

Comparison of Rapid Cycle Deliberate Practice Simulation to Traditional Simulation in a Resource-Limited Setting

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Introduction

- High-fidelity simulation-based education has shown improved resident knowledge and performance in high-resource settings^{1,2,3}
- There is little research on low-fidelity simulation to teach complex scenarios, particularly in resource-limited settings
- In traditional post-simulation debriefing, participants complete a scenario before discussing areas for improvement, leaving no time to return to the scenario to apply this new knowledge
- Rapid Cycle Deliberate Practice (RCDP) utilizes repeated rounds of a scenario with intermittent feedback allowing for immediate practice of newly obtained knowledge and skills⁴
- No studies exist comparing the use of RCDP and traditional post-scenario debriefing in a resource-limited setting

Objectives

- Develop a six-month simulation-based curriculum for pediatric residents on the care of acutely ill children
- Compare the effectiveness of traditional post-simulation debriefing vs debriefing with RCDP both using low-fidelity simulation based on pre- and post-intervention performance on a simulation

Methods

- Pediatric residents at the Kigali University Teaching Hospital (KUTH) were randomly assigned to traditional or RCDP group
- Basic demographic data and data regarding prior training were collected
- Residents were tested in a simulated resuscitation pre-intervention
- Residents completed all simulation sessions during the intervention period according to their assigned group (RCDP or traditional)
- Cases focused on management of shock, respiratory failure, and cardiac arrest
- A mid-fidelity mannequin was used for simulations, with feedback regarding physical exam and vital signs given verbally by the instructor
- An iPhone/ iPad app was used to enhance realism of the scenario utilizing an iPad to serve as the patient monitor
- Following the study period, residents were retested in a similar simulated resuscitation
- Videos of the resuscitations were scored by 2 investigators, with the blinded investigator's scores used for data analysis, and the non-blinded investigator's scores used to calculate the intraclass correlation coefficient (ICC)
- A modified version of the Simulation Team Assessment Tool (STAT)⁵ was used to score videos
- Sub-analysis was performed to compare RCDP and traditional groups on early basic life-saving interventions and leadership skills

Results

Table 1. Demographic Comparisons of RCDP vs. Traditional Simulation Training (N = 33)

	Traditional N = 13 (39.4%) N (%) or Median (IQR)	RCDP N = 20 (60.6%) N (%) or Median (IQR)	P-value
Residency Level			
I	3 (23.1)	6 (30.0)	0.60
II	4 (30.8)	4 (20.0)	
III	6 (46.2)	8 (40.0)	
IV	0 (0.0)	2 (10.0)	
Years Practiced	2.0 (2.0, 3.50)	2.0 (1.50, 3.0)	0.23
Medical School			
UR	12 (92.3)	16 (80.0)	0.63
Other	1 (7.7)	4 (20.0)	
Taken BLS			
No	2 (15.4)	8 (40.0)	0.25
Yes	11 (84.6)	12 (60.0)	
Taken PALS			
No	7 (53.8)	8 (40.0)	0.44
Yes	6 (46.2)	12 (60.0)	
Taken ETAT			
No	3 (23.1)	2 (10.0)	0.36
Yes	10 (76.9)	18 (90.0)	
ETAT Instructor			
No	11 (84.6)	19 (95.0)	0.55 ^a
Yes	2 (15.4)	1 (5.0)	
PED Months			
0	6 (46.2)	8 (40.0)	0.63
1	5 (38.5)	6 (30.0)	
2	2 (15.4)	6 (30.0)	
Number of Resuscitations			
0-10	6 (46.2)	13 (68.4)	0.21
≥11	7 (53.8)	6 (31.6)	

Results

- Both groups showed a statistically significant improvement from pre- to post-intervention performance on a simulated resuscitation of 21% (p<0.001)
- ICC for video review was 0.95 (95% CI 0.90-0.98; p<0.001)
- No statistically significant difference between groups in overall performance, or on sub-analysis comparing performance on early lifesaving skills or leadership skills

Figure 1. Comparison of Pre and Post STAT Scores Stratified by Study Group (N = 33)

