QUESTION

Should in-situ simulation vs. the education accrued during typical organizational practice be used for training interprofessional healthcare providers to improve clinician behaviors during patient care and/or patient outcomes?.?

POPULATION:	training interprofessional healthcare providers to improve clinician behaviors during patient care and/or patient outcomes?.
INTERVENTION:	in-situ simulation
COMPARISON:	the education accrued during typical organizational practice
MAIN OUTCOMES:	Mortality; Safety Event Mitigation; Clinical Metrics of Care; Diagnostic Decisionmaking; Technical Skills Measured in Patient Care; Non-technical Skills Measured During Patient Care ; Resource Impact; Cost Impact; Adverse Emotional Impact; Adverse Care Impact;
SETTING:	
PERSPECTIVE:	
BACKGROUND:	
CONFLICT OF INTERESTS:	

ASSESSMENT

Problem

Is the problem a priority?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ● Yes ○ Varies ○ Don't know		This judgement is based solely on the fact that we deemed the question important enough to look at.

Desirable Effects

How substantial are the desirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Trivial ○ Small ● Moderate ○ Large ○ Varies ○ Don't know		Discussed as we analyzed the data

Outcomes	With the education accrued during typical organizational practice	With in-situ simulation	Difference	Relative effect (95% CI)
Mortality	44 per 1,000	**1 per 1,000** (-2 to -0)	**43 fewer per 1,000** (46 fewer to 44 fewer)	**RR 0.02** (-0.04 to -0.01)

	Safety Event Mitigation	435 clinicians Median decrease in 2 LST's per sim (significant via statistical control chart rules) 10 LST's mitigated. Descriptive improvement in identified system hazards and in time to blood arrival (no statistics given 49 more LST's identified in-situ than in center based, no statistics
	Clinical Metrics of Care	Note: Studies ranged from Observational, RCT, and Quasi-Experimental1123 clinicians 29004 patientsSummary:**Percentage Metrics:**1.2-49% change across multiple metrics. p values from 0.25 to 0.0001**Time-based Metrics:**Ranged from 2.3 to 360 sec improvement P values between 0.28 – 0.007 Detail:Changes in performance of various neonatal metrics of care between 0.16 – 3.4 (p between 0.0001 and 0.006)8% increase in uterotonic use (not sig), but significant increase in appropriate dose (15.98 ± 7.4 versus 25.1 ± 12.3; p < .001)Decreasing linear trend of postpartum hemorrhage cases (there was no assessment of significance, ant it seemed to have begun prior to the sim so this is of questionable meaning)Descriptive improvement in identified system hazards and in time to blood arrival No statistically significant changes in ED teamwork (specific numbers unreported)Improved CPR initiation 1.38±0.51 1.16±0.69 (22 seconds) p = 0.031. but no mortality improvement[Patient outcome (dead vs. alive) 2.343 0.487-11.265]PICU discharge status (dead vs. alive) 3.750 (0.661-21.251) Improved BLS initiation time 31% (p=0.019) and 28Improvement in electrical therapy for shockable rhythm (p=0.007),Improved trauma scores [6 points (p = 0011)], but this decayed in 12 months to a non-significant valueImproved time to ultrasonography (pre vs. 6-months post = 9.54 vs. 12-months post = 8.61; p = .0071).76% increase in frequency of near-perfect task completion (p < 0.001), ED resuscitation time reduced by 16%), p < 0.05, Mean resuscitation time reduced by 6 min p < 0.05Longer cord clamp times 53 ± 42 to 67 ± 47 s (p < 0.0005).Increase in infant stim 14.5% to 16.3% (p = 0.016). Increase in suction 13.0% to 15.8% (p < 0.0005)Decrease in BMV 7.3% to5.9% (p=0.005), faster spontaneous breathing in post cohort 9.8 ± 14.7 versus11.1 ± 18.3 (p < 0.0005). NOTE -THE BEST QUALITY RESULTS IN THIS SECTION ARE BELOW:Skills assessment: 49% point increase for AMTSL (95% CI 41 to 57), 42% point increase for recognition of retained placenta (95% CI 32 to 50) and 42% point increase (95% CI 39 to 45) for management

