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### Structured training in assessment increases confidence amongst basic life support instructors

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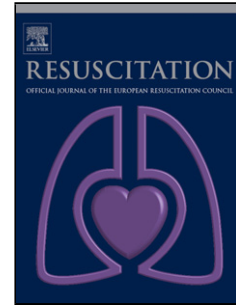
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1 Structured Training in Assessment Increases Confidence Amongst Basic Life Support Instructors

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32 ABSTRACT

33 Aim:

34 Assessment skills are often neglected in resuscitation training and it has been shown that the ERC BLS/AED instructor  
35 course may be insufficient to prepare candidates for an assessment role. We have introduced an Assessment  
36 Training Programme (ATP) to improve assessors' decision making. In this article we present our ATP and an  
37 observational study of candidates' confidence levels upon completing both an ERC BLS/AED instructor course and  
38 our ATP.

39 Methods:

40 Forty seven candidates undertook the ERC instructor course and 20 qualified ERC BLS/AED instructors undertook the  
41 ATP. Pre-and post-course questionnaires were completed. Confidence was assessed on ten-point Visual Analogue  
42 Scales (VAS).

43 Results:

44 Overall confidence on the ERC BLS/AED instructor course rose from 5.9 (SD 1.8) to 8.7 (SD 1.4) ( $P<0.001$ ). A more  
45 modest improvement was witnessed on the ATP, rising from 8.2 (SD 1.4) to 9.6 (SD 0.5) ( $P<0.001$ ). Upon completion  
46 of their respective courses, assessors (mean 9.6, SD 0.5) were significantly more confident at assessing than  
47 instructors (mean 8.7, SD 0.5) ( $P<0.001$ ). Confidence in assessing individual algorithm components was similar on  
48 both courses. On the post-course questionnaire those on the ATP remained significantly more confident at assessing  
49 borderline candidates compared to instructors ( $P<0.001$ ), with no difference for clear pass ( $P=0.067$ ) or clear fail  
50 ( $P=0.060$ ) candidates.

51 Conclusion:

52 The ATP raises the confidence of assessing BLS/AED candidates to a level above that of the ERC instructor course  
53 alone. We advocate that resuscitation organisations consider integrating an ATP into their existing training structure.

54

55 Key words: basic life support (BLS); adult; assessment; cardiopulmonary resuscitation (CPR); 2010 European Resuscitation Council  
56 (ERC) guidelines;

57

58

## 59 INTRODUCTION

60 Prompt and effective delivery of cardiopulmonary resuscitation (CPR) combined with the other links in the 'Chain of  
61 Survival' significantly improves outcomes from sudden cardiac arrest (SCA)<sup>1</sup>. Increasing the dissemination of CPR  
62 skills throughout the population has been shown to improve survival from SCA,<sup>2</sup> in-part due to an increased  
63 willingness of lay-persons to initiate CPR.<sup>3</sup> Consequently, widespread community based Basic Life Support (BLS)  
64 tuition is strongly advocated by the European Resuscitation Council (ERC) in their most recent guidelines.<sup>4</sup> These  
65 guidelines also dictate the criteria for the training and assessment of BLS providers.<sup>4</sup> Current ERC BLS/AED provider  
66 accreditation procedures allow either continuous assessment or formative assessment at the end of their course.  
67 This is carried out by an ERC accredited instructor who has successfully passed an ERC instructor course. Formal  
68 training in BLS assessment currently constitutes only a small component of the ERC instructor course. Previous work  
69 by our group has demonstrated that this may be insufficient to prepare instructors for an assessment role and that  
70 there is scope for additional training focussing on assessment skills.<sup>5</sup>

71

72 There is ample evidence within the literature that conventional instructor courses still fail to achieve standardisation  
73 of assessment decisions in the practical assessment of life support.<sup>6,7</sup> For almost two decades, the Resuscitation for  
74 Medical Disciplines (RMD) group at the University of Birmingham has run a unique, peer-led basic life support course  
75 that has been described previously.<sup>8</sup> At the outset of each academic year a new cohort of 48 healthcare-student  
76 instructors undertake an ERC BLS/AED instructor course in order to gain formal ERC BLS/AED instructor accreditation  
77 status. In 2007, RMD Birmingham introduced an additional Assessment Training Programme (ATP) in an attempt to  
78 standardise the inherent subjective nature of BLS assessments.<sup>5</sup> The ATP runs in parallel with the ERC instructor  
79 course and trains a cohort of 20 student assessors annually, each of whom has previous experience as an ERC  
80 BLS/AED instructor (Fig 1).

