Journal of Acute Medicine 8(2): 39-46, 2018
DOI: 10.6705/j.jacme.201806_8(2).0001
Review Article

The Contribution of Taiwan in International Liaison Committee on Resuscitation Consensus on Science and Treatment Recommendation 2015 (ILCOR CoSTR 2015)

Tzong-Luen Wang[1,2,3,*]

[1]Department of Emergency Medicine, Chang Bing Show Chwan Memorial Hospital, Changhua, Taiwan
[2]School of Law, Fu Jen Catholic University, New Taipei City, Taiwan
[3]School of Medicine, Fu Jen Catholic University, New Taipei, Taiwan

Taiwan has begun its board certification of emergency medicine since 1998. The scholars have also devoted themselves to research in the related fields including resuscitation for decades. On the other hand, International Liaison Committee on Resuscitation (ILCOR) was established to build up international expert consensus on resuscitation science in 1992. The National Resuscitation Council of Taiwan (NRCT) is a multi-disciplinary organization and becomes one of the founding members of the Resuscitation Council of Asia (RCA) in 2005, whereas the RCA has also become currently the final regional member of ILCOR. Under these international platforms, the experts from Taiwan have significant contributions in establishment of evidence review and clinical guidelines on resuscitation such as ILCOR Consensus on Science and Treatment Recommendation (CoSTR). This brief review will introduce explicitly these important Taiwan investigations cited in ILCOR CoSTR 2015.

Key words: *resuscitation, Taiwan, ILCOR, CoSTR, guidelines*

Introduction

In 1992, International Liaison Committee on Resuscitation (ILCOR) was established to create an international platform for collaboration among regional resuscitation councils in the world, including Resuscitation Council of Asia (RCA). ILCOR has therein accomplished for its pioneering vision and leadership in resuscitation science since then. After explicit systematical review of the evidence for resuscitation guidelines and comprehensive adjustment for regional differences, ILCOR reached consensus on international resuscitation guidelines in 2000, and on international science and treatment recommendations in 2005, 2010 and 2015, respectively.[1] Regional and national guidelines are established accordingly without significant violation of ILCOR Consensus on Science and Treatment Recommendation (CoSTR). ILCOR has delivered international CoSTRs for the last 25 years. Its new vision, mission and values lead to future collaboration and sustainable growth. ILCOR has also decided to deliver continuous evidence evaluation (CEE) to promise the global scientists and practitioners to receive the newest and relevant information in resuscitation with the final goal of saving more lives in the world.

Development of National Resuscitation Council of Taiwan (NRCT) and RCA

The NRCT was founded in 2000. With govern-

Received: April 30, 2018; Accepted: April 30, 2018.
*Corresponding author: Tzong-Luen Wang, MD, Chang Bing Show Chwan Memorial Hospital, No. 6, Lugong Rd., Lugang Town, Changhua County 505, Taiwan. E-mail: conrad@ntu.edu.tw

mental endorsement, the NRCT was initially composed of representatives from Fire Department, Ministry of Health, the Red-Cross Society of the Republic of China, Taiwan Society of Emergency Medicine, and the Society of Critical Care and Emergency Medicine of Taiwan. The founding chairman is Professor Heng Chang. The NRCT has two roles including being responsible for mandatory school cardiopulmonary resuscitation (CPR) training in Taiwan and establishing international collaboration with American Heart Association (AHA) and ILCOR in promoting the quality and outcome of resuscitation. The NRCT has also become one of the founding members of the RCA in 2005.

The RCA was founded on July 17, 2005 at the "Tachibana" Hall in Aichi Medical University, Japan. The founding members of RCA include the National Resuscitation Council of Singapore (NRCS) (founded in 1998), Japan Resuscitation Council (JRC) (founded in 2000), Korean Association of Cardiopulmonary Resuscitation (KACPR) (founded in 2002), and the NRCT. The RCA became an official member of the ILCOR in 2006. The Council of CPR, Philippines Heart Association (founded in 1982) and the Thai Resuscitation Council, the Heart Association of Thailand (founded in 1999), and the Resuscitation Council of Hong Kong (founded in 2012) joined RCA in 2010, 2011 and 2016, respectively. The Penang CPR society (founded in 2013) also joined the RCA family as an associate member in 2014. The RCA serves currently the population of more than 415.7 million in Asia.

