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| **Question** |
| **Are alternative** **approaches to skills teaching superior to the ‘Peyton 4 steps’ approach?**  |
| **Population:** | Adults and children undertaking skills training related to resuscitation and First Aid in any educational setting. |
| **Intervention:** | Approaches to skills teaching that are not the ‘Peyton four-steps’ approach. This includes: approaches without distinct stages: or modified ‘Peyton four-steps’ approaches with more or less than four steps; or with delivering one or more steps by alternative methods (e.g. video). |
| **Comparison:** | The ‘Peyton four steps’ approach for skills teaching. |
| **Main outcomes:** | Improved educational outcomes: Skill performance after end of course; skill performance at end of course; participants’ confidence to perform the skill on patients; participants’ preference of teaching method.Patient outcomes: skills performed appropriately on real patient after the courseAdditional outcomes: Teachers’ preference of teaching method; side effects of teaching |
| **Setting:** | Any training of resuscitation skills  |
| **Background:** | The instructional approach for skills teaching is likely to impact later performance, and various methods have been described. Walker & Peyton proposed that a stepwise approach for skills teaching (‘Peyton’s 4 steps’) would be more effective than other approaches (Walker 1998 171). Peyton’s four-step approach is applied in the standard course formats of the ERC (Bullock 2000 139), the UK(RC), the Australian RC, and various National Resuscitation Councils in Europe. However, it is not clear in the literature whether a 4 step process is superior to modifications such as using less than 4 steps, or substituting single steps by e.g. video (Barelli 2010 1607), or to no sequencing (Gradl-Dietsch 2019 270). We decided to use ‘Peyton’s four steps’ as the comparator since most studies regard ‘Peyton’s four steps’ as the standard and compare alternative teaching approaches against it.Definitions:We use Walker & Peyton’s definition of a ‘stepwise approach’ as a sequence of (a) ‘demonstration’ (of the skill, at normal pace, without commenting), (b) ‘deconstruction’ (of the skill, e.g., demonstration in slow motion, with detailed explanations for the learner with a special focus on critical steps), (c) ‘comprehension’ (by the learner, e.g., by explaining each step while talking the teacher through the skill), (d) ‘performing and practicing’ (of the skill by the learner, ideally until performance is sufficient). |
| **Conflict of interests:** | The following Task Force members declared an intellectual conflict of interest and this was acknowledged and managed by the Task Force Chairs and Conflict of Interest committees: Robert Greif and Andrew Lockey were excluded from data extraction and Risk of Bias assessment of one the studies as both were co-authors of this study [Greif 2010 1692] |

**Assessment**

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| **Problem**Is the problem a priority? |
| **Judgement** | **Research evidence** | **Additional considerations** |
| ○ No○ Probably no○ Probably yes● Yes○ Varies○ Don't know | Evidence on how to conduct skills training for resuscitation is contradictory. | The teaching methodology of several Resuscitation Councils (e.g., the ERC and various NRCs) strongly focusses on the ‘Peyton’s four-step-approach’ for skills training. However, it is known that many instructors do not adhere to the approach in practice. To bring this issue to a more evidence-based foundation, a systematic review of the literature appears important.  |
| **Desirable Effects**How substantial are the desirable anticipated effects? |
| **Judgement** | **Research evidence** | **Additional considerations** |
| ○ Trivial○ Small● Moderate○ Large○ Varies○ Don't know | For the critical educational outcome of ‘skill performance after 3 or more months’ we found 5 studies (Risks of bias ranging from ‘low’ to ‘serious’, with very low certainty of evidence due to heterogeneity and imprecision). 4 studies showed no difference, and one found superior results of the group trained by a 4-step approach (in this study, 4 steps were one element of a bundle of ‘best practice’ strategies). For the important educational outcome of ‘skill performance at end of course’ (from end-of-course testing up to 2 months) we found 13 studies with differing Risks of Bias ranging from ‘low’ to ‘serious’ (certainty of evidence: very low). Overall, 11 studies did not show a difference between the groups and 2 studies found an advantage of 4-step approaches over 2-step approaches.For the important educational outcome of ‘participants’ confidence to perform the skill on patients’ we found 5 studies. None of these studies showed differences between the groups.For the important educational outcome of ‘participants’ preference of teaching method’ we found 3 studies. One study reported preferences for the 4-step approach as compared to 2 steps. For the critical clinical outcome of ‘skills performed appropriately on real patient after the course’ we did not find any study. | While there is a solid justification in educational theory for ‘Peyton’s four-step-approach’, literature suggests no (or very small) effects. A recent systematic review of the ‘Peyton’s four-step-approach’ [Giacomino 2020 e10129] in respect to a wider range of skills in healthcare found a very small advantage of the four-step approach. However, some of the skills assessed had a significantly higher complexity than most of the skills related to resuscitation training.The main desirable effect of this review is to provide clear guidance for instructor courses in the field of resuscitation how to best teach skills (such as chest compressions, or airway control).In addition, it might be a possibility that skills training could be shortened since one study spent 20% less time for training when using a two-step approach (Bjornshave 2018 18). |
| **Undesirable Effects**How substantial are the undesirable anticipated effects? |
| **Judgement** | **Research evidence** | **Additional considerations** |
| ● Trivial○ Small○ Moderate○ Large○ Varies○ Don't know | No negative effect reported |  |
| **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 |

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| **Outcome** | **Certainty of evidence** |
| Patient outcomes  | - |
| Educational outcomes at > 3 months  | Very low |
| Educational out-comes end-of-course to 3 months | Very low  |
| Confidence to per-form skill on pat. | Very low |
| Preference of teaching method | Very low |

 | Certainty of evidence is limited by many factors, mainly due to high heterogeneity of the studies and missing information for important confounders. Heterogeneity was significant for* the nature of skills studied (manual defib.:1, BLS/AED:2, BLS: 2; chest compressions (only): 3, naso-gastric tube: 2, iv-cannulation: 1, NLS: 1, ATLS: 1, needle cricotomy: 1, laryngeal mask: 1, endotracheal intubation: 1),
* skill complexity, and
* populations (novice medical students, advanced medical students, nursing students, mixed HCP groups, and laypersons).

