

WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care**Worksheet author(s)**

Maaret Castrén
Barbara Furry

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Clinical question.

In BLS providers, are there any specific intervals for retraining (I) compared with standard practice (C) that increase outcome (retention, skill acquisition) (O) ?

Is this question addressing an intervention/therapy, prognosis or diagnosis? Intervention/therapy

State if this is a proposed new topic or revision of existing worksheet: This worksheet is an update from the former number 186 worksheet

Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet? No

Search strategy (including electronic databases searched).

Search strategy involved four (4) electronic data bases:

1. EMBASE: 1990- July 2008. CPR, skills, retention, education, strategies, resuscitation, ALS training, BLS training
2. AHA Endnotes: respiratory arrest, cardiac arrest, education, training strategies, professional training
3. Medline: 1980- June 2008. coronary arrest, skills, education and training, intervals
4. Cochrane Library: 2008 current. Includes the database of systematic reviews. Facilitating education, skills, memory aids, retraining intervals. Resuscitation guidelines

EMBASE ('skill'/exp OR 'skill') AND retention AND resuscitation, N=40

PUBMED: Search education N= 704686

Search cardiopulmonary resuscitation N= 11619

Search heart arrest N= 36771

Search #2 AND #3 AND #4 N= 618

N=55, handpicked 19

• State inclusion and exclusion criteria

Inclusion: only human, retraining in BLS studied, retention or skill acquisition measured somehow

Exclusion: no assessment of skill retention, other skills than BLS or ALS, letters, editorials

Number of articles/sources meeting criteria for further review: 25

Number of articles meeting criteria for final analysis: 16

Conclusion:

None of the articles examined are of the quality that fully answers the question. More research is needed to examine the frequency of retraining to ensure competency of skills.

Former Worksheet 186B by Dr Anthony J Handley:

Question: How frequently are BLS re-training / update sessions required in order to maintain skills in a) laypersons and b) health professionals?

Hypothesis: BLS re-training/update sessions are required at specified intervals in order to maintain skills in a) laypersons and b) health professionals.

The single study (Berden 1993) involved nurses, retrained in BLS at 3 monthly or 6 monthly intervals for a year, with a control group receiving only the initial training. The study was prospective and randomized, and

concluded that retraining at either 3 monthly or 6 monthly intervals resulted in a similar improvement in measured skills at 1 year compared with the control group.

Unfortunately, the paper gives no details of statistical significance, and the assessment scores are shown only in graphical form rather than numerically. It is impossible to draw firm conclusions.

Alternative searches were therefore made to determine the pattern of skill decay following initial training. These are tabulated in Appendix 1 (lay persons) and 2 (health professionals). From these it can be seen that significant decay occurs from about 3 months to 1 year after initial training, possibly with no further deterioration after 1 year.

Appendix 3 lists those studies in which the authors gave a recommended retraining interval. The retraining intervals varied between 3 months and 1 year (one study recommended 2 years).

Conclusions:

- 1) There are no published studies of quality that answer the question about retraining intervals for BLS skills for either lay persons or health professionals
- 2) BLS skills decay rapidly, certainly by 3 months after initial training. There is a suggestion that retraining at 3 or 6 monthly intervals will delay/halt this decay, and that no further decay occurs 1 year after training
- 3) Research is needed to define the frequency of retraining to assure competency and to define the best method of retraining
- 4) A separate review of the rate at which skill decay occurs should be undertaken

Consensus statement

Evidence from a single study in adult healthcare professionals [LoE 2] suggests that re-training in BLS at either 3-monthly or 6-monthly intervals results in a similar improvement in skill at 1 year, compared with no re-training over this period. LEVEL INTERMEDIATE

Summary of evidence

Evidence Supporting Clinical Question

Retraining every 6-12 months is required in order to maintain adequate skills in CPR

Good		Beckers SK,2007,444 ^E		Wayne DB,2006,S9 ^E	
Fair	Jensen ML,2009,903 ^E	Riegel B,2006,254 ^E Andresen D,2008,419 ^E		Castle N, 2007,664 ^E Wik L,2005,27 ^E Christenson J,2007,52 ^E	
Poor					
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation C = Survival to hospital discharge E = Skills retention
 B = Survival of event D = Intact neurological survival *Italics = Animal studies*

