

4. 19. 5. 4

有控制输血严重危害
(SHOT)的方案与实施
情况记录。(★)

【C】

1. 有控制输血严重危害 (SHOT) 的预案, 记录及时、规范。
 - (1) 监测输血的医务人员经培训, 能识别潜在的输血不良反应症状。
 - (2) 有确定识别输血不良反应的标准和应急措施。
 - (3) 发生疑似输血反应时医务人员有章可循, 并能立即向输血科和患者的主管

三级综合医院评审标准实施细则

(2011 年版)

输血严重危害

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[输血](#)的非传染性严重危害 广东省中医院麻醉科 钟敏 编译 摘要由于对供血者增加了问卷调查和对复杂传染疾病的血液筛查[输血](#)的传染性并发症已经日益减少而[输血](#)导致的非...

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[输血引起的非感染性严重危害-【维普网】-仓储式在线作品出版平台-...](#)

通过对献血者进行的问卷调查和各种复杂感染性疾病血液筛选方法的改善, [输血](#)引起的感染性并发症的发生率已明显下降,与此同时,非感染性严重危害(NISHOTs)已成为[输血](#)...

www.cqvip.com/QK/88833X/201003/34387909.html 2012-3-14 - [百度快照](#)

[输红细胞引发的危害 好大夫在线](#)

[输血](#)传播感染性疾病的风险现显著降低,非感染性严重危害已成为[输血](#)最常见的并发症。对于慢性难治性贫血而依赖[输血](#)的患者来讲,更需要关注的是——

www.haodf.com/zhuangjiaguandian/chengqinfen... 2012-4-6 - [百度快照](#)

- 

serious hazards of transfusion (SHOT) initiative: analysis of the first two annual reports

L M Williamson, S Lowe, E M Love, H Cohen, K Soldan, D B L McClelland, P Skacel, and J A J Barbara
BMJ, Jul 1999; 319: 16 - 19.

... Papers 76 **serious hazards of transfusion (SHOT) initiative: analysis...major transfusion events-serious hazards of transfusion (SHOT)-affiliated to the...interests: None declared. Serious hazards of transfusion (SHOT) initiative: analysis... ..**

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Jeanne E. Hendrickson and Christopher D. Hillyer
Anesth. Analg., Mar 2009; 108: 759 - 769.

... ..ARTICLE Noninfectious **Serious Hazards of Transfusion** Jeanne E. Hendrickson...screening, noninfectious **serious hazards of transfusion (NISHOTs)** have emerged...transmission to noninfectious **serious hazards of transfusion (NISHOTs)**. With the advent... ..

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D Stainsby, H Jones, AW Wells, B Gibson, H Cohen, and SHOT Steering Group
Br J Haematol, Apr 2008; 141(1): 73-9.

... ..analysis of UK reports to the **serious hazards of transfusion** scheme 1996-2005. | Between 1996 and 2005 the **Serious Hazards of Transfusion (SHOT)** scheme analysed...risk is to be reduced. | **Serious Hazards of Transfusion**, Manchester, UK. dorotheastainsby... ..

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Serious hazards of transfusion: a decade of hemovigilance in the UK.

D Stainsby, H Jones, D Asher, C Atterbury, A Boncinelli, L Brant, CE Chapman, K Davison, R Gerrard, A Gray, S Knowles, EM Love, C Milkins, DB McClelland, DR Norfolk, K Soldan, C Taylor, J Revill, LM Williamson, H Cohen, and SHOT Steering Group
Transfus Med Rev, Oct 2006; 20(4): 273-82.

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ABO incompatible transfusions--experience from the UK Serious Hazards of Transfusion (SHOT) scheme Transfusions ABO incompatible.

D Stainsby
Transfus Clin Biol, Nov 2005; 12(5): 385-8.

... ..**transfusions--experience from the UK Serious Hazards of Transfusion (SHOT) scheme Transfusions ABO incompatible.** | The **Serious Hazards of Transfusion (SHOT)** scheme has now accumulated 8... ..

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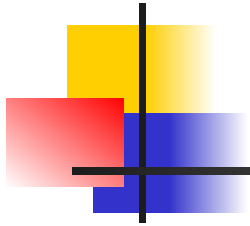
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输血严重危害（SHOT）及其相关问题



- ☞ SHOT的基本概念
- ☞ SHOT的发病情况
- ☞ NISHOT的诊断与治疗
- ☞ NISHOT的预防与控制

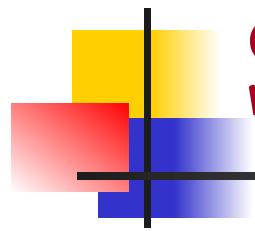
SHOT的基本概念



SHOT:serious hazards of transfusion

noninfection hazards of transfusion(NISHOT)

transfusion-transmitted infectious disease



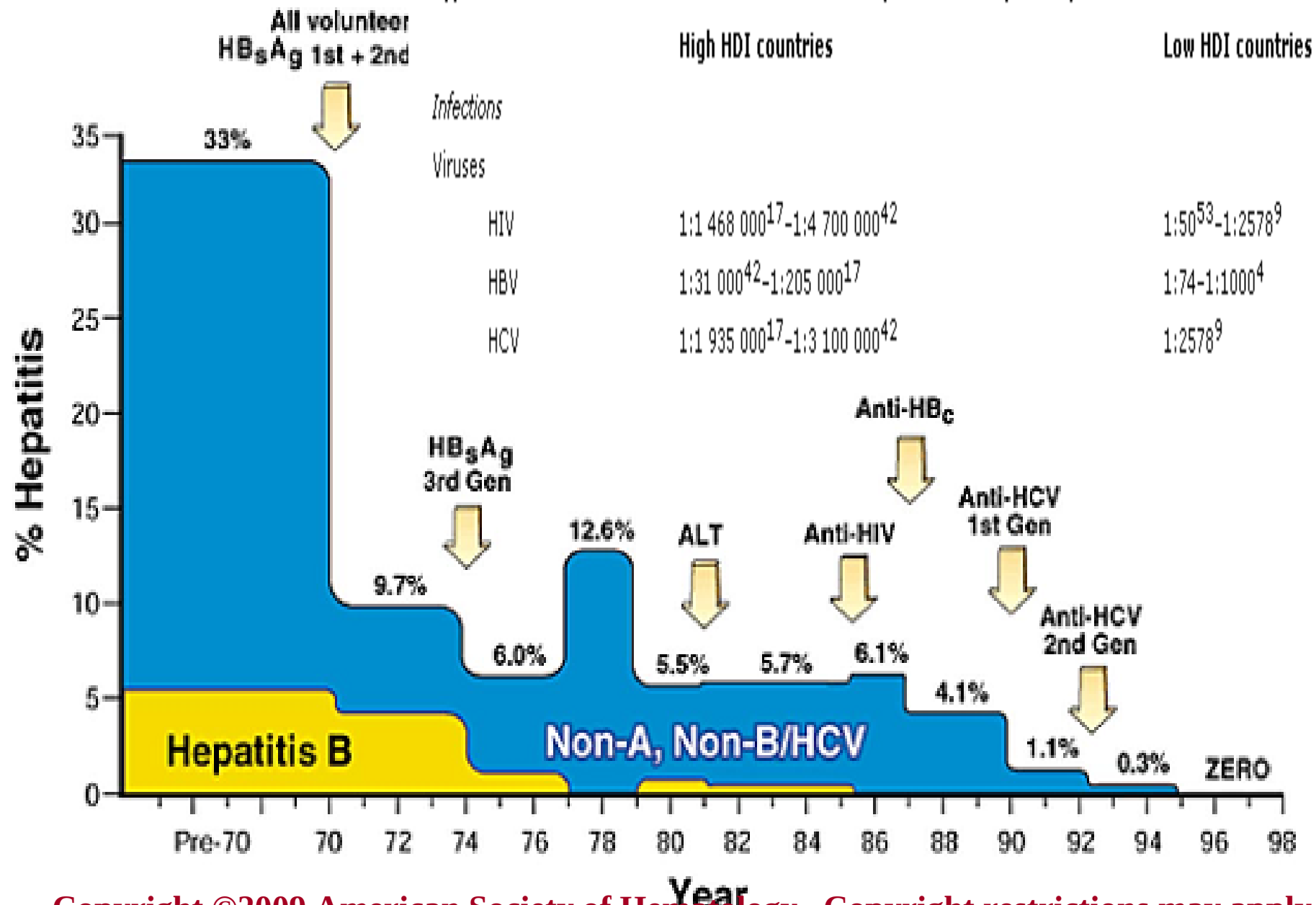
SHOT的发病情况

输血传播疾病的发病情况

NISHOT的发病情况

NISHOT引起的死亡情况

SHOT的发病情况



SHOT的发病情况

Table 1. Noninfectious Serious Hazards of Transfusion (NISHOTs)^a

Immune mediated

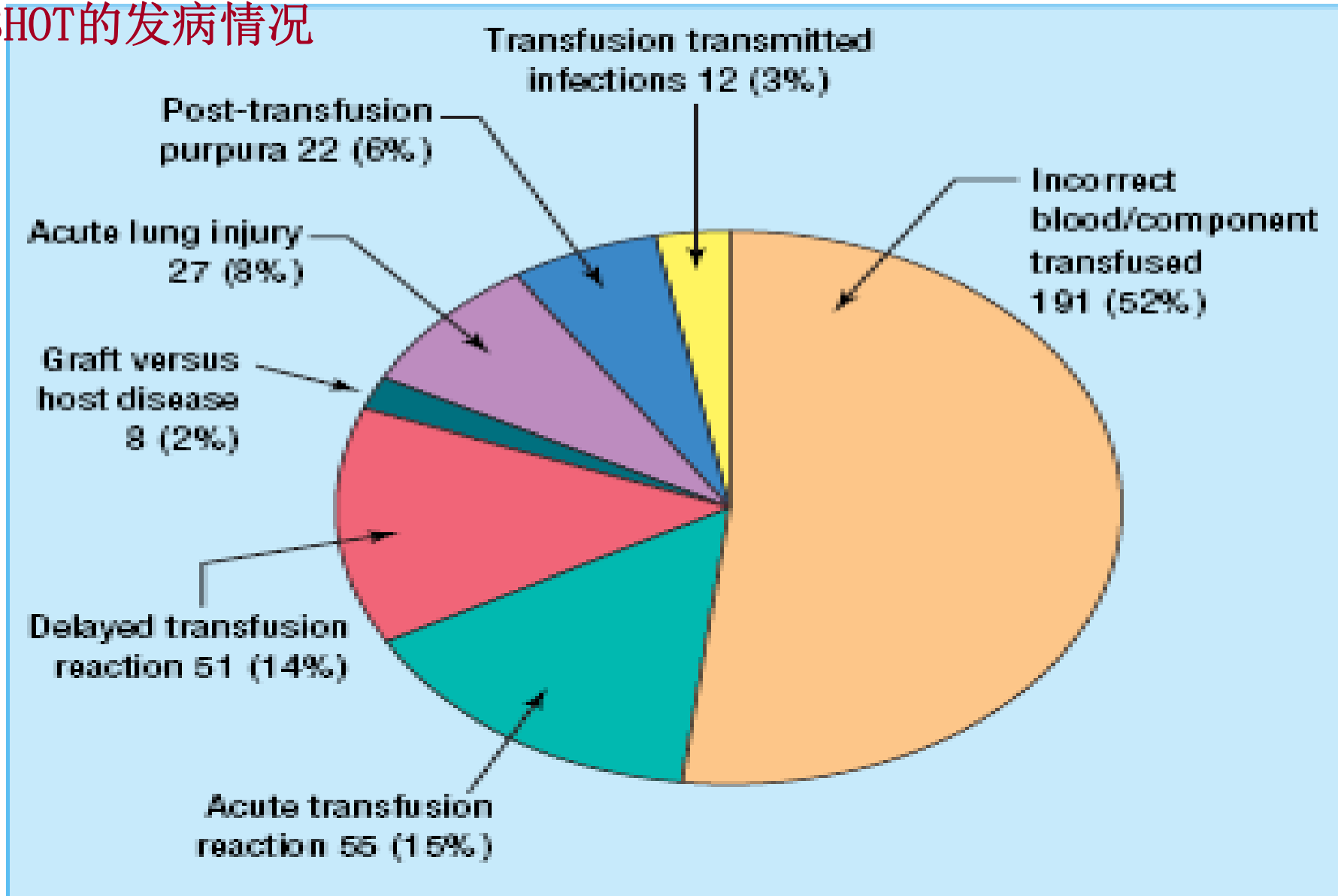
- Hemolytic transfusion reactions
- Febrile nonhemolytic transfusion reactions
- Allergic/urticarial/anaphylactic transfusion reactions
- Transfusion-related acute lung injury (TRALI)
- Posttransfusion purpura (PTP)
- Transfusion-associated graft versus host disease (TA-GVHD)
- Microchimerism
- Transfusion-related immunomodulation (TRIM)
- Alloimmunization

Nonimmune mediated

- Septic transfusion reactions
- Nonimmune hemolysis
- Mistransfusion
- Transfusion-associated circulatory overload (TACO)
- Metabolic derangements
- Coagulopathic complications from massive transfusion
- Complications from red cell storage lesions
- Over/undertransfusion
- Iron overload

^a Listed in order as discussed in text.

