



# 6th Advanced Course on Knee Surgery

January 31<sup>st</sup> – February 5<sup>th</sup>, 2016 Val d'Isère - France

[www.kneecourse.com](http://www.kneecourse.com)



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# Peri-operative Bleeding Management

Dr Albertini S.

Anesthesiology

Grenoble - France



**No conflict of interest**

## Bleeding management : Context

Demographics of blood use in England during year  
2000 :

52% medical patients

41% surgical patients

With 8% for THA/TKA and hip fracture repair

i.e. major orthopedic surgery is #1

## Bleeding management : Context

2006 National french Survey over 3 years (SFAR/ CefiDC –INSERM)

Imperfect bleeding management responsible  
for 20% of overall per and post operative deaths  
and

Blood Transfusion is much less at risk than no transfusion

## Bleeding management : Context

So, let's give blood to our patients!

But...

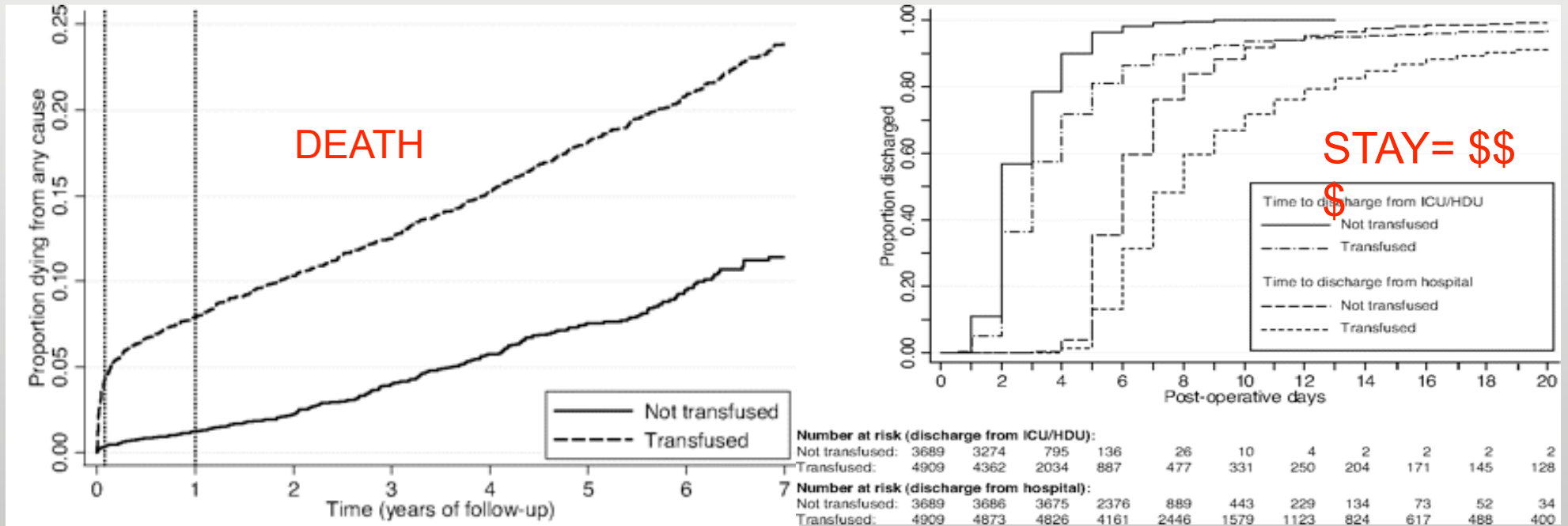
# Bleeding management : Context

But...

Allogenic Transfusion is associated with :

Increase of post operative mortality

Increase of Length of Stay and Admission Cost



Murphy and al. Circulation 2007

## Bleeding management : Context

So, let's give blood to our patients...

Only if we have to

And let's try not to have to give any



## Pre operative anemia assessment

It's important !

