

Patient Blood Management
We're part of it!



The Cost Perspective of Patient Blood Management

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Patient Blood Management

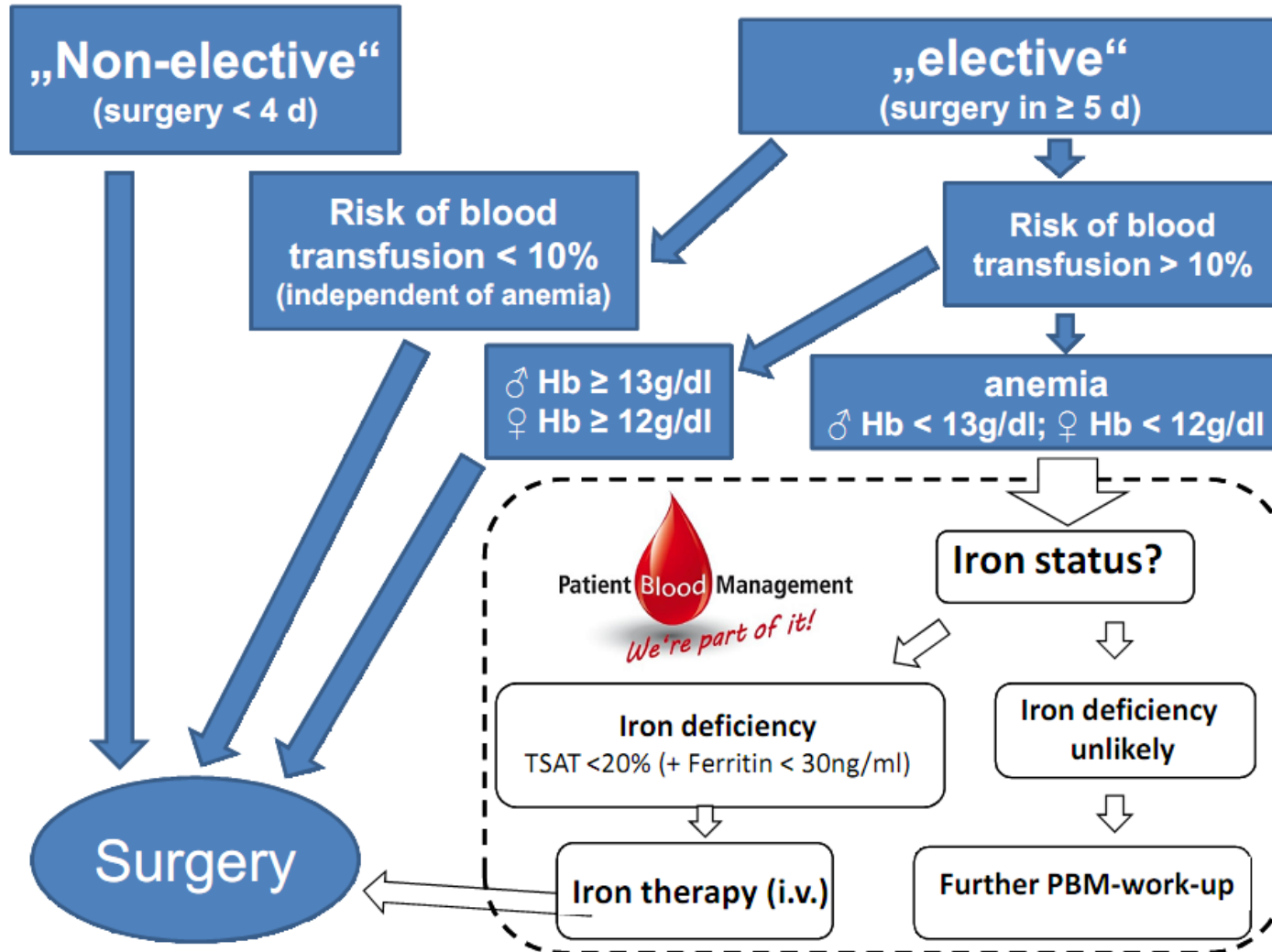
1. Management of preoperative anaemia

- ▶ Screening and diagnosis
- ▶ Treatment

2. Minimising blood loss and bleeding

3. Restrictive use of RBCs

1. Management of preoperative anaemia



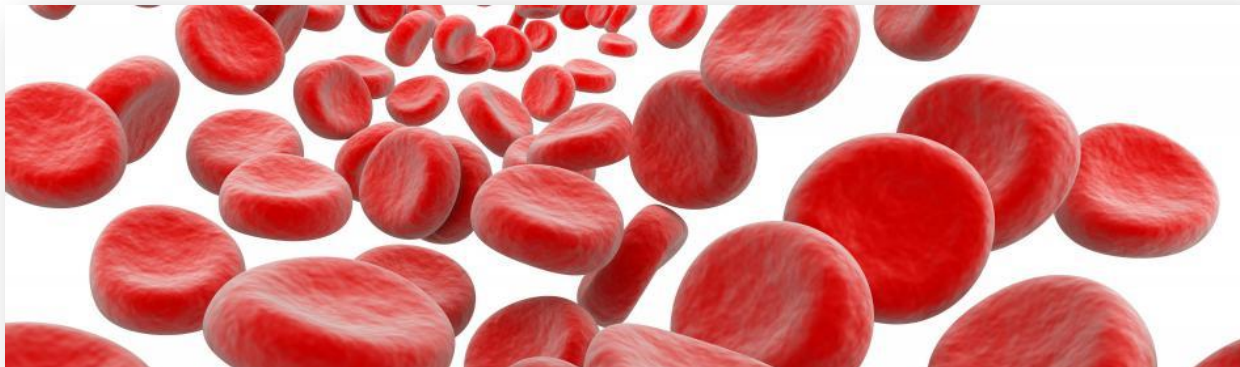
1. Management of preoperative anaemia

Diagnosis of anaemia

Costs of materials and services 33.99 – 109.18 €

Materials	0.18 €	2 Blood collection tubes: EDTA and Serum
Laboratory Tests: Basic	33.81 €	incl. CBC, reticulocytes, iron metabolism parameters (iron, transferrin, ferritin)
Laboratory Tests: Extended	109.00 €	incl. CBC, reticulocytes, manual blood count, iron metabolism parameters (extended version), haptoglobin, folic acid, vitamin B12, liver and kidney function tests

Kleinerüschkamp et al., Anaesthesist 2016



1. Management of preoperative anaemia

Diagnosis of anaemia

Costs of materials and services 33.99 – 109.18 €

Activity-based costs 12.10 €

Anamnesis, Blood sampling, Evaluation	12.10 €	Physician: 12 min; Nurse: 5 min
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Kleinerüschkamp et al., Anaesthesist 2016



