



INTERNATIONAL
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**
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]? **3 observational studies + 1 experimental study**

Selection criteria



POPULATION: patients who might need transfusion (surgical and non-surgical patients/ acute and chronic disease patients/adults 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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Evidence-to-Decision framework

CRITERIA	JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS	
1. DESIRABLE EFFECTS	How substantial are the desirable anticipated effects?	 EVIDENCE	 Rapporteurs	 Audience
2. UNDESIRABLE EFFECTS	How substantial are the undesirable anticipated effects?	 EVIDENCE	 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?	 OPINION 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?	 OPINION POLL	 Rapporteurs	 Audience
9. ACCEPTABILITY	Is the intervention acceptable to key stakeholders?	 OPINION POLL	 Rapporteurs	 Audience
10. FEASIBILITY	Is the intervention feasible to implement?	 OPINION 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 + Education: RBC utilization	⊕○○○ VERY LOW ^{a,b}

Summary of judgments



DESIRABLE EFFECTS	Trivial		Small	Moderate	Large	Varies	Don't know
UNDESIRABLE EFFECTS	Large		Moderate	Small	Trivial	Varies	Don't know
CERTAINTY OF EVIDENCE	Very low		Low	Moderate	High	No included studies	
VALUES	Important uncertainty or variability		Possibly important uncertainty or variability	Probably no important uncertainty or variability	No important uncertainty or variability		
BALANCE OF EFFECTS	Favors the comparison ◀◀	Probably favors the comparison ◀	Does not favor either the intervention or the comparison ●	Probably favors the intervention ▶	Favors the intervention ▶▶	Varies	Don't know
RESOURCES REQUIRED	Large costs ◀◀	Moderate costs ◀	Negligible costs and savings ●	Moderate savings ▶	Large savings ▶▶	Varies	Don't know
COST EFFECTIVENESS	Favors the comparison ◀◀	Probably favors the comparison ◀	Does not favor either the intervention or the comparison ●	Probably favors the intervention ▶	Favors the intervention ▶▶	Varies	No included studies
EQUITY	Reduced ◀◀	Probably reduced ◀	Probably no impact ●	Probably increased ▶	Increased ▶▶	Varies	Don't know
ACCEPTABILITY	No		Probably no	Probably yes	Yes	Varies	Don't know
FEASIBILITY	No		Probably no	Probably yes	Yes	Varies	Don't know



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).

