[12] Gallerani M, Avato FM, Dal Monte D, Caracciolo S, Fersini C, Manfredini R. The time for suicide. Psychol Med 1996;26:867–70.
[13] Caracciolo S, Manfredini R, Gallerani M, Tugnoli S. Circadian rhythm of parasuicide in relation to violence of method and concomitant mental disorder. Acta Psychiatr Scand 1996;93:252–6.
[14] Manfredini R, La Cecilia O, Boari B, Steliu J, Michelini V, Carli P, et al. Circadian pattern of emergency calls: implications for ED organization. Am J Emerg Med 2002; 20:282–6.

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8 May 2018

Can the Ottawa Subarachnoid Haemorrhage Rule help reduce investigation rates for suspected subarachnoid haemorrhage?

https://doi.org/10.1016/j.ajem.2018.05.015

The Ottawa Subarachnoid Haemorrhage (SAH) Rule is a clinical decision tool to facilitate identification of subarachnoid haemorrhage in alert, neurologically intact adults admitted to the Emergency Department (ED) with acute non-traumatic headache. It was developed by Perry et al. on the basis of data derived from a multicentre cohort study in Canada [1]. It takes into account clinical features that were deemed high risk for SAH, including age ≥ 40, neck pain/stiffness, witnessed loss of consciousness, onset during exertion, thunderclap headache and limited neck flexion on examination. It had been originally purported that the tool had the potential to reduce investigation rates by approximately 10–20% [2]. We performed an up-to-date review of the literature and present a summary of the current evidence base for the validity and usefulness of the Ottawa SAH Rule.

From 66 unique citations identified using our search strategy, we found four relevant articles [3-6]. Across a total of 3317 patients enrolled from four countries in these studies, the Ottawa SAH rule had not missed a single case of SAH, with a pooled sensitivity of 100%. Employing the rule correctly may have the advantage of reducing the investigation rate for patients, in turn reducing radiation exposure from computed tomography (CT) scanning and avoiding invasive tests such as lumbar puncture. In addition, the rule may provide a cost-effective screening tool for physicians in resource-constrained or remote healthcare facilities when formulating decisions for transferring patients to suitable centres for further work up. The strength of the current evidence base is that it includes two large multicentre prospective cohort studies externally validating the rule [4,5].

However, there appear to be a number of other factors which limits the use of the Ottawa SAH score. Most importantly, its specificity has been shown to be universally poor, with point estimates ranging from 7.6% [3] to 13.6% [5]. Physicians should be cautious not to investigate patients merely because they demonstrate one or more high risk features; in these circumstances, the score should act as a prompt to apply clinical judgement more keenly in formulating a clinical diagnosis of SAH. Secondly, the actual or potential reduction in investigation rate has been shown to be relatively modest at 4.7% by both Perry et al. [5] and Chu et al. [6]. Furthermore, Bellolio et al. suggest that the rule can only be applied to a small proportion (9%) of the ED cohort [3]. Nevertheless, given the substantial rise in CT imaging rates in recent years [7], even modest reductions may accrue benefits for healthcare institutions. Thirdly, interobserver variability may limit the reliability of the tool. This has, however, been addressed by Perry et al. who have demonstrated excellent interobserver reproducibility [5]. Whilst it is true that this may be partly confounded by the fact that they enrolled the same centres as from the original derivative study, this may highlight the role of education and training in maintaining adequate interobserver reliability.

To conclude, it appears that based on the current literature, the Ottawa SAH rule is a reliable clinical decision tool in excluding SAH and can avoid unnecessary investigations in a small, select proportion of patients. It is limited by a poor specificity and clinical judgement must be applied in managing patients who demonstrate one or more high risk features from the rule.

References

[1] Perry JJ, Stiell IG, Sivilotti ML, Bullard MJ, Hohl CM, Sutherland J, et al. Clinical decision rules to rule out subarachnoid hemorrhage for acute headache. JAMA Sep 25 2013; 310(12):1248–55.
[2] Perry JJ, Stiell IG, Sivilotti ML, Bullard MJ, Lee JS, Eisenhauer M, et al. High risk clinical characteristics for subarachnoid haemorrhage in patients with acute headache: prospective cohort study. BMJ Oct 28 2010;341:c5204.
[3] Bellolio MF, Hess EP, Gilani WI, VanDyck TJ, Ostby SA, Schwarz JA, et al. External validation of the Ottawa subarachnoid hemorrhage clinical decision rule in patients with acute headache. Am J Emerg Med Feb 2015;33(2):244–9.
[4] Kimura A, Kobayashi K, Yamaguchi H, Takahashi T, Harada M, Honda H, et al. New clinical decision rule to exclude subarachnoid haemorrhage for acute headache: a prospective multicentre observational study. BMJ Open Sep 9 2016;6(9):e010999.
[5] Perry JJ, Sivilotti MLA, Sutherland J, Hohl CM, Émond M, Calder LA, et al. Validation of the Ottawa Subarachnoid Hemorrhage Rule in patients with acute headache. CMAJ Nov 13 2017;189(45):E1379–85.
[6] Chu KH, Keijzers G, Furyk JS, Eley RM, Kinnear FB, Thom ON, et al. Applying the Ottawa subarachnoid haemorrhage rule on a cohort of emergency department patients with headache. Eur J Emerg Med Dec 5 2017 [Epub ahead of print].
[7] Royal College of Radiologists. Information submitted to Health Education England workforce planning and education commissioning round – 2015/16. London: RCR; 2016; 8–10.

