

Physical counter-pressure maneuvers (PCM) of any type compared with no use of PCM be used for symptoms of presyncope?

Adults and children with signs and symptoms of **presyncope** (e.g., faintness, dizziness) of suspected vasovagal or orthostatic origin

Physical Counter-Pressure Maneuvers (PCM) (of any type)

PCM are physical movements that can be performed by the individual as a first-line intervention for acute presyncope symptoms progressing to full syncope (i.e., loss of consciousness), reduce symptoms of presyncope (e.g., dizziness, faintness) and to prevent postural tone which can lead to falls and trauma

PCMs include **squatting, leg crossing and leg muscle tensing, abdominal muscle tensing or compression, hand gripping, arm tensing** and neck flexion.

No PCM used, other PCMs, or other interventions

Abort Syncope; Symptom Improvement; Improvement to Hemodynamics (HR; SBP; DBP); Injury or Adverse Events

Most study participants had a history of recurrent vasovagal or orthostatic syncope;  
Studies were conducted in lab setting with tilt table-induced symptoms or in real-life follow-up.

Of the First Aid Provider and the individual experiencing presyncope

Syncope is a common condition with an estimated life-time prevalence of 35%. There are many causes of syncope and presyncope. The most common causes of syncope include vasovagal syncope (50%), orthostatic hypotension (7%) and cardiac syncope (7%). Syncope has a considerable medical and socioeconomic burden on the adult population. Worldwide, about 50% of females and 25% of males are expected to have a syncopal event in their lifetime. Physical injuries resulting from syncope occur in approximately 30% of patients admitted to hospital. Injuries include skull or long bone fractures, intracranial hemorrhage, internal organ injury and neurological defects.

Current first aid recommendations for an individual with presyncope symptoms includes assisting them to a sitting or lying position, loosening tight clothing, and calling for an ambulance. The use of evidence-based recommendations for the management of presyncope has the potential to prevent progression to syncope, reduce falls and injuries, minimize symptoms and discomfort, prevent hospitalization and other socioeconomic beneficial outcomes.

None identified

...ity?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
	<p>Syncope is a common medical problem. The frequency of syncope, according to age in the general population, is between 15% and 39% (Lewis 1999 205, Serletes 2006 1967, Lipsitz 1985 45). The annual incidence is 18.1–39.7 per 1000 people with a high prevalence between 10 and 30 years of age, mainly presenting with vasovagal syncope (Moya 2009 2631).</p> <p>The sudden onset of presyncope and syncope can lead to physical injuries (29-35%) and sometimes result in major trauma (4.7%). Presyncope and syncope may also have a significant impact on quality of life. The hospitalization costs of these conditions is estimated at \$2.4 billion annually in USA (Sun 2013 370).</p>	<p>The quality of life of individuals with recurrent syncope and/or presyncope is seriously affected.</p> <p>A wide variety of pharmacological treatments are proposed for recurrent syncope, but they are inadequate in many cases. Non-pharmacological “physical” treatments are becoming first choice treatments.</p> <p>Due to the number of affected individuals, the economic costs from the disorder and its impact on quality of life, providing an effective treatment may result in significant benefits for the population.</p> <p>There are currently no first aid measures that assist with preventing presyncope or progressing to full syncope or treatment of presyncope symptoms.</p>

**Effects**

...the desirable anticipated effects?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS

There is little evidence available for the use of PCM.

Available studies demonstrate a small beneficial effect from the use of PCM to abort syncope. The effect was beneficial and statistically significant in one small RCT, but the beneficial findings in four observational studies were not significant.

There was a significant beneficial effect of symptom improvement in two RCTs.

Hemodynamics improved in both RCTs and observational studies with PCM.