1. Management of preoperative anaemia

Treatment of anaemia

Costs of materials and services

2.21 – 117.59 €

Iron (Fe³⁺) <i>Ferinject</i> [®]	117.59 €	Dosage: 500 mg
Folic acid <i>Folsan</i> [®]	6.00 €	Dosage: 10 mg / day for 30 days
Cyanocobalamin <i>Cytobion</i> [®]	2.21 €	Dosage: 1000 µg / week for 90 days
Epoetin alpha [optional] <i>Erypo</i> [®]	640.00 €	Dosage: 40.000 IU, 2 x preoperatively

Kleinerüschkamp et al., Anaesthesist 2016



1. Management of preoperative anaemia

Treatment of anaemia

Costs of materials and services

2.21 – 117.59 €

Activity-based costs

9.00 €

Medication and Monitoring	9.00 €	Physician: 5 min; Nurse: 10 min
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Kleinerüschkamp et al., Anaesthesist 2016



1. Management of preoperative anaemia

Diagnosis of anaemia 46.09 – 121.28 €

Costs of materials and services 33.99 – 109.18 €

Activity-based costs 12.10 €

Treatment of anaemia 11.21 – 126.59 €

Costs of materials and services 2.21 – 117.59 €

Activity-based costs 9.00 €

Total cost 57.30 – 247.87 €



Kleinerüschkamp et al., Anaesthesist 2016

1. Management of preoperative anaemia

2. Minimising blood loss and bleeding

- ▶ Normothermia and treatment of hypocalcaemia / acidosis
- ▶ Blood sparing strategies
- ▶ Intraoperative blood salvage
- ▶ Coagulation management