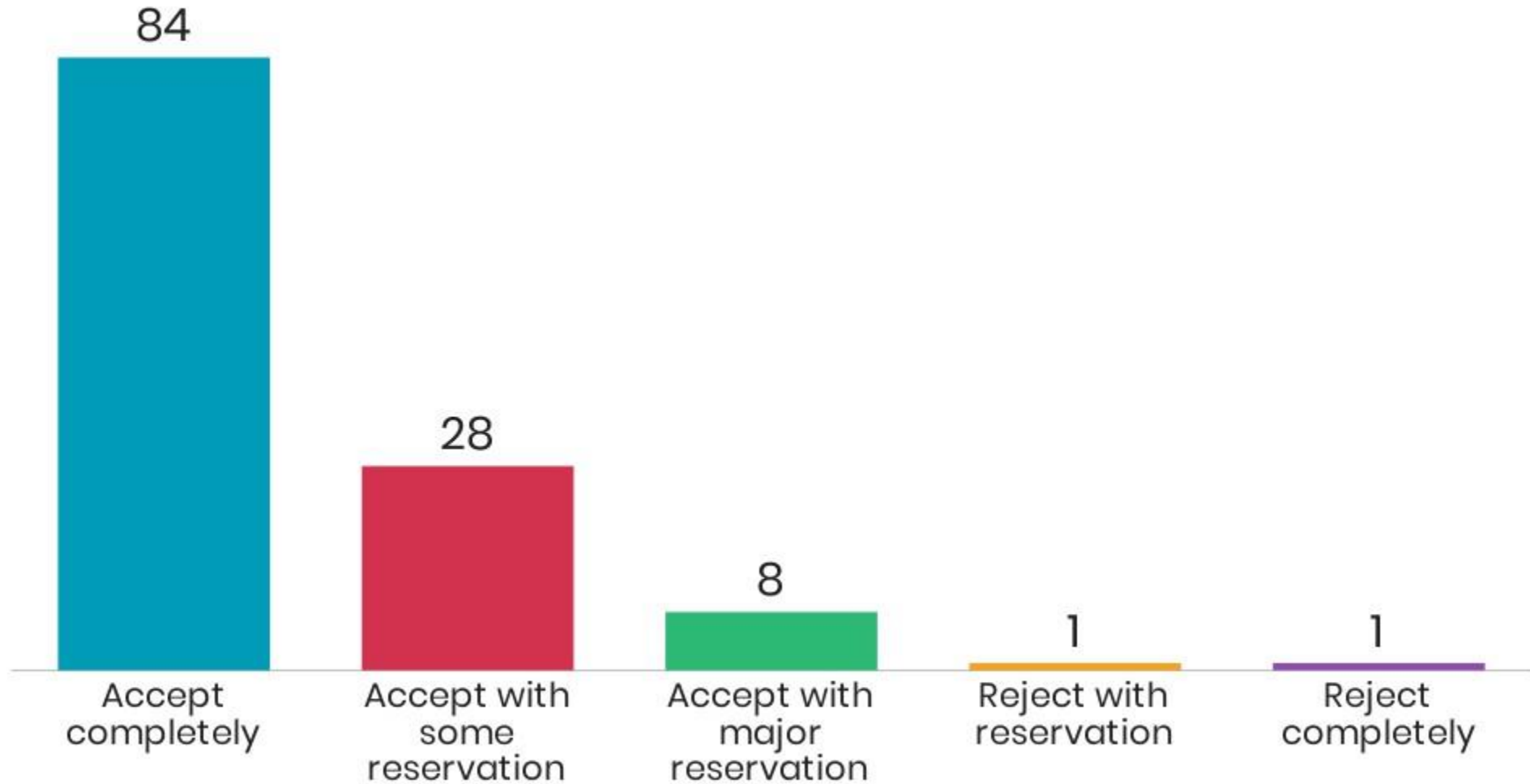


The ICC-PBM guideline panel decided to formulate a research recommendation on using behavioural interventions (transfusion guideline/audit/form/education) to improve appropriate blood product utilization

- 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



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% CI)
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	⊕⊕○○ LOW
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	⊕○○○ VERY LOW
30-day readmission follow up: 42 months	CRITICAL	⊕○○○ VERY LOW

Summary of judgments



DESIRABLE EFFECTS	Trivial	Small	Moderate	Large	Varies	Don't know
UNDESIRABLE EFFECTS	Large	Moderate	Small	Trivial	Varies	Don't know
CERTAINTY OF EVIDENCE	Very low	Low	Moderate	High	No included studies	
VALUES	Important uncertainty or variability	Possibly important uncertainty or variability	Probably no important uncertainty or variability	No important uncertainty or variability		
BALANCE OF EFFECTS	Favors the comparison ◀◀	Probably favors the comparison ◀	Does not favor either the intervention or the comparison ●	Probably favors the intervention ▶	Favors the intervention ▶▶	Varies Don't know
RESOURCES REQUIRED	Large costs ◀◀	Moderate costs ◀	Negligible costs and savings ●	Moderate savings ▶	Large savings ▶▶	Varies Don't know
COST EFFECTIVENESS	Favors the comparison ◀◀	Probably favors the comparison ◀	Does not favor either the intervention or the comparison ●	Probably favors the intervention ▶	Favors the intervention ▶▶	Varies No included studies
EQUITY	Reduced ◀◀	Probably reduced ◀	Probably no impact ●	Probably increased ▶	Increased ▶▶	Varies Don't know
ACCEPTABILITY	No	Probably no	Probably yes	Yes	Varies	Don't know
FEASIBILITY	No	Probably no	Probably yes	Yes	Varies	Don't know

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).