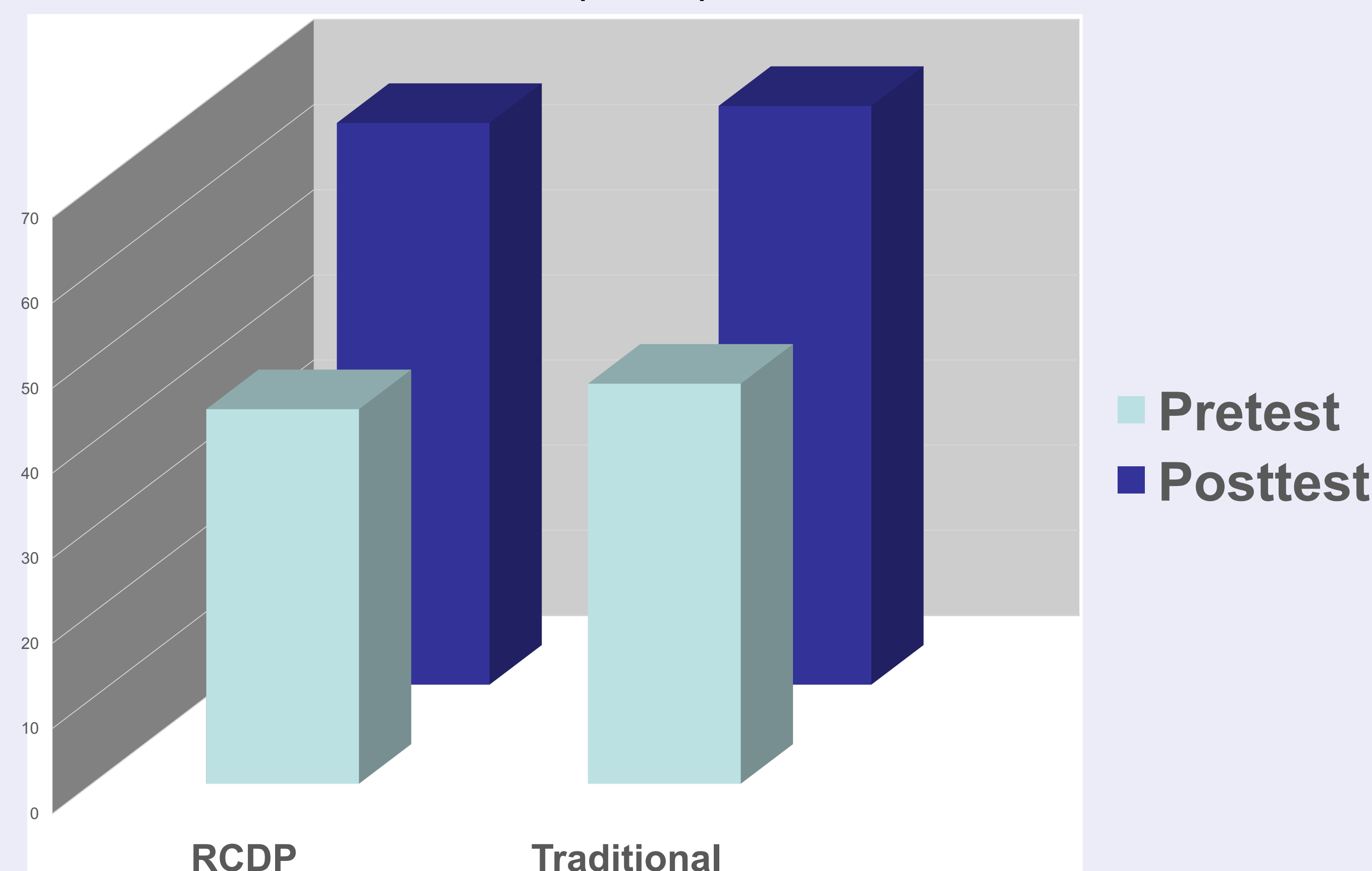


Table 2. Comparison of Pre and Post STAT Scores Stratified by Study Group (N = 33)

Groups	Pre-Evaluation Percent Mean (±SD)	Post-Evaluation Percent Mean (±SD)	Post-Pre Evaluation Percent Difference Mean (±SD)	95% Confidence Interval	P-value ^a
Overall	0.45 (0.12)	0.67 (0.12)	0.21	0.17 – 0.25	<0.001
Traditional	0.47 (0.10)	0.68 (0.11)	0.21	0.14 – 0.28	<0.001
RCDP	0.44 (0.13)	0.66 (0.13)	0.21	0.16 – 0.26	<0.001

^a P-value was calculated using the Paired t-Test

Table 3. Differences in Paired STAT Test Scores and Study Group (N = 33)

Traditional Group Percent Mean (±SD)	RCDP Percent Mean (±SD)	Mean Percent Difference	95% CI	P-value ^a
0.21 (0.11)	0.21 (0.11)	-0.003	-0.08 – 0.08	0.94

^a P-value was calculated using the Independent t-Test.

Limitations

- Small sample size may have limited our ability to detect differences on sub-analysis
- No data on how performance on our simulated scenarios translates into performance in actual resuscitations.

Conclusions

- Completion of a six month simulation-based curriculum for pediatric residents in Rwanda led to a statistically significant improvement in performance in a simulated resuscitation
- Residents randomized to receive instruction utilizing RCDP vs traditional debriefing demonstrated similar improvement
- RCDP and traditional simulation-based instruction may both be valuable tools to improve resuscitation skills in pediatric residents

References

- Lee MO BL, Bender J, et al. A medical simulation-based educational intervention for emergency medicine residents in neonatal resuscitation. Academic Emergency Medicine;19:577-85.
- Sudikoff SN, Overly FL, Shapiro MJ. High-fidelity medical simulation as a technique to improve pediatric residents' emergency airway management and teamwork: a pilot study. Pediatric emergency care 2009;25:651-6.
- Ross JC, Trainor JL, Eppich WJ, Adler MD. Impact of simulation training on time to initiation of cardiopulmonary resuscitation for first-year pediatrics residents. Journal of graduate medical education 2013;5:613-9.
- Hunt EA, Duval-Arnould JM, Nelson-McMillan KL, et al. Pediatric resident resuscitation skills improve after "Rapid Cycle Deliberate Practice" training. Resuscitation 2014;85:945-51.
- Reid J, Stone K, Brown J, et al. The Simulation Team Assessment Tool (STAT): development, reliability and validation. Resuscitation 2012;83:879-86.