SHOT的发病情况

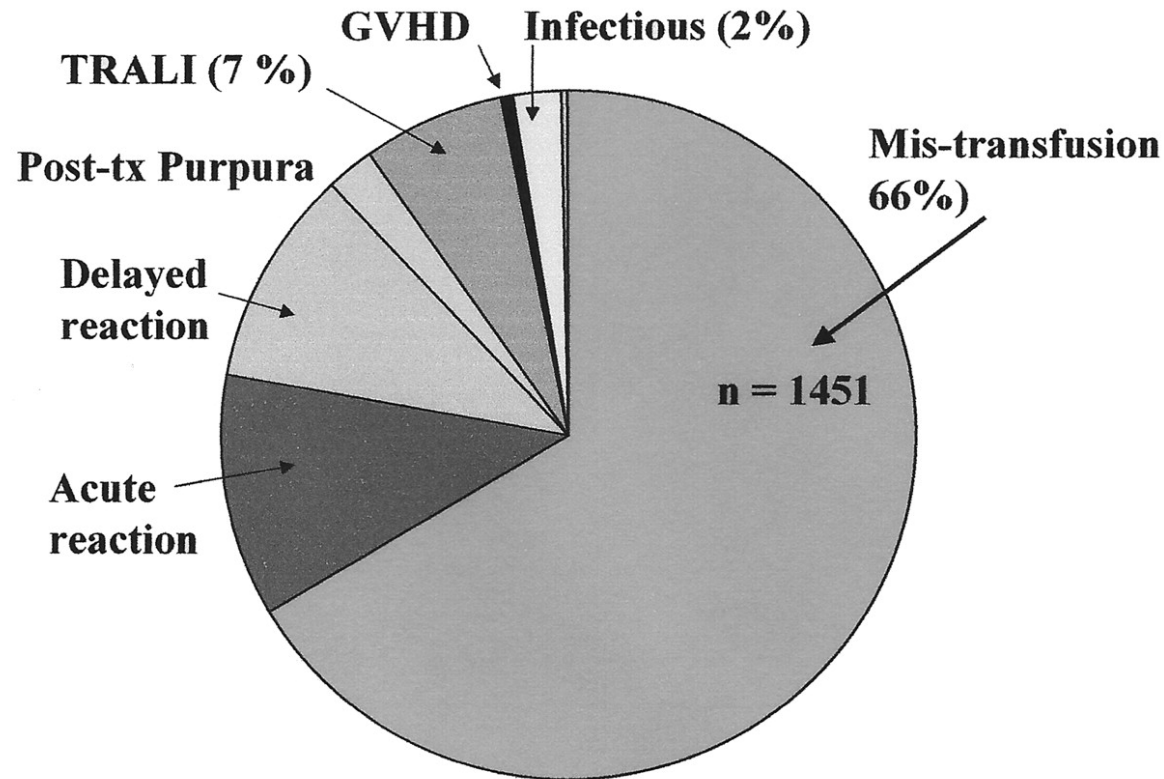


Overview of 366 cases for which initial report forms were received

SHOT的发病情况

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SHOT: Cumulative Data 1996- 2003



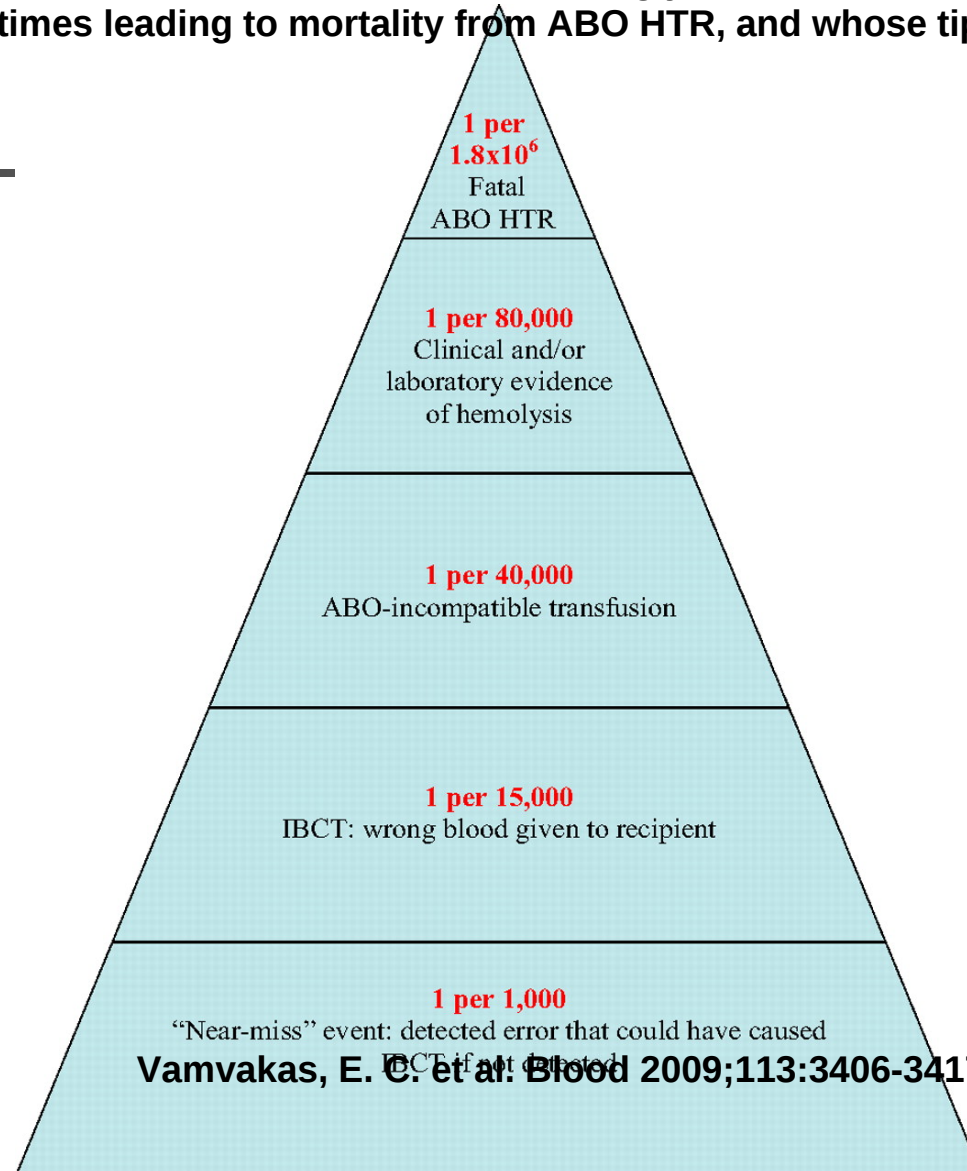
SHOT Annual Report, April 2004: www.shot.demon.co.uk

SHOT的发病情况

blood

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SOCIETY OF
HEMATOLOGY

Figure 3 Likelihood of a serious ABO HTR, shown as a pyramid whose base represents the probability of events predisposing to incorrect blood component transfusion, whose successive layers show the likelihood of increasingly more hazardous (as well as less likely) events sometimes leading to mortality from ABO HTR, and whose tip represents mortality



Vamvakas, E. C. et al: Blood 2009;113:3406-3417

Copyright ©2009 American Society of Hematology.

SHOT的发病情况

Table 2: Time from transfusion to onset or diagnosis of clinically important transfusion-associated adverse events and their estimated incidence.

Adverse event	Typical time to occurrence or diagnosis	Incidence* and mortality
Acute		
Acute hemolytic transfusion reaction	During transfusion (within minutes) or up to 4 h post transfusion	Incidence¶ 1:38 000-1:70 000 Mortality - About 1:30
Febrile nonhemolytic transfusion reaction	During transfusion or up to 4-6 h post transfusion	Incidence† - Red blood cells, about 1:526 - Platelets, about 1:900
Simple allergic transfusion reaction	During transfusion or up to a few hours post transfusion	Incidence 1:3-1:300
Severe allergic or anaphylactic transfusion reaction	Usually during transfusion (within minutes) but can occur up to 4 h post transfusion	Incidence 1:20 000-1:50 000
Transfusion-associated circulatory overload	During transfusion or up to a few hours post transfusion	Incidence < 1:100 (higher in susceptible patients [e.g., heart failure])
Transfusion-related acute lung injury	During transfusion or up to 6 h post transfusion	Incidence 1:5 000-1:190 000
Sepsis	Usually during or within an hour of transfusion, but can be seen up to 4-8 h post transfusion	Incidence - Detectable bacterial contamination of platelets‡, 1:1000-1:10 000 - Red blood cell contamination (symptomatic septic reactions), 1:65 000-1:500 000 Mortality - Sepsis due to platelet transfusion, 1:7500-1:100 000 - Sepsis due to red blood cell transfusion, 60% with gram-negative organisms

SHOT的发病情况

Delayed		
Delayed hemolytic transfusion reaction (immune-mediated)	From 3 d to 2 or more weeks post transfusion	Incidence 1:4000-1:11 000
Alloimmunization to red blood cell antigens	- IgM response: 10 d to 2 wk post transfusion - IgG response: 3 or more wk post transfusion	Incidence§ 1:10-1:100
Transfusion-associated graft-versus-host disease	2-30 d post transfusion (most commonly within 4-10 d of transfusion)	Incidence¶ 1:400 000 Mortality - Virtually 100%
Transfusion-transmitted diseases	Days to years post transfusion (varies by causative agent)	Incidence Varies by infectious agent and disease (Table 3)