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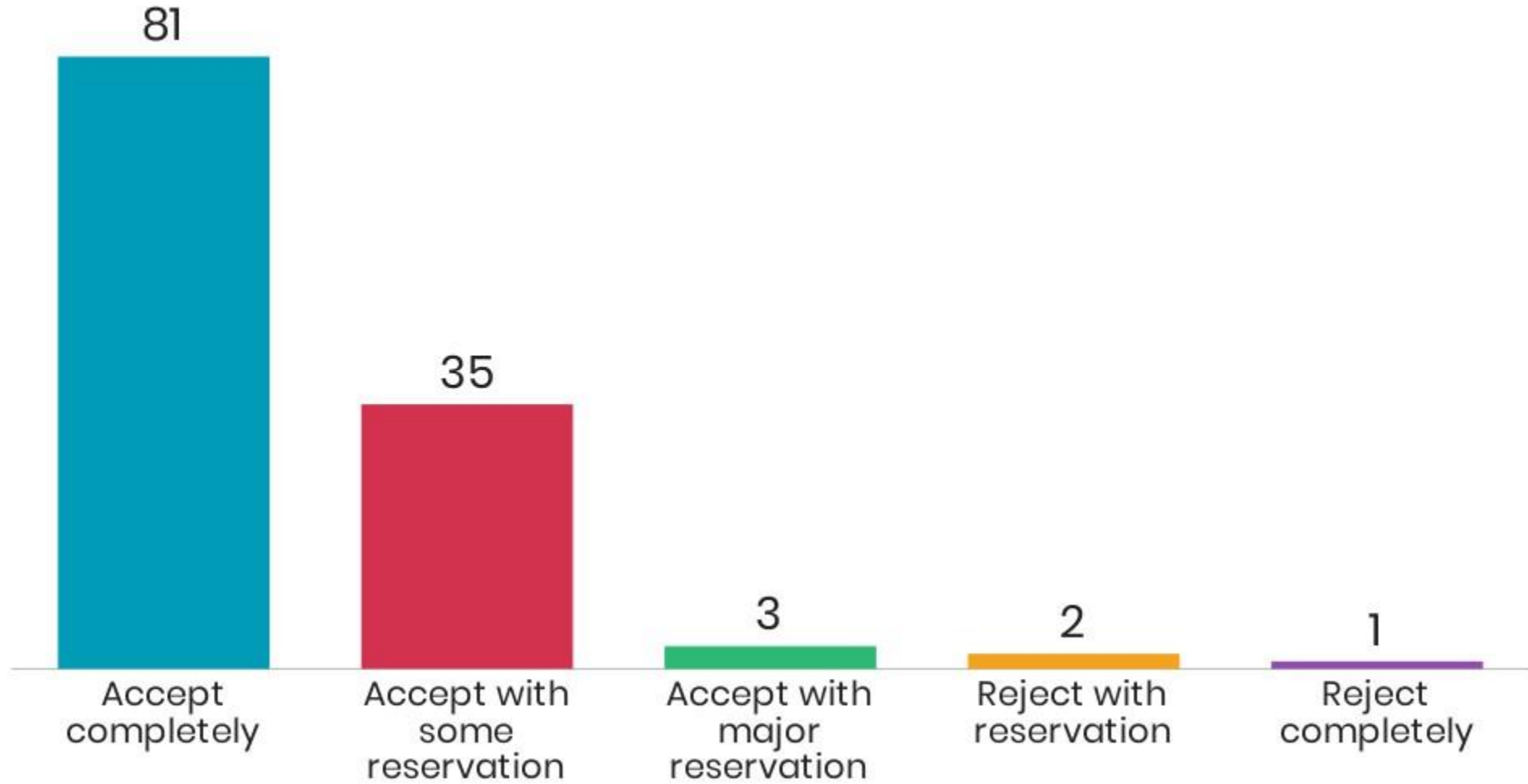


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- The ICC-PBM guideline panel suggest using electronic/computerized decision support systems to improve appropriate RBC utilization (conditional recommendation based on low certainty in the evidence of effects).
 - Accept completely
 - Accept with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