81

82 Assessment in medical education is a complex topic with numerous techniques described as effective.<sup>9</sup> Berden et al.  
83 proposed a template for assessment of BLS during training which has been adopted by a number of courses;<sup>10</sup> a  
84 modified version of which is used by our course during the formal assessment of BLS skills.<sup>8</sup> Training of assessors is  
85 an area of medical and resuscitation education which is often neglected and frequently experience alone is used as a

86 tool to qualify an individual to assess students. The ATP seeks to teach relatively inexperienced assessors how to  
87 assess in the style of a more experienced assessor and elevate their decision making skills to a level above that of an  
88 ERC BLS/AED instructor. A previous study by the authors identified that the ATP significantly improved the decision  
89 making of ATP-trained assessors when compared to ERC instructors.<sup>5</sup> This article aims to ascertain the confidence of  
90 both ERC instructors and ATP-trained assessors in facilitating an ERC BLS/AED provider assessment. The authors also  
91 describe the ATP components in detail so that this model may be more widely disseminated.

92

## 93 METHODS

94 We sought to compare instructors' confidence in making decisions in the context of assessing BLS competence. This  
95 was assessed before and after they had completed a standard ERC BLS/AED instructor course and before and after  
96 undertaking the ATP. Forty seven candidates attending an ERC BLS/AED instructor course participated, in addition to  
97 20 qualified ERC BLS/AED instructors who undertook the ATP as additional training, in line with local requirements.  
98 All participants completed a questionnaire which sought to evaluate their confidence in assessment decision making  
99 on two occasions. The first was prior to undertaking assessment training and second was after they had undergone  
100 training (Fig 2). Both questionnaires were identical and consisted of standardised questions with the same stem, for  
101 example: 'Please rate your confidence in facilitating a BLS/AED assessment of a borderline candidate'. Confidence  
102 was assessed on a ten-point Visual Analogue Scales (VAS). Participants were also provided with space for free text  
103 answers in order to describe anything not captured by the more structured questions.

104

105 Data were analysed by SPSS version 22 (IBM, New York, USA). Differences between the instructor and assessor  
106 groups were analysed using independent t-tests. Differences between pre and post-course responses from  
107 individuals were analysed by paired t-tests. P-values of <0.05 were considered statistically significant. All participants  
108 were provided with information relating to the study prior to providing their consent to participate, were free to  
109 withdraw from the study at any time and were free to choose not to participate without any impact on their  
110 progression on either the ERC instructor course or the ATP. Each participant signed an informed consent sheet and  
111 all participants' responses were kept anonymous from the outset. Ethical self-assessment was carried out as per  
112 institutional policy and formal ethical approval was not required for this study.

113

114 The Birmingham Assessment Training Programme

115 The ATP focuses upon the role of the assessor, with its primary intention being to standardise intra-assessor decision  
116 making. This transforms the decision making of more junior assessors to become more in-line with that of an  
117 experienced assessor. Whilst this is achieved in part through utilisation of a BLS algorithm checklist, the ATP  
118 especially focuses on decision making in equivocal situations.

119 The ATP is a five hour course (see Supplementary Material for timetable). As a pre-requisite, participants possess a  
120 minimum of one years' experience as a BLS/AED instructor. The course is facilitated by experienced BLS instructor  
121 trainers at a ratio of one instructor trainer to six trainee assessors. Whilst it has been shown that the ERC BLS/AED  
122 instructor course is enough to train inexperienced student assessors to examine their peers,<sup>11</sup> when carrying out  
123 internal audit of the assessors it was noted that the assessment decision making process and candidate outcomes  
124 are variable when compared with more experienced instructor trainers. Thus, the ATP has evolved to primarily focus  
125 on 'grey areas'; or areas of uncertainty that more junior assessors appeared to struggle with. Potential assessors are  
126 given training on scene setting and communication skills including 'how to break pass/fail decisions to a candidate'.  
127 Following small group practice with straightforward pass/fail scenarios the concept of 'grey areas' is introduced and  
128 scenarios with more subtle errors made by the candidate are practised and then discussed in small groups with a  
129 facilitator. A reflective focus on explaining the reasons behind the decision making process with regard to these  
130 'grey areas' is encouraged, using the 'learning conversation'.<sup>12</sup> These discussions allow a consensus to be reached  
131 between the assessors which ultimately results in the standardisation of inter-assessor decision making.