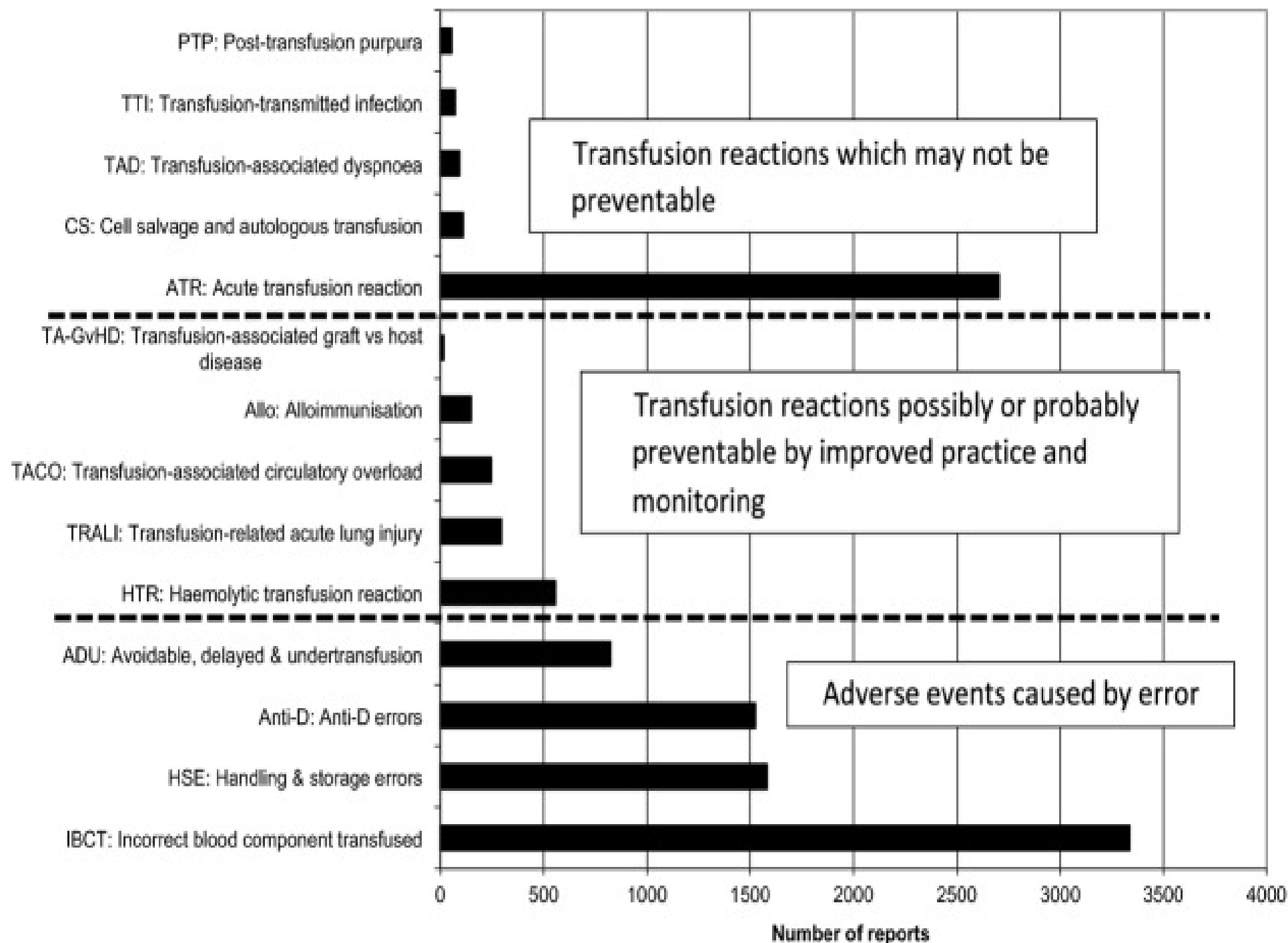
*Estimated incidence varies widely in the published literature; the reported numbers are representative estimates.¹⁻¹⁰

†Based on observed rates using pre-storage leukoreduced products, such as those available from Canadian Blood Services.⁴

‡Reported range of detectable bacterial contamination in platelet products is broad because tests with different sensitivities are used at different centres. See Yazer and Triulzi⁷ for details.

§Incidence of alloimmunization to red blood cell antigens increases with the number of transfusions and is therefore more common in chronically transfused patients (e.g., those with sickle cell anemia).

¶Only a select population of highly immunosuppressed patients or those receiving products from donors with shared HLA haplotypes are at risk for transfusion-associated graft-versus-host disease.



SHOT引起的死亡情况

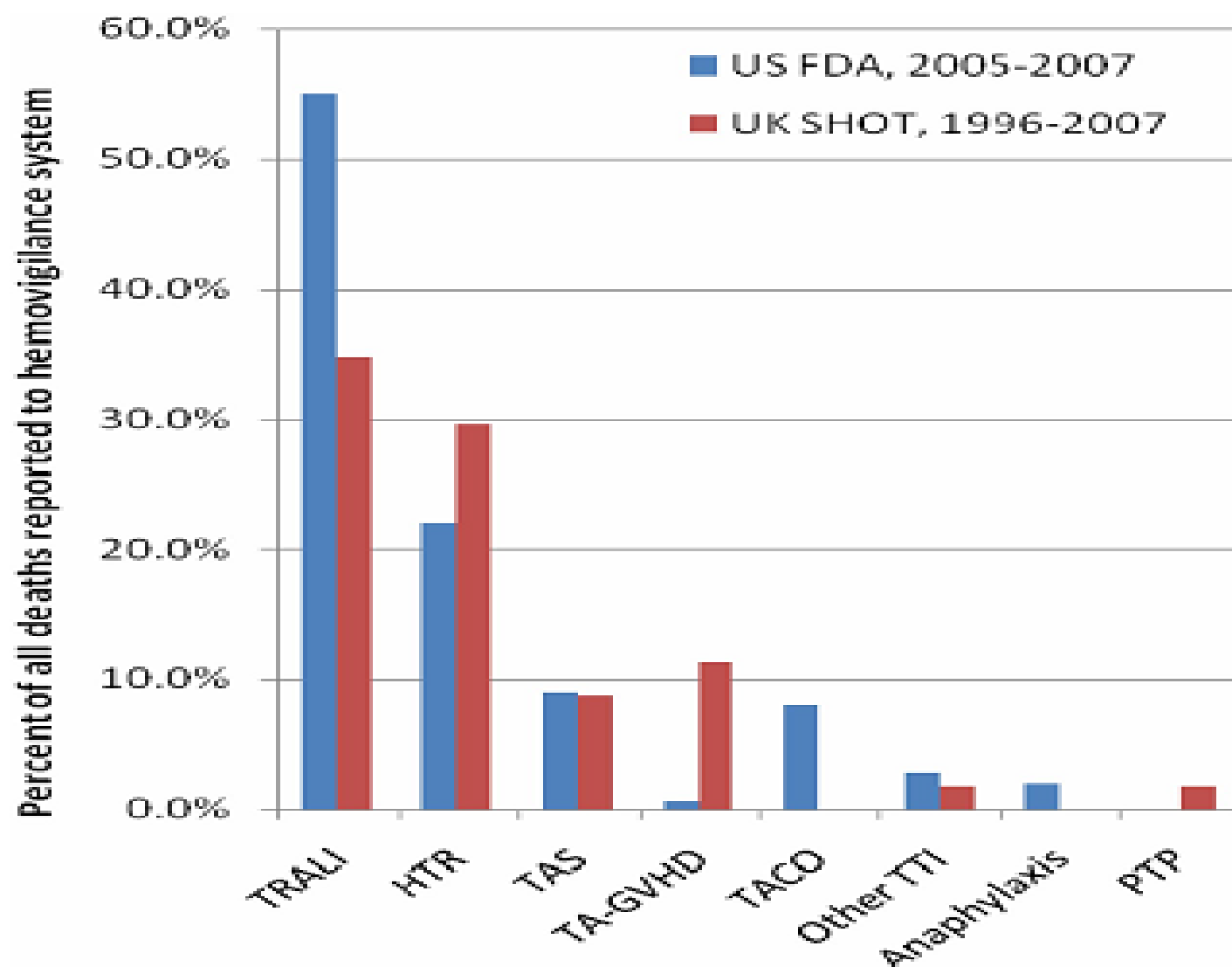
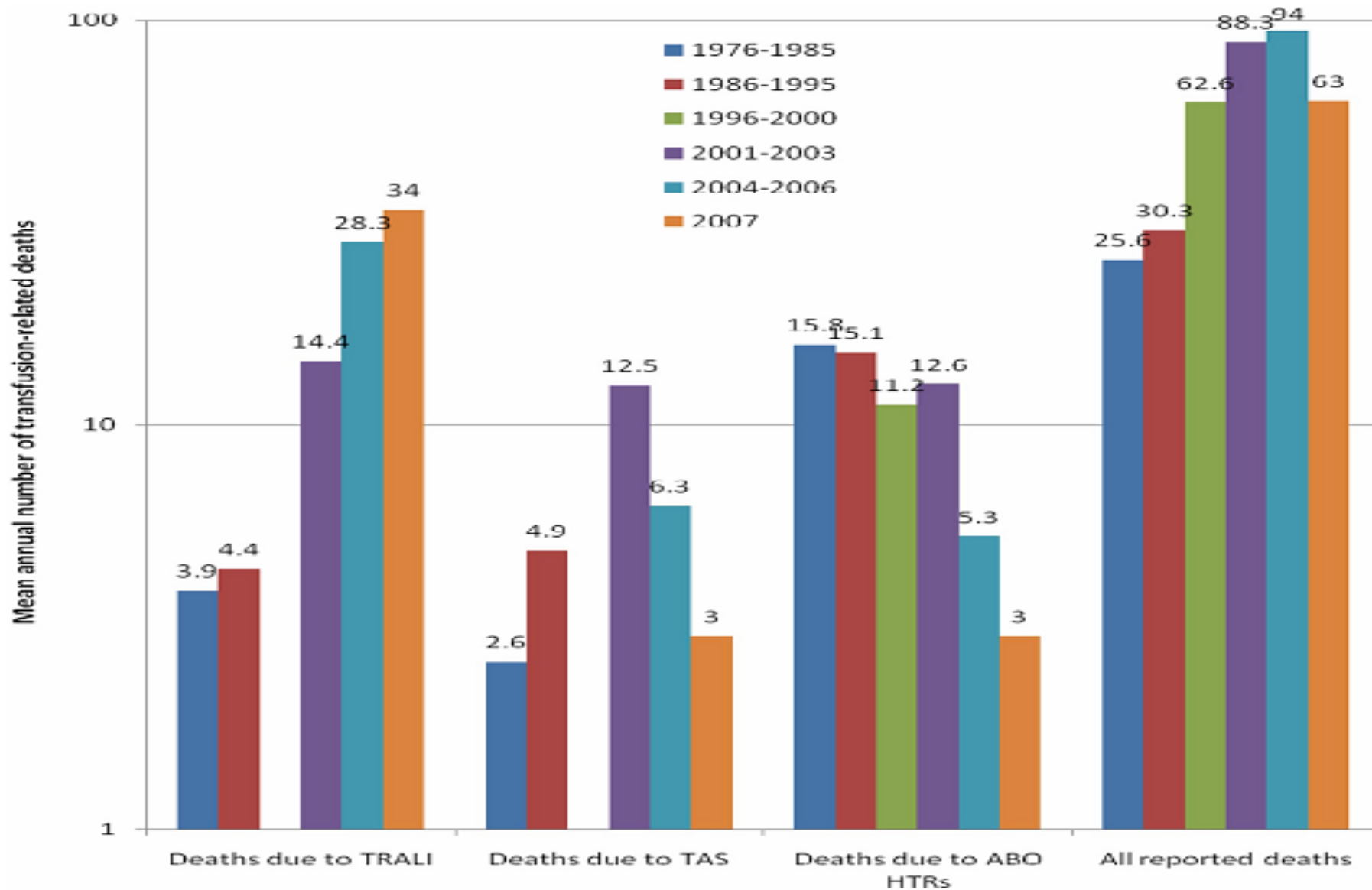


Figure 1. Causes of allogeneic blood transfusion-related deaths as a percentage of all deaths reported to SHOT (1996-2007)⁴ or the FDA (2005-2007).¹ The

SHOT引起的死亡情况



SHOT引起的死亡情况

Table 2

Estimated risk of infection from transfusion in the UK (Public Health England, [201](#)
morbidity or death (all causes) from transfusion based on SHOT data for 2012 (Bol

Category	Risk per million donations [95% confidence interval] for viral infections, and per million components issued for SHOT data	Reciprocal 1 per numb
Major morbidity	46.7 (all causes)	1 in 21 413
Death	3.1 (all causes)	1 in 322 580
Hepatitis B	0.76 [0.22–1.61]	1 in 1.3 millic
Hepatitis C	0.036 [0.015–0.07]	1 in 28 millic
HIV	0.15 [0.09–0.32]	1 in 6.7 millic