PICO questions

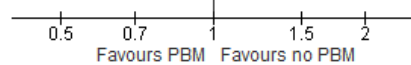
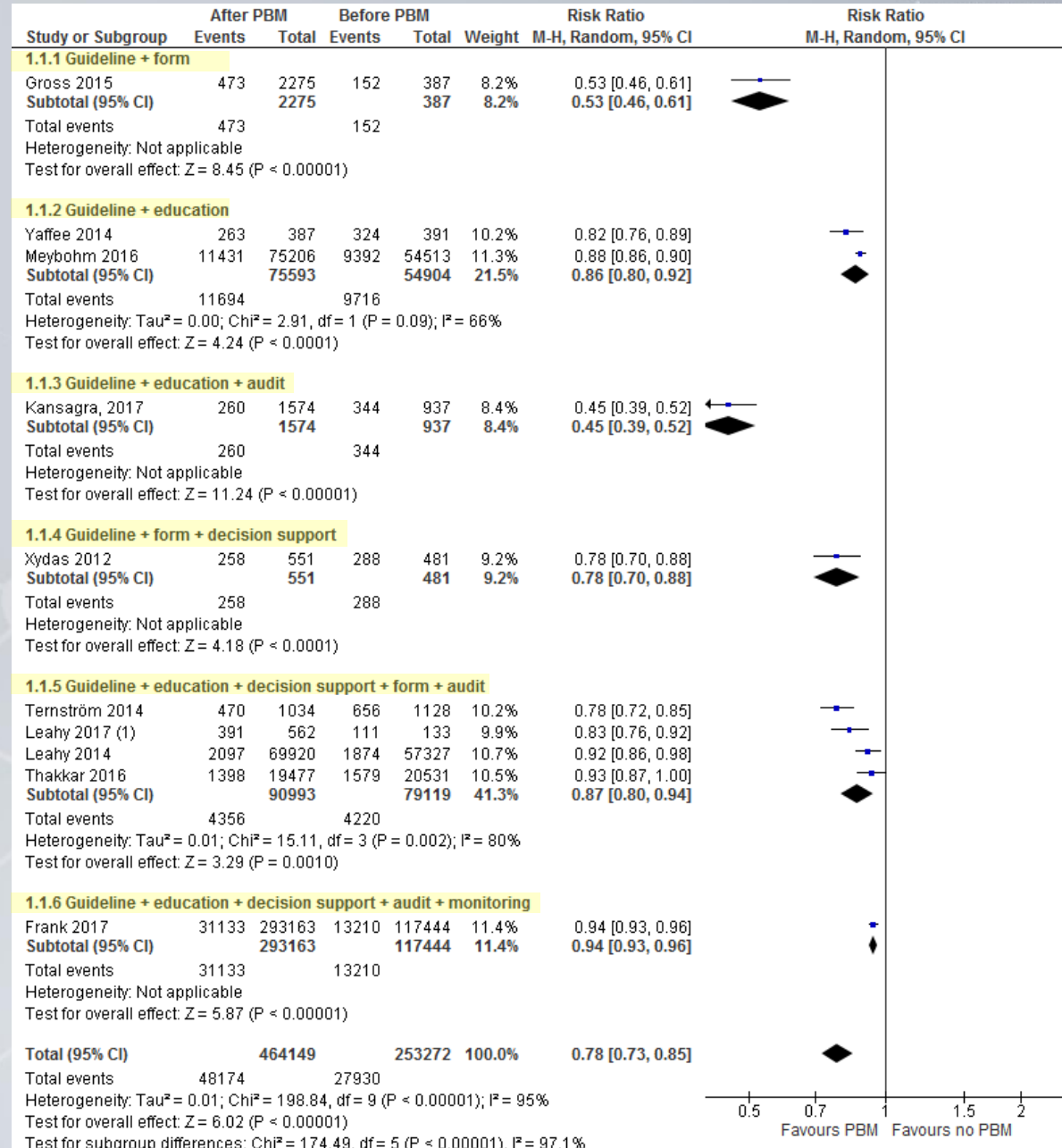


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Behavioural interventions/DSS/monitoring in comprehensive PBM programs (PICO 15)



Outcome: Number of patients/admissions that received RBC transfusions



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	⊕○○○ VERY LOW ^c
Mortality - hospital mortality follow up: median 24 months	⊕○○○ VERY LOW ^{a,c}
Mortality - 30-day mortality follow up: median 9 months	⊕○○○ VERY LOW ^{b,c}
Morbidity - acute ischaemic stroke follow up: median 18 months	⊕○○○ VERY LOW ^d

Summary of judgments

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COST EFFECTIVENESS	Favors the comparison ◀	Probably favors the comparison ◀	Does not favor either the intervention or the comparison ●	Probably favors the intervention ▶	Favors the intervention ▶	Varies	No included studies
EQUITY	Reduced ◀	Probably reduced ◀	Probably no impact ●	Probably increased ▶	Increased ▶	Varies	Don't know
ACCEPTABILITY	No	Probably no	Probably yes	Yes	Varies	Don't know	
FEASIBILITY	No	Probably no	Probably yes	Yes	Varies	Don't know	

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



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Recommendation (PICO 15)

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Recommendation (PICO 15)



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