Evidence Neutral to Clinical question

Good					
Fair					
Poor					
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation C = Survival to hospital discharge E = Other endpoint
 B = Survival of event D = Intact neurological survival *Italics = Animal studies*

Evidence Opposing Clinical Question

Retraining earlier than 6 months after training is required to maintain appropriate skills in CPR, so retraining has to happen before 6 months from training

Good	Spooner B,2007,417 ^E			Smith KK,2008,59 ^E Woollard M,2004,17 ^E Semeraro F,2006,101 ^E Woollard M,2006,17 ^E	
Fair	Berden HJ,1993,1576 ^E Einspruch EL,2007,476 ^E			Roppolo LP,2007,276 ^E	
Poor					
	1	2	3	4	5
Level of evidence					

A = Return of spontaneous circulation

C = Survival to hospital discharge

E = Skills retention

B = Survival of event

D = Intact neurological survival

Italics = Animal studies

REVIEWER'S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:

Question: In BLS providers, are there any specific intervals for retraining (I) compared with standard practice (C) that increase outcome (O) ?

Two good randomized studies show that the majority of trained nurses were not competent in performing CPR after 3 months from the training and that the retraining interval should not exceed 7 months in laypersons, because the skills have deteriorated significantly already at this time. Smith et al. (2008) showed in a randomized study, retraining of nurses 3, 6, 9 or 12 months after training. ACLS skills deteriorated rapidly. The majority was not competent after 3 months. In BLS skills, only 14% past after 12 months; LOE 4, good. Woollard et al. (2004) showed in a randomized trial that the interval for refresher training should not be longer than 7 months in order to minimize the effects of skill decay. LOE 4, good.

One fair randomized study show that over 70% of laypersons remain competent after 12-17 months from the training to perform CPR and that retention of AED skills is better than of CPR skills. Riegel et al. (2006); LOE 2, fair.

After reviewing these 16 articles for the final analysis, it would seem that skills retention does decline after only six months post initial training. What are the variables behind this poor skills retention? Stress both before and during the teaching session, instructors teaching skills, and the lack of positive feedback during skills instruction.

In order to maintain CPR skills, refresher training should be given every six months or less.

Acknowledgements:

Citation List

Former Worksheet 2005:

Berden HJ, Willems FF, Hendrick JM, Pijls NH, Knape JT . How frequently should basic cardiopulmonary resuscitation training be repeated to maintain adequate skills? BMJ. 1993 Jun 12;306(6892):1576-7.

Comment: The study involved nurses, retrained in BLS at 3 monthly or 6 monthly intervals for a year, with a control group receiving only the initial training. The study was prospective and randomized, and concluded that retraining at either 3 monthly or 6 monthly intervals resulted in a similar improvement in measured skills at 1 year compared with the control group. LOE 1, fair.

Search 2004-2009:

Andresen, D., H. R. Arntz, et al. (2008). "Public access resuscitation program including defibrillator training for laypersons: a randomized trial to evaluate the impact of training course duration." Resuscitation **76**(3): 419-24.

Comment: A randomized trial of different times of initial training, skills decreased significantly in all groups, lowest at 12 months if no 6 months test was done. So, the study concludes that if a short test is done 6 months after the initial training, the skills will not decrease from what they were at 6 months. No long time follow up was done. LOE 2 (the randomisation was not done for the retesting), fair (the group not tested at 6 months were not properly controlled).

Beckers, S. K., M. Fries, et al. (2007). "Retention of skills in medical students following minimal theoretical instructions on semi and fully automated external defibrillators." Resuscitation **72**(3): 444-50.

Comment: A randomized study of use of two different AEDs. Did not test CPR skills. No randomization of the retesting. Test at 1 week and 6 months. Skills had deteriorated after one week, but not from that level after 6 months. LOE 2 (randomization not for the retesting), good.