Summary of findings for PCM any compared to no PCM for presyncope:

**RCT**

Outcome № of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects (95% CI)		Difference
		Without PCM	With PCM	
Abort Syncope 64 (4 observational studies)	RR 2.20 (0.96 – 5.05)	27.7%	50.0%	222 more per 1,000 (from 11 fewer to 1000 more)
Abort Syncope 19 (1 RCT)	RR 1.80 (1.16 to 2.79)	52.6%	94.7%	421 more per 1,000 (from 137 more to 468 more)
Abort Syncope 37 (2 observational)	not estimable	-	349/351 episodes (99.4%)	-
Injuries or Adverse Events 37 (2 observational)	not estimable	-	0/37 (0%)	-
Symptom Improvement 19 (1 RCT)	RR 6.00 (1.55 to 23.26)	10.5%	63.2%	530 more per 1,000 (from 60 more to 1000 more)
Symptom improvement - Follow-up phase 96 (1 RCT)	RR 1.57 (0.98 to 2.51)	44.0%	69.0%	251 more per 1,000 (from 26 more to 409 more)
Symptom Improvement 21 (1 observational)	not estimable	-	20/20 (100%)	-
HR - acute study phase				MD 8 higher

As many individuals with vasovagal orthostatic presyncope often have symptoms, there is opportunity to avoid syncope and improve symptoms.

90% of participants who used PCM they were highly or moderately improved (Brignole 2002 2053)

Quality of life survey scores improved 1 year after individuals with syncope applying PCMs during presyncope (Brignole 2007 672).

19 (1 RCT)				(6.4 lower to 22.4 higher)
SBP - acute study phase 19 (1 RCT)				MD 32 higher (12.48 higher to 51.52 higher)
SBP 39 (2 observational)				MD 21 mmHg higher (18.25 higher to 23.41 higher)
DBP - acute study phase 19 (1 RCT)				MD 20 higher (5.57 higher to 34.43 higher)
DBP 39 (2 observational)				MD 11 mmHg higher (9.36 higher to 13.08 higher)

## Effects

the undesirable anticipated effects?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS													
	<p>In two observational studies no patients had injury or adverse event/morbidity related to use of PCM. Patient satisfaction was very high (Brignole 2002 2053, Croci 2004 287). No other studies reported adverse events or morbidity as outcomes.</p> <p><b>Observational studies</b></p> <table border="1"> <thead> <tr> <th rowspan="2">Outcome № of participants (studies)</th> <th rowspan="2">Relative effect (95% CI)</th> <th colspan="3">Anticipated absolute effects (95% CI)</th> </tr> <tr> <th>Without PCM</th> <th>With PCM</th> <th>Difference</th> </tr> </thead> <tbody> <tr> <td>Injury or adverse events - Follow-up phase 37 (2 observational studies)</td> <td>not pooled</td> <td>0.0%</td> <td>0.0%</td> <td>not pooled</td> </tr> </tbody> </table>	Outcome № of participants (studies)	Relative effect (95% CI)	Anticipated absolute effects (95% CI)			Without PCM	With PCM	Difference	Injury or adverse events - Follow-up phase 37 (2 observational studies)	not pooled	0.0%	0.0%	not pooled	<p>Undesirable effects are not anticipated to be substantial with the use of PCM. There is no evidence that PCM leads to adverse events, increased morbidity or mortality.</p> <p>It is unknown if the rate of adverse injuries could be higher with the use of PCM in elderly adults or those with comorbidities. As there are few studies in these groups, additional care may be required to avoid adverse effects.</p>
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		Without PCM	With PCM	Difference											
Injury or adverse events - Follow-up phase 37 (2 observational studies)	not pooled	0.0%	0.0%	not pooled											