**Pre-operative anemia** is associated with increased morbidity and mortality after orthopedic surgery, and exposure to allogeneic blood transfusions

Carson and al. Effect of anemia and cardio-vascular disease on surgical mortality and morbidity. *Lancet* 1996

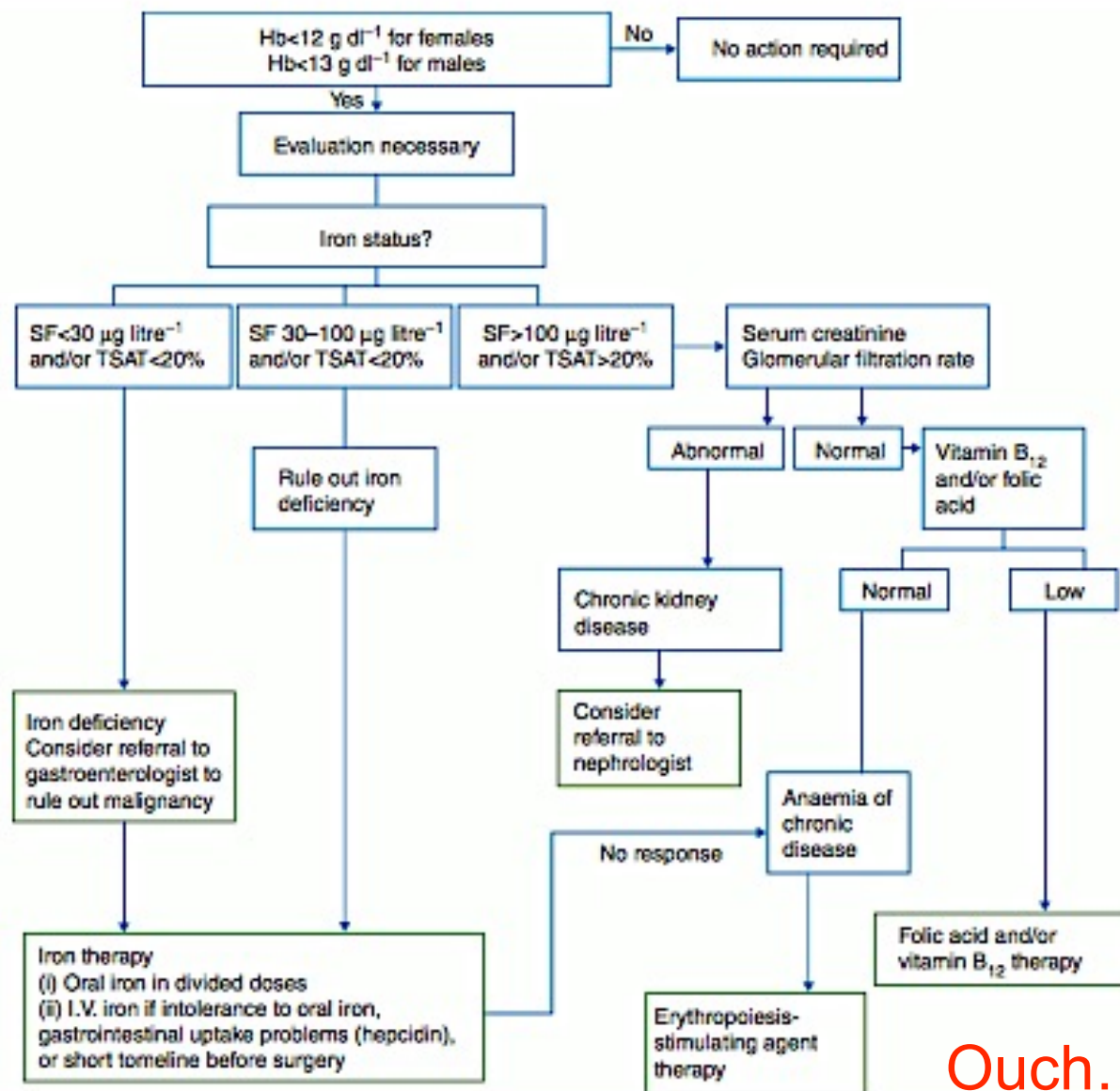
Gruson and al. The relationship between admission hemoglobin level and outcome after hip fracture. *J Orthop Trauma* 2002

Beattie and al. Risk associated with preoperative anemia in noncardiac surgery: a single-center cohort study. *Anesthesiology* 2009

Wu and al. Preoperative hem- atocrit levels and postoperative outcomes in older patients undergoing noncardiac surgery. *J Am Med Assoc* 2007

## Detection, evaluation, and management of preoperative anaemia in the elective orthopaedic surgical patient: NATA guidelines

- 1- Hb level determination as close to 28 days prior to surgery
- 2- “Regular” patient : Male > 13 g/dl      Female > 12g/dl (WHO)
- 3-Lab testing : nutritional / kidney / chronic inflammatory disease / iron deficiency
- 4- Nutritional deficiencies treated (Folate and/or B12)
- 5- EPO + Iron in anemic patients (600 UI/kg/week)



Ouch...!

