

CONSENSUS CONFERENCE ICC-PBM FRANKFURT 2018

IMPLEMENTATION OF PBM

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PICO questions



- 1. PICO 15: Is a **'comprehensive' PBM program** [intervention] effective to improve clinical and economic outcomes [outcomes] compared to no PBM program [comparison]? **19 observational studies**
- 2. PICO 16: Is a specific **behavioural intervention** [intervention] more effective to improve blood product ordering [outcomes] compared to no/another behavioural intervention [comparison]? **19 observational studies**

 PICO 17: Is a specific decision support system [intervention] more effective to improve the appropriate use of blood products or clinical outcomes [outcome] compared to no intervention or another decision support system/behavioural intervention [comparison]? 3 observational studies + 1 experimental study

Selection criteria

POPULATION: patients who might need transfusion (surgical and non-surgical patients/ acute and chronic disease patients/ and children) (PICO 15-17)

INTERVENTION:

Behavioural interventions (PICO 16):

- → Guidelines
- → Educational sessions (group or individual)
- → Transfusion forms containing reminders of appropriate criteria for transfusion
- → Audit with feedback (retrospective audits with feedback given to individuals or groups after the transfusion)
- → Audit with approval (audit with approval needed before transfusion of products).

Decision support systems (PICO 17):

→ Any electronic/computerised DSS that provides clinicians with recommendations on RBC, platelet, plasma, cryoprecipitate, or granulocyte ordering at the time the decision to order a transfusion is being made based on individual patient characteristics.

Comprehensive PBM programs (PICO 15):

- → Component 1: interventions of at least 2 PBM pillars
- → Component 2: behavioural interventions and/or decision support systems

COMPARISON (PICO 15-17): another or no intervention

OUTCOMES: blood product utilization (PICO 15-17), clinical outcomes (PICO 15), economic outcomes (PICO 15)

STUDY DESIGN: observational studies (cohort studies – before-after studies – time interrupted series) (**PICO 15-17**) and experimental studies (RCT) (**PICO 17**)



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- 3. PICO 17: Is a specific **decision support system** [intervention] more effective to improve the appropriate use of blood products or clinical outcomes [outcome] compared to no intervention or another decision support system/behavioural intervention [comparison]?

Evidence-to-Decision framework



INTERACIONAL INTERACTION ICC-PBM FRANKFURT 2018

CRITERIA	JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
1. DESIRABLE EFFECTS	How substantial are the desirable anticipated effects?		Rapporteurs Audience
2. UNDESIRABLE EFFECTS	How substantial are the undesirable anticipated effects?		Rapporteurs Audience
3. CERTAINTY OF EVIDENCE	What is the overall quality of the evidence of effects?	EVIDENCE	Rapporteurs Audience
4. VALUES	Is there important uncertainty about or variability in how much people value the main outcomes?	POLL	Rapporteurs Audience
5. BALANCE OF EFFECTS	Does the balance between desirable and undesirable effects favor the intervention or the comparison?	EVIDENCE	Rapporteurs Audience
6. RESOURCES REQUIRED	How large are the resource requirements (costs)?		Rapporteurs Audience
7. COST EFFECTIVENESS	Does the cost-effectiveness of the intervention favor the intervention or the comparison?		Rapporteurs Audience
8. EQUITY	What would be the impact on health equity?	POLL	Rapporteurs Audience
9. ACCEPTABILITY	Is the intervention acceptable to key stakeholders?	POLL	Rapporteurs Audience
10. FEASIBILITY	Is the intervention feasible to implement?	POLL	Rapporteurs Audience



1. How substantial are the desirable anticipated effects?

Outcomes	Impact
Behavioural intervention(s) versus no intervention: RBC utilization	(Statistically significant) reduction in RBC utilization after implementation of different behavioural interventions (Guideline only, Education only, Guideline + Education, Guideline + Education + Form + Audit/feedback, Education + Audit/feedback)
Guideline + Form + Audit versus Guideline: RBC utilization	(Statistically significant) reduction in RBC utilization after implementation of a guideline + form + audit versus a guideline only.
Behavioural intervention(s) versus no intervention: FFP utilization	(Statistically significant) reduction in FFP utilization after implementation of different behavioural interventions (Guideline + Audit/feedback , Form + Audit/feedback, Guideline + Audit/feedback + Education + Form, Education only, Audit/approval + Form).
Behavioural intervention(s) versus no intervention : PLT utilization	(Statistically significant) reduction in PLT utilization after implementation of different behavioural interventions (Form + Audit/feedback, Education only, Audit/approval + Form, Guideline only).
Behavioural intervention(s) versus no intervention: Cryoprecipitate	(Statistically significant) reduction in cryoprecipitate utilization after versus before implementation of a behavioural intervention (Guideline + Form + Education + Audit/feedback)