132 After the successful completion of the course, each assessor is required to attend three out of four assessment  
133 sessions that take place throughout the academic year. On each session they will undertake between 9-12  
134 assessments of ERC BLS/AED providers. Should a candidate fail their assessment they have the opportunity for  
135 immediate further tuition and a single re-sit opportunity. The re-sit assessments are carried out by experienced BLS  
136 instructor trainers and the course director. Should a candidate fail on both attempts they must re-attend the entire  
137 BLS/AED provider course. To provide ongoing support to assessors, external assessors (who are experienced  
138 BLS/AED instructor trainers) observe and positively critique the assessors' performance throughout the year. This

139 permits standardisation of pass/fail decisions and a means for improving their assessment skills in a constructive  
140 manner.

## 141 RESULTS

### 142 Participant Demographics

143 A total of 67 participants took part in this study. Of these, 27 were male and 40 female. There were 43 new  
144 instructors, 4 returning instructors, 13 new assessors and 7 returning assessors. The median age for instructors was  
145 19 (range 18-22) and 21 (range 20-27) for assessors. Of the returning assessors, three possessed one years'  
146 experience as an assessor, two possessed two years' experience and a further two possessed three years'  
147 experience. One new assessor's responses were excluded from the analyses due to failure to complete the post-  
148 course questionnaire.

### 149 Confidence in Assessment

150 A breakdown of participant responses to the questionnaires can be seen below in Table 1. Those undertaking the  
151 ERC BLS/AED instructor course demonstrated the greatest improvement in assessment confidence, rising from 5.9  
152 (SD 1.8) to 8.7 (SD 1.4) ( $P<0.001$ ). Those undertaking the ATP demonstrated a more modest improvement rising from  
153 8.2 (SD 1.4) to 9.6 (SD 0.5) ( $P<0.001$ ). The mean increase of 2.8 (SD 1.7) in the instructor group was significantly  
154 greater than the respective increase in the assessor group of 1.4 (SD 1.4) ( $t(64)=3.21$ ,  $P=0.002$ ). Upon completion of  
155 their respective courses, assessors (mean 9.6, SD 0.5) were significantly more confident at performing an assessment  
156 than instructors (mean 8.7, SD 0.5) ( $t(64)=-3.79$ ,  $P<0.001$ ).

Component		Instructors Pre-Course	Instructors Post-Course	P-Value	Assessors Pre-Course	Assessors Post-Course	P-Value
Assessment Confidence of BLS Algorithm Components	Correct Algorithm VAS Score (SD)	7.5 (1.0)	9.5 (0.7)	<0.001	8.7 (1.1)	9.7 (0.5)	0.001
	Checking for Danger VAS Score (SD)	8.8 (1.0)	9.9 (0.5)	<0.001	9.5 (1.1)	9.8 (0.4)	0.282
	Assessing Casualty VAS Score (SD)	7.4 (1.5)	9.7 (0.6)	<0.001	8.9 (1.0)	9.6 (0.6)	0.002
	Chest Compression Depth VAS Score (SD)	5.7 (1.5)	8.9 (0.7)	<0.001	7.1 (1.8)	8.7 (1.4)	0.001
	Chest Compression Rate VAS Score (SD)	6.6 (1.6)	9.4 (0.7)	<0.001	8.4 (1.0)	9.5 (0.8)	0.001