Dr. Kazuo Okada was RCA's founding Chairman (2005–2011) and has also served as the President of JRC since its inception till 2014. In addition, he has hosted the ILCOR taskforce (TF) meeting followed by the 1st International Resuscitation Science Symposium (I-ReSS) in Osaka in 2009. He has since been conferred the title of Emeritus Chairman of RCA and JRC. The rest of the founding executive members were Dr. Sung Soon Kim (KACPR, Vice-Chairman), Dr. Swee Han Lim (NRCS, Secretary), and Dr. Matthew Ma (NRCT, Treasurer).

Dr. Swee Han Lim was the second chairman (2011–2016). From 2001 to 2005, Dr. Swee Han Lim (NRCS), Dr. Naoki Shimizu (JRC) and Dr. Keiichi Tanaka (JRC) participated in the International Consensus on Emergency Cardiac Care (ECC) and CPR Science with Treatment Recommendations (C2005) as evidence evaluation worksheet authors. Being an ILCOR member, RCA has been an active participant in ILCOR C2010 and C2015. Two members from RCA have been appointed to participate in each of the seven ILCOR C2015 TFs. Dr. Lim has also been elected as Treasurer of ILCOR since 2012. In 2016, RCA has released and published its first version of Basic Life Support (BLS) guideline under the coordination of Chung et al.[2]

The current RCA Executive Committee members are: Dr. Tzong-Luen Wang (NRCT, Chairman), Dr. Sung-Oh Hwang (KACPR, Vice-Chairman), Dr. Mayuki Aibiki (JRC, Secretary) and Dr. Swee Han Lim (NRCS, Treasurer). In the past, RCA does not have its own scientific meeting, instead, RCA general assemblies are held in conjunction with local, regional or international scientific conferences of anesthesiology, cardiology, critical care or emergency medicine. The cities who have previously hosted the RCA general assemblies include Nagoya (twice), Yokohama, Fukuoka and Tokyo of Japan (total of five general assemblies); Taipei, Taiwan (five times); Singapore (three times); Busan and Seoul, South Korea (thrice); Manila, Philippines; and Bangkok, Thailand. There are currently 17 experts who are elected as members of six ILCOR TFs. To coordinate the new process of CEE, RCA has also assigned the chairmen of seven RCA TFs (including acute coronary syndrome [ACS] TF) who are responsible for updating the information of ILCOR CoSTR and implementing future RCA guidelines.[3]

The future milestones of RCA will be to continue to increase in strength and in collaborations among the members, to help the member countries to work with their local healthcare authorities to implement as much of the ILCOR CoSTR to their communities based on the local culture and economic factors so as to improve both out-of-hospital cardiac arrests (OHCA) and in-hospital cardiac arrest (IHCA) survival, and to increase collaboration with and contribution to the ILCOR CoSTR process as TF members and worksheet authors.

This review will introduce explicitly these important Taiwan investigations cited in ILCOR CoSTR 2015. Because there is no study from Taiwan enrolled in the sections of ACS and neonatal resuscitation, the author will not discuss about this.

Adult BLS

There are four important viewpoints that ILCOR

CoSTR 2015 has emphasized. The first is that the Emergency Medical Service (EMS) dispatcher plays a critical role in identifying cardiac arrest, providing CPR instructions to the caller, and activating the emergency response. Second, the duration of submersion is not the key prognostic factor when predicting outcomes from drowning as expected. Besides, the fundamental performance metrics of high-quality CPR remain critical, with an emphasis on compressions of adequate rate and depth, allowing full chest recoil after each compression, minimizing pauses in compressions, and avoiding excessive ventilation. Some additional registry data suggest an optimal range for compression rate and depth. Finally, public access defibrillation programs providing early defibrillation have the potential to save many lives if the programs are carefully planned and coordinated.[4,5] The investigators from Taiwan have contributed to provide the evidence of dispatcher-assisted CPR (DA-CPR) and prognostic factors of pediatric submersion victims.

Dispatch-Assisted CPR

Ma et al. ever demonstrated a retrospective review of a total of 199 audio recordings from the EMS dispatch center of Taipei city.[6] The survey showed that most callers were emotionally stable and cooperative when calling for help, even when facing cardiac arrest patients. The female callers revealed better cooperation and performance. In four-fifths of interviews, the dispatchers disclosed good skills; while in the other one fifth the interview skills were suboptimal. About one third of the cases were provided with telephone cardiopulmonary resuscitation (T-CPR) by the dispatchers. The sensitivity and positive predictive value (PPV) for predicting OHCA by dispatchers were high. A moderate correlation was found between callers' stability and dispatchers' interview skills.