3. What is the overall quality of the evidence of effects?

Outcomes	Certainty of the evidence (GRADE)
Behavioural intervention(s) versus no intervention: RBC utilization	⊕○○○ VERY LOW ^a
Behavioural intervention(s) versus no intervention: FFP utilization	⊕○○○ VERY LOW ^a
Behavioural intervention(s) versus no intervention: PLT utilization	⊕○○○ VERY LOW ^a
Behavioural intervention(s) versus no intervention: Cryoprecipitate	⊕◯◯◯ VERY LOW ^{a,b}
Guideline + Form + Audit versus Guideline: RBC utilization	⊕◯◯◯ VERY LOW ^{a,b}
Computerized decision support (CPOE) versus Guideline + Educaton: RBC utilization	⊕◯◯◯ VERY LOW ^{a,b}

Summary of judgments



DESIRABLE EFFECTS	Trivial	Small	Small		Moderate		Large		
UNDESIRABLE EFFECTS	Large	Moderate	Moderate		Small		Trivial		Don't know
CERTAINTY OF EVIDENCE	Very low	Low	Low		Moderate		High		
VALUES	Important uncertainty or variability	Possibly important ur variability	Possibly important uncertainty or variability		Probably no important uncertainty or variability		portant uncertainty or variability		
BALANCE OF EFFECTS	Favors the comparison Pr	obably favors the comparison	Does not favor either the intervention or the comparison		Probably favors the interv	vention	Favors the intervention		
RESOURCES REQUIRED	Large costs	Moderate costs	Negligible costs and savings		Moderate savings		Large savings	Varies	
COST EFFECTIVENESS	Favors the comparison Pr	obably favors the comparison	Does not favor either the intervention or the comparison		r the Probably favors the interv		Favors the intervention		No included studies
EQUITY	Reduced	Probably reduced	Probably no impact		o impact Probably increased		Increased		
ACCEPTABILITY	No	Probably n	10	Ρ	robably yes		Yes		
FEASIBILITY	No	Probably n	10	Р	robably yes		Yes		

Recommendation 1



- The ICC-PBM guideline panel decided to formulate no recommendation on the use of behavioural interventions to improve appropriate FFP/PLT/cryo utilization
- The ICC-PBM guideline panel suggest using behavioural interventions (transfusion guideline/audit/form/education) to improve appropriate RBC utilization (conditional recommendation based on very low certainty in the evidence of effects).

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The ICC-PBM guideline panel decided to formulate a research recommendation on using behavioural interventions (transfusion guideline/audit/form/education) to improve appropriate blood product utilization

- Accept completely
- Accept with some reservation
- Accept with major reservation
- Reject with reservation
- Reject completely

Go to www.menti.com and use the code 55 42 44

The panel decided to formulate a research recommendation on using behavioural interventions to improve appropriate blood product utilization

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PICO questions



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Decision support system versus no decision support system (PICO 17)



One single centre RCT randomised young doctors to CDS or control. Three other studies assessed red cell component usage before and after the intervention.

The RCT showed an increase in appropriate transfusions (red cells, platelets, and plasma) from 32.5% to 40.4% P < 0.0001 (study authors' own analysis). No other review outcomes were reported separately for intervention and control groups.

A meta-regression on the three ITS studies was performed.

These showed a reduction in overall red cell usage (red cell transfusions per 100 inpatient days) (P < 0.0001), in addition to the statistically significant reduction in red cell usage over time (P = 0.01).

These showed a reduction in inappropriate red cell usage (red cell transfusions per 100 inpatient days) (P < 0.001), in addition to the statistically significant reduction in inappropriate red cell usage over time (P < 0.001).

