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24 Contributions of each author

25 Dr Alan Platt, as part of his doctoral studies, made a substantial contribution to the  
26 design, data collection, analysis and interpretation of data. As well as the drafting,  
27 critical review, final approval and agreement to be accountable for all aspects of the  
28 publication.

29 Dr Peter McMeekin, as principle supervisor, made a substantial contribution to the  
30 design, analysis and interpretation of data. As well as the drafting, critical review, final  
31 approval and agreement to be accountable for all aspects of the publication.

32 Dr Linda Prescott-Clements, as second supervisor, made a substantial contribution to  
33 the design analysis and interpretation of data. As well as the drafting, critical review,  
34 final approval and agreement to be accountable for all aspects of the publication.

35

### 36 **Word count**

37 3,490

38

### 39 **What this paper adds:**

40 What is already known on this subject:

- 41 • Deliberate practice, as an educational approach in simulation-based education,  
42 has been demonstrated to improve the performance of individual learners.
- 43 • It has also been demonstrated that the use of simulation-based education in  
44 team training leads to positive outcomes in the performance of healthcare  
45 teams.
- 46 • At a team level, the use of team deliberate practice has been used successfully  
47 to improve team performance in various sports, however, there is little evidence  
48 of its use within healthcare simulated-based education.

49

50 What this study adds:

- 51 • Our study suggests that the use of team deliberate practice in simulation-based  
52 education can improve the performance of adult nursing pre-registration  
53 students.
- 54 • The study further suggests that the model “Simulation using Team Deliberate  
55 Practice” was a viable approach to use within adult nursing pre-registration  
56 education.

57

# ABSTRACT

58

59

## 60 **Background**

61 The use of simulation has grown in prominence, but variation in the quality of provision  
62 has been reported, leading to calls for further research into the most effective  
63 instructional designs. Simulation Using Team Deliberate Practice (Sim-TDP) was  
64 developed in response. It combines the principles of simulation with deliberate practice,  
65 therefore, providing participants with opportunities to work towards well-defined goals,  
66 rehearse skills, and reflect on performance whilst receiving expert feedback. This study  
67 aimed to compare the effects of Sim-TDP, versus the use of traditional simulation, on  
68 the performance of second year adult nursing students.

## 69 **Methods**

70 Using a longitudinal quasi-experimental design, the effects of the two approaches were  
71 compared over a one-year period. Sixteen groups, each containing an average of six  
72 participants, were randomised into an intervention arm ( $n = 8$ ) or comparison arm ( $n =$   
73  $8$ ). Data collection took place at three monthly intervals, at which point the performance  
74 and time to complete the scenario objectives/tasks, as a team, were recorded and  
75 analysed using a validated performance tool.

## 76 **Results**

77 The independent  $t$ -tests, comparing the performance of the groups, did not  
78 demonstrate any notable differences during the three phases. However, in phase 1, the  
79 independent  $t$ -tests suggested an improvement in the Sim-TDP participants' time spent  
80 on task ( $t_{(14)} = 5.12, p < .001$ ), with a mean difference of 7.22 minutes. The mixed  
81 ANCOVA inferred that the use of the Sim-TDP led to an improvement, over time, in the

82 participants' performance ( $F_{(1, 5)} = 12.91, p = .016$ ), and thus, an association between  
83 Sim-TDP and the enhanced performance of participants.

#### 84 **Conclusion**

85 The results suggest that Sim-TDP, potentially, optimised participant performance,  
86 whilst maximising the use of Simulation-based education (SBE) resources, such as  
87 simulation facilities and equipment. The model could be of practical benefit to nurse  
88 educators wishing to integrate SBE into their programmes.

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90 **Word count 299**

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## 102 INTRODUCTION

103

104 The use of simulation-based education (SBE) in healthcare education has grown  
105 rapidly over the past decade <sup>1</sup>, buoyed by a growing evidence base and a greater  
106 understanding of the underpinning pedagogy <sup>2</sup>. However, a scoping exercise  
107 undertaken in the United Kingdom found a wide variation in the quality of delivery <sup>3</sup>.  
108 Anderson, et al. <sup>3</sup> reported that integrating SBE across healthcare curricula, and  
109 underpinning it with robust pedagogical research, would support a more consistent high  
110 quality approach. Deliberate Practice (DP), developed by Ericsson <sup>4</sup>, is one such  
111 approach as some authors <sup>2 5</sup> posit that it boosts learner performance. Clapper and  
112 Kardong-Edgren <sup>6</sup> reason that implementing DP would benefit nursing programmes  
113 through enhancing student performance.

114 DP is described as an approach that engages individual learners in repetitive learning  
115 activities encompassing well-defined learning objectives, set at an appropriate level,  
116 and supported by an expert facilitator providing immediate feedback <sup>2 4</sup>. Ericsson <sup>4</sup>  
117 identifies that SBE, incorporating DP, provides individual learners with opportunities to  
118 improve performance. However, it can be constrained by timetabling restrictions and  
119 the availability of resources such as specialised staff, SBE rooms, and equipment <sup>7</sup>.

120 When combined with large student cohorts, nurse educators wishing to utilise SBE face  
121 significant challenges<sup>8</sup>. Harris, et al. <sup>9</sup> proposed that Team Deliberate Practice (TDP)  
122 offers a potential solution to these challenges. In concordance with the DP approach,  
123 TDP combines well-defined learning objectives, set at an appropriate level, with  
124 opportunities for repetitive team practice under the supervision of a coach providing  
125 immediate feedback <sup>10 11</sup>. As an approach, Helsen et al <sup>10</sup> report that international  
126 football players combine both individual DP and TDP to improve their performance and

127 master their team sport. However, in the healthcare context, although nursing studies <sup>12</sup>  
128 <sup>13</sup> have indicated that SBE improves team performance, there remains little guidance  
129 as to how TDP should be integrated into an SBE curricula.