# evidence

certainty of the evidence of effects?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS																														
Studies	<p>The certainty of the included studies is low or very low.</p> <p>Of eight included studies, two were RCTs and the remaining were observational studies.</p> <p><b>RCT</b></p> <table border="1" data-bbox="239 537 1173 1086"> <thead> <tr> <th>Outcomes</th> <th>Relative importance</th> <th>Certainty of the evidence (GRADE)</th> </tr> </thead> <tbody> <tr> <td>Abort Syncope - acute study phase</td> <td>CRITICAL</td> <td>⊕○○○ VERY LOW</td> </tr> <tr> <td>Symptom Improvement - acute phase</td> <td>IMPORTANT</td> <td>⊕⊕○○ LOW</td> </tr> <tr> <td>Symptom improvement - Follow-up phase</td> <td>IMPORTANT</td> <td>⊕○○○ VERY LOW</td> </tr> <tr> <td>HR - acute study phase</td> <td>IMPORTANT</td> <td>⊕○○○ VERY LOW</td> </tr> <tr> <td>SBP - acute study phase</td> <td>IMPORTANT</td> <td>⊕⊕○○ LOW</td> </tr> <tr> <td>DBP - acute study phase</td> <td>IMPORTANT</td> <td>⊕○○○ VERY LOW</td> </tr> </tbody> </table> <p><b>Observational Studies</b></p> <table border="1" data-bbox="239 1176 1173 1411"> <thead> <tr> <th>Outcomes</th> <th>Relative importance</th> <th>Certainty of the evidence (GRADE)</th> </tr> </thead> <tbody> <tr> <td>Abort Syncope - acute study phase</td> <td>CRITICAL</td> <td>⊕○○○ VERY LOW</td> </tr> <tr> <td>Injury or adverse events - Follow-up phase</td> <td>CRITICAL</td> <td>⊕○○○ VERY LOW</td> </tr> </tbody> </table>	Outcomes	Relative importance	Certainty of the evidence (GRADE)	Abort Syncope - acute study phase	CRITICAL	⊕○○○ VERY LOW	Symptom Improvement - acute phase	IMPORTANT	⊕⊕○○ LOW	Symptom improvement - Follow-up phase	IMPORTANT	⊕○○○ VERY LOW	HR - acute study phase	IMPORTANT	⊕○○○ VERY LOW	SBP - acute study phase	IMPORTANT	⊕⊕○○ LOW	DBP - acute study phase	IMPORTANT	⊕○○○ VERY LOW	Outcomes	Relative importance	Certainty of the evidence (GRADE)	Abort Syncope - acute study phase	CRITICAL	⊕○○○ VERY LOW	Injury or adverse events - Follow-up phase	CRITICAL	⊕○○○ VERY LOW	<p>Much of the research was conducted in clinical settings. Some observational studies identified the effect of PCM on outcomes after they were trained to apply PCM. There are no studies on first aider performance or instructing individuals with acute conditions to use PCM.</p>
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certainty about or variability in how much people value the main outcomes?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<p>certainty or</p> <p>important uncertainty or</p> <p><b>important variability</b></p> <p>uncertainty or</p>	<p>90% of participants who used PCMs reported they were highly or moderately satisfied (Brignole 2002 2053)</p> <p>Quality of life survey scores improved one year after individuals with syncope began applying PCMs during presyncope (van Dijk 2007 672).</p>	<p>While there is little data on this, it is reasonable to assume that most people value the desired outcomes of preventing syncope, decreasing symptoms, and potentially decreasing injury related to syncope with a simple, no-cost intervention.</p>

## Effects

between desirable and undesirable effects favor the intervention or the comparison?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<p>comparison</p> <p>vs the comparison</p>	<p>Available studies demonstrate a small beneficial effect of the use of PCM to abort syncope. The effect was beneficial and statistically significant in one small RCT, but the beneficial findings in four observational studies were not significant:</p> <p>There was significant beneficial effect for symptom improvement in two RCTs.</p>	<p>As it is unlikely for an individual with presyncope symptoms who attends a clinic to experience an adverse event, it is likely or possible that they will benefit from the intervention, though the benefit is small.</p>

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e comparison  
s the intervention  
ervention

Hemodynamics improved in RCTs and observational studies with PCM.  
There were no adverse events or injuries related to the use of PCM reported in the included studies.

between desirable and undesirable  
favours the intervention (PCM)  
comparison (not using PCM, or  
first aid procedures).  
It is important to note here that  
and its recommendations are li  
presyncope of orthostatic and v  
etiology. Presyncope for other re  
more complex and the balance  
desirable and undesirable effec  
favour PCM, but rather for first  
to focus on basic first aid proce  
including lying the individual su  
accessing emergency care/call

required  
source requirements (costs)?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
<p>s sts and savings ngs</p>	<p>There is no research evidence that studied the cost of PCM.</p>	<p>The only resources that are rec those needed to train first aid p to coach people who have acut symptoms to attempt PCM. Thi negligible costs related to curri development, development of t including diagrams or video clip demonstrating various PCM tec instructor training. First aid pro also be trained to recognize pre orthostatic and vasovagal etiolo differentiate it from other cause  Potential savings could be mod based on avoidance of physicia emergency department visits re injuries from falling related to s</p>

## evidence of required resources

of the evidence of resource requirements (costs)?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
udies	There is no research evidence on required resources.	No additional resources are needed for the individual or the first aiders in the community (other than training).