3. Restrictive use of RBCs

2. Minimising blood loss and bleeding

Normothermia, Treatment of hypocalcaemia / acidosis

Costs of materials and services

0.23 – 18.63 €

Thermal blanket	4.79 €	
Fluid warming system	12.27 €	
Calcium <i>Calciumgluconat[®] 10%</i>	0.23 €	Dosage: 940 mg
Hydrogen carbonate <i>Natriumhydrogencarbonat[®] 8,4%</i>	1.34 €	Dosage: 8,4 g

Kleinerüschkamp et al., Anaesthesist 2016



2. Minimising blood loss and bleeding

Normothermia, Treatment of hypocalcaemia / acidosis

Costs of materials and services 0.23 – 18.63 €

Activity-based costs 0.00 €

Thermal management	0.00 €	additional effort inconsiderable
Medication	0.00 €	additional effort inconsiderable

Kleinerüschkamp et al., Anaesthesist 2016



2. Minimising blood loss and bleeding

Intraoperative blood salvage

Costs of materials and services

142.80 €

Autotransfusion set	107.10 €	Including tubing set, waste bag, reinfusion bag
Collection reservoir	35.70 €	

Kleinerüschkamp et al., Anaesthesist 2016



2. Minimising blood loss and bleeding

Intraoperative blood salvage

Costs of materials and services 142.80 €

Activity-based costs 10.00 €

Preparation Use of cell saver (C.A.T.S.®)	10.00 €	Nurse: 20 min
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Kleinerüschkamp et al., Anaesthesist 2016



2. Minimising blood loss and bleeding

Coagulation management: Diagnostics

Costs of materials and services 11.74 – 67.57 €

Standard (including materials)	11.74 €	aPTT, Quick / INR, Fibrinogen
Rotem [®] (including materials)	33.15 €	exTEM, inTEM, apTEM, fibTEM, hepTEM
Multiplate [®] (including materials)	22.68 €	TRAP, ASPI, ADP

Kleinerüschkamp et al., Anaesthesist 2016



2. Minimising blood loss and bleeding

Coagulation management: Diagnostics

Costs of materials and services 11.74 – 67.57 €

Activity-based costs 4.90 – 28.90 €

Blood sampling, Evaluation	4.90 €	Nurse: 5 min; Physician: 3 min
Use of ROTEM [®]	16.00 €	Physician: 20 min
Use of Multiplate [®]	8.00 €	Physician: 10 min

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2. Minimising blood loss and bleeding

Coagulation management: Therapy

Costs of materials and services

3.66 – 1,607.69 €

Tranexamic acid <i>Cyclokapron</i> [®]	3.66 €	Dosage: 0,5 g
Fibrinogen <i>Haemocomplettan</i> [®]	577.91 €	Dosage: 2 g
PCC <i>Prothromplex</i> [®]	209.74 €	Dosage: 1200 IU
Factor XIII <i>Fibrogammin</i> [®]	478.90 €	Dosage: 1250 IU
Desmopressin <i>Minirin</i> [®]	112.98 €	Dosage: 28 µg
Platelet transfusion	224.50 €	Pooled platelets

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2. Minimising blood loss and bleeding

Coagulation management: Therapy

Costs of materials and services 3.66 – 1,607.69 €

Activity-based costs 13.00 – 25.00 €

Antifibrinolytic therapy	5.00 €	Nurse: 10 min
Transfusion of platelets	12.00 €	Physician: 15 min
Monitoring	8.00 €	Physician: 10 min

Kleinerüschkamp et al., Anaesthesist 2016



2. Minimising blood loss and bleeding

Normothermia, Treatment of hypocalcaemia / acidosis

Costs of materials and services 0.23 – 18.63 €

Activity-based costs 0.00 €

Intraoperative blood salvage

Costs of materials and services 142.80 €

Activity-based costs 10.00 €

Coagulation management: Diagnostics

Costs of materials and services 11.74 – 67.57 €

Activity-based costs 4.90 – 28.90 €

Coagulation management: Therapy

Costs of materials and services 3.66 – 1,607.69 €

Activity-based costs 13.00 – 25.00 €

Total cost 0.23 – 1,900.59 €



Kleinerüschkamp et al., Anaesthesist 2016

Patient Blood Management

1. Management of preoperative anaemia

2. Minimising blood loss and bleeding

3. Restrictive Use of RBCs

- ▶ Volume therapy
- ▶ Monitoring tolerance of anaemia
- ▶ Restrictive transfusion trigger