130 Katzenbach and Smith <sup>14</sup> describe a team as a small group, committed to a common  
131 goal, whose success is dependent on them interacting efficiently. As effective team  
132 working is viewed as essential to high quality, safe healthcare <sup>15 16</sup>, team training  
133 interventions are vital to achieve high standards of performance <sup>17</sup>. Salas, et al. <sup>17</sup>  
134 describe team training as a set of tools and methods used to enhance teamwork and  
135 refer to three components: teamwork, task-work and a combination of both. Teamwork,  
136 in this context, refers to the behaviours that facilitate effective team interaction <sup>15</sup>  
137 including decision making, assertiveness, situational awareness and communication  
138 skills <sup>18</sup>. Task-work denotes what team members are doing with regard to team goals <sup>16</sup>  
139 <sup>19</sup>, including core technical competencies <sup>17</sup>, such as performing and recording vital  
140 observations and undertaking patient assessments. Consequently, the tasks performed  
141 by one member of the team contribute to the overall performance of the team and, as a  
142 result, reflect the effectiveness of team coordination. This mirrors the coordination  
143 component of teamwork <sup>20</sup>, and links to phase one of the model of team development  
144 proposed by Morgan et al <sup>21</sup>, especially the teamwork pathway <sup>21</sup>. They purport that  
145 teams progress through several phases of development and identify two discrete  
146 developmental pathways (Figure 1). The first relates to task-work, the second to  
147 teamwork. For team training to be successful the two pathways need to develop  
148 separately and then combine as learners progress <sup>22</sup>. Given that teams develop along  
149 both pathways, Mathieu and Rapp <sup>23</sup> argue that teams need to establish a solid  
150 foundation for each pathway during the early stages of their development. However,  
151 exactly how this should be integrated into educational programmes has not been  
152 clarified <sup>22</sup>. Nelson, et al. <sup>24</sup> echo this lack of clarity, having found little evidence to  
153 indicate the best way to implement team training into an undergraduate programme.

154 Thus, to implement the team training pathways and potentially address resource  
155 constraints, the 'Simulation using Team Deliberate Practice' (Sim-TDP) model was  
156 developed.

157 **FIGURE 1** The merging of task-related skills and team-related skills during team.  
158 From Morgan BB, Salas E, Glickman AS. An Analysis of Team Evolution and  
159 Maturation. *The Journal of General Psychology*1993;120(3):277-91. Copyright  
2001 by Taylor & Francis Ltd. Reprinted by permission of the publisher (Taylor &  
Francis Ltd, <http://www.tandfonline.com>).

160 The aim of this study was to compare the effects of Sim-TDP on the performance of  
161 second year adult nursing students, compared to that achieved using traditional SBE.  
162 The latter approach followed the classic three stage model; the pre-brief, clinical  
163 scenario and debrief <sup>25</sup> It was hypothesised that the mean performance scores of the  
164 Sim-TDP intervention groups would be different from the scores of the comparison  
165 groups using traditional SBE.

166

## 167 **ETHICS**

168

169 Ethical approval was gained from Northumbria University's research and ethics  
170 committee. Participants were given study information and informed that participation  
171 was completely voluntary. They could refuse to participate and opt out of the study at  
172 any time. As the SBE sessions were part of their nursing programme they still had to  
173 participate in the activity but, if they chose to opt out the data relating to them would not  
174 be used. All data was stored securely.

175

## 176 **METHODS**

177



178 A longitudinal quasi-experimental design was adopted to compare the effects of Sim-  
179 TDP on the performance of second year adult nursing students, to that achieved using  
180 traditional SBE. Both interventions were integrated into the practical modules of an  
181 existing curriculum.

182 Data collection took place at three time points over the year. At these points, the  
183 performance and time to complete the scenario objectives/tasks, as a team, were  
184 recorded and analysed using a validated performance tool. The data was analysed  
185 using the software package Statistical Package for the Social Sciences® (SPSS®)  
186 (IBM® SPSS® Statistics version 22). An independent *t*-test was used to compare both  
187 the mean performance scores and the time on task of the two arms during each  
188 phase. Effect sizes were calculated using Cohen's *d* statistical test. As Sim-TDP is  
189 time dependent, a mixed analysis of co-variance (ANCOVA) was undertaken and  
190 Pearson's correlation coefficient *r* used to estimate the effect size.

191

## 192 **Sample**

193 The sample was taken from a cohort of adult nursing students who had commenced  
194 year two of a three-year adult nursing programme. Due to the structure of the curricula  
195 and timetabling demands, these students had been placed into tutor groups that  
196 comprised of an average of twenty-four students. This tutor group structure dictated  
197 when the students were taught. Due to the data collection timeframe and timetabling  
198 constraints, a convenience sample of four of these tutor groups (N = 4) was used.  
199 These were randomised, following the process outlined in figure 2, into sixteen sub-  
200 groups (n = 8 in the intervention arm, and n = 8 in the comparison arm), each  
201 containing an average of six participants. Once randomised, the comparison and  
202 intervention arms undertook their SBE experiences separately.

203 **Figure 2** The randomisation process

## 204 **The traditional SBE approach**

205 The traditional SBE method (Figure 3) undertaken by the sub-groups within the  
206 comparison arm, followed a standardised approach that was based on the International  
207 Nursing Association for Clinical Simulation and Learning's (INACSL's) Standards of  
208 Best Practice: Simulation<sup>SM</sup> 25. This encompassed three stages; the pre-brief, clinical  
209 scenario and debrief. The pre-brief focused on the effective preparation of the  
210 participants, outlining the aims and objectives of the scenarios, as well as participant  
211 roles, professional expectations, orientation to the environment and simulator. The  
212 scenarios were designed to represent a clinical situation that the participants may  
213 encounter during their clinical practice and followed a standard scripted scenario  
214 template incorporating salient signs and symptoms. These were piloted prior to the  
215 commencement of the study. The scenario ended when the participants, as a team,  
216 completed their assessment and rang for senior help. The sub-group's performance  
217 was video recorded during the scenario but no video feedback was used during the  
218 debrief. The debriefing stage, was facilitated by an experienced faculty member using a  
219 standard proforma based on the three phase structured debriefing model developed by  
220 Steinwachs 26. The three phases were: description, analysis and application phases,  
221 which were underpinned by the debriefing with good judgement approach 27. This  
222 meant the teams in the comparison arm undertook one scenario and one debrief.