Prognosis of Submersion

ILCOR CoSTR 2015 restarted several topics on special resuscitation among which the prognosis of submersion has been re-evaluated.[4,5] Niu et al. reviewed retrospectively the patient status on arrival and eventual outcome of 47 consecutive pediatric submersion victims from 1983 to 1990. There were no differences among the patients of three different outcomes in the variables of estimated submersion time, CPR at the scene, referral from local medical clinics. The favorable prognostic factors include a body temperature greater than 35 degrees centigrade, detectable heart beat and respiration on arrival, Orlowski score below two and physiological stability index below seven.[7] This study provided the evidence that ILCOR has emphasized that it is not adequate to abandon resuscitation only because the victims have been submersed for a long time.

Adult Advanced Life Support (ALS)

The key points of adult ALS in ILCOR CoSTR 2015 are as follows.[4,8] While these mechanical CPR devices should not routinely replace manual chest compressions, they may have a role in circumstances where high-quality manual compressions are not feasible. New data did not prompt a recommendation to change practice but do provide sufficient equipoise for large randomized controlled trials to test whether advanced airways and epinephrine are helpful during CPR. Recent improvements in post-cardiac arrest care include further delineation of the effects, timing, and components of targeted temperature management (TTM), and awareness of the need to control oxygenation and ventilation and optimize cardiovascular function. Post–cardiac arrest patients should be treated with a care plan that includes TTM, but there is uncertainty about the optimal target temperature, how it is achieved, and for how long temperature should be controlled. If waveform capnography not available, non-waveform carbon dioxide detector, esophageal detector device or ultrasound in addition to clinical assessment is an alternative. Vasopressin has been removed from drug lists for cardiac arrest. It's of equal benefit to use bad-valve-mask ventilation, supraglottic airways or tracheal tubes during CPR. Cardiac ultrasound may be considered as an additional diagnostic tool to identify potentially reversible causes if not interfering with standard ALS protocol. Mechanical CPR devices can be considered in difficult circumstances such as limited staff numbers, transport, confined spaces, or during interventions. Some special resuscitation is re-emphasized.[4,8]

The studies from Taiwan contributed mainly to elucidating the sequence of Emergency Medical Technician (EMT)-initiated resuscitation,[9] role of ultrasound in verifying the location of endotracheal tube,[10] the possible benefit of extracorporeal membrane oxygenation (ECMO) CPR for in-hospital patients with cardiac arrest,[11] and the effect of hydrocortisone in resuscitation.[12]

Analyze First or Compress First

It is still controversial whether CPR should be performed prior to rhythm analysis for defibrillation for OHCA before C2010. Ma et al.'s study compared outcomes of OHCA victims treated by "compression first (CF)" vs. "analyze first (AF)" strategies in Taiwan with low rates of shockable rhythms.[4]

The randomized trial was conducted in Taipei City between February 2008 and December 2009.[13] Dispatches of suspected OHCA that activated ALS teams were randomized into the CF and AF strategies. Patients assigned to CF strategy received 10 cycles of CPR prior to analysis by automatic external defibrillator. Of final 289 cases in the final analysis after exclusion by pre-specified criteria, 141 were allocated to CF strategy and 148 to AF strategy. Baseline characteristics were similar. The percentage of return of spontaneous circulation (ROSC) sustained for more than 2 hours were the same between two groups. In a post-hoc analysis of patients who achieved ROSC, those that received CF strategy had better rate of survival to discharge from the hospital. It is suggested that a period of paramedic-administered CPR for up to 10 cycles prior to rhythm analysis could be a feasible strategy in such a community with low rates of shockable rhythms.

Ultrasound Verification of Endotracheal Tube Location

In the past, the correctness of endotracheal tube location has been suggested to be verified by waveform capnography as the first choice.[4,8] Chou et al. underwent a prospective, observational study, conducted at the emergency department of a tertiary hospital.[9] Patients received emergency intubation because of impending respiratory failure, cardiac arrest, or severe trauma. The tracheal rapid ultrasound exam (T.R.U.E.) was performed during emergency intubation with the transducer placed transversely at the trachea over the suprasternal notch. Quantitative waveform capnography was used as the criterion standard for confirmation of tracheal intubation. The main outcome was the concordance between the T.R.U.E. and the capnography.