Decision support system versus no decision support system (PICO 17)



Outcomes	With no decision support systems	With decision support systems	Difference	Relative effect (95% Cl)
Mortality follow up: 42 months	55 per 1.000	33 per 1.000 (28 to 39)	22 fewer per 1.000 (27 fewer to 16 fewer)	RR 0.60 (0.51 to 0.71)
30-day readmission follow up: 42 months	137 per 1.000	85 per 1.000 (77 to 94)	52 fewer per 1.000 (60 fewer to 42 fewer)	RR 0.62 (0.56 to 0.69)



3. What is the overall quality of the evidence of effects?

Outcomes	Importance	Certainty of the evidence (GRADE)
Appropriate transfusions follow up: 4 months	CRITICAL	
Overall RBC usage (RBC transfusions per 100 inpatient days) follow up: range 12 months to 42 months	CRITICAL	⊕⊕◯◯ LOW
Inappropriate RBC usage (RBC transfusions per 100 inpatient days) follow up: range 12 months to 42 months	CRITICAL	⊕⊕◯◯ LOW
Mortality follow up: 42 months	CRITICAL	
30-day readmission follow up: 42 months	CRITICAL	

Summary of judgments



DESIRABLE EFFECTS	Trivial	Small	Small		Moderate		Large		
UNDESIRABLE EFFECTS	Large	Moderate	Moderate		Small		l Trivial		
CERTAINTY OF EVIDENCE	Very low	Low	Low		Moderate		High		
VALUES	Important uncertainty or variability	Possibly important ur variability	Possibly important uncertainty or variability		Probably no important uncertainty or variability		portant uncertainty or variability		
BALANCE OF EFFECTS	Favors the comparison Pro	bbably favors the comparison	Does not favor either the intervention or the comparison		Probably favors the interventi		Favors the intervention		
RESOURCES REQUIRED	Large costs	Moderate costs	Negligible costs and savings		Moderate savings		Large savings	Varies	
COST EFFECTIVENESS	Favors the comparison Pro	obably favors the comparison	Does not fav intervention or	or either the the comparison	r either the Probably favors the internet he comparison		Favors the intervention		No included studies
EQUITY	Reduced	Probably reduced	Probably no impact		Probably increased	ł	Increased		
ACCEPTABILITY	No	Probably n	0	Pi	robably yes		Yes		
FEASIBILITY	No	Probably n	0	Probably yes		Probably yes Yes		Varies	



1 Recommendation – research priorities (PICO 16)

- The ICC-PBM guideline panel suggest using electronic/computerized decision support systems to improve appropriate RBC utilization (conditional recommendation based on low certainty in the evidence of effects).
- The ICC-PBM guideline panel decided to formulate no recommendation on the use of behavioural interventions to improve appropriate FFP/PLT/cryo utilization
- Research priorities
 - Cost-effectiveness
 - Relative effectiveness different types of DSS
 - other blood products

Recommendation 2



• The ICC-PBM guideline panel suggest using electronic/computerized decision support systems to improve appropriate RBC utilization (conditional recommendation based on low certainty in the evidence of effects).

- The ICC-PBM guideline panel suggest using electronic/computerized decision support systems to improve appropriate RBC utilization (conditional recommendation based on low certainty in the evidence of effects).
 - Accept completely
 - Accept with some reservation
 - Accept with major reservation
 - Reject with reservation
 - Reject completely

Go to www.menti.com and use the code 55 42 44

The ICC-PBM guideline panel suggest using electronic/computerized decision support systems to improve appropriate RBC utilization







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Behavioural interventions/DSS/monitoring in comprehensive PBM programs (PICO 15)

