WORSHEET for Evidence-Based Review of Science for Emergency Cardiac Care	
Worksheet author(s)	
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Clinical question.

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

For laypersons and healthcare providers (P), does the use of specific instructional methods (I) when compared to traditional programs (C) increase BLS skill acquisition and retention at 6 months (O)?

State if this is a proposed new topic or revision of existing worksheet: Revision/Update to C2005 worksheet #185.

Conflict of interest specific to this question

Do any of the authors listed above have conflict of interest disclosures relevant to this worksheet?
Mancini has received research funding and published articles on the topic of BLS education.

Search strategy (including electronic databases searched).

Search used the search parameters of "CPR" AND "education" AND "video" relevant libraries and databases were searched. Search terms were used in text searches. Abstracts/articles were reviewed to determine relevance and match inclusion/exclusion criteria.
Electronic databases searched (AHA Endnote & Master library [http://ecc.heart.org/], Cochrane Database for systematic reviews and Central Register of Controlled Trials {http://www.cochrane.org/], MEDLINE {http://www.ncbi.nlm.nih.gov/PubMed/}, CINHAL, and Embase), hand searches of journals, review articles, and review of the literature articles.

Results: electronic databases –
AHA Endnote 7 Mater Library [http://ecc.heart.org/]- (Primary Search) - "CPR" –AND- "education"-AND "video" OR "lecture"= 0.
-Cochrane database for systematic reviews- (Primary Search) - "CPR" = 2; AND "education" = 0; AND "video" OR "lecture" = 0.
-MEDLINE (PubMed)-(Primary Search) -"CPR" = 578; AND "education" = 107; AND "video" OR "lecture" = 7.
-EMBASE –"CPR"- (Primary Search) -"CPR"= 1200; AND "education" = 133; AND "video" OR "lecture = 5.
-Hand Searches of relevant recent articles = 1 additional article.
-Total combined unique returns = 2045.
- Articles were excluded that included healthcare providers since the assignment was to evaluate lay providers only.
- Duplicates were counted in unique returns and excluded in the final review.

Search was rerun in March 2008 and August 2009.
Electronic databases were searched.
- AHA Endnote 7 Mater Library [http://ecc.heart.org/] - (Primary Search) - "CPR" = 0; AND "education" = 0; AND "video" OR "lecture" = 0.
-Cochrane database for systematic reviews - (Primary Search) - "CPR" = 0; AND "education" = 0 -AND "video" OR "lecture"= 0.
-MEDLINE (PubMed) - (Primary Search) -"CPR" = 114; AND "education" = 32; AND "video" OR "lecture" = 4.
-EMBASE –"CPR"- (Primary Search) -"CPR" = 376; AND "education" = 61; AND "video" OR "lecture" = 2.
-Hand Searches of relevant recent articles = 0.
-Total combined unique returns = 1.
- Duplicates were counted in unique returns and excluded in the final review. In revised review, one additional article was found that was overlooked in the initial search and included.

• State inclusion and exclusion criteria

Exclusion criteria - Excluded studies comparing only health care providers. No abstracts on studies, no editorials or comment/discussion articles, no correspondence/letters, excluded studies focusing on skills outside of BLS, no case

studies. Additionally, studies that were primarily focusing on advanced life support skills and any computer-based patient record studies were excluded.

Inclusion criteria - Studies with lay providers only; peer-reviewed manuscripts only, primary focus was teaching BLS skills to lay providers, both prospective and retrospective studies were included.

• **Number** of articles/sources meeting criteria for further review:

67 articles reviewed; 18 articles met the inclusion criteria; 6 papers were subsequently discarded (Knowledge only without skill testing = 2; Traditional course only = 1; Feedback devices = 2; Not relevant = 1). Remaining relevant papers = 12.

Summary of Evidence
Evidence Supporting Clinical Question

	1	2	3	4	5
Good	Lynch, 2005, 31. E Todd, 1998, 364. E				
Fair	Cason, 2009, E1. E	Batcheller, 2000, 101. E	Braslow, 1997, 207. E		
Poor					

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 Neutral to Clinical Question

	1	2	3	4	5
Good	Todd, 1999, 730. E	Liberman, 2000, 249. E			
Fair	Einspruch, 476, 2007. E Roppolo, 2007, 276. E	Reder, 2006, 443. E Jones, 2007, 350. E		Isbye, 2006, 435. E Isbye, 2007, 296. E	
Poor					

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

	1	2	3	4	5
Good					
Fair					
Poor	Dracup, 1998, 170. E				

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*

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

A review of the literature identified twelve (12) articles directly related to the question.