A total of 112 patients were included in the analysis, and 17 (15.2%) had esophageal intubations. There was a high degree of agreement between the T.R.U.E. and capnography. The sensitivity, specificity, PPV, negative predictive value, and the overall accuracy of the T.R.U.E. were all very high. The median operating time of the T.R.U.E. was only 9.0 s. The application of the T.R.U.E. provides a brand new method for confirmation of endotracheal intubation.

On the other hand, Chou et al. also demonstrated that the T.R.U.E. can be applied to intubation during CPR without interruption of chest compressions.[10] Real-time tracheal ultrasonography is an accurate method for identifying endotracheal tube position during CPR without the need for interruption of chest compression. Tracheal ultrasonography in resuscitation management may serve as a powerful adjunct in trained hands.

Role of ECMO CPR

ILCOR CoSTR 2015 suggested ECMO CPR is a reasonable rescue therapy for selected patients with cardiac arrest when initial conventional CPR is failing in settings where this can be implemented (weak recommendation, very-low-quality evidence).[4,8] ECMO CPR is most popular in Asian countries such as Taiwan, Japan and Korea. Taiwan may account for nearly half of the IHCA patients in the reported series. Extracorporeal life-support as an adjunct to cardiac resuscitation has shown encouraging outcomes in patients with cardiac arrest. Among cited publications. Chen et al. aimed to assess whether extracorporeal CPR was better than conventional CPR for patients with IHCA of cardiac origin.[11] They did a 3-year prospective observational study on the use of extracorporeal life-support for patients aged 18–75 years with witnessed IHCA of cardiac origin undergoing CPR of more than 10 min compared with patients receiving conventional CPR. A matching process based on propensity-score was done to equalize potential prognostic factors in both groups, and to formulate a balanced 1:1 matched cohort study. Of the 975 patients with IHCA events who underwent CPR for longer than 10 min, 113 were enrolled in the conventional CPR group and 59 in the extracorporeal CPR group. Unmatched patients who underwent extracorporeal CPR had a higher survival rate to discharge and a better 1-year survival than those who received conventional CPR. Between the propensity-score matched groups, there was still a significant difference in survival to discharge, 30-day survival, and 1-year survival favoring ECMO CPR over conventional CPR.

Role of Steroids

For IHCA, the TF was unable to reach a consen-

sus recommendation for or against the use of steroids in cardiac arrest. In contrast, it is against the routine use of steroids during CPR for OHCA (weak recommendation, very-low-quality evidence). To understand whether intravenous administration of hydrocortisone will be of benefit to OHCA patients, Tsai et al.[12] conducted a prospective, nonrandomized, open-labeled clinical trial to enroll 97 consecutive patients to test their serum adrenocorticotropic hormone and cortisol levels and analyze the possible effect of hydrocortisone 100 mg for 36 of them. The hydrocortisone group had a significantly higher ROSC rate than the nonhydrocortisone group, but there was no significant difference between the two groups in 1- and 7-day survival and hospital discharge rates. They concluded that hydrocortisone administration within 6 minutes of emergency department arrival may be associated with an improved ROSC rate in OHCA patients. The lacking in evidence of improving short-term and long-term survival shown in this study provides the evidence of the final treatment recommendation of steroids for OHCA patients.

Organ Donation

Resuscitation from cardiac arrest is not always successful, and it is always questioned whether the non-surviving patients can become organ donors in consideration of the potential injury to organs during the period of cardiac arrest. ILCOR ALS TF considered there were two separate situations. In the first situation, an individual who dies after initially successful CPR may become an organ donor after brain death has been judged or having withdrawal of life-supporting therapy. Second, an individual may have in response to resuscitation in a medical center with a rapid response system that allows harvesting of organs. Most recipient death was considered equivalent to graft failure, whereas the primary outcomes were graft function in kidney transplants because recipients can survive with renal replacement therapy even with graft failure. The studies enrolled for evidence review have to be carefully selected to avoid big bias.