German National Guideline



Guidelines of the **German Medical Association**
regarding the use of blood and blood
components 2014; 1-137

Transfusionstrigger-checklist

Hb < 6 g/dl

- Independent of compensational capacity

Hb 6 - 8 g/dl

- Signs for anaemic hypoxia
- risk factors for cardiopulmonary insufficiency
- other indication _____

*RBC transfusion at hb > 8g/dl is associated with
dubious risk-benefit balance*

- Hb > 8 g/dl (low level of evidence (2 C), only in individual cases)

3. Restrictive use of RBCs

Volume therapy, Monitoring, Transfusion trigger

Costs of materials and services

1.22 – 21.22 €

Cristalloids	1.22 €	Dosage: 1000 ml
Colloids (e.g. HAES 6 %)	3.92 €	Dosage: 500 ml
Monitoring	20.00 €	10 additional BGAs (including materials)

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3. Restrictive use of RBCs

Volume therapy, Monitoring, Transfusion trigger

Costs of materials and services 1.22 – 21.22 €

Activity-based costs 0.00 €

Volume therapy	0.00 €	additional effort inconsiderable
Blood gas analysis	0.00 €	additional effort inconsiderable
Restrictive transfusion trigger	0.00 €	additional effort inconsiderable

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3. Restrictive use of RBCs

Volume therapy, Monitoring, Transfusion trigger

Costs of materials and services 1.22 – 21.22 €

Activity-based costs 0.00 €



Total cost 1.22 – 21.22 €

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Transfusion of RBCs

Patient-related costs from a clinical perspective

Costs of materials and services

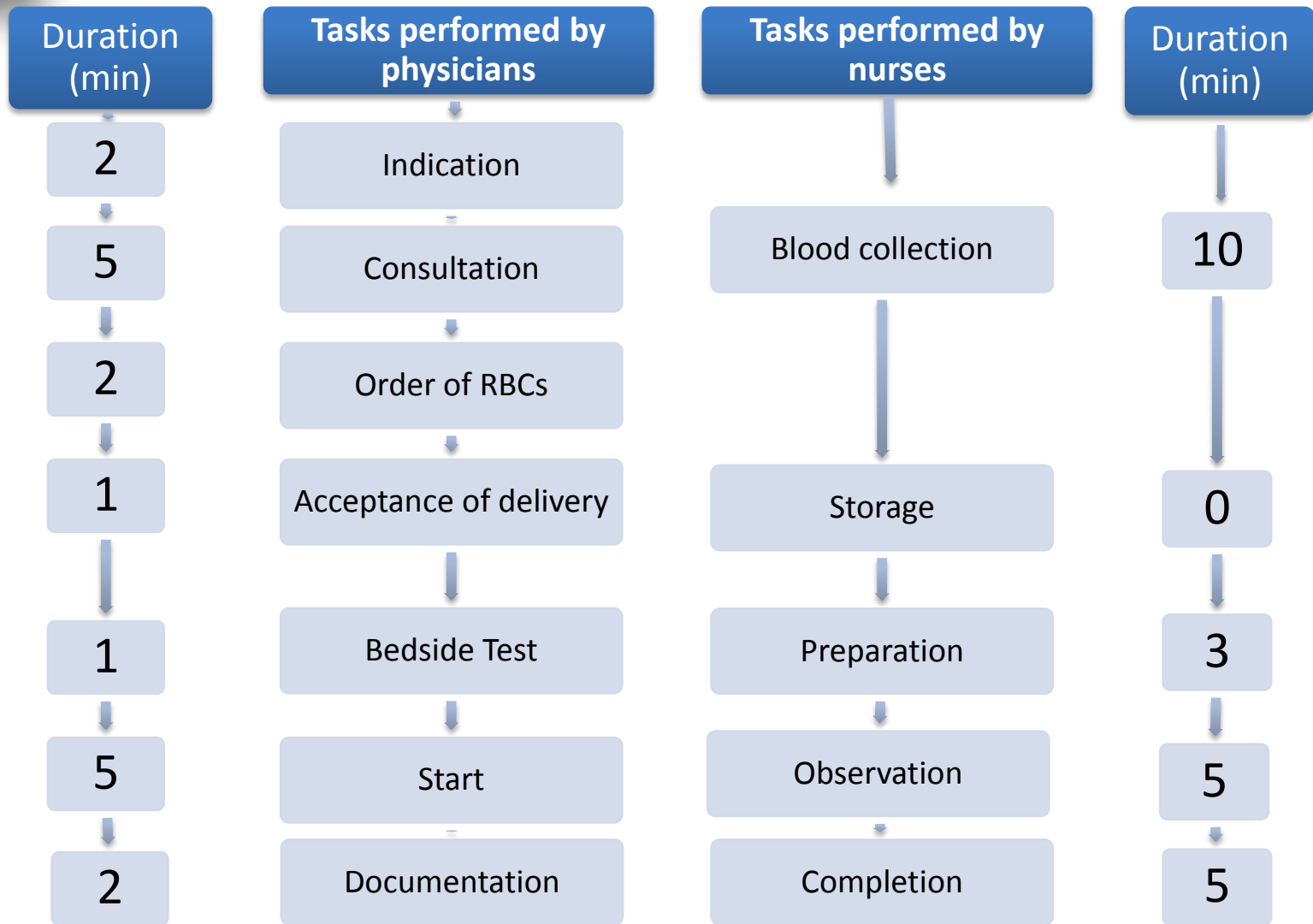
105.92 €

Packed red blood cells	78.50 €	Price per unit
Materials	0.86 €	including bedside test and transfusion set
Compatibility Testing: Basic		Pre-transfusion diagnostics
- ABO and Rhesus D	11.38 €	
- Antibody screen test	7.60 €	
- Cross-matching	7.58 €	Sample validity: 3 days

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Process Flowchart: Transfusion of RBCs



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Transfusion of RBCs

Patient-related costs from a clinical perspective

Costs of materials and services 105.92 €

Activity-based costs 25.90 €

Preparation, Transfusion	25.90 €	Physician: 18 min; Nurse: 23 min
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Patient-related costs from a clinical perspective

Additional costs (variable)

not included

Extended diagnostics		
- Rhesus types and Kell	11.00 €	e.g. women of childbearing age
- Antibody identification	2.28 €	e.g. positive result of antibody screen test
- Further blood grouping	x.xx €	e.g. other blood group systems
Irradiation of blood products	7.50 €	e.g. immunocompromised patients
Special laboratory orders	19.81 €	e.g. urgent / at night
Delivery	0.00 €	logistics service is free of charge
Indirect costs: discarded pRBCs	2.56 €	unused pRBCs (which are not returned)