FRANKFURT 2018

Outcome: Number of patients/admissions that received RBC transfusions

	After	PBM	Before	PBM		Risk Ratio	Ratio Risk Ratio			
Study or Subgroup	Events	Total	Events	Total	Weight	M-H, Random, 95% Cl	M-H, Random, 95% CI			
1.1.1 Guideline + form	1									
Gross 2015 Subtotal (95% CI)	473	2275 2275	152	387 387	8.2% <mark>8.2%</mark>	0.53 [0.46, 0.61] 0.53 [0.46, 0.61]	•			
Total events	473		152							
Heterogeneity: Not ap	plicable									
Test for overall effect: .	Z = 8.45 ((P < 0.000	101)							
1.1.2 Guideline + educ	cation									
Yaffee 2014	263	387	324	391	10.2%	0.82 [0.76, 0.89]				
Meybohm 2016 Subtotal (95% CI)	11431	75206 75593	9392	54513 <mark>54904</mark>	11.3% 21.5%	0.88 [0.86, 0.90] 0.86 [0.80, 0.92]	•			
Total events	11694		9716							
Heterogeneity: Tau ² =	0.00; Chi 7 = 4 24 (P < 0.000 P < 0.000	tf = 1 (P = ו1)	: 0.09); l²:	= 66%					
restion overall ellect.	2 - 4.24 (, • 0.000								
1.1.3 Guideline + educ	cation + a	audit								
Kansagra, 2017 Subtotal (95% Cl)	260	1574 1574	344	937 937	8.4% <mark>8.4%</mark>	0.45 [0.39, 0.52] 0.45 [0.39, 0.52]	•			
Total events	260		344							
Heterogeneity: Not ap	plicable 7 - 44 04	(D ≥ 0.00	0.043							
restior overall ellect.	2 = 11.24	(P < 0.00	001)							
1.1.4 Guideline + form	ı + decisi	ion suppo	ort							
Xydas 2012	258	551	288	481	9.2%	0.78 [0.70, 0.88]				
Subiolal (95% CI)	250	22.1	200	481	9.2%	0.78 [0.70, 0.88]	-			
Heterogeneity: Not an	nlicable		200							
Test for overall effect:	Z = 4.18 ((P < 0.000	1)							
1 1 5 Guidalina + adur	pation + (locicion	upport +	form + a	udit					
Tornotröm 2014	470	4024	ese	1400	40.200	0 70 10 70 0 051				
Leaby 2017 (1)	470	562	111	133	99%	0.78 [0.72, 0.83]				
Leahy 2014	2097	69920	1874	57327	10.7%	0.92 [0.86, 0.98]				
Thakkar 2016	1398	19477	1579	20531	10.5%	0.93 [0.87, 1.00]				
Subtotal (95% CI)		90993		79119	41.3%	0.87 [0.80, 0.94]	•			
Total events	4356		4220							
Heterogeneity: Tau ² =	0.01; Chi 7 - 0.00 /	r = 15.11, D	df = 3 (P	= 0.002);	I* = 80%					
Test for overall effect: .	2 = 3.29 (P = 0.001	0)							
1.1.6 Guideline + educ	cation + c	lecision s	support +	audit + n	nonitoring	9				
Frank 2017 Subtotal (95% CI)	31133	293163 293163	13210	117444 117444	11.4% 11.4%	0.94 [0.93, 0.96] 0.94 [0.93, 0.96]	•			
Total events	31133		13210							
Heterogeneity: Not ap	plicable									
Test for overall effect: .	Z = 5.87 ((P < 0.000	101)							
Total (95% CI)		464149		253272	100.0%	0.78 [0.73, 0.85]	◆			
Total events	48174		27930							
Heterogeneity: Tau ² =	0.01; Chi	r = 198.84	4, df = 9 (i	P < 0.000	01); I ² = 9	5%	0.5 0.7 1 1.5 2			
Test for overall effect: .	∠=6.02(xonooc:	(H ≤ 0.000 Chi≩ = 4.7.	101) 4.40. df -	5/D × 0 0	00041	- 07 104	Favours PBM Favours no PBM			
Test for subdroup diffe	erences:	on=+ <i>11</i>	4.49, uí =	0 (F S U.L	100017, 11	- 97.170				

Behavioural interventions – DSS – monitoring in comprehensive PBM programs (PICO 15)