Fig 2 Proposed algorithm for the detection, evaluation, and management of preoperative anaemia. SF, serum ferritin; TSAT, transferrin saturation.

# Bleeding management : Before surgery

Just remember

28 days

+

Standard biology

Blood count / Creatinin / Cockroft

+

Iron Status (Ferritin/ Transferrin)

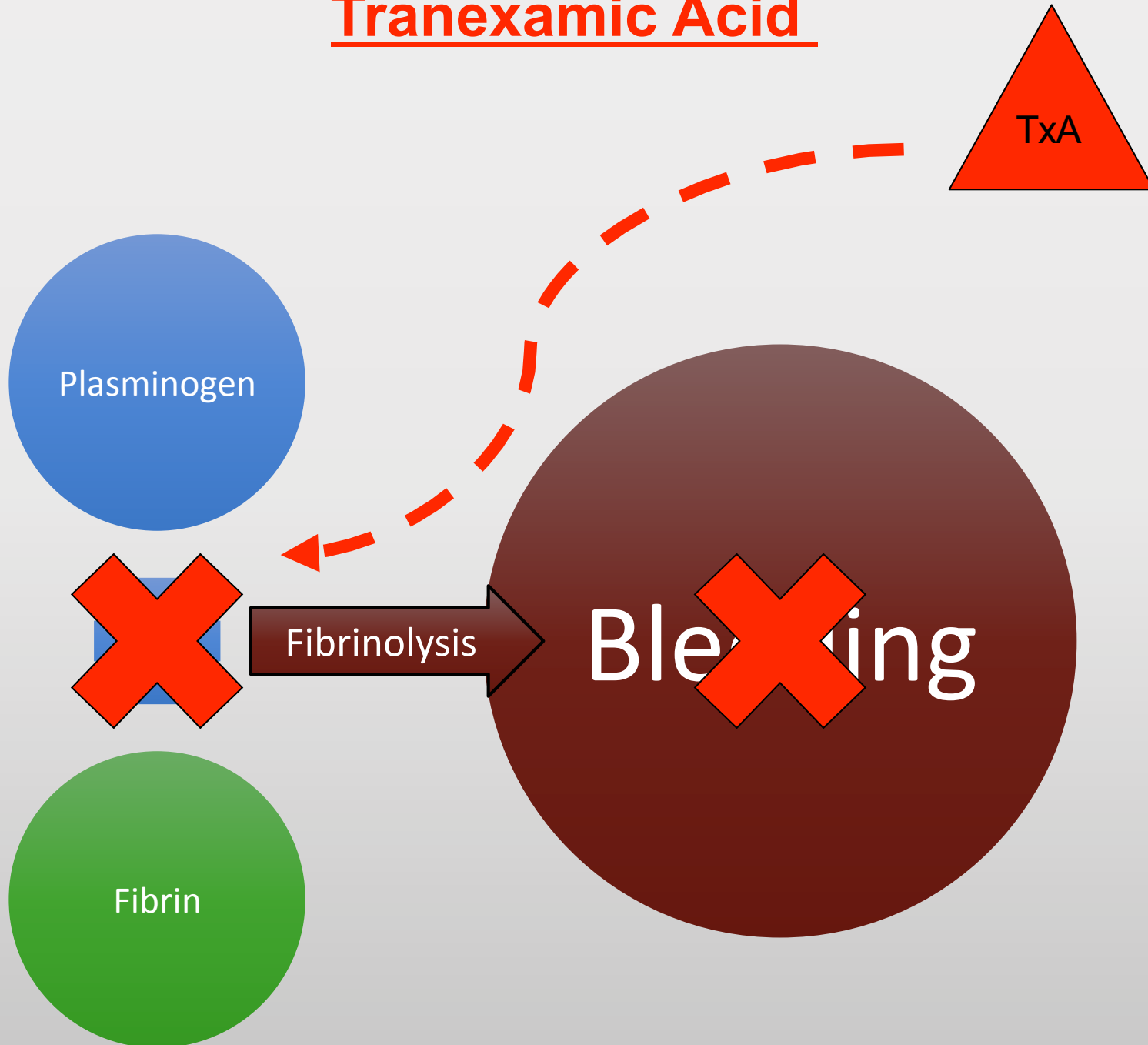
Nutritional Status ( Folate / B12)

Inflammatory Disease (CRP / Sed. Speed)

+

And send your patient soon enough to see the anesthetist ! (with the results!)