Does the use of steps decrease the quality of cardiopulmonary resuscitation when children as rescuers perform chest compression?

Dear editor,

I have read the article by Otero-Agra et al. titled “What biomechanical factors are more important in compression depth for children life-savers? A randomized crossover study” with great interest [1]. Although the study results showed that the use of steps did not increase cardiopulmonary resuscitation (CPR) quality, I have several concerns about the study conclusion, and will share these with the authors and readers of the journal.

I think that the authors designed this study to verify whether the use of steps could increase the quality of CPR during chest compressions delivered by children as rescuers. This issue is important to basic life support because CPR delivered by children is of lower quality than that provided by adult rescuers, as noted by the authors. The positive effect of using steps on CPR quality is based on the height difference between the patient and the rescuer [2-4]. Most CPR training is conducted on the floor in a kneeling position beside a manikin because CPR guidelines describe the standard position for CPR as a kneeling position beside the patient on the floor. Changes in position between the patient and rescuer caused deterioration of CPR quality in previous studies [5-7]. Interestingly, this deterioration disappeared when the bed height was adjusted to the knee height of the rescuer, because adjusting the bed height to knee height enables the rescuer to assume a position similar to that of standard position for CPR [8]. Therefore, the current hypothesis on the

positive effect of the use of steps would be implemented by adjusting the bed height to the rescuer's knee height.

However, the setting of the present study was opposite to that assumed by the hypothesis. Although the authors wanted to verify that the use of steps would increase CPR quality, the height differences between the manikin and children as rescuers were increased when they used steps (T1, T2, and T3). Therefore, steps affected CPR quality adversely in the present study.

The major difference in the experimental environment between previous studies and the present study was whether the manikin was on the bed or on the floor. If the author had used the same setting with the manikin on the bed, the effect of using steps would be positive.

Even though they did not verify the positive effects of steps, I agree that the results have significance. By elevating the rescuers' location above the standard position (T0), they created a favorable environment to load the rescuer's weight onto the compression area. This environment might increase the chest compression depth because the rescuer can load their weight more easily than in standard position. However, the results showed that the chest compression depth (CCD) decreased when the height of steps increased. This result might be caused by a leaning effect. Increasing rates of incomplete recoil might reflect the leaning effect. However, the occurrence of leaning could not be confirmed because the rate of incomplete recoil further decreased at the highest step (15 cm). The authors could show data (leaning depths) for each group, to confirm whether leaning depth increases according to step height.

Although the CCD was maximized when the bed height was the same as the rescuer's knee height, it decreased significantly when the bed height was 20 cm higher than the knee height of the rescuer in a previous study [4]. The setting in the present study is the same whether the bed height is used with a rescuer's knee height, knee height – 5 cm, knee height – 10 cm, and knee height – 15 cm. Therefore, significant differences in CCD according to different step heights might not be obtained with a small number of study participants, considering the results of the previous study [4]. Instead, the results of the present study explain why the CCD did not decrease significantly when the bed height was 20 cm lower than the rescuer's knee height.

In conclusion, the present study offers a deeper understanding of the environment needed for high-quality CPR. Although the anthropometric characteristics of children as rescuers were different among the study participants, it was confirmed that the height difference between the patients and the children might affect CPR quality, similar to that with adult rescuers. Further study is warranted, including use of another setting to confirm the effect of height difference on CPR quality.