Regarding missing information on important confounders, none of the studies assessed the individual instructional quality of intervention and control (i.e., instructors’ individual teaching performance). Therefore, instrumentation biases cannot be ruled out.Only 5 studies addressed a critical educational outcome. For all these studies, we noted relevant limitations. Finally, no studies addressing outcome at the patient level were found. |
| **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 | none | More clarity for appropriate teaching strategies will be valued by instructors and by faculty of instructor courses.  |
| **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  | undecided | Instructors and faculty of instructor courses might experience more freedom in tailoring their teaching strategies to the needs of course participants. |
| **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 | none | Brings opinion-driven discussions to a more scientifically based point. Teaching in instructor courses will be simplified.No specific resources required. As course material and instructor courses should be regularly revised and updated to the most recent evidence, results will be included within the natural updating process. |
| **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 | none |  |
| **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 direct influence on cost-effectiveness | Is likely to settle discussions on the specific type of teaching strategy. Thereby, discussion time in instructor courses could be saved, and teaching be focussed on more important content.  |
| **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 | N/A |  |
| **Acceptability**Is the intervention acceptable to key stakeholders? |
| **Judgement** | **Research evidence** | **Additional considerations** |
| ○ No○ Probably no● Probably yes○ Yes○ Varies○ Don't know | none | Will probably be well accepted.It appears important to emphasise that instructors should use (appropriate) stepwise approaches for skills teaching. If not, we see the risk of instructors paying too little attention to the way how skills are taught (laissez-faire). None of the studies included addressed the individual teaching quality of instructors. Developing this individual component of teaching quality might be much more important to the quality of courses and should be paid more attention to as an important moderator of teaching success.  |
| **Feasibility**Is the intervention feasible to implement? |
| **Judgement** | **Research evidence** | **Additional considerations** |
| ○ No○ Probably no○ Probably yes● Yes○ Varies○ Don't know | None | Easy to implement. |

**Summary of judgements**

|  | **Judgement** |
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| **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 |
| **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**

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| 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 |
| ○  | ○ | ● | ○  | ○  |

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| **Recommendation** |
| We suggest that stepwise training should be the method of choice for skills training in resuscitation (weak recommendation, very low certainty of evidence). |
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| **Justification** |
| In making the recommendation, the EIT task force considered the following:* For resuscitation skills training there was insufficient evidence that the four-step approach as proposed by Walker & Peyton was superior to other approaches.
* We acknowledge a solid foundation of stepwise training approaches in educational theory.
* The optimal stepwise training approach (including the number and type of steps) may be dependent on the type of skills taught. A variation of the number and kinds of steps should be adapted to the nature of the skill taught.
* The two studies showing advantages of the Walker & Peyton’s four-step approach compared it to ‘two-steps’ approaches. These ‘two-steps’ approaches appear to have little educational structure and should be regarded as non-stepwise approaches. We do not support the use of non-stepwise training approaches.
* Skills training using a four-step approach, or modifications of it, should be limited to skills of low to moderate complexity as there is indication that truly complex skills training should break up the training into more than one session (Nicholls 2016 1056).
* Putting less emphasis on the need of 4-step training approach will prompt instructors and faculty of instructor courses to consider tailoring their teaching strategies to the needs of course participants. Therefore, the findings conclusion of this systematic review will be easy to implement into instructor courses with little to no costs.
* Most of the studies were conducted with health care students of various professions. It is possible that the results may not be translated to other learner populations (e.g., children)
* None of the studies identified controlled for the teaching quality of individual instructors although it is well established that individual teaching quality has most probable a stronger impact on learning as the method applied.
* We recognize the risk that instructors may move away from all types of stepwise training approaches. Instructor training should therefore continue to emphasize the importance of stepwise training approaches.
* Finally, we did not identify studies investigating effects on course participants’ performance on real patients.
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| **Subgroup considerations** |
| We conducted no subgroup analysis |
| **Implementation considerations** |
| To be easily implemented into instructor courses. However, we anticipate the risk that instructor courses put less focus on the importance of stepwise skills teaching. Stepwise teaching of skills is well founded in educational theory and should therefore be a cornerstone of instruction. |

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| **Monitoring and evaluation** |
| n.a. |
| **Research priorities** |
| Knowledge gaps identified in the published literature include* There were no studies that controlled for the quality of the individual teacher performance – which should be controlled for in future studies,
* There are no guidelines for uniform reporting of educational outcomes in resuscitation science.
* There were no studies that considered the learning needs of different participants and how stepwise training approaches should be adapted (e.g., children, or elderly).
* There were no studies that considered the effect of different approaches to skills teaching on participants’ performance on real patients. Whilst challenging - it would be desirable to at least find adequate surrogates at the patient level.
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