223 **Figure 3** Traditional Simulation Model

224

## 225 **The intervention**

226 The Sim-TDP model (Figure 4) using the same templates and models followed the first  
227 three phases of the traditional SBE approach. However, following the debriefing stage

228 the Sim-TDP sub-groups were provided with further opportunities to rehearse the same  
229 scenario. Each team, under the guidance of an expert facilitator using the ‘within-event’  
230 debriefing approach <sup>28</sup>, first undertook a “coached walk through” of the scenario in the  
231 SBE environment. Once completed, the team then repeated the same scenario, which  
232 was video recorded. The teams then undertook a final debrief following Steinwacks <sup>26</sup>  
233 model. This meant the intervention sub-groups repeated or rehearsed the scenario  
234 three times and undertook two debriefings.

235 **Figure 4** Simulation with Team Deliberate Practice Model

236

## 237 **The SBE Programme**

238 In total six scenarios were used, with each phase incorporating two scenarios (Figures  
239 3 and 4). These were undertaken in the University’s simulation centre over a three hour  
240 time period, with one hour and twenty-five minutes for each rotation of SBE or Sim-  
241 TDP. Due to the numbers of participants per group, the simulations followed the  
242 process outlined in figure 5, enabling both the Sim-TDP and traditional SBE groups to  
243 undertake one scenario and observe a second. No other educational interventions  
244 were used.

245 **Figure 5** Scenario Delivery

246

247 The SBE environment was set up to represent a surgical or medical ward and  
248 contained relevant clinical equipment, for example oxygen masks. The patient  
249 simulators used were Laerdal’s SimMan® (Laerdal Medical, Stavanger, Norway). Their  
250 functionality meant that participants could record relevant vital observations, for  
251 example respiratory rate and blood pressure. They could also be “voiced” so that

252 participants could communicate with the patient and to increase realism further relevant  
253 moulage was used, for example to replicate cyanosis. Another experienced faculty  
254 team member facilitated the scenario as the student's mentor following a standardised  
255 script. To ensure consistency, all facilitators were fully trained in using both traditional  
256 SBE and Sim-TDP.

257 Each scenario focused on the recognition of a deteriorating patient and, as  
258 recommended by the Resuscitation Council (UK) <sup>29</sup>, the use of the "ABCDE" (**A**irway,  
259 **B**reathing, **C**irculation, **D**isability and **E**xposure) systematic assessment framework and  
260 the "SBAR" mnemonic (**S**ituation, **B**ackground, **A**ssessment and **R**ecommendation).  
261 These formed the basis of the scenario learning objectives, which were to recognise a  
262 deteriorating patient, use the ABCDE assessment and SBAR handover tool. These  
263 were set at the participants' current level of development. This process was repeated at  
264 three-monthly intervals.

265

## 266 **Performance tool development**

267 The performance tool (Figure 6) was structured using the "ABCDE" assessment  
268 framework <sup>29</sup> and "SBAR" handover <sup>29</sup> mnemonics. Content validity was established  
269 over several phases. Initially, content was identified through a literature review and this  
270 was used to develop a checklist of representative tasks <sup>4</sup>. The checklist was reviewed  
271 by an expert panel (N=12) comprised of university academics and hospital-based  
272 practitioners who had expertise in both SBE and critical care. The content validity index  
273 (CVI) <sup>30</sup> was used to assess the relevance of each item and a scale content validity  
274 index (S – CVI) rating of 0.98 was found, which was above the 0.90 recommended by  
275 Polit and Beck <sup>30</sup>.

276

Figure 6 TDP performance observation tool - Hypovolaemia

277

278 To ensure the reliability of the data, all the videos captured (N = 59) were reviewed by  
279 two independent raters and the researcher (N = 3). The data collected was analysed  
280 for inter-rater reliability using the Intraclass Correlation Coefficient. A Cronbach's  $\alpha$  of  
281 0.71 (95% confidence interval: 0.55 – 0.84) was found, which was above the 0.70  
282 threshold demonstrating the reliability of the tool <sup>31</sup>.

283

## 284 RESULTS

285

286 Data was assessed for any potential violation of assumptions. Demographic data,  
287 including the participants' gender and age, was extracted (Table 1).

Table 1: Demographic data								
			Intervention	Comparison	t - Test	p - value	$\chi^2$	p - value
Participants	Total	98	52 (53%)	46 (57%)	1.04	.303	3.93	.686
	Withdrew	1	1	0				
	Left programme	4	2	2				
	Grand total	93	49	44				
Gender	Male	3 (3%)	2	1	-.492	.624	.246	.620
	Female	95 (97%)	50	45				

Age	18-24	73 (76%)	34	39	2.090	.039	4.26	.039
	25-30	24 (24%)	17	7				
	31-36	6 (6%)	5	1				
	37 +	8 (8%)	4	4				

288

289 Homogeneity of participant numbers and gender was evident across the intervention  
 290 and comparison arms, however, the analysis suggested heterogeneity across the age  
 291 groups.

292 **Performance analysis**

293 Descriptive statistics were performed at the sub-group level (n=16) for both the  
 294 intervention arm and the comparison arms (Table 2).