Of the twelve (14) studies, Five (5) studies {3 LOE-1 (Lynch, 2005, 31; Todd, 1998, 364; Cason, 2009, E1); and1 LOE-2 (Batcheller, 2000, 101); and 1 LOE-3 (Braslow, 1997, 207)} were supportive of the clinical question.

Lynch (2005, 276) reported that older subjects (N=285 adults - 40-70 years of age) taught using a VSI program with a 22-minute practice-while-watching DVD, a personal manikin, and an audio-prompting feedback device (CPR-Coach) learned CPR skills at least as well as (and for some skills, better than) those subjects who took a traditional 3-4 hour course. Todd (1998, 364) found a group of incoming freshman medical students that a half-hour of VSI resulted in superior overall CPR performance compared with that in traditional trainees. Cason (2009, E1) provides evidence that cardiopulmonary resuscitation performance skills using self-directed learning methods are as good as or, on a number of parameters, better than those achieved with a more resource- and time-intensive traditional approach. Barcheller (2000, 101) compared subjects over 40 years of age (average = 59.4 years; S.D. = 10.9) using an ~30 minute video self-instruction (VSI) with a traditional (TRAD) ~ 4 hour classroom training program for lay providers. On a measure of overall performance, 62.7% of VSI subjects were noted as "competent" or better compared to only 6.1% for TRAD subjects. VSI was noted as an effective, convenient, and inexpensive training method. Braslow (1997, 207) compared an ~ 30-minute VSI to a TRAD 3-4 hour course. VSI subjects were rated as "competent" 80% of the time compared to 45.1% for TRAD subjects. Differences were statistically significant at end of course. After 60 days, the differences between groups persisted but were no longer significant.

Eight (8) studies were judged as providing evidence that was neutral to the question—Video self-instruction equal to the TRAD. These studies {Three LOE-1 studies: Good (Todd, 1999, 730) and Fair (Einspruch, 2007, 476; Roppolo, 2007, 276); Three LOE-2 studies: Good (Lieberman, 2000, 249) and Fair (Reder, 2006, 443; and Jones, 2007, 350); Two LOE-4 studies: Fair (Isbye, 2006, 435 and Isbye, 2007, 296) reported various populations were able to acquire CPR skills in courses taking as little as 8 minutes.

One study (Dracup, 1998, 170) reported opposing evidence. Parents of at-risk infants were taught CPR using an instructor-led course including video, an instructor led course using social discussions, or video alone. Parents who were in instructor-led groups were more successful than those in the video only group.

Three articles were reviewed and found to have supportive data for the question at hand but were missing important elements. Two articles (Toner, 2007 and Connelly, 2007) reported on successful acquisition and retention of CPR knowledge using a 2-hour course with 10-12 year olds. As the psychomotor skills of CPR were not studied, these articles were not included in the evidence matrix. Kelly (2006, 229) reported the successful acquisition and retention of CPR skills and use of an AED using a 1-hour course to teach 8th graders. However, there was no randomization and no comparison to a traditional course. Therefore, this article was also not included in the evidence matrix.

In regards to retention of skills, while end points for retention testing varied (from no retention testing at all to testing at periods from two days to 3 months) results showed deterioration of various skills over time. When reported, degradation of skills was often substantive and occurred in relatively short time frames but this information was not consistently reported across studies.

Acknowledgements:

Citation List

Citation Marker	Full Citation
Batcheller (2000, 101)	**Batcheller A M, Brennan RT, Braslow A, Urrutia A, Kaye W. Cardiopulmonary resuscitation performance of subjects over forty is better following half-hour video self-instruction compared to traditional four-hour classroom training." Resuscitation, 2000; 43: 101-110.** *Level 2; fair; supporting: Study designed for randomization but variations occurred. No retention testing. Highly significant benefit for video group for overall skills, correct compressions, and correct ventilation.*
Braslow (1997, 207)	**Braslow A, Brennan RT, Newman MM, Bircher NG, Batcheller AM, Kaye W. CPR training without an instructor: development and evaluation of a video self-instructional system for effective performance of cardiopulmonary resuscitation. Resuscitation. 1997; 34: 207–220.** *Level 3; fair; supporting: Practice while you watch video performed significantly better than Traditional at end of program. Performance differences between groups persisted at 60 days but no longer reached statistical significance.*
Cason (2009, E1)	**Cason CL, Kardong-Edgren S, Cazzell M, Behan D, Mancini, ME. Innovations in basic life support education for healthcare providers: improving competence in cardiopulmonary resuscitation through self-directed learning. J Nurses Staff Dev. 2009 May-Jun; 25(3):E1-E13.** *Level 1; fair; supporting: No retention testing.*
Dracup (1998, 170)	**Dracup K, Moser DK, Doering LV, Guzy PM. Comparison of cardiopulmonary resuscitation training methods for parents of infants at high risk for cardiopulmonary arrest. Ann Emerg Med 1998; 32: 170-177.** *Level 1; poor; opposing: Significantly more successful if instructor-led. Limited details of randomization; no details of course and/or video duration; instructor-led training also received video.*
Einspruch (2007, 476)	**Einspruch, E., Lynch, B., Aufderheide, T.P., Nichol, G., Becker, L. (2007). Retention of CPR skills learned in a traditional AHA Heart saver course versus 30-min video self-training: A controlled randomized study. *Resuscitation, 74,* 476-486.** *Evidence Neutral to Clinical Question - LOE = 2; Good*
Isbye (2007, 296)	**Isbye, D. L., Meyhoff, C. S., Lippert, F.K., & Rasmussen, L.S. (2007). Skill retention in adults and in children 3 months after basic life support training using a simple personal resuscitation manikin. *Resuscitation, 74,* 296-302.** *Evidence Neutral to Clinical Question – LOE = 4; Fair*
Isbye (2006, 435)	**Isbye, D.L., Rasmussen, L. S., Lippert, F.K., Rudolph, S.F., & Ringsted, C.V. (2006). Laypersons may learn basic life support in 24 min using a personal resuscitation manikin. *Resuscitation, 69,* 435-442.** *Evidence Neutral to Clinical Question – LOE = 4; Fair*
Jones (2007, 350)	**Jones, I., Handley, A.J., Whitfield, R., Newcombe, R., & Chamberlain, D. (2007). A preliminary feasibility study of a short DVD-based distance-learning package for basic life support. *Resuscitation, 75,* 350-356.** *Evidence Neutral to Clinical Question – LOE = 2; Fair*
Kelley (2006, 229)	**Kelley, J., Richman, P.B., Ewy, G. A., Clark, L., Bulloch, B., & Bobrow, B.J. (2006). Eighth grade students become proficient at CPR and use of an AED following condensed training programme. *Resuscitation, 71*(2), 229-236.** *Evidence Neutral to Clinical Question – LOE = 4; Poor – No randomization, no control, subjective measures.*
Liberman (2000, 249)	**Liberman M, Golberg N, Mulder D, Sampalis J. Teaching cardiopulmonary resuscitation to CEGEP students in Quebec--a pilot project. Resuscitation 2000; 47: 249-257.**

	Level 2; fair; neutral: Nursing students randomized into 4 groups: 11-minute video + unlimited time on manikin; 2 instructor-led courses (different student:manikin ratios); 2-hr practical teaching. Tested immediately after training and at 17 weeks. No overall difference in skill scores.
Lynch (2005, 31).	**Lynch, B., Einspruch, E.L., Nichol, G., Becker, N.G., Aufderheide, T.P., Idris, A. (2005). Effectiveness of a 30-min CPR self-instruction program for lay responders: A controlled randomized study. *Resuscitation, 67,* 31-43.** *Evidence Supportive to Clinical Question – LOE =1; Good.*
Reder (2006, 443)	**Reder, S., Cummings, P., & Quan, L. (2006). Comparison of three instructional methods for teaching cardiopulmonary resuscitation and use of an automatic external defibrillator to high school students. *Resuscitation, 69,* 443-453.** *Evidence Neutral to Clinical Question – LOE = 2; Fair.*
Roppolo (2007, 276)	**Roppolo LP, Pepe PE, Campbell L, Ohman K, Kulkarni H, Miller R, Idris A, Bean L, Bettes TN, Idris AH. (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* 2007; 74: 276-285.** *Evidence Neutral to Clinical Question – LOE = 1; Good.*
Todd (1998, 364)	**Todd KH, Braslow A, Brennan RT, Lowery DW, Cox RJ, Lipscomb LE, Kellerman AL. Randomized, controlled trial of video self-instruction versus traditional CPR training. Ann Emerg Med 1998; 3: 364-369.** *Level 1, fair, supportive: Medical students. 34-min VSI compared with 4-hr Heartsaver instructor-led course. Randomized. Tested 2-6 weeks after training (average time same for each group). Overall scores for 14 skills significantly better for video group.*
Todd (1999, 730)	**KH, Heron SL, Thompson M, Dennis R, O'Connor J, Kellerman AL. Simple CPR: a randomized, controlled trial of video self-instructional cardiopulmonary resuscitation training in an African American church congregation. Ann Emerg Med 1999; 34: 730-737.** *Level 1, good, neutral: Adults were randomized to 34-minute VSI + simple manikin compared with TRAD 4-hour course. Tested one month after training. Only significant difference between groups was hand placement which was better performed by VSI group.*