非感染性输血严重危害

过敏反应

溶血反应

发热性非溶血性输血反应

细菌污染血输血反应

输血相关性急性肺损伤

输血相关性循环负荷过重

输血相关性移植物抗宿主病

大量输血的输血不良反应

输血后紫癜

输血相关性血色病



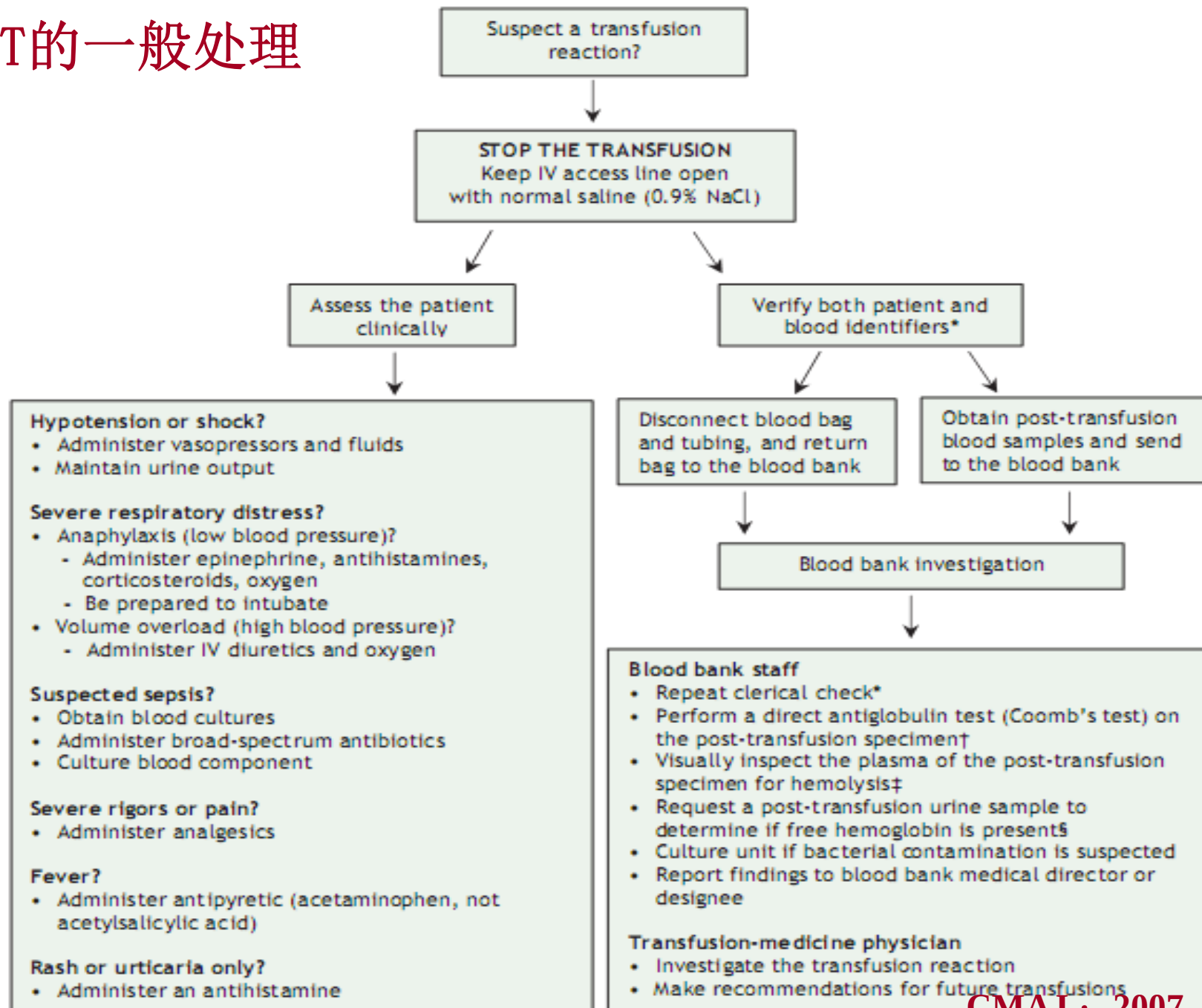
SHOT一般表现与诊断

Table 1: Common signs and symptoms of suspected transfusion reactions

Signs and symptoms	Most common causes	Less common causes
Fever, with or without chills and rigors	• Patient's underlying condition • Febrile nonhemolytic transfusion reaction	• Acute hemolytic transfusion reaction (intravascular hemolysis) • Septic transfusion reaction • Transfusion-related acute lung injury*
Rash	• Mild allergic reaction (to transfused blood product or to a recently administered medication)	• Severe allergic reaction or anaphylaxis
Marked hypotension or shock	• Patient's underlying condition • Severe allergic reaction or anaphylaxis	• Acute hemolytic transfusion reaction • Septic transfusion reaction • Transfusion-related acute lung injury *
Dyspnea	• Patient's underlying condition • Volume overload	• Acute hemolytic transfusion reaction • Severe allergic reaction or anaphylaxis • Transfusion-related acute lung injury * • Severe rigors • Patient anxiety
Pain with localization	• Patient's underlying condition	• Acute hemolytic transfusion reaction (pain at site of infusion, chest pain, flank pain) • Severe allergic reaction/anaphylaxis (abdominal pain and cramping) • Volume overload (chest pain)

*Characterized by marked dyspnea with decreased oxygen saturation (usually requires supplemental oxygen) and a chest radiograph showing new noncardiogenic pulmonary edema and normal heart size, and may be accompanied by fever and changes in blood pressure.

SHOT的一般处理



SHOT的诊断与鉴别诊断

■Table 1■

Current Criteria for the Diagnosis of TRALI

American-European Consensus Conference Definition of ALI³⁹

Acute onset

Bilateral pulmonary infiltrates evident on chest radiograph

Hypoxemia, defined as $Pao_2/Fio_2 \leq 300$

No evidence of left atrial hypertension (ie, no congestive heart failure; or PAOP ≤ 18 , if available)

National Heart, Lung, and Blood Institute Definition of TRALI⁴⁰

No ALI before transfusion

Signs or symptoms of TRALI during or within 6 hours of transfusion

In patients with an alternative ALI risk factor, TRALI is still possible.

Massive transfusion should not exclude the possibility of TRALI.

European Haemovigilance Network Definition of TRALI³⁷

Respiratory distress during or within 6 hours of transfusion

No signs of circulatory overload

Radiographic evidence of bilateral pulmonary infiltrates

ALI, acute lung injury; Fio_2 , fraction of inspired oxygen; PAOP, pulmonary artery occlusion pressure; TRALI, transfusion-related ALI.

SHOT的诊断与鉴别诊断

■Table 2■

Investigation of Suspected TRALI*

Discontinue transfusion

Notify hospital transfusion service

Repeat ABO typing and crossmatch

Obtain CBC count, levels of ABG, blood cultures, and chest radiograph

Return all component bags recently transfused

Test donor and recipient for HLA class I and II antibodies and human neutrophil antigen–specific antibodies (antihuman globulin complement–dependent cytotoxicity or flow cytometry)

Determine specificity, if antibodies detected

Perform donor-recipient WBC crossmatch

Determine parity of donor(s)

Determine age of unit(s) transfused

Test for neutrophil-priming activity when available in research settings

ABG, arterial blood gases; TRALI, transfusion-related acute lung injury.

* Based, in part, on American-European Consensus Conference recommendations.³⁹

Am J Clin Pathol 2008;129:287

一、过敏性输血反应

过敏性输血反应：是指由于输注血浆和含血浆的血液成分而引起的一种变态反应性的输血反应。

发生率：1~3%



病因与发病机制:

1gA同种免疫的作用

异型变异原的作用

低丙种球蛋白血症的影响

1gG重链抗原性差异与同种免疫



临床表现:

轻度过敏反应: 皮肤瘙痒、红斑、荨麻疹等

重度过敏反应: 呼吸困难、哮喘甚至休克等

治疗

轻度过敏反应：减慢输血速度

抗过敏治疗

支持对症治疗

重度过敏反应：立即停止输血

抗过敏治疗

解痉平喘治疗

其他治疗



二、溶血性输血反应

溶血性输血反应：是指在输血开始后发生的，与输血相关的红细胞异常破坏引起的一系列病理反应。

发生率：

急性溶血性输血反应： 1： 3000

慢性溶血性输血反应： 1： 9000

病因与发病机制：

免疫性溶血性输血反应

非免疫性溶血反应



临床表现：

急性溶血性输血反应：起病急

溶血表现

并发症表现

慢性溶血性输血反应：起病慢

溶血表现

并发症表现

实验室检查

一般检查：

血型的复查

重做交叉配血试验

重做抗体筛查试验

血管内溶血的有关检查：

血浆游离血红蛋白

血清结合珠蛋白

血红蛋白尿

血管外溶血的有关检查：

胆红素测定

尿胆原及尿胆红素



治疗

急性溶血性输血反应的治疗：

- 立即停止输血
- 肾上腺皮质激素
- 大剂量免疫球蛋白
- 并发症的防治

迟发性溶血性输血反应的治疗：

- 肾上腺皮质激素
- 并发症的防治
- 支持对症



三、发热性非溶血性输血反应 (FNHTR)

FNHTR: 是指在输血期间或输血后1~2小时内体温升高1℃或1℃以上, 不能用其他原因解释的发热反应

发生率: 红细胞制品: 0.5~1%

手工血小板: 20~30%

病因与发病机制:

细胞因子

WBC、PLT、血浆蛋白及其抗体
致热原的作用



临床表现：

发热

其他症状体征：畏寒、寒战、抽搐

消化道表现

基础疾病加重

治疗：

暂停输血

药物治疗 异丙嗪、地塞米松等

其他：保暖、监测、支持对症治疗等

四、细菌污染血输血反应

细菌污染血输血反应：是指细菌污染血液、血液制品并在其中增殖，经输血进入血循环时引起严重细菌性败血症的一种输血不良反应。

发生率：	1u红细胞	0.26/万
	1u手工血小板	0.8~5.1/万
	1人分单采血小板	0.5~23/万

病因与发病机制：

菌血症献血员献血

献血员局部皮肤带有细菌

输血器材本身污染细菌

血制品制备、运输、发放时污染细菌



污染细菌谱：

革兰氏阳性菌 49%

革兰氏阴性菌 46%

其他混合杂菌 5%

临床表现：

基本症状 寒战、高热、烦躁不安、呼吸
困难、干咳、面色潮红

全麻状态下 血压下降
手术创面渗血不止等

严重者 休克
急性肾功能衰竭
DIC

实验室检查： 直接涂片镜检
细菌培养



治疗：

立即停止输血

尽早联用大剂量广谱抗生素

并发症的治疗

其他支持对症治疗



五、输血相关急性肺损伤 (TRALI)