295

Table 2: Post-performance group statistics						
	Condition	Group statistics				
		n	Mean	SE	<i>P</i> value	Effect size (Cohen <i>d</i> )
Phase 1 performance post	Comparison	8	37.13	1.81	<i>p</i> = .305	<i>d</i> = 0.53
	Intervention	8	39.50	1.31		
Phase 2 performance post	Comparison	7	35.57	2.22	<i>p</i> = .131	<i>d</i> = 1.24
	Intervention	3	42.00	2.52		

Phase 3 performance post	Comparison	6	31.83	2.10	$P = .779$	$d = 0.17$
	Intervention	5	32.80	2.65		

296

297 In phase one, the performance scores between the Sim-TDP intervention group ( $M =$   
298  $39.50$ ,  $SE = 1.31$ ) and the traditional SBE comparison group ( $M = 37.13$ ,  $SE = 1.81$ ),  
299 had a mean difference of  $-2.38$ , 95% CI ( $-7.16$ ,  $2.41$ ), with a  $t_{(14)} = -1.06$ , and  $p = .305$ .  
300 A moderate effect size ( $d = 0.53$ ) was noted. In phase two, the mean difference  
301 between the performance scores for the Sim-TDP intervention sub-groups ( $M = 42.00$ ,  
302  $SE = 2.52$ ) and the comparison sub-groups ( $M = 35.57$ ,  $SE = 2.22$ ) was  $-6.43$ , 95% CI  
303 ( $-15.25$ ,  $2.39$ ), with a  $t_{(8)} = -1.68$ , and  $p = .131$ . The Sim-TDP intervention had a large  
304 effect size ( $d = 1.24$ ). In phase three, the mean difference in the performance scores  
305 between the Sim-TDP intervention sub-groups ( $M = 32.80$ ,  $SE = 2.65$ ) and the  
306 comparison sub-groups ( $M = 31.83$ ,  $SE = 2.10$ ) was  $-0.97$ , 95% CI ( $-8.51$ ,  $6.59$ ), with a  
307  $t_{(9)} = -.29$ , and  $p = .779$ . A very small effect size ( $d = 0.17$ ) was found. In terms of the  
308 performance of the teams during the individual phases, the analysis suggests there  
309 were no differences between the Sim-TDP intervention and the comparison groups,  
310 inferring that Sim-TDP during the individual phases did not influence performance.

311 In phase one, the analysis found that the mean difference between the post-  
312 performance time on task, in minutes, for the intervention sub-group ( $M = 8.52$ ,  $SE =$   
313  $0.70$ ) and the traditional SBE comparison sub-groups ( $M = 15.74$ ,  $SE = 0.70$ ), was  
314  $7.22$ , 95% CI ( $4.19$ ,  $10.24$ ), with a  $t_{(14)} = 5.12$ , and  $p < .001$ , and a very large effect size  
315 ( $d = 2.56$ ). This suggests that Sim-TDP potentially reduced the time on task compared  
316 to the traditional SBE and facilitated the achievement of the scenario objectives earlier.  
317 However, the analysis in phases two and three did not demonstrate any differences,  
318 although the effects sizes for both were large. In phase two, this was  $d = 0.85$ , and in

319 phase three it was  $d = 1.34$ . This analysis suggests that Sim-TDP did have a potential  
320 positive effect on the teams by reducing their time on task.

321 As age was found to be a co-variant, a mixed ANCOVA was undertaken on the  
322 participants' performance across the three phases, and a difference between the  
323 groups in the two arms was found ( $F_{(1, 5)} = 12.91, p = .016$ ). Pearson's correlation  
324 coefficient  $r$  was used to estimate the effect size, and this was found to be large,  $r^2 =$   
325  $.85$ , with an observed power of  $.82$ . This infers that Sim-TDP, independent of age, had  
326 a potential positive effect overtime on the performance scores of the teams.

327

## 328 **DISCUSSION**

329

330 The findings highlight the potential of the Sim-TDP model as an effective instructional  
331 design for SBE. In terms of team performance, the results suggest that the model had  
332 a potential positive effect. As Ericsson<sup>4</sup> identifies, providing opportunities to practice is  
333 a vital component of DP, and the Sim-TDP model was designed to maximise these  
334 opportunities. Although the independent  $t$ -tests on the participants' performance did not  
335 demonstrate any difference during the phases, the mixed ANCOVA identified a  
336 possible practical benefit of the intervention. This was the achievement of continuous  
337 skill improvement<sup>2</sup>, and the attainment of progressively higher levels of performance  
338 over time<sup>4</sup>. These findings are in line with the results of other DP studies in nurse  
339 education<sup>32</sup>, highlighting the potential efficacy of using Sim-TDP in nursing curricula.  
340 They also echo the results reported by Ward et al<sup>33</sup>, who found that the accumulated  
341 hours spent in TDP consistently discriminated between elite and sub-elite football  
342 players. Furthermore, studies by Baker et al<sup>34</sup> and Lund et al<sup>11</sup> found that effective  
343 performance depended upon the cohesive interaction among team members, gained  
344 through individual and coached team training.



345

346 The reduction in the participants' time on task in phase one was promising. In terms of  
347 patient safety, this could have beneficial effects on patient care if teams are able to  
348 recognise patient deterioration earlier. It also appeared that Sim-TDP had its largest  
349 effect on the participants' time on task when they were at an earlier stage in their  
350 professional development, which further supports its early integration into an  
351 undergraduate nursing curriculum. In terms of team training, the findings echoed the  
352 improvement in neonatal resuscitation performance of paediatric residents found by  
353 Sawyer, et al. <sup>35</sup>. In this study, participants working in teams of two undertook three  
354 simulation scenarios over a two month period. Although Sawyer, et al. <sup>35</sup> did not identify  
355 their intervention as TDP, they reported a positive impact of using DP in SBE.

356 The results provisionally support the use of the Sim-TDP model early in the education  
357 of undergraduate adult nursing students to support the assimilation of their task-  
358 working and their team working skills <sup>20 36</sup>. As emphasised by Kardong-Edgren, et al. <sup>37</sup>,  
359 finding the SBE methodology with the most impact with regard to learning and retention  
360 is vital. The improvement in participants' performance, over time, infers that by using  
361 small teams of participants the Sim-TDP model potentially achieves a balance between  
362 optimising team performance and maximising available SBE resources. As the  
363 enhanced performance Sim-TDP achieved was within the same location, timeframe  
364 and resources as the traditional SBE approach. This provisionally points to a more  
365 efficient model of SBE that potentially overcomes the resource challenges faced by  
366 SBE educators. These challenges include the availability of SBE rooms, equipment;  
367 and appropriately trained staff <sup>7</sup>. Consequently, Sim-TDP offers SBE educators a  
368 model that could be integrated into a wide range of professional undergraduate  
369 curricula effectively.