Castle, N., H. Garton, et al. (2007). "Confidence vs competence: basic life support skills of health professionals." Br J Nurs **16**(11): 664-6.

Comment: This study shows that CPR skills have increased in a hospital after a training program training every year has been implemented, doctors with 6 months training intervals had the best skills. LOE 4, fair.

Christenson, J., S. Nafziger, et al. (2007). "The effect of time on CPR and automated external defibrillator skills in the Public Access Defibrillation Trial." Resuscitation **74**(1): 52-62.

Comment: The study concludes that CPR skills degrade over 12 months, but 80% of volunteers remained competent in CPR and 90% in AED skills. LOE 4, fair (less than 15% of the initial group was retested).

Einspruch, E. L., B. Lynch, et al. (2007). "Retention of CPR skills learned in a traditional AHA Heartsaver course versus 30-min video self-training: a controlled randomized study." Resuscitation **74**(3): 476-86.

Comment: Skills after two different kind of training deteriorate after 2 months. No longer follow up. An untrained control group was included. LOE 1, fair.

Jensen, M. L., F. Mondrup, et al. (2009). "Using e-learning for maintenance of ALS competence." Resuscitation **80**(8): 903-8.

Comment: A randomized study looking at the possibility to retain ALS skills with a monthly e-learning. There could not be seen an effect at one year after the training. LOE 1, fair.

Riegel, B., S. D. Nafziger, et al. (2006). "How well are cardiopulmonary resuscitation and automated external defibrillator skills retained over time? Results from the Public Access Defibrillation (PAD) Trial." Acad Emerg Med **13**(3): 254-63.

Comment: There is a deterioration in skills, but even after 12-17 months from training the skills of 70% of volunteers were adequate. Only 32% of the volunteers participated in the final testing. AED skills retention was better than CPR skills retention. LOE 2, fair.

Roppolo, L. P., P. E. Pepe, et al. (2007). "Prospective, randomized trial of the effectiveness and retention of 30-min layperson training for cardiopulmonary resuscitation and automated external defibrillators: The American Airlines Study." Resuscitation **74**(2): 276-85.

Comment: The volunteers were randomized in two groups getting different training, 33% in both groups came back for retesting 6 months after the training. Only one sixth of the participants were judged to perform adequate CPR at 6 months. LOE 4 (no randomisation of retraining), fair.

Semeraro, F., L. Signore, et al. (2006). "Retention of CPR performance in anaesthetists." Resuscitation **68**(1): 101-8.

Comment: Doctors (N=47) were retested 6 months after ALS course testing. There was a significant deterioration both in knowledge and in skills. There was only a 64% satisfactory skill performance. LOE 4, good.

Smith, K. K., D. Gilcreast, et al. (2008). "Evaluation of staff's retention of ACLS and BLS skills." Resuscitation **78**(1): 59-65.

Comment: Randomized study, retraining of nurses 3, 6, 9 or 12 months after training. ACLS skills deteriorated rapidly. The majority was not competent after 3 months. In BLS skills, only 14% past after 12 months. LOE 4, good.

Spooner B, Fallaha J, Kocierz L, Smith C, Smith S, Perkins G (2007). An evaluation of objective feedback in basic life support training. Resuscitation Volume 73, Issue 3, Pages 417-424.

Comment: Spooner compared two groups using standard instruction and with instruction using a "Skillreporter" manikin. Skill retention was tested immediately and after six weeks. Ninety-eight students were tested, half with traditional instruction, half with the skillreporter manikin. Six weeks later sixty-six returned for retesting. The skillreporter group achieved greater compression depth and more perfect compression. The study showed that objective feedback at initial testing helps the student retain the skills. LOE 1, good.

Wayne, D. B., V. J. Siddall, et al. (2006). "A longitudinal study of internal medicine residents' retention of advanced cardiac life support skills." Acad Med **81**(10 Suppl): S9-S12.

Comment: ACLS skills in medical students after a simulation-based educational program did not decay significantly in tests 6 and 12 months after the training. LOE 4, good.

Wik, L., H. Myklebust, et al. (2005). "Twelve-month retention of CPR skills with automatic correcting verbal feedback." Resuscitation **66**(1): 27-30.