	Chest Compression Hand Position VAS Score (SD)	7.2 (1.2)	9.4 (0.7)	<0.001	8.3 (1.2)	9.4 (0.7)	0.001
	Rescue Breaths VAS Score (SD)	7.3 (1.4)	9.4 (0.7)	<0.001	8.6 (1.0)	9.6 (0.7)	0.001
	AED VAS Score (SD)	7.5 (1.4)	9.4 (0.7)	<0.001	9.1 (0.8)	9.6 (0.7)	0.014
Assessment Confidence of Provider Quality	Clear Pass VAS Score (SD)	7.3 (1.2)	9.4 (0.8)	<0.001	8.8 (1.5)	9.7 (0.5)	0.015
	Borderline VAS Score (SD)	5.2 (1.6)	7.6 (0.9)	<0.001	6.4 (2.0)	8.5 (1.1)	0.001
	Clear Fail VAS Score (SD)	7.3 (1.5)	9.2 (0.9)	<0.001	8.7 (1.7)	9.7 (0.6)	0.021
Assessment Decision Confidence	Informing a candidate that they have passed VAS Score (SD)	7.8 (1.2)	9.4 (0.7)	<0.001	9.3 (1.1)	9.7 (0.5)	0.130
	Informing a candidate that they have failed VAS Score (SD)	6.5 (1.6)	8.8 (1.0)	<0.001	8.3 (2.0)	9.5 (0.8)	0.010
Overall Mean Confidence VAS Score (SD)		5.9 (1.8)	8.7 (1.4)	<0.001	8.2 (1.4)	9.6 (0.5)	0.001
Mean Difference Between Overall Pre and Post-course Confidence (SD)		2.8 (1.7)			1.4 (1.4)		0.002

157

158 With regards to components of the BLS algorithm, the greatest improvement in confidence was in relation to  
 159 assessing chest compression depth. The mean increase between the instructors was 3.2 (SD 1.5) and 1.6 (SD 1.2) in  
 160 the assessor group. Upon the completion of both courses, both instructors and assessors had very similar confidence  
 161 levels for assessing the individual aspects of the BLS/AED algorithm.

162 In relation to assessing candidates who were described as either: clear passes, borderlines or clear fails; assessors  
 163 were significantly more confident in the pre-course questionnaire ( $P < 0.001$ ,  $P = 0.013$ ,  $p = 0.002$  respectively). On the  
 164 post course questionnaire however, there were no significant differences between the groups for assessing the clear  
 165 pass ( $P = 0.067$ ) and clear fail ( $P = 0.060$ ) candidates. Assessors remained significantly more confident at assessing  
 166 borderline candidates ( $P < 0.001$ ). Both courses made candidates significantly more confident at assessing each  
 167 quality category. Of the 47 instructors, 83.0% (39/47) indicated on the pre-course questionnaire that they required  
 168 further training prior to performing an assessment. Following completion of an ERC instructor course this fell to  
 169 12.8% (6/47). The corresponding value for assessors before the ATP was 42.1% (8/19) and upon completion, 0%  
 170 (0/19).

171 In the assessor group there was a moderately-strong positive correlation between the number of years' experience  
 172 as an assessor and the pre-course overall confidence in assessing (Spearman's  $\rho = 6.32$ ,  $P = 0.004$ ). By the conclusion of  
 173 the course this correlation was non-existent. New instructors had an overall post-course confidence of 8.7 (SD 1.4),

174 but those instructors who had completed a years teaching and returned for the ATP had a lower overall pre-course  
175 confidence of 8.2 (1.4).

176 Table 2 demonstrates a sub-group analysis that was undertaken on returning instructors (n=4) and new assessors  
177 (n=14), who were therefore standardised with regards to teaching experience. Mean change in confidence over the  
178 course was greater in the new assessors (2.1, SD 1.3) compared to the returning instructors (1.8, SD 1.7), although it  
179 did not reach significance ( $t(14)=0.30$ ,  $P=0.767$ ).