370

## 371 **STUDY LIMITATIONS AND STRENGTHS**

372

373 The study had several limitations. Firstly, the quasi-experimental design means that the  
374 study findings are not generalisable, and only associative, not causal, inferences can  
375 be made. Secondly, the study sample size was relatively small ( $n = 16$ ) and a  
376 convenience sampling technique was used to select the initial tutor groups ( $N = 4$ ). This  
377 was compounded by the heterogeneity in the age groups. However, to reduce threats  
378 to internal validity, the naturally occurring groups were randomly assigned into their  
379 respective arms.

380 A third limitation related to the structure of the two models. The performance of those  
381 observing the initial scenarios could have affected their results. As the traditional SBE  
382 approach only included one scenario and debrief compared to three scenarios and two  
383 debriefs in the Sim-TDP approach, the process of repeating the scenarios rather than  
384 the model itself could have influenced the results. However, as O'Regan, et al. <sup>38</sup>  
385 reported, observation conveys no advantage to participants.

386 Fourthly, as the data collection tool was designed by the authors this created a  
387 potential source of bias. However, the design and development of this tool was very  
388 specific to the study population and followed a rigorous development process. Finally,  
389 several logistic and technological issues, such as timetabling cancellations and the loss  
390 of video captured materials may have potentially affected the results.

391 Nevertheless, it is envisaged that the results will act as a catalyst for SBE educators to  
392 either incorporate Sim-TDP into their SBE programmes or to undertake additional  
393 research into its use. The study had several key strengths, the first of which was the  
394 approach we adopted in relation to the interpretation of  $p$  values. Acknowledging the  
395 debate on the use of  $p$  values and statistical significance <sup>39</sup>, we adopted an open and

396 cautious approach to the interpretation of the findings. Secondly, the study was  
397 undertaken in an actual curriculum setting, using participants studying on a nursing  
398 programme, and not as an additional SBE activity. This increases the potential for  
399 translation into other curricula and adds credibility to the findings. Another strength  
400 includes the use of standardised scenarios and debriefing methods for both arms and,  
401 the use of experienced SBE facilitators trained in the use of both approaches. The use  
402 of three raters to evaluate and rate the performance of the sub-groups added further  
403 strength to the study, since this led to a consensus score for each sub-group reducing  
404 the potential risk of bias.

405

## 406 **CONCLUSION**

407

408 Overall, the results suggested that the Sim-TDP model, as an instructional design, had  
409 a positive impact on the participants' performance. The greater levels of performance  
410 over time and the reduced time on task achieved within the same timeframe and  
411 resources highlights the potential efficacy and practical benefit of Sim-TDP. The results  
412 were promising and signalled the possible feasibility of developing the task-work and  
413 team working skills of student nurses. Consequently, Sim-TDP offers an approach that  
414 could potentially aid SBE educators in developing the professional competencies of  
415 student nurses.

416

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418

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420 **DISCLOSURES**

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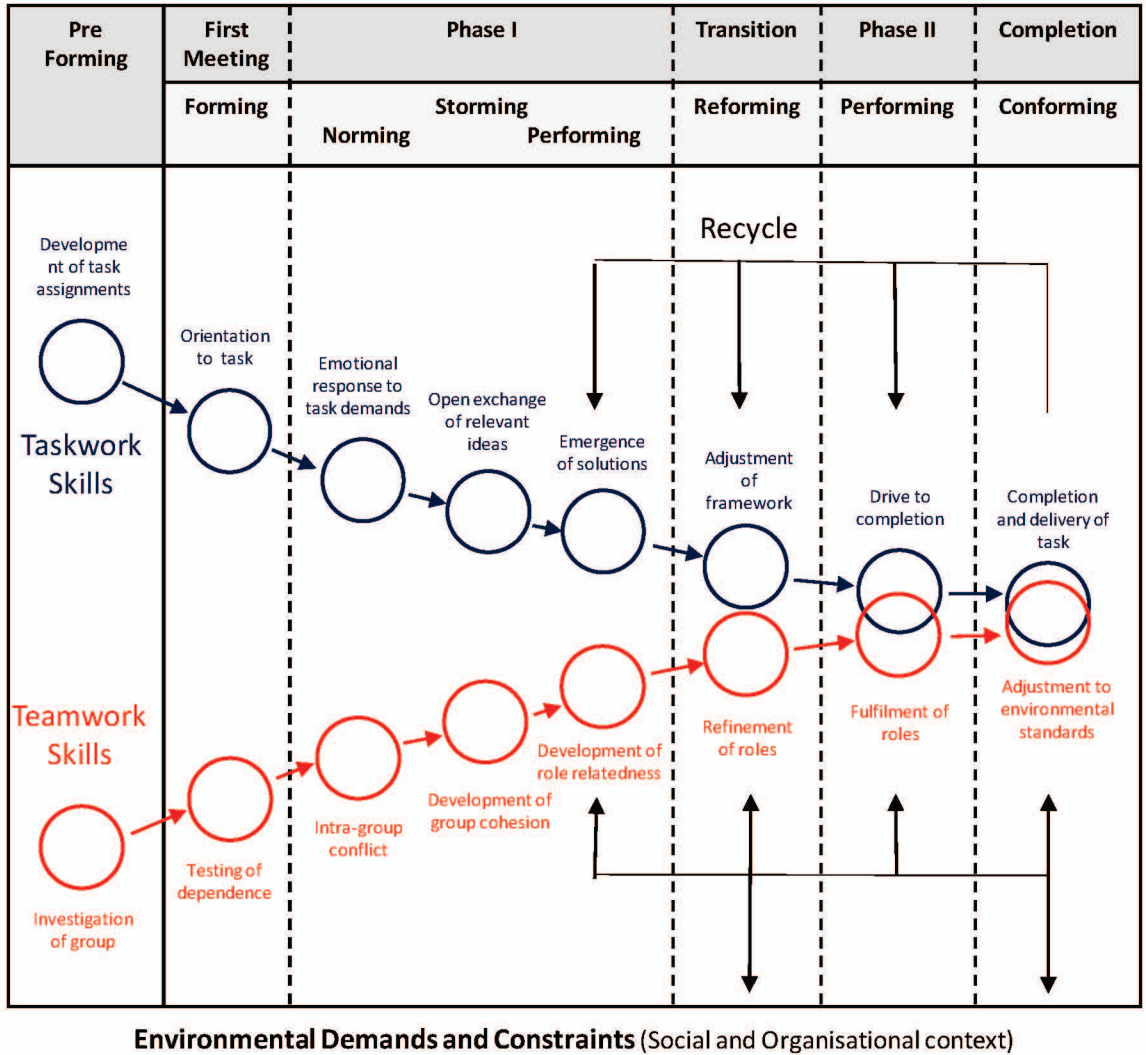
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**FIGURE 1** The merging of task-related skills and team-related skills during team. From Morgan BB, Salas E, Glickman AS. An Analysis of Team Evolution and Maturation. *The Journal of General Psychology* 1993;120(3):277-91. Copyright 2001 by Taylor & Francis Ltd. Reprinted by permission of the publisher (Taylor & Francis Ltd, <http://www.tandfonline.com>).



