Correspondence

Is it possible to terminate resuscitation in accordance with the termination of resuscitation rule?

Masahiro Kashiura[1]**; SOS-KANTO 2012 study group**

[1]Tertiary Emergency Medical Center, Tokyo Metropolitan Bokutoh Hospital, Tokyo, Japan

Correspondence to: Masahiro Kashiura, MD. 4-23-15 Kotobashi, Sumida-ku, Tokyo 130-8575, Japan. Email: kashiura@me.com.

Submitted Sep 08, 2016. Accepted for publication Sep 19, 2016.

doi: 10.21037/jtd.2016.10.35

View this article at: http://dx.doi.org/10.21037/jtd.2016.10.35

We appreciate the interests of Bernhard *et al.* and Yoon *et al.* regarding our article in Critical Care, which showed a high false-positive rate (FPR) for the termination of resuscitation (TOR) rules in patients with out-of-hospital cardiac arrest (OHCA) with a non-cardiac etiology (1). We agree with their views (2,3), and herein we respond to their comments and provide results of our reanalysis.

Bernhard *et al.* pointed out generalizability as a problem of our study, such as the exclusion of trauma or young patients (<18 years old), regional limitation, and fact that we did not evaluate the basic life support (BLS) TOR rule as a universal TOR rule (2). First, the prognosis of young patients with OHCA is better than that of older patients. Therefore, the exclusion of young patients may underestimate, not overestimate, the result of our study. In addition, the result of young patients will be reported in another study subgroup. Second, we excluded trauma patients when evaluating BLS and advanced life support (ALS) TOR rules, because there are other TOR position statements by the National Association of Emergency Medical Service Physicians and the Subcommittee on Emergency Services-Prehospital of the American College of Surgeons' Committee on Trauma (4). Third, we investigated the diagnostic accuracy of BLS and ALS TOR rules according to the American Heart Association cardiopulmonary resuscitation (CPR) guideline, not the BLS TOR rule as a universal TOR rule (5). On the basis of the comments by Bernhard *et al.*, we reanalyzed the BLS TOR rule as a universal TOR rule and included trauma patients (*Table 1*). Even after this reanalysis, the BLS TOR rule had a low specificity and high FPR in patients with a non-cardiac etiology, although it had a high specificity and low FPR in patients with a cardiac etiology. Finally, the Kanto area in Japan where our study was conducted has a denser population than other regions in Japan. The regional limitation is important, as we mentioned previously (1), and a population-based study is needed. However, an emergency medical service system, including transportation of patients with OHCA, is authorized regionally. The result of our study suggested that the TOR rule may be established for each region, because the diagnostic accuracy of the TOR rule can differ in each region or emergency medical service system.

The CPR duration is an important problem in TOR for OHCA, as Yoon *et al.* mentioned. The CPR duration is independently and inversely associated with favorable neurological outcomes and survival. Previous studies have shown that the prehospital CPR durations for OHCA are 35–48 minutes in patients with initial shockable rhythm, and 15–48 minutes in those with initial pulseless electrical activity or asystole, at which time the probability of survival decreased to <1% (6,7). However, the current CPR guidelines did not mention a specific time limit for CPR duration (5). In the future, the CPR duration should be considered to establish a new TOR rule.

Cost-effectiveness is very important with regard to the TOR rule. Moreover, emergency services providers are at risk of injury from motor vehicle crashes during emergency transportation. Using the BLS TOR rule decreased futile transportation by approximately 50% in previous study (8). However, the decision of TOR is more challenging compared to other interventions with an ethical dilemma. Therefore, it has been argued that success rates of <1% still justify the effort of resuscitation (9), and we should validate or re-evaluate the TOR rule according to the result of our study.