Component	Returning Instructors Pre-Course	Returning Instructors Post-Course	P-Value	New Assessors Pre-Course	New Assessors Post-Course	P-Value
Overall Mean Confidence VAS Score (SD)	6.5 (3.0)	8.3 (SD 1.7)	0.001	7.5 (1.2)	9.6 (0.5)	0.001
Mean Difference between pre and post-course (SD)	1.8 (1.7)			2.1 (1.3)		0.767

180

181 Free Text Answers

182 Twenty seven candidates (40.3%) identified chest compression depth as the aspect of BLS that they felt least  
183 confident at assessing on the pre-course questionnaire. On the post-course questionnaire this lack of confidence was  
184 reversed and all instructors and assessors felt confident in the assessment of chest compression depth.

185

186 DISCUSSION

187 Our results demonstrate that the greatest absolute improvement in assessment confidence was across the ERC  
188 BLS/AED instructor course. This change was significantly greater than the increase witnessed over the ATP. These  
189 results consolidate the effectiveness of both courses in preparing instructors and assessors for the role of BLS/AED  
190 assessment. Importantly, the overall end confidence of the assessor group was significantly greater than the  
191 instructor group which clearly demonstrates that the ATP raises assessors to a level above BLS/AED instructors.  
192 Significantly, this difference was still present when participants were standardised for teaching experience in the  
193 sub-group analysis.

194 With regards to candidates' confidence in facilitating an ERC provider assessment, 12.8% of instructors indicated on  
195 the post-course questionnaire that they required further assessment-focused tuition before they were competent  
196 enough to facilitate a BLS/AED provider assessment. These results reinforce the conclusions of a previous objective  
197 study by the authors which found that instructors' decision making in assessments was occasionally suboptimal.<sup>5</sup>  
198 Surprisingly, 42.1% of assessors, each with a minimum of one years' teaching experience, also indicated that they  
199 required additional assessment-focussed tuition in their pre-course questionnaires. This reduction in confidence  
200 may be due to assessment skill attrition over the course of the year; because instructors are not required to perform  
201 regular formal assessments as these are entirely carried out by assessors trained on the ATP. This pattern is also  
202 highlighted by the mean post-course confidence being 8.7 (SD 1.4) at the end of the BLS/AED instructor course, but  
203 only 8.2 (1.4) for those instructors who have returned to train as assessors, following one years' teaching experience.

204 As expected, naïve candidates trained on the ERC instructor course demonstrated significant improvements in all  
205 areas of assessment confidence as this represented their first formal training in assessment. Following the ATP the  
206 improvements which showed significance were those areas which show more ambiguity and subjectivity in  
207 assessment such as borderline candidates and chest compression depth. This clearly demonstrates the added  
208 benefit of a formal ATP and explains why when measured objectively, assessors trained in this way make decisions  
209 that more closely resemble those of experienced assessors. A lower level of confidence in these more ambiguous  
210 areas was also demonstrated in the free text questions. The challenge of determining correct chest compression  
211 depth is well reported,<sup>11,13-15</sup> and ensuring that candidates achieve the required depth is of paramount importance.  
212 High-quality chest compressions are a critical component of the chain of survival, with the importance of correct  
213 depth being highlighted in the most recent ERC guidelines which increased the target depth from 3-5cm to 5-6cm.<sup>1</sup>  
214 As a direct result of this finding, there is now a greater emphasis on chest compression depth training during both  
215 instructor and assessor training and appears often in the aforementioned 'grey-areas' section on the ATP.

## 216 Limitations

217 The authors acknowledge that the prior teaching experience of the assessors may be a confounding factor that lends  
218 them to possess greater confidence than their instructor counterparts. This does not however, negate the fact that  
219 ultimately assessors did display more confidence in assessing than instructors and therefore consolidates the  
220 rationale behind the ATP. Furthermore, due to the hierarchical structure of our course, it is practically impossible to

221 standardise for teaching experience, as it would be ill-advised to allow student assessors to assess in the absence of  
222 pre-requisite teaching experience.

223 A further limitation is the fact that the questionnaire was designed in-house and was not externally validated. To the  
224 best of the authors' knowledge there are no validated questionnaires for the purpose of determining assessment  
225 confidence in the field of BLS. Visual analogue scales are however a well-recognised method of assessing confidence  
226 and therefore make the comparisons that have been drawn between the groups more reliable.