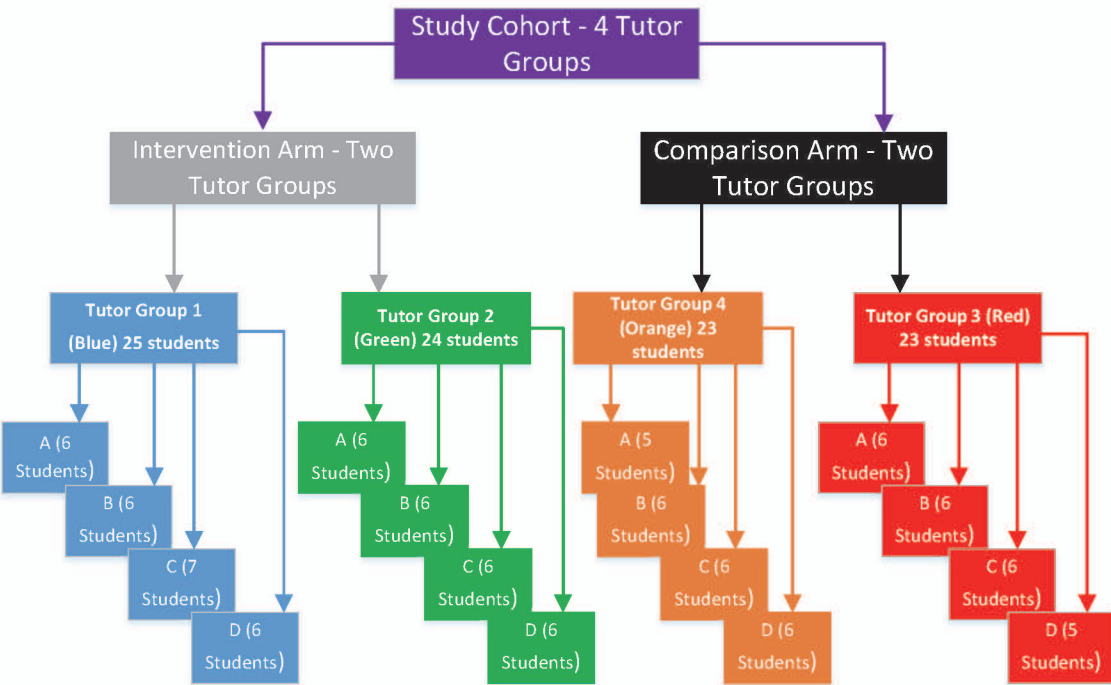
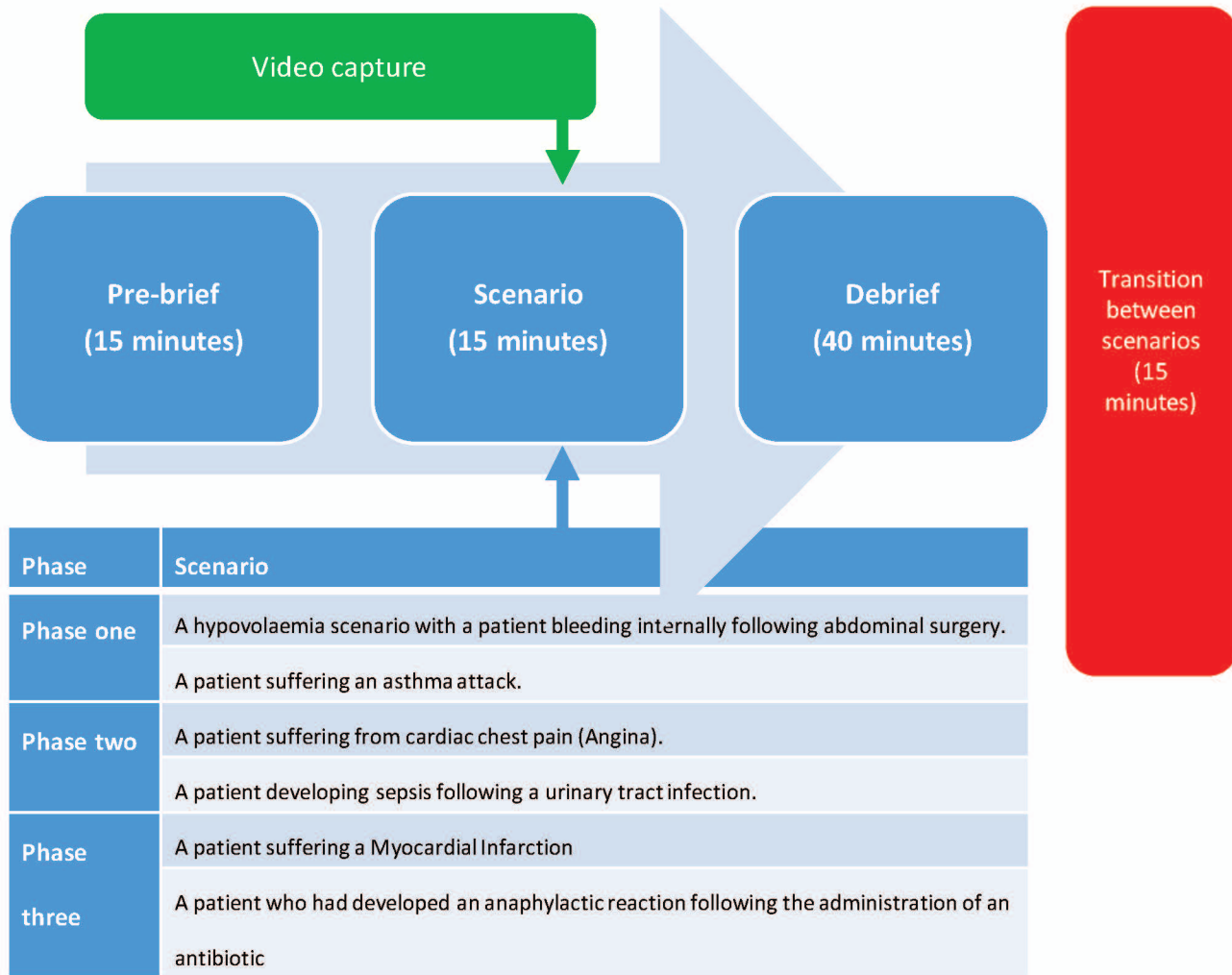
