Can lightweight rescuers adequately perform CPR according to 2010 resuscitation guideline requirements?

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ABSTRACT
Aim To evaluate associations between rescuers’ anthropometric characteristics and chest compressions (CC) depth according to 2010 resuscitation guidelines.

Methods 186 medical and pharmacy students, never trained in basic life support (BLS) before, underwent video self-instruction training. The participants were asked to perform a BLS test on a manikin connected to a PC for 6 min immediately after training, and the quality of the cardiopulmonary resuscitation (CPR) skills was evaluated.

Results Women with body weights less than 56 kg were 6.29 times more likely to produce insufficient CCs than women weighing 56–62.7 kg, and 4.72 times more likely to produce insufficient CCs compared with women weighing more than 62.7 kg.

Conclusions Lightweight rescuers may have difficulty achieving the full compression depth of 5–6 cm required by new resuscitation guidelines. These rescuers require special attention during CPR training, with an emphasis on correct body positioning and use of body weight for CCs.

INTRODUCTION
Lightweight rescuers, especially women, have difficulty achieving adequate chest compressions (CC) depths and tire more quickly.1–4 Since the 2010 guidelines were released, the aim of CCs has been to push the chest to a depth of at least 5 cm.3 The aim of our study was to evaluate the associations between rescuers’ anthropometric characteristics (weight, height, body mass index (BMI) and body fat percentage) and CC depth, as measured on a basic life support (BLS) manikin.

METHODS
The Regional Ethics Committee of the Lithuanian University of Health Sciences (LUHS) approved the study. The participants included in this study were sixth-year medical and fourth-year pharmacy students who underwent BLS training according to the LUHS curriculum in the Department of Disaster Medicine between January and March 2011. We excluded students who had already received practical training in BLS.

The video-based lecture titled AHA Family and Friends, CPR Anytime in Lithuanian was employed to teach practical cardiopulmonary resuscitation (CPR) skills. Each participant was given an individual Resusci Anne manikin. BLS skills were tested one-by-one immediately after the training session by American Heart Association (AHA)-certified BLS instructors using a case-based scenario.

Data analysis was performed at a significance level of 5% (two-tailed) using SPSS V.12 (SPSS Inc, Chicago, IL, USA). To investigate associations between variables, we used Pearson’s and Spearman’s correlations, t tests, chi-squared tests and logistic regression. To allow a logistic regression analysis, the variable of compression depth was dichotomised: compression depth <50 mm was regarded as ‘insufficient’ and other depths were labelled ‘sufficient’.

RESULTS
The average CC depth of male participants was sufficient (5.8 (0.8) cm). Data from 146 female students who met the selection criteria were used for further analysis. There was a significant correlation between the weight, height, BMI and compression depth of female participants. We used a cross-tabulation to determine the association between insufficient CC depth and the weight of the female study participants. There was a significant difference between the first and the other terciles in the number of cases with insufficient compression depth (table 1). The association between weight and compression depth is presented as a scatter plot in figure 1. We calculated ORs to illustrate the associations between anthropometric factors and insufficient compression depth (table 2). Our sample size (n=146) allowed us to detect OR>5.5 at the statistical power 0.80.

DISCUSSION
The lightweight women in our study were not able to perform CCs of adequate depth in accordance with the 2010 resuscitation guidelines. The percentage of inadequate compressions was 60.3% (2010 guidelines) versus 18.5% (2005 guidelines). Women resuscitate victims more frequently, but it is known that the depth of their compressions,
and thus the quality of their resuscitations, are often inadequate.\textsuperscript{1, 3-6, 7} Our study also supports the notion that the gender effect might be explained by physical characteristics such as body weight or muscle strength.\textsuperscript{12, 7}

It seems that 22 min of video self-instruction training is not sufficient to teach lightweight women to produce CCs of sufficient depth. Virtual feedback devices are not always adequate, and a live instructor’s feedback is necessary to ensure that an individual approach is taken. A focus on correct body positioning during CPR training will help lightweight rescuers produce efficient CCs for a longer period of time.

CONCLUSIONS

Lightweight women are likely to perform inadequate CCs; therefore, we recommend that during CPR training for lightweight adults, especially women, trainers should emphasise how the maximum use of body mass can be achieved during CCs. Instructors should focus on correct rescuer body positioning and biomechanics.

Contributors

All authors have made substantial contributions.

AK, KS, MD and DV contributed to the conception and design of the study, acquisition of data, analysis and interpretation of data.

AK, MD, ZD and EV contributed to drafting the article or revising it critically for important intellectual content.

PD and DV contributed to final approval of the version to be submitted.

Competing interests

None.

Ethics approval

The study was approved by the Regional Ethics Committee based at Lithuanian University of Health Sciences (Protocol No. BC-MF-188/2011).

Provenance and peer review

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REFERENCES