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Transfusion of RBCs

Patient-related costs from a clinical perspective

Costs of materials and services 105.92 €

Activity-based costs 25.90 €

Additional costs (variable) not included

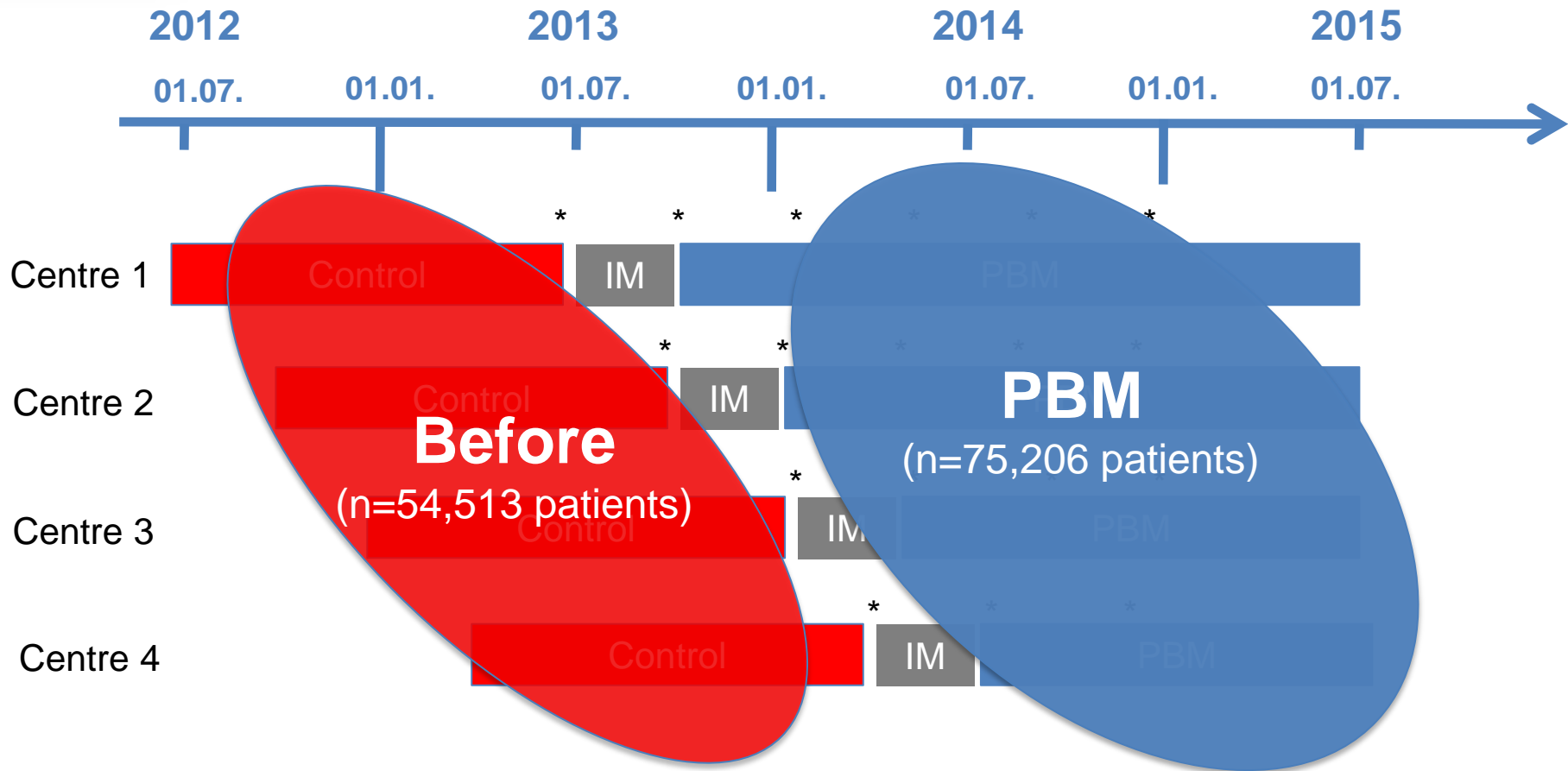
Total cost ≥ 131.82 €

Transfusion of additional pRBC units
within 72 h ≥ 116.64 €
(lower cost of pre-transfusion diagnostics)