Comments: Feedback in the test situation helps perform adequately 6 and 12 months after the training. Without feedback retention of skills was almost back to pretraining skills. LOE 4, fair.

Woollard, M., R. Whitfield, et al. (2004). "Skill acquisition and retention in automated external defibrillator (AED) use and CPR by lay responders: a prospective study." Resuscitation **60**(1): 17-28.

Comment: Randomized trial showing that the interval for refresher training should not be longer than 7 months in order to minimize the effects of skill decay. LOE 4, good.

Woollard, M., R. Whitfield, et al. (2006). "Optimal refresher training intervals for AED and CPR skills: a randomised controlled trial." Resuscitation **71**(2): 237-47.

Comment: There was a clear deterioration of skills in a test 6 months after initial training. LOE 4, good.

Studies not included in the final recommendation:

De Lorenzo, R. A. and C. A. Abbott (2007). "Effect of a focused and directed continuing education program on prehospital skill maintenance in key resuscitation areas." J Emerg Med **33**(3): 293-7.

Comment: This study looks at skills at 6 months after a pre-test and a course (without test after course) between the two tests, so it does not actually look at retraining at given times. The conclusion is that continuing training improves skill performance. LOE 5, poor (no controls). Not included in the final recommendation.

De Regge M, Calle PA, De Paep P, Monsieurs KG. Basic life support refresher training of nurses: individual training and group training are equally effective. Resuscitation. 2008 Nov;79(2):283-7. Epub 2008 Aug 8.

Comment: There were two groups getting different training; one instructor and one trainee or group training, baseline data on skills were poor in both groups. Skills after 10 months did not differ between the groups. The study was not included because it was not targeted to look at retention of skills.

Isbye, D. L., C. S. Meyhoff, et al. (2007). "Skill retention in adults and in children 3 months after basic life support training using a simple personal resuscitation manikin." Resuscitation **74**(2): 296-302.

Comment: This study measures the skills for the first time 3 months from the training, so it does not address deterioration. Not included in the final recommendation.

Madden, C. (2006). "Undergraduate nursing students' acquisition and retention of CPR knowledge and skills." Nurse Educ Today **26**(3): 218-27.

Comment: Retesting only ten weeks after the training. The first test was done one year after training during the students basic training and skills were very poor before the training included in the study. This might be due to incompetent training in the first place, as the article states. Not included in the final recommendations.

Mahony, P. H., R. F. Griffiths, et al. (2008). "Retention of knowledge and skills in first aid and resuscitation by airline cabin crew." Resuscitation **76**(3): 413-8.

Comment: Only testing 12 months after the course so deterioration could not be measured. Not included in the final recommendation.

Paal, P., M. Falk, et al. (2008). "Retention of mouth-to-mouth, mouth-to-mask and mouth-to-face shield ventilation." Emerg Med J **25**(1): 42-5.

Comment: Looks at only ventilation. The conclusion stated the amount of hyperventilation and didn't really tell if the skills needed for CPR were deteriorated and how much.

Riegel, B., A. Birnbaum, et al. (2005). "Predictors of cardiopulmonary resuscitation and automated external defibrillator skill retention." Am Heart J **150**(5): 927-32.

Comments: Riegel cites the study in which AED skill retention was studied. Variable such as the students age, minority status, prior experience, marital status, and education were taken into consideration. Her results were that certain subgroups of lay students may need to be targeted with more training time, more practice, and more intense retraining to maintain and retain skills. Not included.

Sutton, R. M., A. Donoghue, et al. (2007). "The voice advisory manikin (VAM): an innovative approach to pediatric lay provider basic life support skill education." Resuscitation **75**(1): 161-8.

Comment: This study only tested skills immediately after training, it is a future goal of the group to assess the skills later on. Not included in the final recommendation.

Verplancke, T., P. De Paepe, et al. (2008). "Determinants of the quality of basic life support by hospital nurses." Resuscitation **77**(1): 75-80.

Comment: The study only looks at skills immediately after a BLS course and does no address retention at all. Not included in the final recommendation.