In conclusion, the present TOR rule has several

Table 1 Diagnostic accuracy of basic life support termination of resuscitation rules for 1-month neurological outcomes

Etiology of cardiac arrest	Neurologically unfavorable outcome (n)	Neurologically favorable outcome (n)	Sensitivity (95% CI)	Specificity (95% CI)	FPR (95% CI, %)	PPV (95% CI)	NPV (95% CI)
All types							
Met criteria	9,357	16	0.776	0.954	4.6	0.998	0.110
Did not meet criteria	2,697	332	0.769–0.784	0.926–0.974	2.6–7.4	0.997–0.999	0.099–0.121
Cardiac etiology							
Met criteria	4,326	6	0.738	0.978	2.2	0.999	0.151
Did not meet criteria	1,533	273	0.727–0.750	0.954–0.992	0.8–4.6	0.997–0.999	0.135–0.169
Non-cardiac etiology							
Met criteria	5,031	10	0.812	0.855	14.5	0.998	0.048
Did not meet criteria	1,164	59	0.802–0.822	0.750–0.928	7.2–25.0	0.996–0.999	0.037–0.062

CI, confidence interval; FPR, false-positive rate; NPV, negative predictive value; PPV, positive predictive value.

limitations if used as the universal TOR rule. Additionally, the TOR rule should be reconsidered for each region and emergency medical service system.

Acknowledgements

None.

Footnote

Provenance: This is an invited article commissioned by the Section Editor Zhongheng Zhang (Department of Critical Care Medicine, Jinhua Municipal Central Hospital, Jinhua Hospital of Zhejiang University, Jinhua, China).
Conflicts of Interest: The authors have no conflicts of interest to declare.

Response to: Bernhard M, Becker TK, Hossfeld B. Should we resuscitate or not-that is the question! J Thorac Dis 2016;8:1053-6.
Yoon JC, Kim WY. What should we consider when applying termination of resuscitation rules? J Thorac Dis 2016;8:1377-80.

References

1. Kashiura M, Hamabe Y, Akashi A, et al. Applying the termination of resuscitation rules to out-of-hospital cardiac arrests of both cardiac and non-cardiac etiologies: a prospective cohort study. Crit Care 2016;20:49.
2. Bernhard M, Becker TK, Hossfeld B. Should we resuscitate or not-that is the question! J Thorac Dis 2016;8:1053-6.
3. Yoon JC, Kim WY. What should we consider when applying termination of resuscitation rules? J Thorac Dis 2016;8:1377-80.
4. Millin MG, Galvagno SM, Khandker SR, et al. Withholding and termination of resuscitation of adult cardiopulmonary arrest secondary to trauma: resource document to the joint NAEMSP-ACSCOT position statements. J Trauma Acute Care Surg 2013;75:459-67.
5. Mancini ME, Diekema DS, Hoadley TA, et al. Part 3: Ethical Issues: 2015 American Heart Association Guidelines Update for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care. Circulation 2015;132:S383-96.
6. Goto Y, Funada A, Goto Y. Relationship Between the Duration of Cardiopulmonary Resuscitation and Favorable Neurological Outcomes After Out-of-Hospital Cardiac Arrest: A Prospective, Nationwide, Population-Based Cohort Study. J Am Heart Assoc 2016;5:e002819.
7. Grunau B, Reynolds JC, Scheuermeyer FX, et al. Comparing the prognosis of those with initial shockable and non-shockable rhythms with increasing durations of CPR: Informing minimum durations of resuscitation. Resuscitation 2016;101:50-6.

8. Morrison LJ, Visentin LM, Kiss A, et al. Validation of a rule for termination of resuscitation in out-of-hospital cardiac arrest. N Engl J Med 2006;355:478-87.
9. Bossaert LL, Perkins GD, Askitopoulou H, et al. European Resuscitation Council Guidelines for Resuscitation 2015: Section 11. The ethics of resuscitation and end-of-life decisions. Resuscitation 2015;95:302-11.

Cite this article as: Kashiura M; SOS-KANTO 2012 study group. Is it possible to terminate resuscitation in accordance with the termination of resuscitation rule? J Thorac Dis 2016;8(10):E1435-E1437. doi: 10.21037/jtd.2016.10.35