## Cost-effectiveness

Does the evidence of the intervention favor the intervention or the comparison?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
comparison favors the intervention either the comparison favors the intervention intervention udies	There is no research evidence in which the cost-effectiveness of PCM was studied.	The cost effectiveness favors PCM. The intervention is low cost (only training) considering the net benefit of preventing syncope or injury associated with falls.

Impact on health equity?

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
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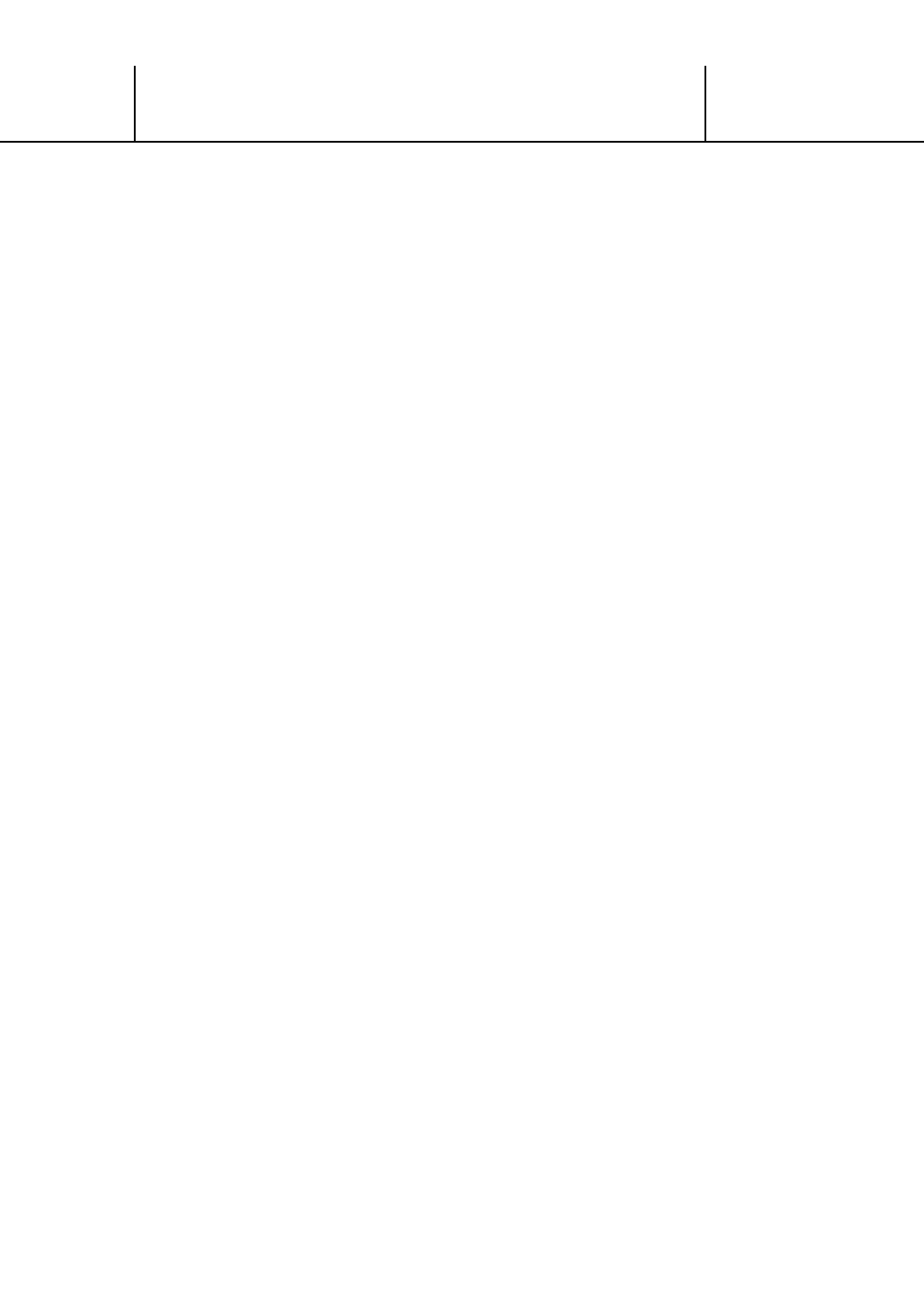
<p>ced mpact eased</p>	<p>There is no research evidence related to the impact on equity.</p>	<p>The use of PCM may reduce equity for those who do not have ready access to health services, although there is no research evidence to support this.</p>
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**Acceptability to key stakeholders?**