# Tranexamic Acid



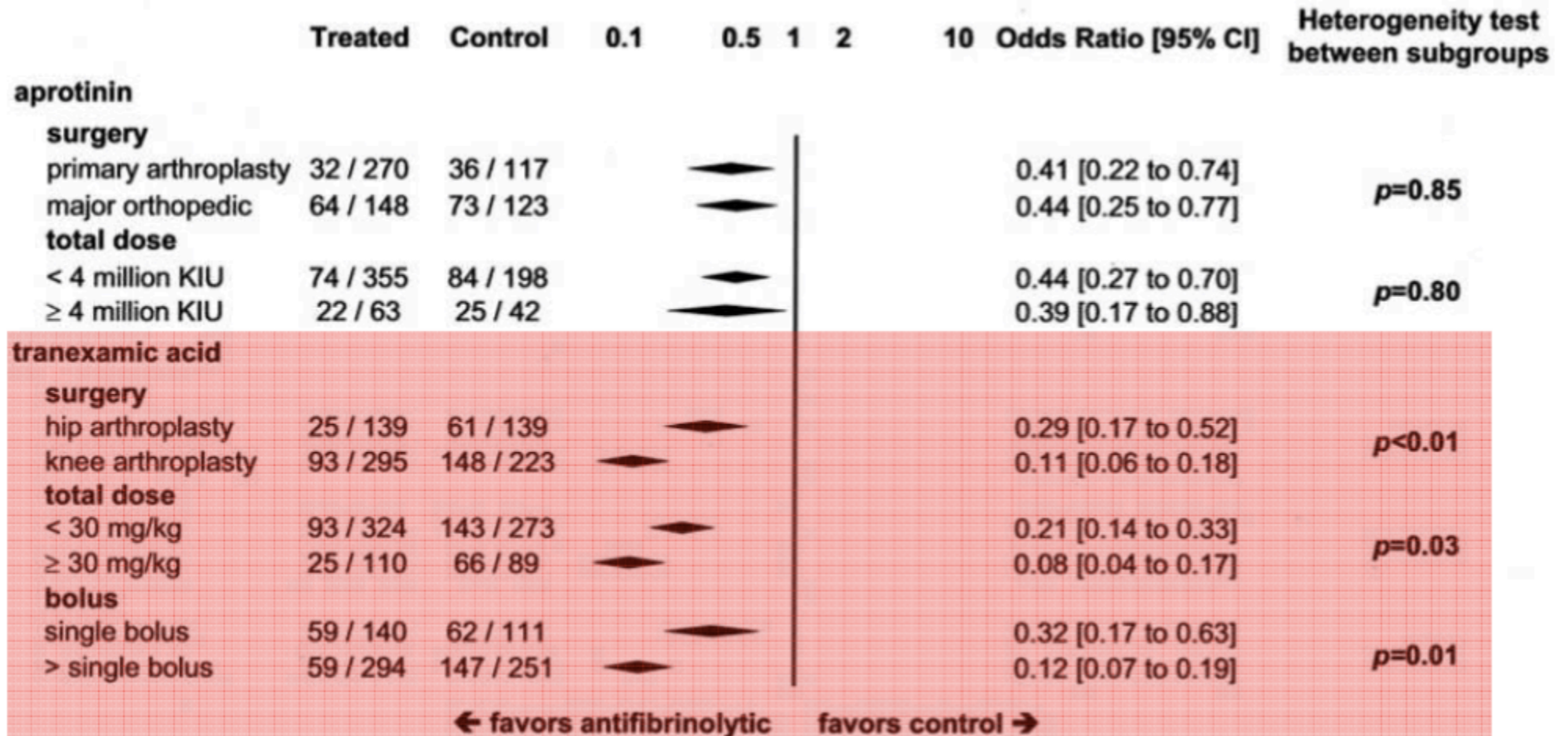
# Tranexamic Acid

Anesthesiology 2006; 105:1034-46

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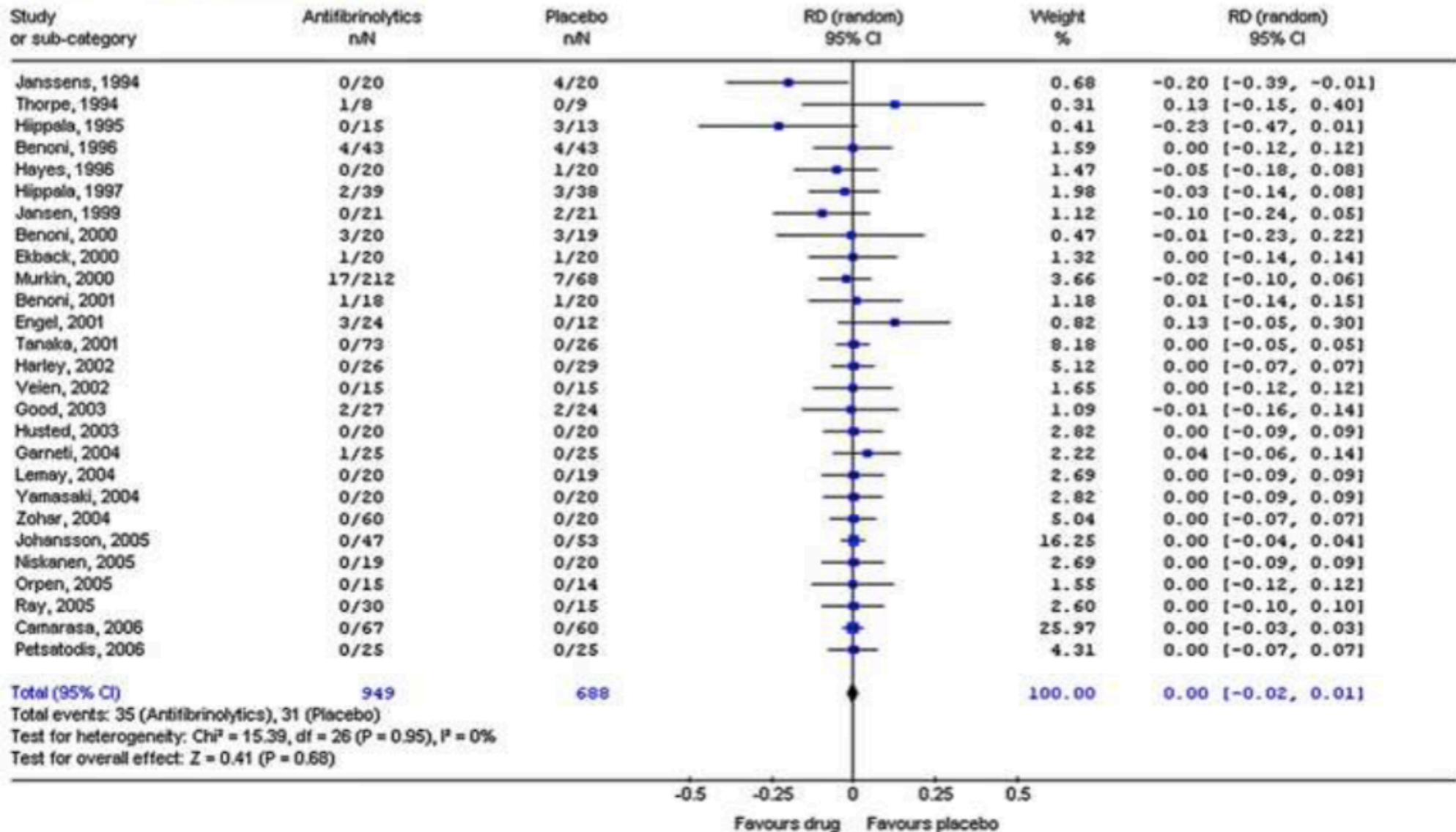
## Do Antifibrinolytics Reduce Allogeneic Blood Transfusion in Orthopedic Surgery?

Paul Zufferey, M.D.,\* Fanette Merquioli, M.D.,† Silvy Laporte, M.Sc., Ph.D.,‡ Hervé Decousus, M.D.,§  
Patrick Mismetti, M.D., Ph.D.,§ Christian Auboyer, M.D.,|| Charles Marc Samama, M.D., Ph.D.,# Serge Molliex, M.D., Ph.D.||



# Tranexamic Acid

Review: Effect of antifibrinolytic agents on bleeding and transfusion in orthopedic surgery  
 Comparison: 01 Primary analyses  
 Outcome: 03 Thromboembolic complications



Impact of antifibrinolytic agents on risk of venous thromboembolism.

## Bleeding management : During Surgery

Tranexamic Acid +++

It works !

Decrease of 35% blood loss per TKA

Safe !