	of severe PPH.No significant differences in two of the primary indicators: all-cause near misses and PPH near misses among all women who delivered in a facility.Significant downward trend of PPH near miss (difference-in-differences of slopes −5.3, 95% CI −7.8 to −2.7, p<0.001)Avg Door-to-needle time- no significant diff. But significant door to needle decrease in post intervention (5 min p=0.03), when potential confounders factored out. This remained at 6 min diff (p=0.05). Door to groin time when potential confounders factored out was 21 min (p=0.04)	
Diagnostic Decisionmaking	note: Cluster RCT and Quasi-Experimental 3150 patients/patient events Summary: **Percent change** 14-31% 95% CI (1.02-2.95) **Timed change**: 4.1 min (95%CI-6.2 to -1.9.) Detail: Mean decision to deliver interval decreased by 4.1 min (95%CI-6.2 to -1.9) 14% increase in complication recognition (IRR 1.14, 95% CI 1.02 to 1.27); a 31% increase hemorrhage recognition (IRR 1.31, 95% CI 1.13 to 1.52) 86% increase insepsis recognition (IRR 1.86, 95% CI 1.17 to 2.95).	
Technical Skills Measured in Patient Care	179 clinicians Higher technical scores in intervention groups in Scenario 1 (17.4 [15.6–19.5], vs. 24.4 [18.7–26.6], P = .01) and Scenario 2 (17.5 [15.3–19.6] vs. 22.7 [21.3–25.0], P = .004	
Non-technical Skills Measured During Patient Care	311 clinicians 244 patients/patient events Summary: Percent change in score between 3-42% P values ranged from 0.049-0.001 Qualitative data only presented for some studies, with no observed change. Detail:	

	Overall positive change in communication behavior (P = 0.006), Overall Reduction in "No callback" of 5 (3–6) 2 (1–2) 1 (1–2) p = 0.028 overall, which was maintained 3 months post study (p = 0.033) No significant change in readback, verbal , or non-verbal aspects of communication Improved trauma scores 6 points out of 21 on tool (p = 0011), but this decayed in 12 mo. Overall communication improved from median 5.0 (4.0–7.0) to median 8.0 (8.0–8.0), p = 0.012 No change in ANTS scores (scores of 3-4 throughout study period. Mean notechs score increased 1 pt. (16.7 to 17.7) p <0.05	

Undesirable Effects

How substantial are the undesirable anticipated effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large ○ Moderate ○ Small ○ Trivial ○ Varies ● Don't know	None were discussed in the papers	Among potential undesirable effects, we discussed Resource Impact, Cost Impact, Adverse Emotional Impact, Adverse Care Impact

Certainty of evidence

What is the overall certainty of the evidence of effects?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Very low ○ Low ● Moderate ○ High ○ No included studies	Several RCT's were fould although the majority were observational	See Evidence Table

Values

Is there important uncertainty about or variability in how much people value the main outcomes?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS

○ Important uncertainty or variability ○ Possibly important uncertainty or variability ○ Probably no important uncertainty or variability ● No important uncertainty or variability	After discussing all main outcomes, the group agreed readily on the importance of each, with several being critical and the rest important.	

Balance of effects

Does the balance between desirable and undesirable effects favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ 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	Positive evidence in tables, no negative evidence or outcomes assessed	Cannot rank as clearly in favor without data as to potential undesirable effects, cost, and feasibility.

Resources required

How large are the resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Large costs ○ Moderate costs ○ Negligible costs and savings ○ Moderate savings ○ Large savings ○ Varies ● Don't know		These were not clearly described in these studies, nor compared when possible to control groups.

Certainty of evidence of required resources

What is the certainty of the evidence of resource requirements (costs)?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Very low ○ Low ○ Moderate ○ High ● No included studies		These were not clearly described in these studies, nor compared when possible to control groups.