227

## 228 CONCLUSIONS

229 This is the first study to compare the assessment confidence of candidates partaking in an ERC BLS/AED instructor  
230 course. This study has added further evidence to the need for an additional course that equips participants with the  
231 skill set necessary to perform an accurate and reproducible assessment of a candidate's BLS/AED performance. We  
232 believe that the ATP has wide ranging benefits for candidates and assessors alike, setting them in good stead for  
233 further practical assessments in their chosen careers. Given that the ATP has now been shown to improving both the  
234 decision making<sup>5</sup> and assessment confidence of BLS instructors, we believe that there is a need for a bespoke course  
235 that directly teaches assessment skills. We advocate that centres who already utilise peer-peer tuition consider  
236 integrating the ATP into their training structure.

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## 240 CONFLICT OF INTEREST

241 The authors declare that they have no competing interests relating to this article.

242

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245

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## 252 REFERENCES

- 253 1. Koster RW, Baubin MA, Bossaert LL, et al. European Resuscitation Council Guidelines for Resuscitation 2010  
254 Section 2. Adult basic life support and use of automated external defibrillators. *Resuscitation* 2010;81:1277–  
255 92.
- 256 2. Sasson C, Rogers M a M, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a  
257 systematic review and meta-analysis. *Circ Cardiovasc Qual Outcomes* 2010;3:63–81.
- 258 3. Axelsson Å, Thorén A, Holmberg S, Herlitz J. Attitudes of trained Swedish lay rescuers toward CPR  
259 performance in an emergency. *Resuscitation* 2000;44:27–36.
- 260 4. Soar J, Monsieurs KG, Ballance JHW, et al. European Resuscitation Council Guidelines for Resuscitation 2010  
261 Section 9. Principles of education in resuscitation. *Resuscitation* 2010;81:1434–44.
- 262 5. Thorne CJ, Jones CM, Harvey P, Hulme J, Owen A. An analysis of the introduction and efficacy of a novel  
263 training programme for ERC basic life support assessors. *Resuscitation* 2013;84:526–9.
- 264 6. Perkins GD, Hulme J, Tweed MJ. Variability in the assessment of advanced life support skills. *Resuscitation*  
265 2001;50:281–6.
- 266 7. Dankbaar MEW, Stegers-Jager KM, Baarveld F, et al. Assessing the assessment in emergency care training.  
267 *PLoS One* 2014;9:e114663.
- 268 8. Harvey PR, Higenbottam C V, Owen A, Hulme J, Bion JF. Peer-led training and assessment in basic life support  
269 for healthcare students: synthesis of literature review and fifteen years practical experience. *Resuscitation*  
270 2012;83:894–9.
- 271 9. Epstein RM. Assessment in medical education. *N Engl J Med* 2007;356:387–96.
- 272 10. Berden HJ, Pijls NH, Willems FF, Hendrick JM, Crul JF. A scoring system for basic cardiac life support skills in  
273 training situations. *Resuscitation* 1992;23:21–31.
- 274 11. Bucknall V, Sobic EM, Wood HL, et al. Peer assessment of resuscitation skills. *Resuscitation* 2008;77:211–5.
- 275 12. Resuscitation Council (UK). Debrief as a Learning Conversation 2010. Available at  
276 [www.resus.org.uk/pages/gicDbflc.pdf](http://www.resus.org.uk/pages/gicDbflc.pdf). Accessed 04/04/2014.
- 277 13. Aufderheide TP, Pirrallo RG, Yannopoulos D, et al. Incomplete chest wall decompression: a clinical evaluation  
278 of CPR performance by trained laypersons and an assessment of alternative manual chest compression-  
279 decompression techniques. *Resuscitation* 2006;71:341–51.
- 280 14. Odegaard S, Saether E, Steen PA, Wik L. Quality of lay person CPR performance with compression: ventilation  
281 ratios 15:2, 30:2 or continuous chest compressions without ventilations on manikins. *Resuscitation*  
282 2006;71:335–40.

- 283 15. Wik L, Kramer-Johansen J, Myklebust H, et al. Quality of cardiopulmonary resuscitation during out-of-hospital  
284 cardiac arrest. JAMA 2005;293:299–304.