(Cid. Transfusion 2005 and Zufferey. Anesthesiology 2006)

Low cost ! (3 euros/patient)



## Bleeding management : During Surgery

### Tranexamic Acid

Short half-life : 3 hours

-> Continuous IV during and after surgery

Caution: contraindications do exist

History of Stroke, Myocardial infarction, Thromboembolism, Obliterating Arteriopathy, Kidney failure (<30ml/min)

*What we do :*

*15 mg/kg bolus then 10mg/h during surgery and recovery room*

# Bleeding management : During Surgery

## Cell salvage

Reduced LOS, time to ambulation, infection rate, exposition to transfusion?

There is limited arthroplasty evidence comparing cell salvage with washing to other strategies or no strategy in terms of exposure to allogenic blood. In general, published studies have low levels of evidence. In addition, studies have been underpowered to detect significant differences in postoperative infection rates with and without the use of cell salvage. Taking these factors into account, the evidence available suggests that there is a reduction in exposure to allogenic blood with the use of salvage systems in arthroplasty. The protective effect appears to be more consistent and greater for THA. The importance of risk stratification in the use of cell salvage remains unclear. Contradictory evidence exists with respect to whether low or high preoperative hemoglobin strengthens or weakens the protective effect of cell salvage. There is a lack of evidence surrounding the importance of perioperative versus postoperative cell salvage. The relative volumes collected for perioperative and postoperative periods, the use of drains and the possible effect on transfusion rates for TKA and THA should be further explored. This may be an important factor in consideration of a cost–benefit analysis of cell salvage.

Dusik and al. Can J Surg 2014

## Cell salvage

The authors reviewed and processed 75 studies investigating the effectiveness of cell salvage in orthopaedic (36 studies), cardiac (33 studies), and vascular (6 studies) surgery.

Overall, the findings show that cell salvage reduces the need for transfusions of donated blood.

**The authors conclude that there appears to be sufficient evidence to support the use of cell salvage in cardiac and orthopedic surgery.**

Cell salvage does not appear to cause any adverse clinical outcomes.

*As the methodological quality of the trials was poor, the findings may be biased in favour of cell salvage.*

Larger trials of high methodological quality that assess the relative effectiveness, safety, and cost-effectiveness of cell salvage in different surgical procedures, should be the focus of future research in this area.

## Tourniquet

Meta analysis including 689 patients for TKA from 13 Randomized Control Trials

2 groups :With and Without Tourniquet

*Results*

### ***With Tourniquet :***

*Reduction in intra-operative blood loss by 200ml*

*But no difference in overall blood loss*

*And no difference regarding blood transfusion*

*Reduction of 10° in knee ROM in first 10 days*

*Increase of thrombotic events*

# Tourniquet

To make it simple

No effect on blood loss

Possibly hurts tissues = swelling, more pain, less ROM

But makes things possibly easier for surgeons

**Therefore : it is a surgical matter**

**No opinion of the anesthetist**

## Bleeding management : During Surgery

Intentional Isovolemic Hemodilution : NEVER

Intentional « controlled » Hypotension : NEVER

# Bleeding management : After Surgery

## Hemoglobin thresholds for transfusion HAS –Expert Council 2014

Acute anemia

< 7g/dl : transfuse everybody

< 10 g/dl if acute coronary, clinical intolerance, heart failure or  $\beta$ -blocked

Below 8 to 9 g/dl : transfuse if vascular history (heart, stroke...)

## Bleeding management : Local Study

*(Under press – Courtesy of Dr Panisset – Clinique des Cèdres)*

Continuous prospective study  
One operator

117 patients for TKA (March to November 2105)  
*1<sup>st</sup> intention -- TKAPS cementless XNOV*

61% female / 39% male  
- mean age 69 years - mean BMI 28.5 (17-44)

Mean procedure time 50 minutes  
68% with Tourniquet --- mean time 27 minutes



# Bleeding management : Local Study

## Main results

*Overall transfusion rate 15%*

**Male** > Female 4,07 vs 3,29 g/dl

Transfusion rate increased with **age**

Transfusion Risk if preop **Hb <12.5** = 38.89% vs 2.97% si  
>12.5.

**Tranexamic Acid (TxA):** 3.37 vs 3,99 g/dl (p<0,0083)

Transfusion Risk without TxA= 77.78% vs 29% with TxA

9% overall Thrombotic event not correlated with TxA

# Bleeding management : at the end of it all

Allogenic transfusion must be avoided

Assessing and correcting pre operative anemia is essential (28 days !)  
EPO and Iron supplementation

PAD should be used only for rare blood groups or poly immunized patients

Blood salvage depends on habits/availability with preference for washed if bleeding > 1000ml

++++ Tranexamic acid +++++

Don't transfuse too late ! Keep critical thresholds in mind