TRALI: 是指输入的血液中含有与受者白细胞抗原相应的HLA抗体或粒细胞特异性抗体, 因这些抗原抗体反应而导致的急性呼吸功能不全或肺水肿

发生率: 1/5000

发病机制: 尚不十分清楚。
可能与供、受者血中有白细胞凝集素或HLA特异性抗体有关。

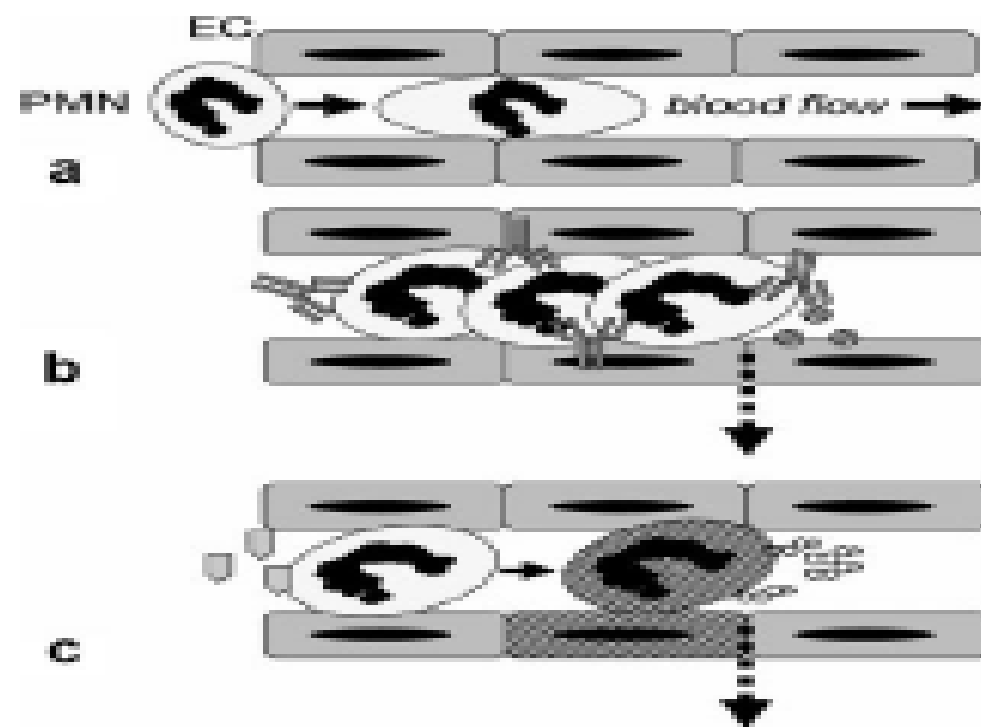


Figure 2. a–c. Pathophysiology of transfusion-related acute lung injury (TRALI). Under physiologic conditions, the granulocytes, which has an average size similar to, or larger than, the diameter of a lung capillary, has to squeeze itself through many of the lung capillaries during its passage through the lungs (a). Activated neutrophils are trapped in the pulmonary vasculature, a prerequisite for the initiation of TRALI. Two models have been proposed. If transfused antibodies induce granulocyte agglutination, this leukoagglutinate will be trapped in the lung vessels, a model referred to as immune TRALI (b). In severely ill patients, the reactivity of the endothelium or the granulocyte may be enhanced due to the underlying disease; if biologically active lipids, which accumulate during storage of cellular blood components, are transfused, the trapped granulocyte is finally activated and induces TRALI, a model referred to as nonimmune TRALI (c).³⁹ (Reproduced with kind permission of Springer Science + Business Media.)

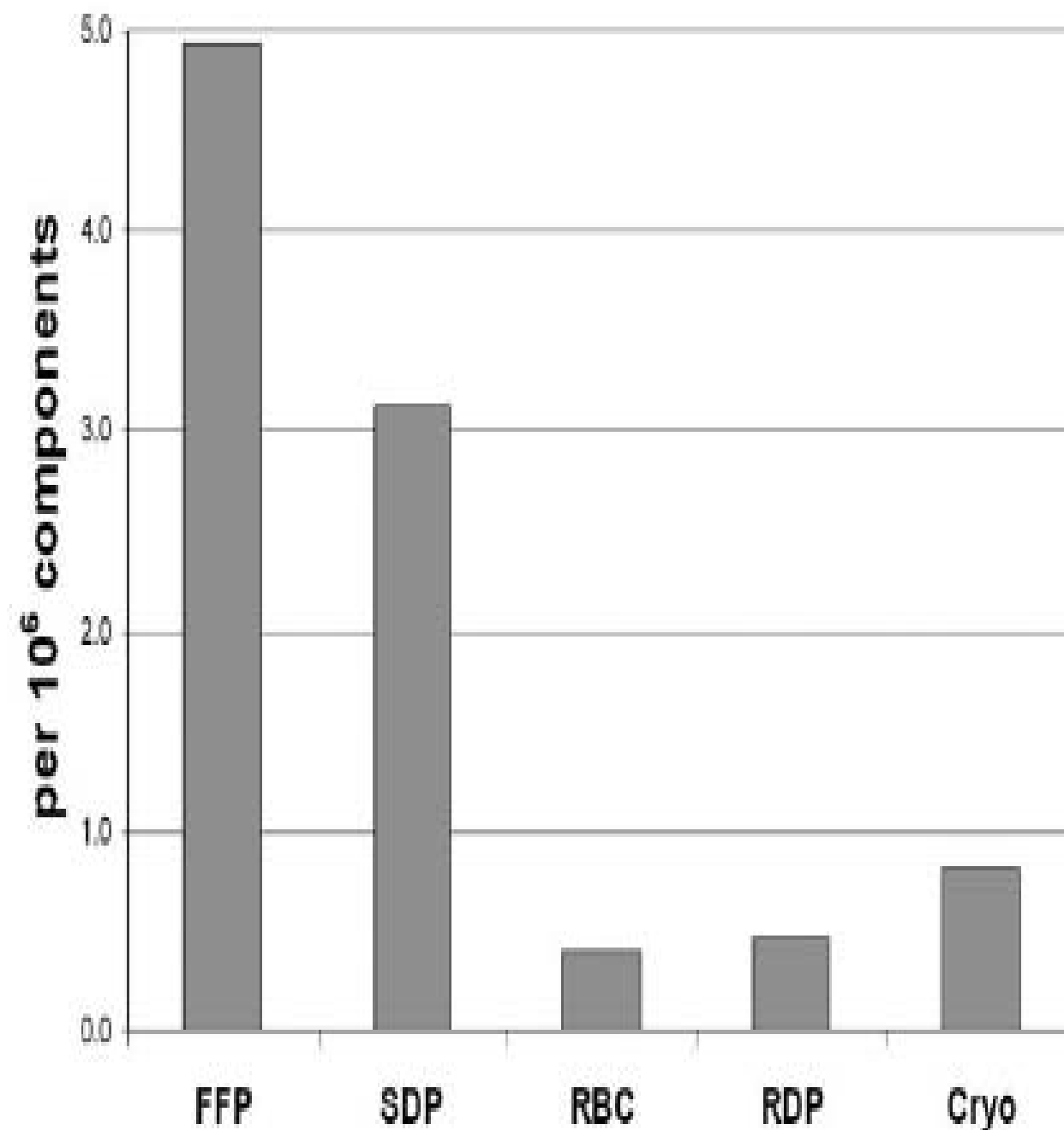


Figure 1. Risk of fatality from transfusion-related acute lung injury (TRALI) by component. Data based on 38 cases of probable TRALI-related deaths from American Red Cross surveillance reports (2003–2005).¹⁵



表现： 输血数分钟-40小时发病
(2-4h多见)