ILCOR ALS TF therein recommend that all patients who have restoration of circulation after CPR and who subsequently progress to death be evaluated for organ donation (strong recommendation, low-quality evidence). Heart transplantation, for example, can now be performed with donors and recipients with more extended criteria due to improvements in surgical techniques and postoperative care. Hsu et al. reported the results of heart transplantation with marginal donors and recipients in a tertiary hospital in Taiwan from June 1993 through June 1998.[14] At that time, marginal recipients were defined as those with high pulmonary vascular resistance (> 6 Wood units), severe renal impairment (serum creatinine > 2 mg/dL and creatinine clearance < 50 mL/min), or severe hepatic dysfunction (alanine transaminase [ALT] and aspartate transaminase [AST] > 100 IU/L or serum bilirubin > 2.5 mg/dL). Marginal donors were those with any of the following conditions: old age (> 40 years), size mismatch (donor/recipient body weight ratio < 0.8), history of chronic alcohol use, previous CPR and hypotension, hepatitis B or C virus positivity, coronary artery disease, high-dose dopamine (> 10 μg/kg/min), or prolonged allograft ischemic time (> 4 hours). Of the 79 transplantations performed, 45 (58%) involved marginal recipients or donors. The short-term (30 days) and long-term (1 year or 5 years) survival rates did not differ significantly between cases involving marginal donors or recipients and those involving nonmarginal donors and recipients. This Taiwan experience demonstrated that heart transplantation may be performed in marginal recipients and donors, with acceptable operative mortality.

Pediatric BLS and ALS

Pediatric life support includes pre-cardiac arrest care, BLS care during cardiac arrest, ALS care during cardiac arrest, and post-cardiac arrest care. The new development includes improvement of outcomes of OHCA kids when fever is prevented, and a period of moderate therapeutic hypothermia or strict maintenance of normothermia is provided; the use of restricted volumes of isotonic crystalloid leading to improved outcomes from pediatric septic shock in specific settings; and the use of lidocaine or amiodarone for treatment of shock-resistant pediatric ventricular fibrillation/pulseless ventricular tachycardia (VF/pVT).[15]

The post-resuscitation care section focuses on specific interventions and predictive factors to optimize the recovery of children after cardiac arrest and ROSC. Although almost all of the studies showed shock occur commonly in infants and children after ROSC, Lin et al.[16] have demonstrated clearly the prognostic factors for these age groups.

Lin et al.[16] retrospectively evaluated the medical records of 228 children who presented to the emer-

gency department without spontaneous circulation following non-traumatic OHCA during the period January 1996 to December 2008. Among these children, 80 achieved sustained ROSC for at least 20 min. The post-resuscitative clinical features during the first hour after achieving sustained ROSC that correlated with survival, median duration of survival, and death were analyzed. The favorable prognostic factors associated with survival rate and duration included sinus cardiac rhythm, normal heart rate, normal blood pressure, urine output > 1 mL/kg/h, normal skin color, lack of CPR-induced rib fracture, initial Glasgow Coma Scale score > 7, and duration of in-hospital CPR ≤ 10 min.

On the other hand, the outcome of children with traumatic OHCA is poor, and the information regarding survival in the post-resuscitative period is limited. Lin et al.[17] underwent another study to determine the clinical features during the early post-resuscitative.

period defined as the first hour after achieving sustained ROSC that may predict survival or neurologic outcomes in children with traumatic OHCA in 3 medical centers from January 2003 to December 2010. The favorable prognostic factors included the following: high or normal blood pressure, normal heart rate, sinus rhythm, urine output of more than 1 mL/kg/h, and noncyanotic skin color. Initial Glasgow Coma Scale score of greater than 7 predicted a good neurologic outcome in survivors. These clinical features, which reflected initial cardiac output and end-organ perfusion, can predict the chance of survival.

As to the post-resuscitation care, brain injury after resuscitation is associated with high morbidity and mortality in children. Therapeutic hypothermia has theoretical benefits on brain preservation. It has been shown to be effective in improving neurological outcomes after adult ventricular arrhythmia-induced cardiac arrest and neonatal asphyxia. Lin et al.[18] demonstrated a retrospective cohort study in a tertiary pediatric intensive care unit between January 2010 and June 2012. All children from 2 months to 18 years of age with resuscitation and a history of at least 3 minutes of chest compressions with survival for more than 12 hours after return of circulation were included for study. The children in the therapeutic hypothermia group were designed to receive cooling to 33 degrees centigrade for 72 hours. It's concluded that therapeutic hypothermia was associated with increased survival rate after pediatric resuscitation.

Education, Implementation and Training (EIT)

The ILCOR EIT TF organized its work into 3 major sections:[19] (1) BLS training, (2) ALS training, and (3) implementation. It is recommended BLS training for individuals (family or caregivers) caring for high-risk populations, based on the willingness to be trained and the fact that there is low risk of harm and high potential of benefit. Team and leadership training should be included as part of ALS training for healthcare providers. Compared with standard retraining intervals of 12 to 24 months, more frequent manikin-based refresher training for students of ALS courses may better maintain competence. The optimal frequency and duration of this retraining has not yet been determined.