285

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289 LEGENDS TO FIGURES

290 Figure 1: Flow-chart illustrating candidate selection for the Assessment Training Programme

291 Figure 2: Flow-chart illustrating data collection process for the observational study

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293 The authors declare that they have no competing interests relating to this article.

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Figure 1

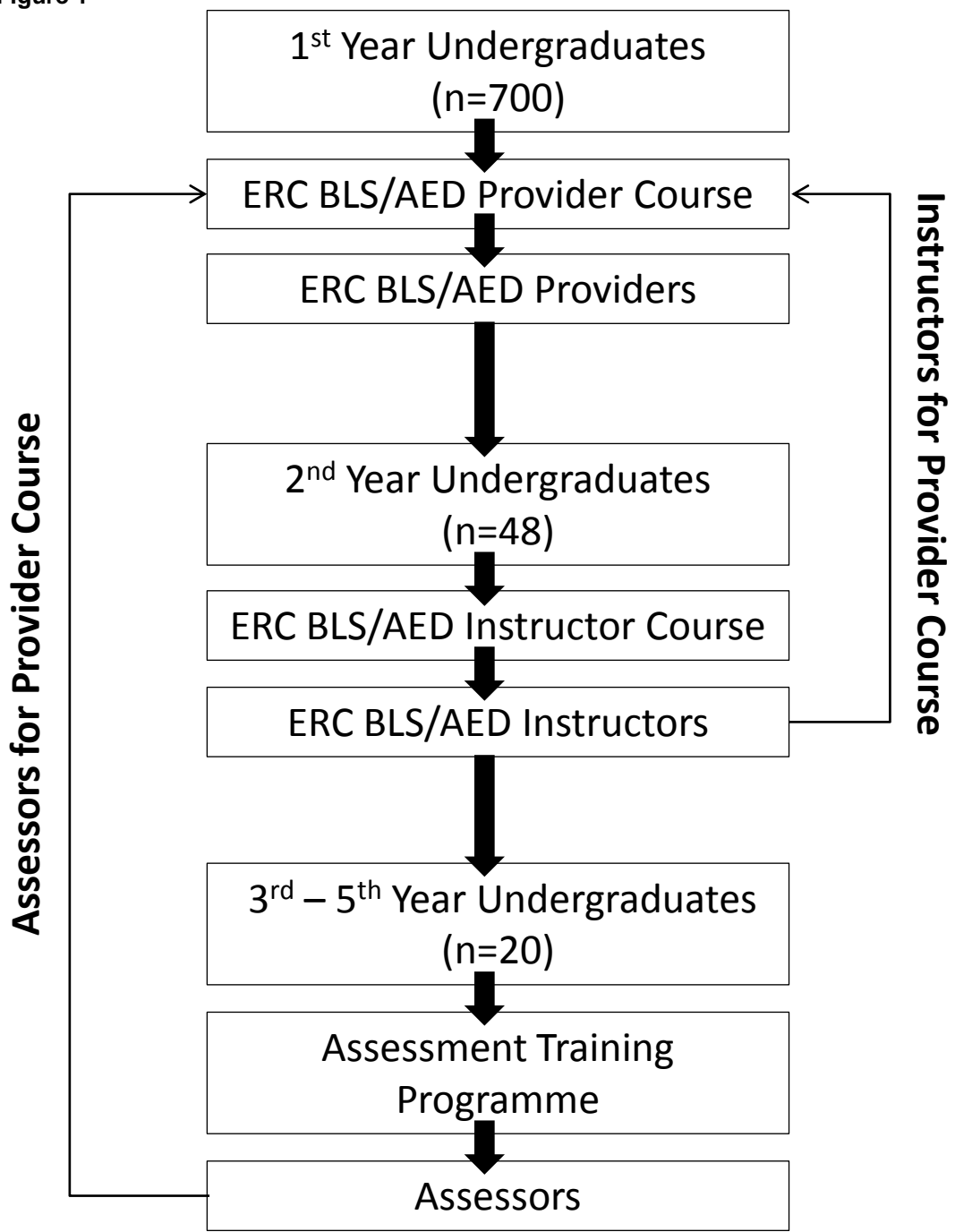


Figure 2