症状： 呼吸急促、憋气、发绀

体征： 发绀、低血压、发热、肺罗音

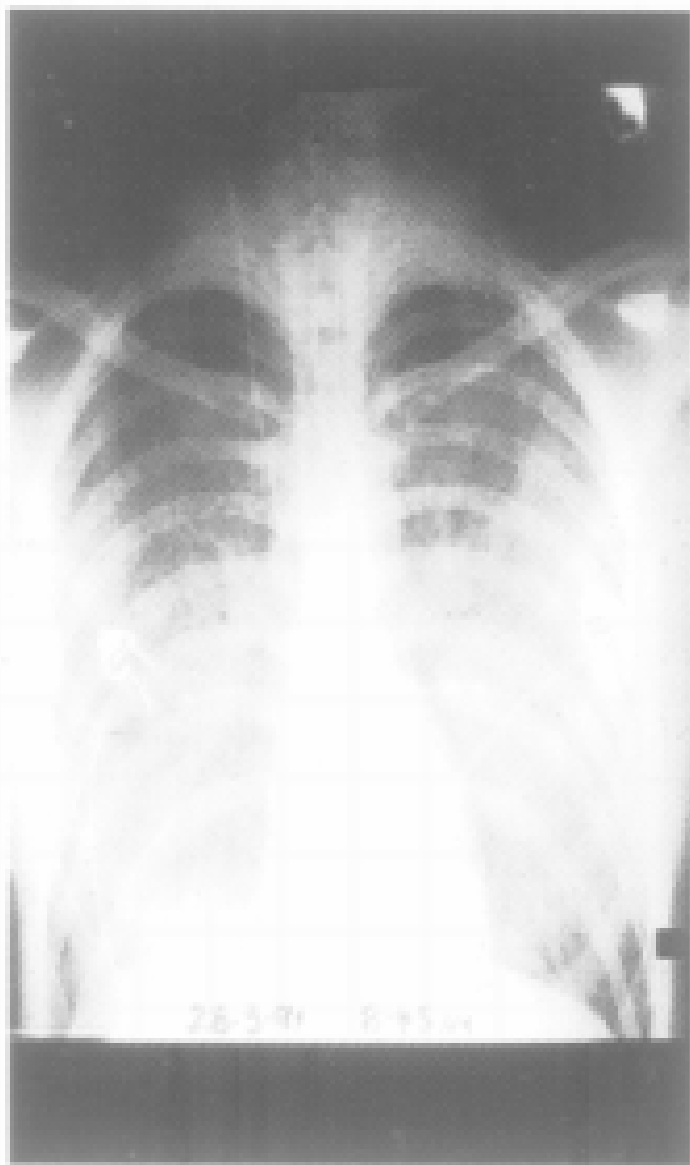
X 线： 双肺浸润、但无心衰表现

处理： 立即停止输血

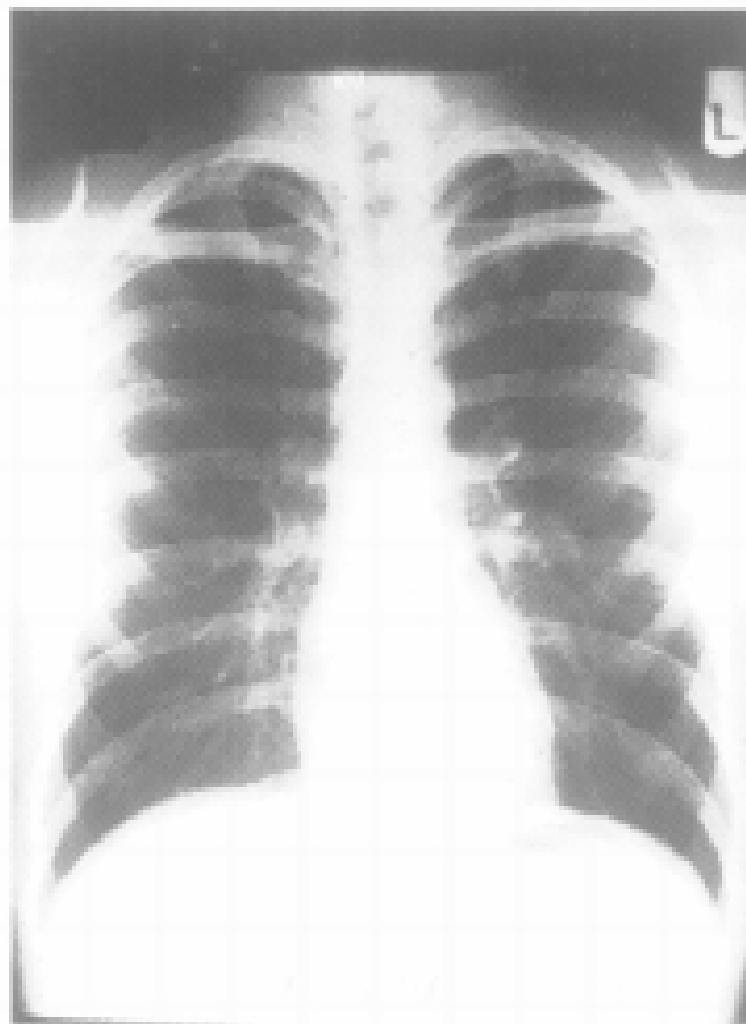
治疗与心衰引起肺水肿相同

预防： 不输粒细胞抗体阳性血

输少白细胞的RBC、WRC、FTRC



输血浆后16小时吸入100%O₂



数周后

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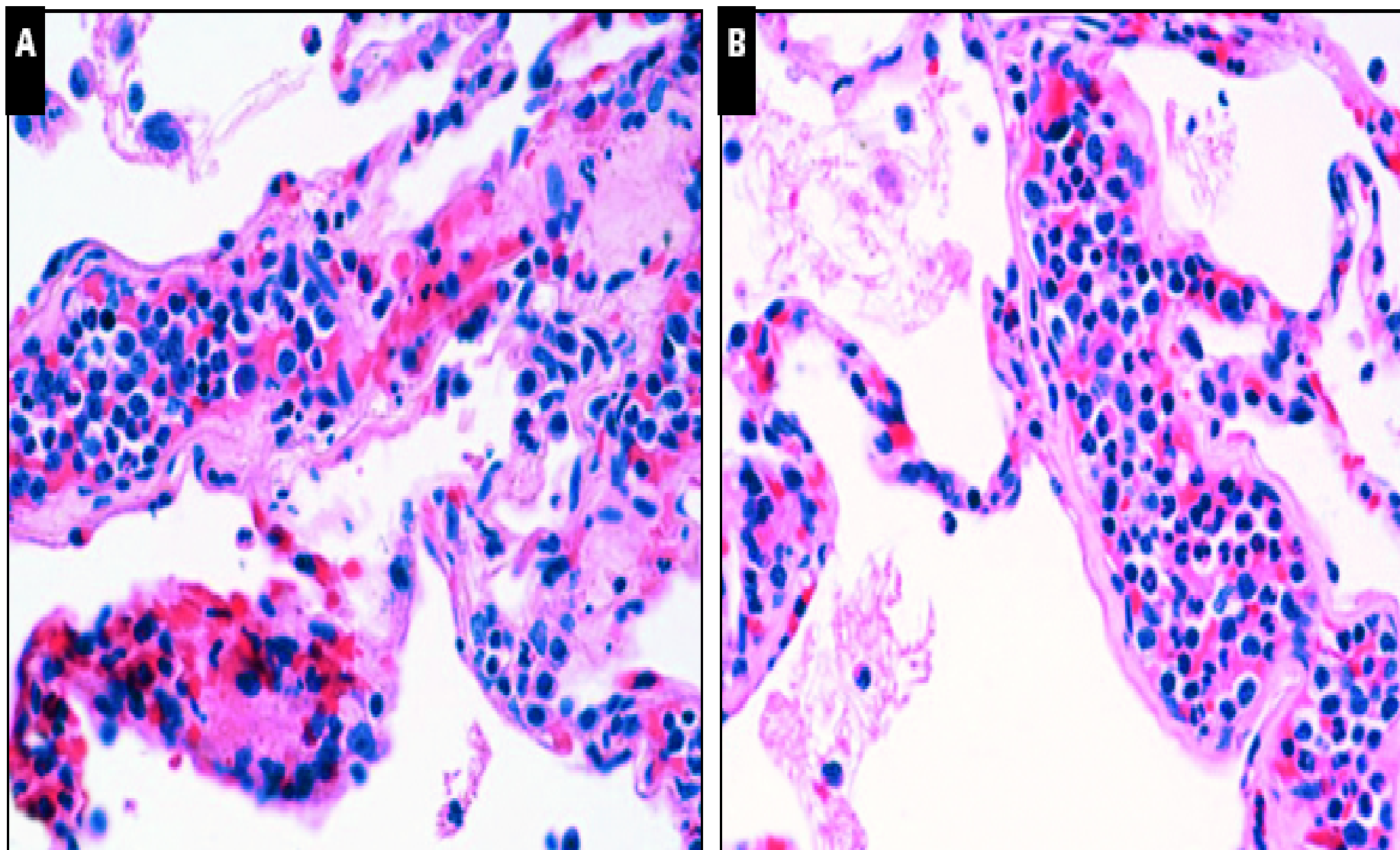


Image 1 A complete autopsy was performed on a patient who died with the clinical diagnosis of transfusion-related acute lung injury. The most significant finding was pulmonary edema (combined lung weight of 2,780 g) (**A**) with neutrophilic aggregates in the pulmonary vasculature (**B**, H&E, $\times 180$).

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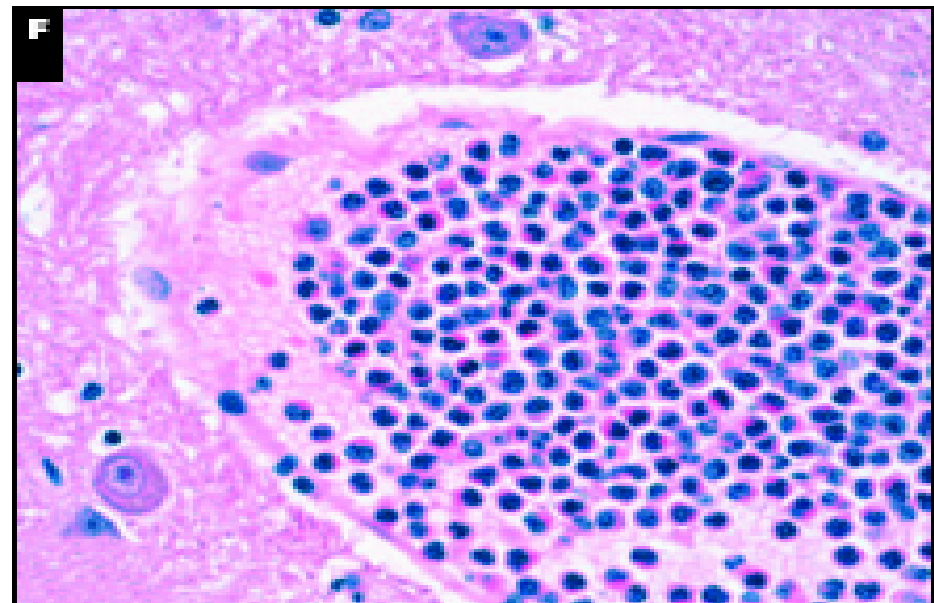
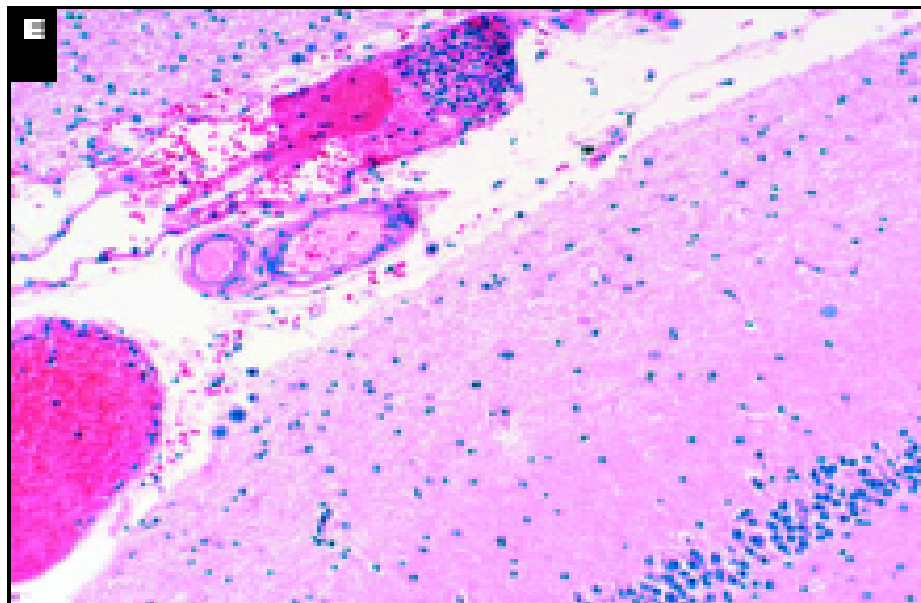
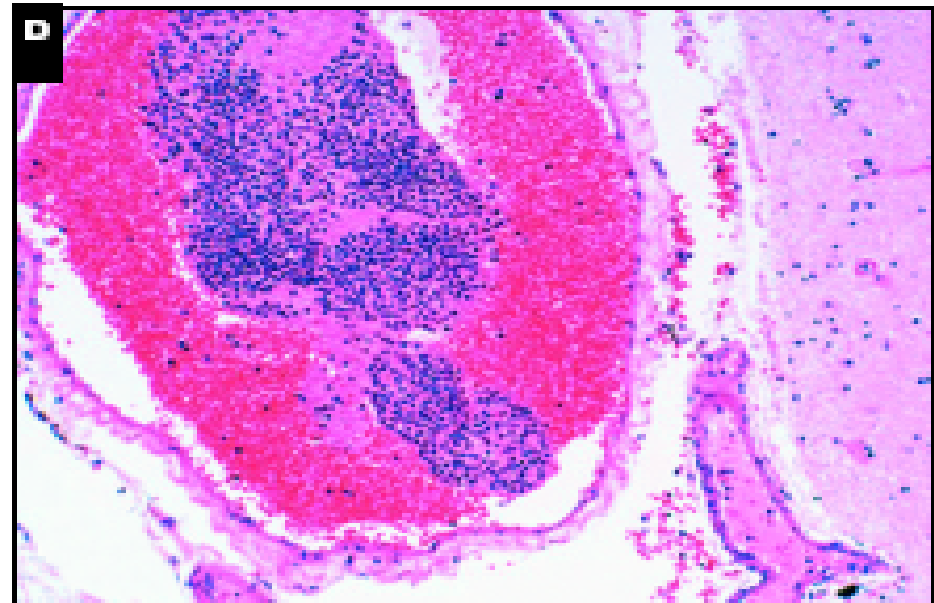
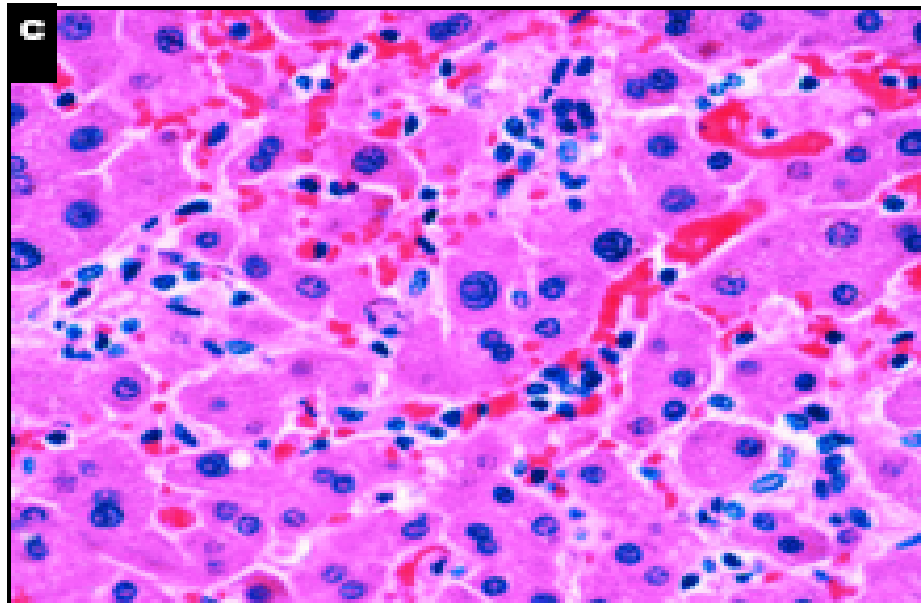


Image 11 Also, marked congestion of most tissues, sludging of RBCs, and neutrophilic collections were found in the liver sinusoids (C, H&E, $\times 180$), myocardium, glomeruli, and central nervous system. Several meningeal blood vessels of frontal lobes and hippocampus contained RBCs and leukocytes (D, H&E, $\times 50$; E, H&E, $\times 50$), and pontine blood vessels had dense neutrophilic aggregates (F, H&E, $\times 180$). Several small lacunar infarcts of the pons were noted (not shown).