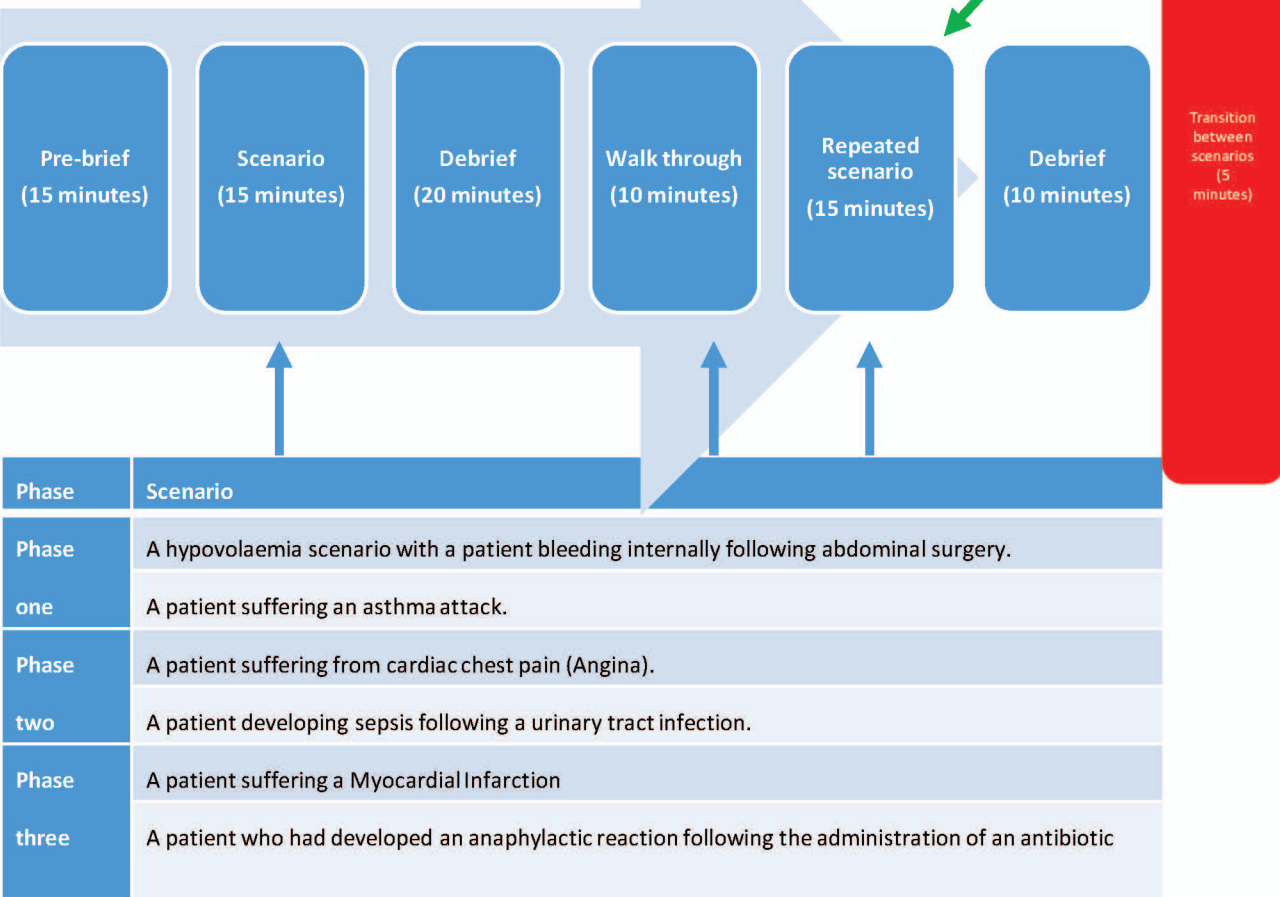