As to implementation, specialist cardiac arrest centers should be implemented as part of a regionalized system of care. Technology, including social media, may serve to notify citizen CPR responders of cardiac arrests, thereby shortening the time to onset of bystander CPR and defibrillation, which can be achieved before EMS arrives. Hospitals consider the introduction of an early warning scoring system or rapid response team/medical emergency team system to reduce the incidence of IHCA and in-hospital mortality. Data-driven, performance-focused debriefing of rescuers after both IHCA and OHCA may help to improve subsequent performance.[19] Specially, the data showed implementation of resuscitation guidelines within organizations that provide care for patients in cardiac arrest can improve quality of bystander CPR performance and short-term outcomes with very-low-quality evidence but the study from Taiwan revealed neutral results.[19,20] Hung et al. conducted an observational cohort study of all OHCA patients seen by the EMS during the period before (November 2003 to October 2005) and after (May 2006 to October 2008) implementing the new resuscitation guidelines depending on ILCOR CoSTR 2015 and did not observe any improvement in survival after implementing the new guidelines.[20] Independent factors of survival-to-hospital discharge are witnessed arrest and initial rhythm with VF/pVT. Because the rates of VF/pVT and bystander CPR in Asia are low, popularizing CPR training programs and increasing the rate of bystander CPR may be more important for improving

OHCA survival rates than frequent guideline changes.[20]

First Aid

There is a new section called "First Aid" in ILCOR CoSTR 2015. The important topics include use of supplementary oxygen for purposes other than patients with chest pain, positioning for shock and recovery, use of bronchodilators for patients with asthma who have acute shortness of breath, use of a second dose of epinephrine for anaphylaxis, and the administration of aspirin for chest pain.[21]

The important recommendations in this section were as follows. There was no evidence to change current practice of supplemental oxygen use by first aid providers. The supine position, instead of lateral recumbent position, was recommended as the recovery position to facilitate airway management. The position recommended for the patient in shock remains the supine position, whereas passive raising of the legs between 30° and 60° may have a transient (7 minutes or less) benefit. Assisting with inhalation of bronchodilators is recommended for patients with asthma attack. The use of a second dose of epinephrine via autoinjector is beneficial when a first dose fails to improve symptoms of anaphylaxis. It's also recommended for the first aid providers to use of Stroke Assessment Systems to aid with recognition of stroke to decrease in time between symptom onset and arrival at hospital. Dietary sugar products were not as effective as glucose tablets for relief of hypoglycemia, but there were still benefit and potential usefulness in cases where glucose tablets are not available.

Important trauma topics included the first aid management of hemorrhage, angulated fractures, open chest wounds, burns, dental avulsion, cervical spinal motion restriction and the recognition of concussion. The study from Taiwan provided some evidence for use of cervical spine motion restriction in the patients with trauma.

Lin et al. retrospectively reviewed patients who sustained lightweight motorcycle injuries, assumed to have been at a low velocity, with incidence of cervical spine damage, from a single medical center's trauma registration from 2008 to 2009.[22] There was no significant correlation of cervical spine injury between the patients who had had the neck collar applied and those who had not. The length of stay in intensive care unit was longer in the patients who had the neck collar applied, but the total hospital length of stay was the same as those who did not receive neck collars. The incidence of cervical spinal injuries in the urban area lightweight motorcyclists is very low. Prehospital protocol for application of a cervical collar brace to people who have sustained a lightweight motorcycle accident in the urban area should be revised to avoid unnecessary restraint and possible complications.

Because there is a growing body of evidence showing complications related to use of neck collars and concern for potential secondary injury due to neck movement during application, ILCOR CoSTR 2015 suggests against the use of neck collars by first aid providers. The first aid providers may not be able to distinguish between high- and low-risk criteria for spinal injuries, so it is recommended that formal spinal motion restriction in high-risk individuals is best accomplished by trained emergency medical rescuers or healthcare professionals.

Conclusion

Taiwan is celebrating the 20th anniversary of emergency physician board certification. In the past 20 years, there are numerous distinguished basic and clinical studies in the field of emergency medicine and resuscitation. This article only reviewed the publications cited in ILCOR CoSTR 2015 because of word limitation. The author would like to express appreciation and respect to other investigators who are engaged in emergency medicine and resuscitation science and believe more and more emergency physicians in Taiwan will become international scholars to attend and promote worldwide collaboration for quality improvement of resuscitation and saving more lives.

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