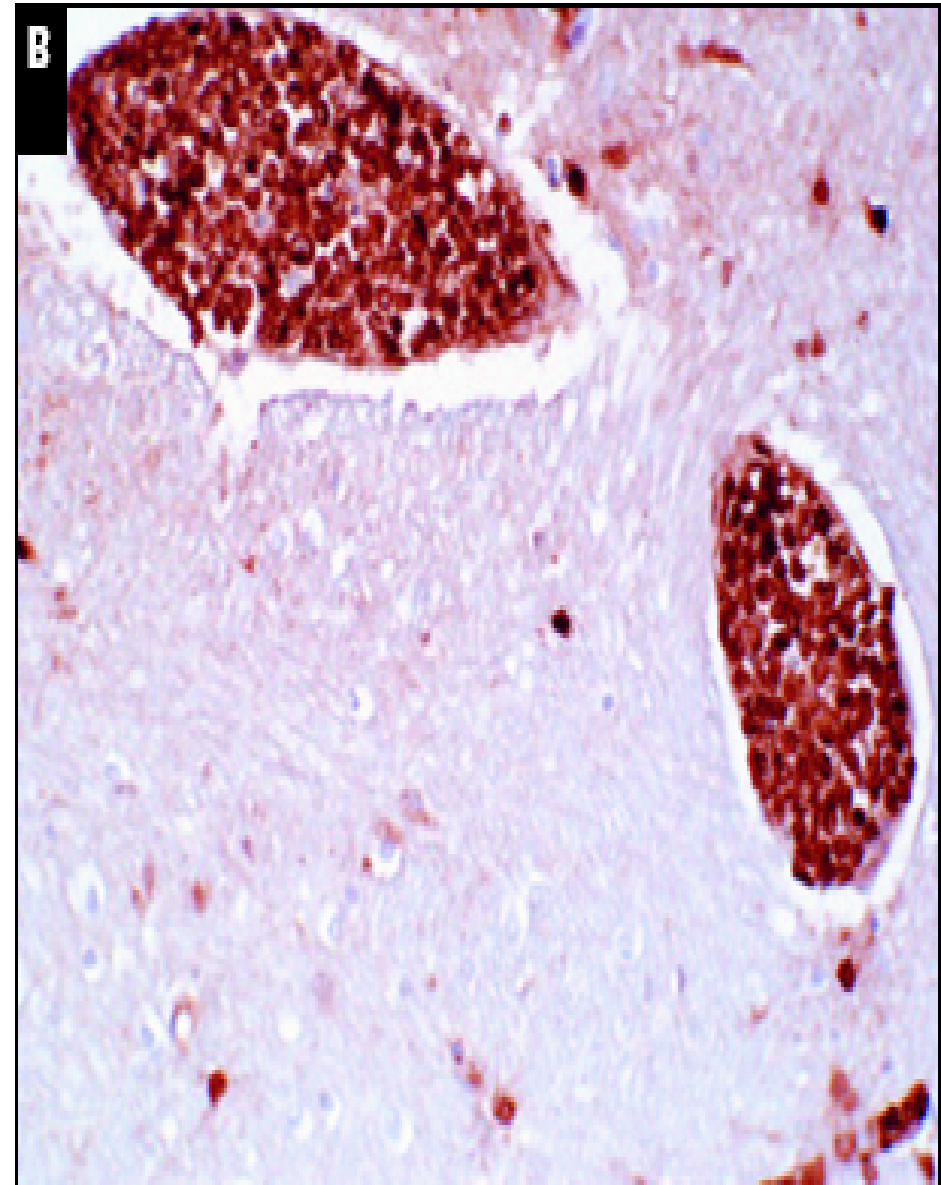
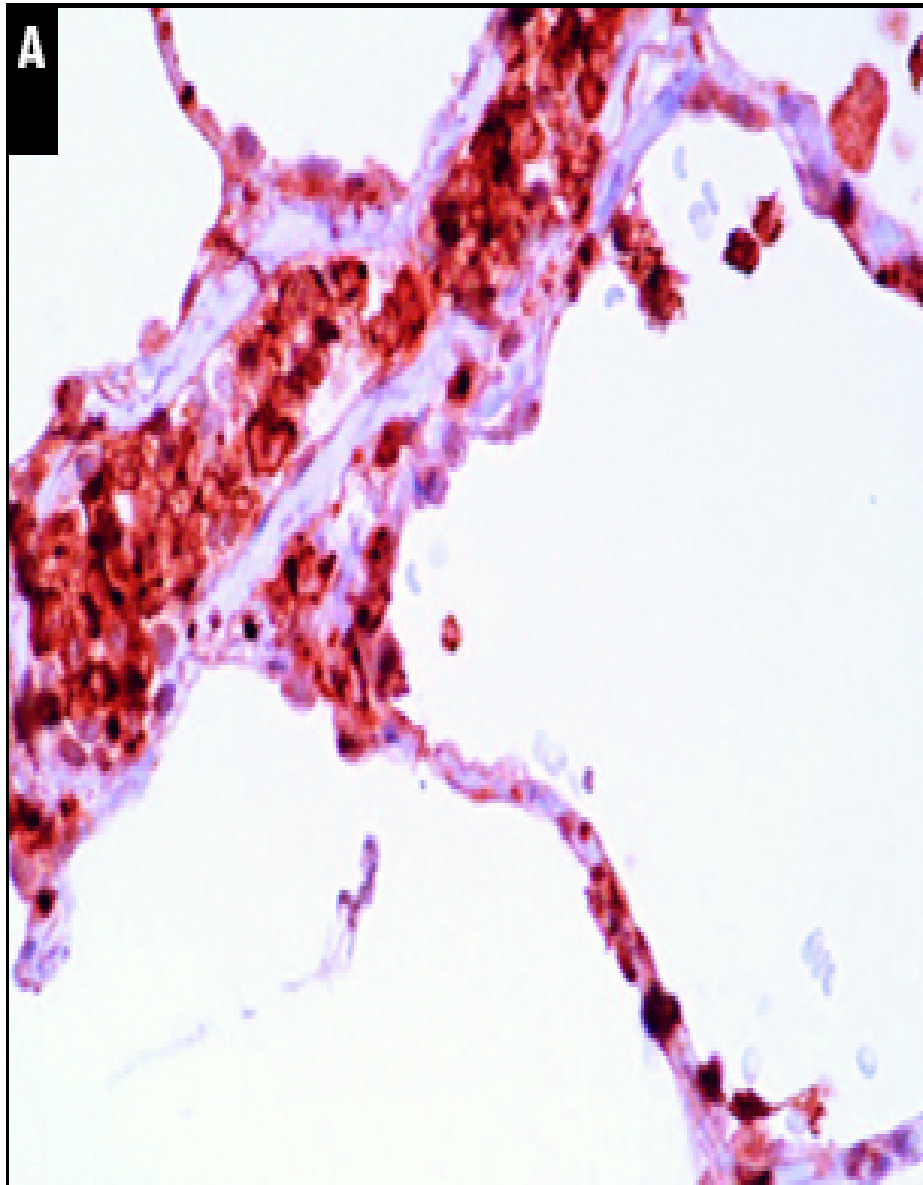


Image 2 Myeloperoxidase (MPO) stain confirmed that most of the cells in the microvasculature of the lungs and pons were neutrophilic/MPO+ collections (**A**, $\times 180$; **B**, $\times 100$).

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六、输血相关循环的环负荷过重

输血相关的循环超负荷：是指即短时间内输入大量血液或输血速度过快，超过病人循环或心脏负荷能力，导致患者出现心力衰竭或急性肺水肿的一种输血反应

病因与发病机制：

心肺功能不全的影响

心功能正常但快速大量的输血或输液

胶体渗透压降低增加的影响

肺血管渗透压增加的影响



表现： 输血过程中出现
突然心率加快
呼吸困难、紫绀、咳粉红色泡沫痰
两肺先有哮鸣音，以后出现湿罗音

预防： 输注速度不要过快
伴心肺疾病时速度以 $<20\text{gtt/分}$ 为宜

治疗： 停止输血
抢救肺水肿

七、输血相关性移植物抗宿主病（GVHD）

GVHD：是指受血者输入含有免疫活性淋巴细胞（主要是T-淋巴细胞）的血制品后发生的一种与骨髓移植引起的GVHD类似的临床征侯群。

病因和发病机制：

受血者的免疫状态
供、受者的组织相容性
输入的淋巴细胞数量
其他

发病率：0.01%-0.10%

病死率：>90%

表 现：输血后7-14天（2-30天）发病

高热、皮肤潮红

腹痛、腹泻

肝脾肿大、肝功能异常

全血细胞下降

预 防：SCT患者等输入照射后RBC

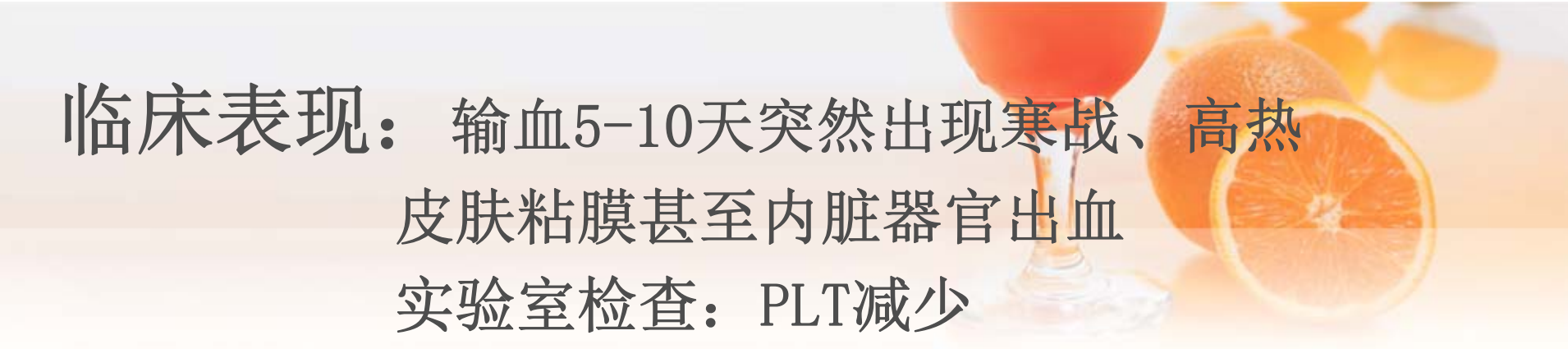
处 理：无特殊有效治疗方法。



八、输血后紫癜（PTP）

PTP：是指因输入不相容的血小板或多次妊娠产生血小板抗体，发生抗原抗体反应，破坏同种或自身血小板，引起急性、免疫性和暂时性血小板减少综合征。

病因与发病机制：PTP 大多数发生于血小板特异性抗原（HPA）即HPA-1a阴性的患者，某些HPA-1a阴性的患者，在多次妊娠、输血后产生抗HPA-1a，当再次输入HPA-1a阳性的浓缩血小板时，抗体与抗原结合可破坏输入或自身HPA-1a阴性的血小板。