Appendix 1: Selected Articles

Instructional Methods

Reference	Subjects	Methods	Time of Test After Training	Results
Einspruch, E., Lynch, B., Aufderheide, T.P., Nichol, G., Becker, L. (2007).	Adults (N= 285) between the ages of 40-70 without CPR training within the past 5 years	Randomized control study using 4 treatment And one control group comparing performance via censored manikins capturing volume of ventilations, rate, depth of compressions, and hand placement using with examiners using protocol and scoring sheets	Post-training and 2 month post-training	The study demonstrated that although performance declines at the 2-month interval, self-trained participants demonstrated CPR skill retention equal to that of Heart saver participants although decline of both reached the level of untrained controls. There was a significant decline in

				skills from Time 1 to Time 2, evidenced by significant main effete of time (p<.001) in overall performance. HS and ST declined (p=.286) and both outperformed the C group (p<.001 for HS vs. C, and for ST vs. C).
Isbye, D. L., Meyhoff, C. S., Lippert, F.K., & Rasmussen, L.S. (2007).	Pupils (N=76)(age 12-14) in three public schools and to 194 employees (age 22-51) in an insurance company	Both groups (N=270) received 24 min DVD-based resuscitation course combined with an inflatable resuscitation manikin with children using their teacher as a facilitator. BLS was taught in accordance with European Resuscitation Council (ERC) guidelines 2000.	After 3 months, all participants were re-tested for skill retention.	There were significant differences between the two groups in the total Cardiff test total score: adults 35 points [32-38] vs. children 32 points [28-37] (p=0.0005). Adults performed better than children in eight variables, two variables were not statistically significant and children performed better in total compression total hands off time with shorter time delay to first ventilation or compression.
Isbye, D.L. et al. (2006).	Lay persons (age 21-55) (N=238)	Compared one group of DVD-based self training and one group of conventional SHI 6 hour course participants	After 3 months, BLS skills were assessed using the Laerdal PC Skill reporting System and total scored compared.	Assessment after three months demonstrated a 24 min DVD based self instruction plus subsequent self-training in BLS is at least as effective compared to a (SHI) 6 hour BLS course
Jones, I, Handley, A.J., Whitfield, R., Newcombe, R., & Chamberlain, D. (2007).	(N=80) 40 participants who requested initial BLS training	8 min DVD self instruction with manikin vs. Heart start BLS instruction with hands on practice with manikin	Before and immediately after training	After training, the SID (DVD) group displayed similar skill acquisition compared to with the control group for most measured variables. Average compression depth was less for the SID group than the control group,

				although was in the acceptable level range.
Kelley, J. et al. (2006).	Eighth grade students (N=38) were evaluated using a new, 1 hour, condensed training programme to teach CPR and AED	One group was taught CPR and AED in a new 1 hour class.	Initially after instruction and 4 weeks later.	Evidence documenting the ability of eighth grade students to learn and retain CPR and AED skills for adult cardiac arrest victims.
Lynch, B. et al. (2005).	(N=285) adults (age 40-70) lay individuals	Assigned to an untrained control, Heartsaver, or one of three versions of (VSI).	None.	The percentage of unresponsiveness, called 911, provided adequate ventilation, proper hand placement, and adequate compression depth was better (p< 0.05) for the (VSI) group than for the untrained controls. (VSI) had better overall performance and better ventilation performance than did the Heartsaver group
Reder, S., Cummings, P., & Quan, L. (2006).	(N=779) C=190, DVD+P=206, Computer+P=170, & Computer, 213.	Three groups of 1) interactive computer only, 2) interactive computer + practice, 3) DVD +dem+practice, 4)control group	2 days and 2 months after training	Evidence suggests that interactive computer based self-instruction is alone was sufficient to teach CPR and AED knowledge and AED actions to high school students.
STUDIES THAT MEASURED CPR KNOWLEDGE BUT NOT SKILLS				
Toner, P., et al. (2007)	(N=85) 7 year pupils	A course of instruction in (CPR) the 'ABC for Life" programme specifically tailored to 10-12 year old children	Pre and post training	Return questionnaires (N=85) at training and (N=80) after training resulted in nine pupils scored over (70%0. After training, one pupil (1.3%) scored full-marks with 55(68.9%) scoring greater than 70%. Following training there was a significant

				improvement in knowledge was observed in 15 questions (p<0.05). Mean baseline scores improved after training from 57.2% to 77.7% (20.5% increase, p>0.001).
Connolly, M., Toner, P., Connolly, D., & McCluskey, D.R. (2007).	School age children (10-12) (N=79).	A 22 point multiple choice questionnaire was developed based on the training course to assess pupils' knowledge of main teaching points.	Initially and at 6 months	Children instructed in CPR showed a higher increase in level of knowledge following training with a decrease at 6 months but significantly higher than the group of children never trained.