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9 May 2018

https://doi.org/10.1016/j.ajem.2018.05.019

References

[1] Otero-Agra M, Rodriguez-Nunez A, Rey E, Abelairas-Gomez C, Besada-Saavedra I, Anton-Ogando AP, et al. What biomechanical factors are more important in compression depth for children lifesavers? A randomized crossover study. Am J Emerg Med 2018. https://doi.org/10.1016/j.ajem.2018.05.003.
[2] Cho J, Oh JH. The importance of the bed height during in-hospital cardiopulmonary resuscitation. Resuscitation 2011;82:634.
[3] Lewinsohn A, Sherren PB, Wijayatilake DS. The effects of bed height and time on the quality of chest compressions delivered during cardiopulmonary resuscitation: a randomised crossover simulation study. Emerg Med J 2012;29:660–3.
[4] Cho J, Oh JH, Park YS, Park IC, Chung SP. Effects of bed height on the performance of chest compressions. Emerg Med J 2009;26:807–10.
[5] Hong CK, Park SO, Jeong HH, Kim JH, Lee NK, Lee KY, et al. The most effective rescuer's position for cardiopulmonary resuscitation provided to patients on beds: a randomized, controlled, crossover mannequin study. J Emerg Med 2014;46:643–9.
[6] Perkins GD, Benny R, Giles S, Gao F, Tweed MJ. Do different mattresses affect the quality of cardiopulmonary resuscitation? Intensive Care Med 2003;29:2330–5.
[7] Tweed M, Tweed C, Perkins GD. The effect of differing support surfaces on the efficacy of chest compressions using a resuscitation manikin model. Resuscitation 2001;51:179–83.
[8] Oh JH, Kim CW, Kim SE, Lee SJ, Lee DH. Comparison of chest compressions in the standing position beside a bed at knee level and the kneeling position: a non-randomised, single-blind, cross-over trial. Emerg Med J 2014;31:533–5.

Bellows sign: A novel sonographic sign for the detection of segmental atelectasis

Point-of-care ultrasound examination of the chest has evolved into a radiation-free bed-side diagnostic tool for a variety of pulmonary disorders, including pneumothorax, pleural effusion, consolidation, edema and ARDS [1-3]. The detection of atelectasis by ultrasound, however, remains a diagnostic challenge.

Atelectasis presents as primary or secondary. During secondary atelectasis, the lung is externally compressed by air or fluid in the pleural space. The diagnosis of secondary atelectasis by ultrasound is demanding, but feasible [4,5]. Primary atelectasis, caused by airway obstruction, results in complete lung, lobar or segmental collapse. Ultrasonography allows early detection of total lung collapse with the “lung pulse” sign, consisting of transmission of the heart beat to the pleural line through collapsed lung tissue [6]. The recognition of primary lobar or segmental atelectasis using ultrasound hasn't been previously described.

We recently identified in a mechanically ventilated 42-year-old patient a novel ultrasonographic pattern that is indicative of primary segmental atelectasis. The patient was admitted to the RICU because of bilateral pneumonia and respiratory failure, requiring mechanical ventilation. Past medical history included hepatitis C, mild chronic kidney disease and drug addiction but no lung disease. Chest-X-ray on admission showed multiple areas of consolidation and a mediastinal shift to the right, allegedly secondary to atelectasis (Fig. 1A). We performed ultrasonography of the lower anterior chest wall (area marked with an arrow on Fig. 1A) using a Philips CX50 ultrasound device (Phillips Medical Systems, Andover, MA, USA) and a phased array probe with 1–5 MHz frequency range. We demonstrated an abnormal inward movement pattern that shortened the distance between adjacent ribs and between two nearby B lines, (Fig. 2A and B). With resolution of atelectasis, mediastinal displacement and the aberrant ultrasonographic movement pattern resolved completely (Fig. 1B). We propose to term this novel point-of care ultrasonographic sign that is indicative of segmental lung atelectasis as the “Bellows Sign”.

Primary segmental atelectasis as result of bronchial obstruction impedes segmental lung expansion during inspirium, because air entry into the involved lung segment is impeded and because of negative pressure distal to the bronchial obstruction. As result, the movement of the chest wall during breathing is not accompanied by normal parallel expansion of the lung. In the absence of adhesions between the visceral and the parietal pleura, “lung sliding” is still present, but the usual to and fro movement is replaced by a centripetal motion, as the hyper-echogenic pleural line appears to converge onto its own center. During the inspiratory phase and in the presence of segmental atelectasis, when the ultrasound transducer is placed to show two coalescing ribs, the ribs and their acoustic shadow demonstrate a converging motion pattern, with the distance separating them diminishing. During the expiratory phase, the entire field appears to re-expand. Interestingly, the “comet tail” and the “B lines” artifact follow the same characteristic centripetal movement during inspiration. The “Bellows Sign” correlates with the “intercostal retraction sign” of atelectasis that is seen over the chest wall by plane observation. Because the ultrasonographic picture is enlarged on the screen, the movement of the involved