临床表现： 输血5-10天突然出现寒战、高热

皮肤粘膜甚至内脏器官出血

实验室检查：PLT减少

骨髓PLT生成良好

可检出抗HPA-1a抗体

治疗： 免疫抑制剂治疗

治疗性血浆置换

支持对症治疗如止血等

九. 大量输血的不良反应

- 出血倾向
- 枸橼酸盐中毒
- 体温过低
- 肺微栓塞
- 酸碱失衡和电解质紊乱
- 体温过低及其处理





什么是大量输血？

24h 内急输血大于病人总血容量的1.5倍，或在1小时内输血量相当血容量的1/2，为大量输血

➤ 出血倾向及其处理

表现：皮肤出血：淤斑、伤口渗血
内脏出血

发病原因：PLT数量↓，PLT活性↓
凝血因子↓

治疗：维持正常血容量
补充浓缩血小板
冷沉淀（Fig<1g/L时）
新鲜冰冻血浆





➤ 枸橼酸盐中毒 及其处理

表现：

- 不自主的肌肉震颤
- 手足抽搐
- 出血倾向
- 血压下降
- 心室颤动甚至停搏



机理：

治疗：输血速度 $>500\text{ml}/10\text{分}$ ，或成人已输血 5000ml 以上，应给予10%葡萄糖酸钙 10ml ，由另一侧静脉注射。

输血过程中注射观察血浆钙离子水平和心电图，高钙血症同样危险

➤ 肺微栓塞及其处理

表 现：肺栓塞表现
ARDS表现

发病机制：血液贮存一周后，WBC、PLT和纤维蛋白等倾向于发生微聚集物。大量输血时，进入血循环微聚集物增多，引起肺血管床弥漫性的血管阻塞。

预 防：输血前可使用微孔滤器清除贮存血中的血液碎屑（输新鲜血及血小板时，不需这种微孔滤器）。





➤ 酸碱失衡和电解质紊乱及其防治

酸中毒：大量输血可出现酸中毒（与未对低血容量进行充分治疗有关）。正常情况下，人体可迅速中和输血造成的酸负荷，不需补碱等处理。

碱中毒：大量枸橼酸盐代谢后产生碳酸氢钠可引起碱中毒。慎用碱性药物即可，不必特殊处理。



➤ 体温过低及其处理

表现：体温过低、心功能受损，心律紊乱
代谢性酸中毒、低钙

机理：

治疗：病人方面：用毯覆盖

用加温垫（37°）

湿化麻醉气体

液体方面：将液体储于温箱中

将液体袋浸入温水中

应用热交换器

输血加温器

加温控制在 $35\sim 36^{\circ}\text{C}$



十、含缺血黄素沉着症

输血所致的含缺血黄素沉着症是由于长期反复输注全血、红细胞使体内铁负荷过重的一种输血不良反应。

病因和发病机制：

人体内封闭的铁代谢系统

人体内铁的总量为3-5g

每天造血约需要20-25mg铁

人体每天排铁不超过1mg

每毫升血约含缺0.5mg

含铁血黄素的沉积



临床表现:

皮肤色素沉着

肝脏病变

心脏病变

胰岛病变与糖尿病

其他脏器病变

实验室检查:

铁负荷过重的实验室表现

组织器官受累的实验室表现



治疗：

铁螯合剂治疗 去铁酸胺或乙二胺四乙酸，每天肌肉注射
10mg/kg，可使机体每天
从尿中排铁10-20mg。

对症治疗

护肝

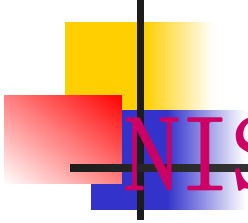
降糖

强心

其他治疗



NISHOT的预防与控制



NISHOT预防、控制的一般策略

NISHOT预防、控制的其他措施

NISHOT预防、控制的一般策略

Table 4. Five currently available interventions for further reducing allogeneic blood transfusion-related mortality

Strategy	Causes of ABT-related deaths mitigated by the strategy
Reduction in the number of exposures to allogeneic blood donors through: conservative transfusion guidelines avoidance of pooled blood products	Transmission of any emerging, potentially fatal TTI Residual risk from known TTIs (especially TAS and babesiosis; Table 3) Other potentially fatal transfusion complications (Table 2)
Use of FFP and single-donor platelets collected exclusively from male donors or female donors without a history of pregnancy or shown not to have WBC antibodies	TRALI
Information systems for checking the identity of units and intended recipients*/other measures to prevent HTRs†	Acute HTRs due to ABO-incompatible transfusions Acute and delayed HTRs due to non-ABO alloantibodies to RBC antigens
WBC reduction of RBCs and platelets administered in cardiac surgery	Adverse effects of ABT attributable to WBCs and their biologically active products elaborated during storage
Pathogen reduction (PR) of platelets and FFP‡	Transmission of most emerging, potentially fatal TTIs Residual risk of known TTIs (especially TAS and babesiosis; Table 3) Transfusion-associated GVHD

*Technologies such as barrier systems, bar codes, and/or national patient identification systems.

†Including donor genotyping for RBC antigens, phenotypic matching of donor and recipient for clinically significant RBC antigens, and/or RBC antibody detection methods with improved sensitivity.

‡No FDA-licensed technology is available in the United States. Moreover, the benefit from this intervention will be suboptimal until PR is also available for RBCs.

NISHOT预防、控制的其他措施

Table 2 Haemoglobin-based and physiological transfusion triggers as a function of patient-related, logistical and geographical factors

Situation	Patients	Hb (g/dl)	Circulation	Myocardial ischaemia	PvO ₂ , Ex-O ₂ , Vo ₂
High HDI countries Intraoperative, ICU	All patients*	6 [†]	Relative tachycardia/hypotension [‡]	ST-segment changes [§]	Yes
	>80 years	7	Relative tachycardia/hypotension [‡]	ST-segment changes [§]	Yes
	CAD	8	Relative tachycardia/hypotension [‡]	ST-segment changes [§]	Yes
	CVD	7	Relative tachycardia/hypotension [‡]	ST-segment changes [§]	Yes
	Fever/hypermetabolism	7	Relative tachycardia/hypotension [‡]	ST-segment changes [§]	Yes
Ward	All patients	6 [†]	Relative tachycardia/hypotension [‡]	Clinical signs [¶]	NA
	>80 years	8	Relative tachycardia/hypotension [‡]	Clinical signs [¶]	NA
	CAD	9	Relative tachycardia/hypotension [‡]	Clinical signs [¶]	NA
	CVD	8	Relative tachycardia/hypotension [‡]	Clinical signs [¶]	NA
	Fever/hypermetabolism	8	Relative tachycardia/hypotension [‡]	Clinical signs [¶]	NA
Low HDI countries All situations	All patients	5 [†]	Signs of circulatory failure	Clinical signs [¶]	NA

NA, not applicable; PvO₂, mixed venous oxygen partial pressure <32 mmHg; Ex-O₂, oxygen extraction ratio >50%; Vo₂, oxygen consumption >10%; CAD, coronary artery disease; CVD, cerebrovascular disease.

An RBC transfusion is indicated if one of the criteria listed (the Hb threshold, the circulation criterion, myocardial ischaemia or the PvO₂, Ex-O₂ or Vo₂ criteria) is reached. Normovolaemia is assumed for all triggers, and anaemia should be the only probable cause.

*Includes all patients except the subcategories aged >80 years, those with CAD, those with CVD and those with fever/hypermetabolism.

[†]One may choose not to transfuse an individual patient without any physiological transfusion triggers.

[‡]Relative tachycardia is defined as a heart rate >120–130% of baseline (>110–130 bpm), and relative hypotension is defined as a mean arterial blood pressure <70–80% of baseline or <60 mmHg (<55 mmHg in young healthy subjects, <70–80 mmHg in patients with CAD or CVD and in hypertensive patients, and even higher in severely hypertensive patients).

[§]A new ST-segment depression >0.1 mV or an ST-segment elevation >0.2 mV.

[¶]To be confirmed with ECG and/or troponin measurement, if possible, in a timely fashion.

NISHOT预防、控制的其他措施

Table 1 Comparison of recommendations for irradiation of blood components for the USA [54,73], UK [11,56], and Japan [55]

USA	UK	Japan
Irradiation of blood components required		
1. Blood component from relative.	1. Blood component from relative.	1. Blood component from relative.
2. HLA-compatible blood components.	2. HLA-compatible blood components.	2. HLA-compatible blood components.
3. Intrauterine transfusions.	3. Intrauterine transfusions.	3. Intrauterine and low birth weight neonate transfusions.
4. Neonatal exchange transfusions.	4. Neonatal exchange transfusions.	4. Neonatal exchange transfusions.
5. Congenital T cell immunodeficiency defects.	5. All granulocyte products.	5. Congenital T cell immunodeficiency defects.
6. Allogeneic BMT or PBSC transplant patients.	6. Congenital T cell immunodeficiency defects.	6. Allogeneic BMT or PBSC transplant patients.
7. Autologous BMT or PBSC transplant patients.	7. Allogeneic BMT or PBSC transplant patients.	7. Autologous BMT or PBSC transplant patients.
8. Patients with Hodgkin's disease.	8. Autologous BMT or PBSC transplant patients – at least 3 months post-transplant.	8. Any RBCs ≤ 3 days old.
9. Patients treated with fludarabine or related purine analogue.	9. Patients with Hodgkin's disease.	9. Frozen/thawed RBCs and fresh plasma when given to patients at risk.
	10. Patients treated with fludarabine or related purine analogue.	10. Cardiovascular surgery patients.
		11. Oncology surgery patients.
		12. Immunocompromised recipients of organ transplantation.
		13. Patients ≥ 65 years old.
		14. Massive blood loss or severe trauma.
		15. Consider irradiated blood products for patients with lymphomas, leukaemias, other haematopoietic malignancies, and solid organ tumours treated with high-dose chemotherapy or radiation.
Irradiation of blood components not recommended		
1. Fresh-frozen plasma.	1. Fresh-frozen plasma.	1. Fresh-frozen plasma.
2. Frozen/thawed RBCs.	2. Frozen/thawed RBCs.	
3. Cardiovascular surgery patients.	3. Cardiovascular surgery patients.	
4. Patients with solid tumours.	4. Patients with solid tumours.	
5. Patients with solid organ transplants.	5. Patients with solid organ transplants.	

HLA, human leucocyte antigen; BMT, bone marrow transplant; PBSC, peripheral blood stem cell; RBC, red blood cells.

NISHOT预防、控制的其他措施

Appendix 1: A patient-oriented discussion of some of the more common questions and concerns about blood transfusions

This information sheet should NOT be a substitute for the informed consent process, nor should it replace a discussion between the physician and patient about the risks and benefits of a transfusion in the individual patient's case.

Why do I need a blood transfusion?

Only your doctor can tell you why you need a blood transfusion. Red blood cells help carry oxygen to different tissues in the body. In general, patients receive a transfusion of red blood cells if they have anemia (low hemoglobin) and have symptoms such as tiredness or shortness of breath. Patients may become anemic if they are bleeding, have cancer or other illnesses, or if they are receiving certain medications like chemotherapy. Plasma (the liquid part of the blood) and platelets (cells that help build clots) are usually given to help stop bleeding or reduce the risk of bleeding. Patients may need plasma or platelets if their body is not making enough or if they are being used up, or if the patient is taking anticlotting medicines and starts bleeding or requires surgery.

What might happen to me while I'm getting blood?

Most blood transfusions are completed without any problems at all. Sometimes, a patient may get an itchy rash or a fever with chills and may need some simple medicines to resolve these minor problems. In rare cases, a patient may have severe shaking, trouble breathing or become faint. In extremely rare cases, a patient can die because of a transfusion; this is more likely to happen if the patient receives the wrong blood.

How can I help make my blood transfusion safer?

Hospital staff are very careful and must follow a lot of rules to make blood transfusion as safe as possible for the patient. It never hurts to ask the nurse to check your wristband and to compare it to the blood label one more time before the transfusion starts. It is also very important to tell your doctors and nurses about any problems that you have had with previous blood transfusions and about any allergies or any medicines that you may be taking.

I'm afraid of getting blood from other people; can I donate blood for myself?

Sometimes, healthy patients who are going to have certain types of surgery can donate 1 or 2 units of blood that can only be used for them if required during or after their surgery. However, donating blood for yourself may also have some risks, so it is a decision that needs to be made after a thorough discussion about the risks and benefits with your doctor. Remember, blood from volunteer donors is always available and is quite safe.

What are my chances of getting a disease from the blood transfusion?

The screening and testing methods used today make the chances of getting a disease from a blood transfusion very low – about 1 in 1.5-3 million for hepatitis C and 1 in 1.5-8 million for HIV (the virus that causes AIDS). If your doctor thinks that you need a transfusion, your risk of becoming very sick or even dying without it would probably be much higher than the risk of acquiring a disease.

Where can I get more information about blood donation and transfusion?

You can talk to your doctor or to the transfusion-medicine doctor at your hospital. You can also contact the Canadian Blood Services or visit their Web site for more information (www.bloodservices.ca).

CMAJ ; 2007, 177:

再见！