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
	<p>There is no research evidence that studied acceptability specifically.</p>	<p>Given the simplicity of the PCM (i.e., its use by first aid providers, easy to do, simple to train and simple to implement) and the likely effectiveness of the intervention is likely to be acceptable to key stakeholders.</p>

**Feasibility to implement?**

	RESEARCH EVIDENCE	ADDITIONAL CONSIDERATIONS
	<p>Training patients to administer PCM was found to be feasible in all of the included studies. The studies which included a real-life follow up phase in which there was benefit to the outcomes of aborting syncope, symptom reduction and adverse events/injuries (Alizadeh, 2016, e5348, Brignole 2002 2053).</p>	<p>PCM is a relatively simple maneuver with a high probability of a good result. It is very feasible to implement.</p>



# OF JUDGEMENTS

JUDGEMENT						
	No	Probably no	Probably yes	<b>Yes</b>		Varies
EFFECTS	Trivial	Small	<b>Moderate</b>	Large		Varies
EFFECTS	Large	Moderate	<b>Small</b>	Trivial		Varies
EVIDENCE	<b>Very low</b>	Low	Moderate	High		
	Important uncertainty or variability	Possibly important uncertainty or variability	<b>Probably no important uncertainty or variability</b>	No important uncertainty or variability		
EFFECTS	Favors the comparison	Probably favors the comparison	Does not favor either the intervention or the comparison	Probably favors the intervention	<b>Favors the intervention</b>	Varies
REQUIRED	Large costs	Moderate costs	<b>Negligible costs and savings</b>	Moderate savings	Large savings	Varies
EVIDENCE OF RESOURCES	Very low	Low	Moderate	High		
NESS	Favors the comparison	<b>Probably favors the comparison</b>	Does not favor either the intervention or the comparison	Probably favors the intervention	Favors the intervention	Varies
	Reduced	Probably reduced	Probably no impact	<b>Probably increased</b>	Increased	Varies
ITY	No	Probably no	<b>Probably yes</b>	Yes		Varies
Y	No	Probably no	<b>Probably yes</b>	Yes		Varies

# RECOMMENDATION

Recommendation against the intervention	Conditional recommendation against the intervention	Conditional recommendation for either the intervention or the comparison	Conditional recommendation for the intervention	<b>Strong recommendation for the intervention</b>
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## IONS

### ation

that first aid providers use any type of PCM for individuals with symptoms of presyncope due to vasovagal or orthostatic causes (weak recommendation, low and very low quality evidence).

that lower body PCMs are preferable to upper body and abdominal PCMs (weak recommendation, very low quality evidence).

Considering this recommendation, the task force places value on avoidance of progression of presyncope symptoms to full loss of consciousness.

a simple, feasible, no-cost intervention that has the potential to temporize symptoms.

possible to train first aid providers on how to instruct individuals with presyncope symptoms to use PCM. However it may be challenging for first aid providers to identify vasovagal and orthostatic causes of presyncope. For other causes of presyncope, first aid providers should instruct individuals to use PCM. Other interventions should not be delayed.

First aid providers should be trained to use the major PCMs types, depending which is most appropriate for the circumstance including standing or squatting with lower body & abdominal muscle tensing, arm tensing and hand grip.

The first aid task force believes that it is important for first aid providers to manage the potential risks with individuals suffering from presyncope remaining standing/upright and attempting PCM. Individuals should be positioned lying or sitting when possible before attempting PCM.

and studies were of participants who were trained in PCM after the onset of symptoms, which is similar to a first aid situation.