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PBM Study



Meybohm P et al. *Ann Surg* 2016

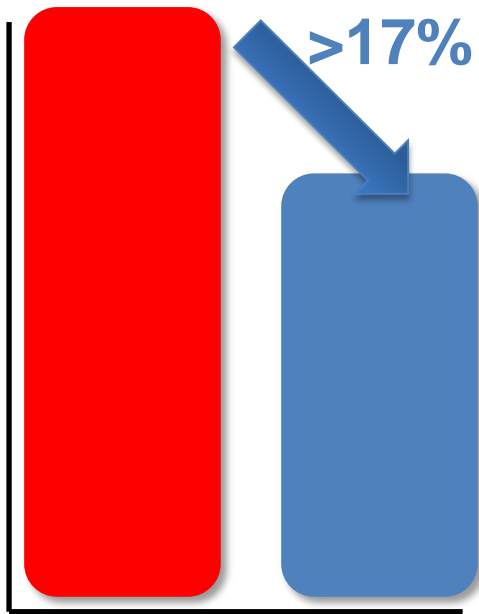


PBM Study Results I

Transfusion

Complications

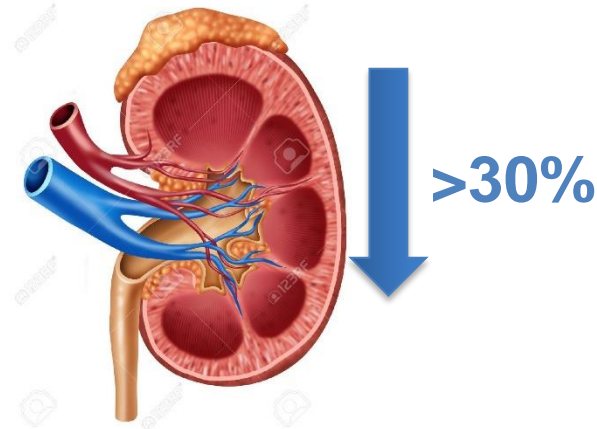
Acute kidney injury (in-hospital)