Figure 2: Randomisation process

**Figure 3 – Traditional Simulation - Model**





**Figure 4 - Simulation with Team Deliberate Practice - Model**

Figure 5 - Scenario Delivery

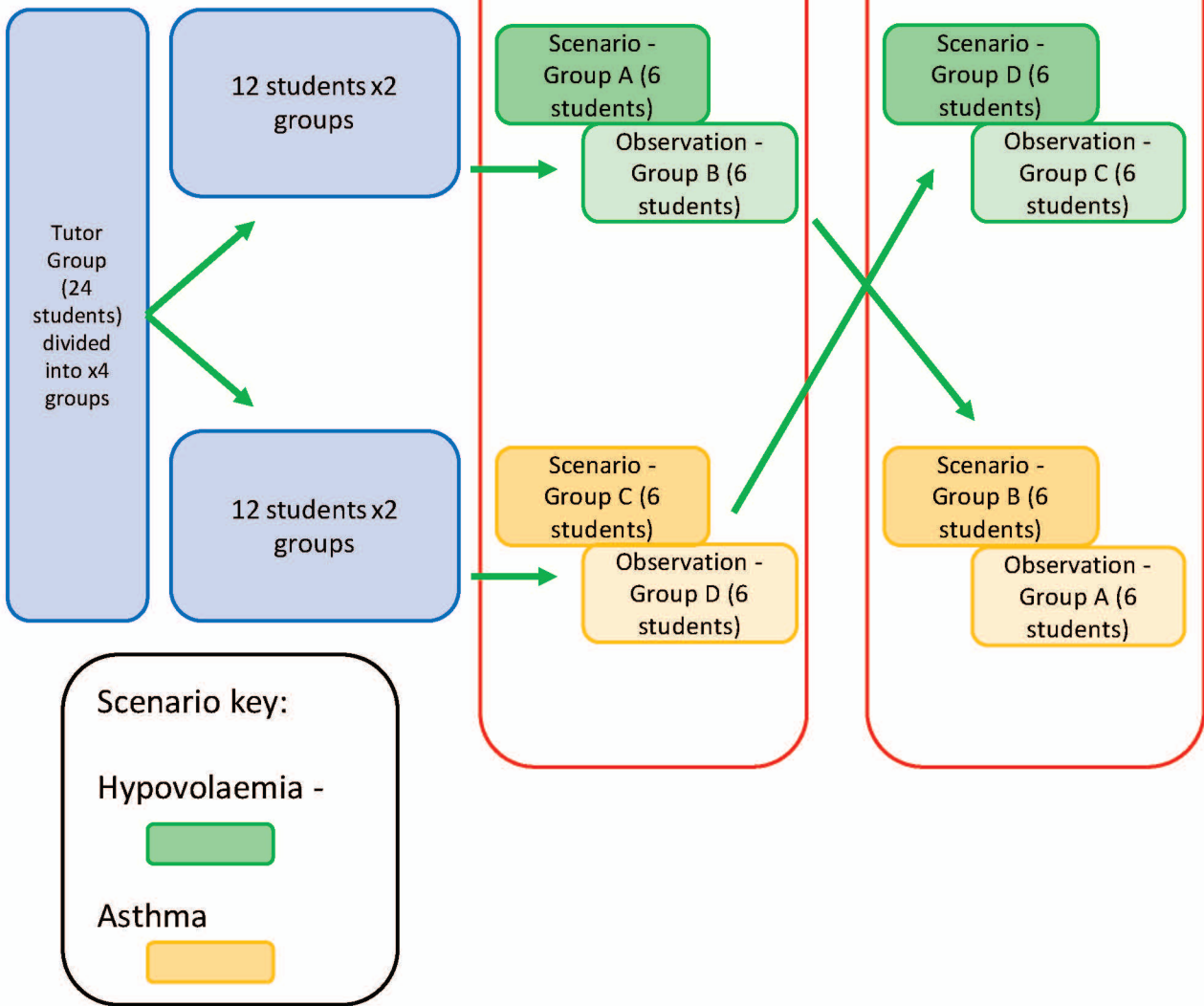


Figure 6: TDP performance observation tool.

Skills		Yes (1)	No (0)
Wash hands			
Introduces team/self to patient			
<b>Patient assessment</b>			
<b>A</b>	Assessment of Airway		
<b>B</b>	Assessment of Breathing		
	<ul style="list-style-type: none"> <li>• Rate</li> <li>• O<sub>2</sub> Saturations</li> <li>• Attaches O<sub>2</sub> mask</li> </ul>		
<b>C</b>	Assessment of Circulation		
	<ul style="list-style-type: none"> <li>• Pulse</li> <li>• Manual BP</li> <li>• Skin colour/Capillary refill</li> <li>• Urine output</li> </ul>		
<b>D</b>	Assesses disability		
	<ul style="list-style-type: none"> <li>• Identifies agitation</li> <li>• Blood sugar</li> </ul>		
<b>E</b>	Assesses exposure		
	<ul style="list-style-type: none"> <li>• Temperature</li> <li>• Checks wound</li> <li>• Checks drain</li> </ul>		
<b>Actions</b>	Records EWS		
	Calls for help – (Senior colleague/doctor)		
<b>SBAR handover</b>	Situation		
	<ul style="list-style-type: none"> <li>• Name and ward</li> <li>• Name of patient</li> <li>• Problem described</li> </ul>		
	<b>Background</b>		
	<ul style="list-style-type: none"> <li>• Reason for patient's admission</li> <li>• Explain significant medical history</li> </ul>		
	<b>Assessment</b>		
	<ul style="list-style-type: none"> <li>• Vital signs</li> <li>• Early warning score</li> </ul>		
	<b>Recommendations</b>		
	<ul style="list-style-type: none"> <li>• Explain what they need</li> <li>• Identify what they would like to happen next</li> </ul>		
<b>Total</b>			
<b>Overall total</b>			