## Considerations

Evidence is similar for all outcomes between participants with vasovagal versus orthostatic cause of presyncope. PCM may be effective for adults, however there was not enough evidence to conduct a sub-group analysis.

## Implementation considerations

Providers must also be trained in how to recognize presyncope of orthostatic and vasovagal etiology, and differentiate these from other causes.

Resources for instructors might include video examples of various PCMs.

Providers should be coached to continue speaking while attempting PCM to avoid inadvertently performing a Valsalva maneuver and inhaling.

## Research and evaluation

Future studies might consider measuring the accuracy of recognition of vasovagal and orthostatic presyncope.

Future studies might consider monitoring the use of PCM, success of intervention, adverse events and injuries related to use of PCM.

## Priorities

is required that compares the effectiveness and adverse events of PCM in different age groups (particularly older or frail and disabled).  
is required to determine if first aid providers can recognize or be trained to recognize orthostatic or vasovagal presyncope/syncope.  
is required on the clinical outcomes of first aid providers coaching individuals with presyncope on how to use PCM.  
is required that compare PCMs to individuals who are positioned supine.

Wong A. (1999). Syncope in pediatric patient. *Pediatr. Clin. North Am.* 46, 205–219.  
Lloyd-Jones DM (2006). Vasovagal syncope in medical students and their first-degree relatives. *Eur. Heart J.* 27, 1967–1970.  
Lloyd-Jones DM, Rowe JW (1985). Syncope in an elderly institutionalized population: incidence, prevalence and associated risk. *Q. J. Med.* 55, 45–55.  
Lloyd-Jones DM (2009). Guidelines for the diagnosis and management of syncope. *Eur. Heart J.* 30, 2631–2671.  
Lloyd-Jones DM. Quality-of-life, health service use, and costs associated with syncope. *Prog. Cardiovasc. Dis.* 55, 370–375.  
Lloyd-Jones DM (2007). Quality of life within one year following presentation after transient loss of consciousness. *Am J Cardiol.* 100:672–676.  
Lloyd-Jones DM (2017). 2017 ACC/AHA/HRS Guideline for the Management and Evaluation of Patients with Syncope. *JACC* 70(5):e39-110.

**S**  
Sambharani M, Keikhavani A, Emkanjoo Z, Rad MA, Ghadrdoost B, Khadazian M. The Role of Acute Physical Counter Pressure Maneuver in the Management of Syncope: A Randomized Control Trial. *Clinic Cardia Electrophysiology* 2016, 1(1):e5348.

Shaw P, Opfer-Gehrking TL, Low PA. Role of Physical Counterpressure Maneuvers in the Management of Orthostatic Hypotension: Efficacy and Safety. *Mayo Clinic Proceedings* 1996, 71(9): 847-53.

Shaw P, Menozzi C, Solano A, Donato P, Oddone D, Puggioni E, Lolli G. Isometric Arm Counter-Pressure Maneuvers to Abort Impending Vasovagal Syncope. *Circulation* 2002, 106(11):2053-9.

Shaw P, Taneja I, Ocon AJ, Stewart JM. Initial Orthostatic Hypotension in the Young is Attenuated by Static Handgrip. *The Journal of Pediatrics* 2002, 141(5):750-4.

M, Menozzi C, Solano A, Donateo P, Oddone D, Puggioni E, Lolli G. Efficacy and feasibility of isometric arm counter-pressure manoeuvre for vasovagal syncope during real life. *Eurospace* 2004, 6:287-91.

Lee KO, Seo TJ, Shon CY, Lim SY, Yun KH, Sohn IS, Hong YJ, Park HK, Kim JH, Kim W, Ahn YK, Jeong MH, Park JC, Kang JC. Usefulness of leg crossing for the prevention of Vasovagal Syncope. *Circulation* 2005, 69:1084-8.

de Waard D, Linzer M, van Lieshout JJ, Wieling W. Management of Vasovagal Syncope Controlling or Aborting Faints by Leg Crossing and Muscle Tensing. *Clinical Autonomic Research* 2006, 106:1684-89.

Shon IK, van Lieshout JJ, Wieling W. Optimizing Squatting as a Physical Maneuver to Prevent Vasovagal Syncope. *Clinical Autonomic Research*