- (Statistically significant) reduction in FFP/PLT utilization

Outcomes	With no PBM program	With a comprehensive PBM program	Difference	Relative effect (95% CI)				
Morbidity - acute myocardial infarction follow up: median 24 months	4 per 1.000	1 per 1.000 (0 to 7)	3 fewer per 1.000 (4 fewer to 3 more)	RR 0.20 (0.02 to 1.73)				
Morbidity - acute kidney injury follow up: median 24 months	43 per 1.000	36 per 1.000 (26 to 50)	7 fewer per 1.000 (17 fewer to 7 more)	RR 0.84 (0.60 to 1.17)				
Mortality - hospital mortality follow up: median 24 months	0 per 1.000	0 per 1.000 (0 to 0)	0 fewer per 1.000 (0 fewer to 0 fewer)	OR 0.64 (0.23 to 1.74)				
Mortality - 30-day mortality follow up: median 9 months	19 per 1.000	23 per 1.000 (15 to 38)	5 more per 1.000 (4 fewer to 19 more)	RR 1.25 (0.78 to 2.02)				
Length of hospital stay (days) follow up: median 16.5 months	reduction in length of hospital stay in 4 studies (3/4 statistical significant), no evidence of effect in 1 study (total knee arthroplasty)							
Morbidity - acute ischaemic stroke follow up: median 18 months	17 per 1.000	17 per 1.000 (12 to 25)	1 more per 1.000 (5 fewer to 9 more)	RR 1.03 (0.71 to 1.52)				

3. What is the overall quality of the evidence of effects?



Behavioural interventions – DSS – monitoring in comprehensive PBM programs (PICO 15)

Outcomes	Certainty of the evidence (GRADE)
Blood product utilization - number of patients/admissions receiving RBC transfusion follow up: median 22.5 months	⊕⊕⊖⊖ LOW
Blood product utilization - number of patients receiving PLT transfusion follow up: median 21 months	⊕○○○ VERY LOW ^a
Blood product utilization - number of patients receiving FFP transfusion follow up: median 12 months	⊕◯◯◯ VERY LOW ^{a,b,c}
Morbidity - acute kidney injury follow up: median 24 months	
Mortality - hospital mortality follow up: median 24 months	⊕○○○ VERY LOW ^{a,c}
Mortality - 30-day mortality follow up: median 9 months	€ C VERY LOW ^{b,c}
Morbidity - acute ischaemic stroke follow up: median 18 months	

Summary of judgments



DESIRABLE EFFECTS	Trivial	Small	Small		Moderate		Large			
UNDESIRABLE EFFECTS	Large	Moderat	rate		Small		Trivial		Don't know	
CERTAINTY OF EVIDENCE	Very Low	Low		1	Moderate		High			
VALUES	Important uncertainty or variability	Possibly important u variabilit	incertainty or ty	Probab uncertai	Probably no important uncertainty or variability		important uncertainty or variability			
BALANCE OF EFFECTS	Favors the comparison	Probably favors the comparison	Does not faw interventi compa	or either the ion or the arison	Probably favors the intervention		Favors the intervention			
RESOURCES REQUIRED	Large costs	Moderate costs	Negligible costs and savings		Moderate savings		Large savings	Varies		
COST EFFECTIVENESS	Favors the comparison	Probably favors the comparison	Does not faw interventi compa	or either the ion or the arison	Probably favors the intervention		Favors the intervention		No included studies	
EQUITY	Reduced	Probably reduced	Probably r	no impact	Probably increased		Increased			
ACCEPTABILITY	No	Probably	no	Pr	obably yes		Yes			
FEASIBILITY	No	Probably	no	Pr	obably yes		Yes			



1 Recommendation – research priorities (PICO 15)

- The ICC-PBM guideline panel decided to formulate a research recommendation on using comprehensive PBM programs to improve appropriate blood product utilization
- Research priorities
 - Across all RBC/FFP/PLT/cryo utilization
 - Focus on adverse events
 - well-conducted observational studies are needed (e.g. time interrupted series)
 - compliance data
 - Clear definitions/description on behavioural interventions/comprehensive programs
 - Cost-effectiveness

Recommendation (PICO 15)



The ICC-PBM guideline panel decided to formulate a research recommendation on using comprehensive PBM programs to improve appropriate blood product utilization

Recommendation (PICO 15)



The ICC-PBM guideline panel decided to formulate a research recommendation on using comprehensive PBM programs to improve appropriate blood product utilization

- Accept completely
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panel decided to formulate a research recommendation on using comprehensive PBM programs to improve appropriate blood product utilization



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