Cost effectiveness

Does the cost-effectiveness of the intervention favor the intervention or the comparison?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ 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	No studies specifically addressed cost of the intervention.	

Equity

What would be the impact on health equity?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ Reduced ○ Probably reduced ○ Probably no impact ● Probably increased ○ Increased ○ Varies ○ Don't know	The overall improvement noted would support an improvement in equity. A few of the studies also addressed bringing low-cost in-situ to impoverished areas of the world, further supporting a probable effect.	

Acceptability

Is the intervention acceptable to key stakeholders?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ● Probably yes ○ Yes ○ Varies ○ Don't know		This was largely based on panel experience, as most of us could foresee administrators supporting interventions such as this one.

Feasibility

Is the intervention feasible to implement?

JUDGEMENT	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
○ No ○ Probably no ○ Probably yes ○ Yes ● Varies ○ Don't know		This would vary depending on the staffing and resources available in various institutions and region.

SUMMARY OF JUDGEMENTS

	JUDGEMENT						
PROBLEM	No	Probably no	Probably yes	**Yes**		Varies	Don't know
DESIRABLE EFFECTS	Trivial	Small	**Moderate**	Large		Varies	Don't know
UNDESIRABLE EFFECTS	Large	Moderate	Small	Trivial		Varies	**Don't know**

	JUDGEMENT						
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**
CERTAINTY OF EVIDENCE OF REQUIRED RESOURCES	Very low	Low	Moderate	High			**No included studies**
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

TYPE OF RECOMMENDATION

Strong recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	**Conditional recommendation for the intervention**	Strong recommendation for the intervention
○	○	○	●	○

CONCLUSIONS

Recommendation

For interprofessional healthcare providers we suggest that participation in-situ simulations offers potentially significant outcome benefits to healthcare users as compared to participating in typical organizational educational practices.

Justification

Four studies were found that, when meta-analyzed, suggesed a small but real effect on mortality when in-situ interventions are applied. Additional studies also showed that the utilization of in-situ assisted in the detection and mitigation of latent safety threats, improved various clinical metrics of care (including percent completion of care checklists and time to critical events), and showed a positive benefit for diagnostic decisionmaking, technical skills, and non-technical skills. Importantly, the study addressing technical skills, one study addressing diagnostic decisionmaking, and one study addressing clinical metrics are RCT's, enhancing the evidence. As a counter, however, no studies addressed potential negative outcomes of in-situ, such as impact of this mode of delivery on hospital resources and cost, as well as the emotional and care impact of simulation in the patient care area on other patients present. That being said, the bulk of evidence is in favor, and so a

weak recommendation can be made.

Subgroup considerations

Specific mortality outcome improvements were seen in neonatal, peds, and adult resuscitations. The highest quality studies showed improvements in post-partum hemorrhage, postpartum sepsis recognition, and improvements in neonatal resuscitation skills,. Also, low cost-low fidelity in-situ simulations (such as helping baipes breathe) offer significant accessibility improvements for LMIC settings.

Implementation considerations

As cost and resource use was not measured in the dataset, it will be vital for institutions implementing this guideline to carefully consider these in order to assure an approach that is sustainable over time. Potential negative impact of in-situ sim on patient workflow in adjacent care areas, as well as its impact on the emotional wellbeing of providers, should also be measured over time.

Monitoring and evaluation

NA

Research priorities

Specific research priorities included the following

1. A need for high-quality studies focused on the impact of in-situ simulation on hospital and program resource use, and how this relates to its cost-effectiveness as an intervention.

2. A need for high-quality studies focused on the financial costs of in-situ simulation on hospital and how this relates to its cost-effectiveness as an intervention. Comparison could be made between costs of the program vs potential cost savings due to avoided harm events.

3. A need to measure the effect of in-situ simulation (especially "surprise" in-situ simulation) on the emotions of providers who are called to participate in these sessions.

4. A need to measure the effect of in-situ simulation (especially "surprise" in-situ simulation) on the care given to other patients on the ward or floor adjacent to the simulation.

REFERENCES SUMMARY