Before



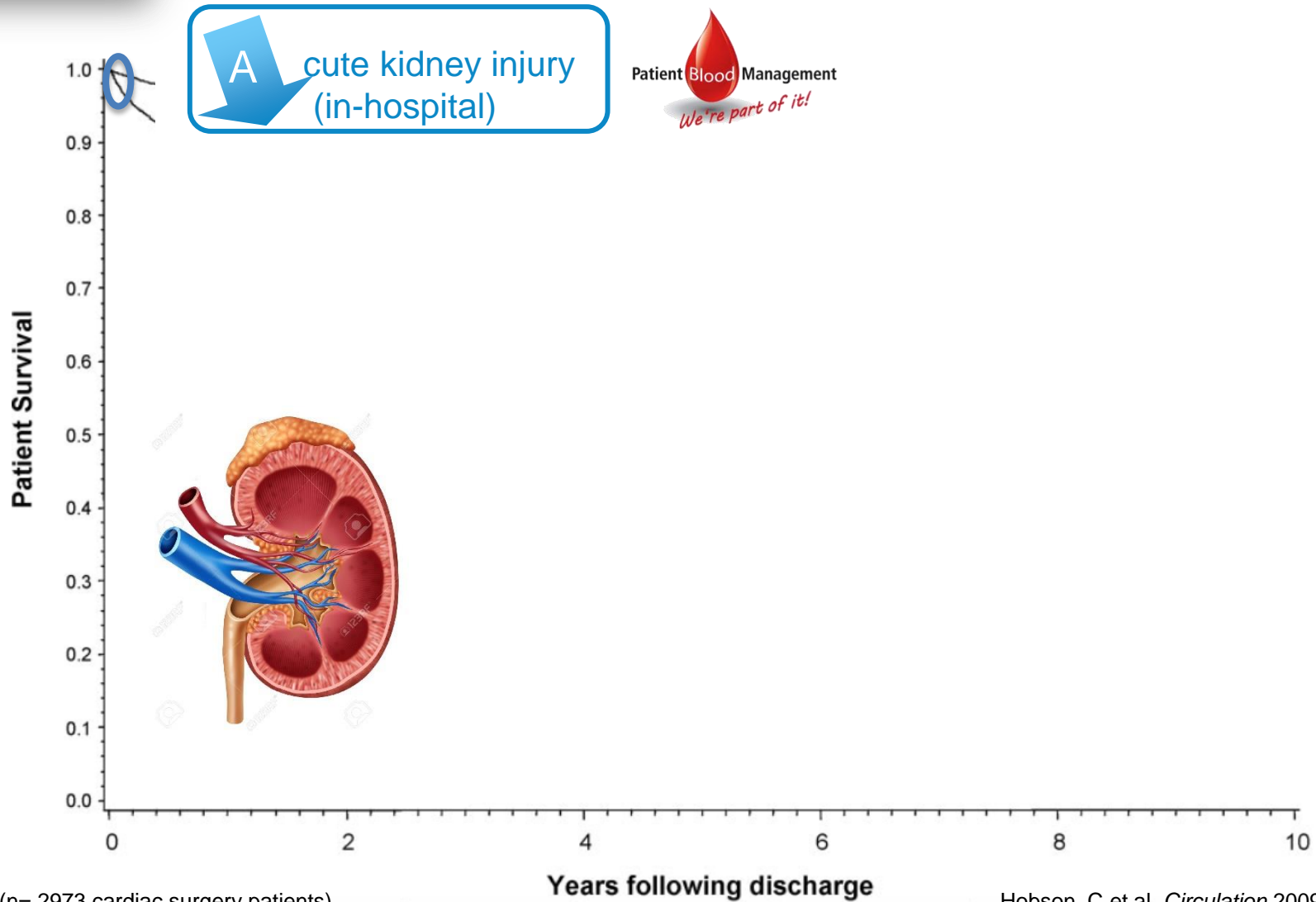
Before



Meybohm et al. 2016 (Annals of Surgery)



Acute kidney injury (AKI)

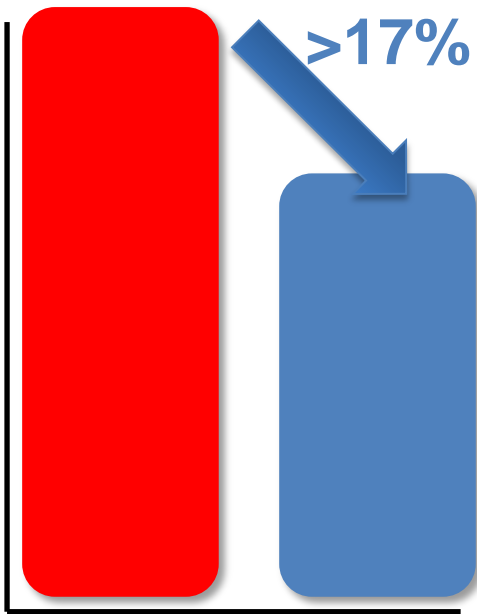


PBM Study Results II

Transfusion

Complications

Costs



Before



Before



Before



Meybohm et al. 2016 (*Annals of Surgery*)

Project costs: Implementation

Implementation (6 months) – 1 centre

Costs of materials and services

6,687.92 €

Publicity materials	2,810.58 €	e.g. brochures, stickers, posters, ballpoint pen
Information materials	871.08 €	e.g. booklets, checklists
Website & Software	1,255.45 €	Creation and updates
Clothes and mascot	777.75 €	Events and public occasions
Layout and Logo	327.25 €	
Patent and figurative mark	645.81 €	

Kleinerüschkamp et al., Anaesthesist 2016



Project costs: Implementation

Implementation (6 months) – 1 centre

Costs of materials and services 6,687.92 €

Activity-based costs 13,704.00 – 15,624.00 €

Project planning	960.00 – 1,440.00 €	conception phase (interdisciplinary meetings)
Project presentation	672.00 €	provision of resources
Overall conditions	2,400.00 – 3,648.00€	content of SOPs and information materials, Software changes
Marketing	1,104.00 -1,296.00 €	e.g. briefing agencies (design of brochures,...)
Communication	4,608.00 €	Enquiries (E-mail, Phone), Organisation
Public affairs	1,152.00 €	Press and media work, Press conference
Events	2,808.00 €	Education and training for medical staff

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Project costs: Continuation

Continuation (12 months)

Costs of materials and services

1,463.40 €

Supplementary orders	999.30 €	Publicity materials, Information materials
Website	464.10 €	Updates

Kleinerüschkamp et al., Anaesthesist 2016



Project costs: Continuation

Continuation (12 months)

Costs of materials and services 1,463.40 €

Activity-based costs 11,984.00 €

Team meetings and Events	1,616.00 €	less frequent
SOPs, Software	4,608.00 €	Revision and Updates
Communication, Media work	5,760.00 €	

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Project costs

Implementation (6 months)

Costs of materials and services 6,687.92 €

Activity-based costs 13,704.00 – 15,624.00 €

Continuation (12 months)

Costs of materials and services 1,463.40 €

based costs 11,984.00 €

Total cost 33,839.32 – 35,759.32 €



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ues...s?

