The acronym of resuscitation ultrasound: RCC – Resume chest compressions!

Acronyms and point-of-care ultrasound “protocols”

Resuscitation ultrasound is a subgroup of point-of-care ultrasound (PoCUS) procedures to improve resuscitation efforts. It can lead to interventions and mainly differs from expert transthoracic echocardiography or laboratory ultrasound of routine diagnostics: Resuscitation ultrasound should be simple, trainable by a broad number of doctors handling acute medical problems. Thus, rather than imaging experts, resuscitation experts are required.

Clinical scientists start research in this field often with an acronym naming a “protocol”. Such protocols introduce novel PoCUS approaches and contain a limited number of sonograms to be obtained in a specific order with the aim to understand the actual physiological state of a patient [1]. Resuscitation related protocols are e.g. TRUE for airway management, FAST/E-FAST in trauma, LUS for lung ultrasound, FEEL, SHoC or RUSH in shock. Early protocols (e.g. FATE) describe static applications are check of Cardiac and cava view (subxiphoid evaluation of cardiac contour and activity, as well as size of IVC), check Airway (confirmation of endotracheal tube position) and check Breathing – (asymmetry in bilateral ventilation). They found diagnostic accuracy of novel ultrasound procedures and the struggle for good images under time pressure, there is considerable danger of distraction of single providers, and the whole team to stare at images, playing with a new toy. Furthermore, cognitive load increases: When needing to integrate information from EKG, blood pressure/pulse check and resuscitation ultrasound – questioning, if this is a reliable finding or diagnosis while observing suboptimal images, and the question of what to do with this novel information. This obviously calls for a procedural approach of any resuscitation ultrasound protocol.

US-CAB or ALS-US-CAB or?

The US-CAB by Lien and coworkers published in this issue [4], slightly moves into this direction. By design, the proposed ultrasound applications are check of Cardiac and cava view (subxiphoid evaluation of cardiac contour and activity, as well as size of IVC), check Airway (confirmation of endotracheal tube position) and check Breathing – (asymmetry in bilateral ventilation). They found diagnostic accuracy for A and B, and rapid identification of esophageal as well as endobronchial tube misplacements as expected [2], found cardiac abnormalities to be treated and were able to draw a timeline for the prognostic value of resuscitation ultrasound regarding return of spontaneous circulation. This significantly adds to previous outcome data [12].

Regarding procedural aspects, those results are promising, because time data are available for single ultrasound applications and – most importantly – cardiac views took no more than the arbitrarily set of a cut-off of ten seconds. The authors conclude that their protocol was feasible and ALS-conformed. But again, single parts of the protocol seem to be interchangeable, and specific alignment of C-A-B versus A-B-C would not make any difference. The IFEM working group for SHoC has undertaken a two step-approach, resulting in a hierarchy of findings based on review of the local epidemiology of reversible causes in cardiac arrest and peri-arrest situations, and consequently, a hierarchy of ultrasound applications, that is, another protocol. It even suggests a specific task alignment. But this has yet to be validated [13].

Training resuscitation ultrasound is mandatory

Unfortunately, the study by Lien et al. failed to measure duration of interruptions of chest compressions, although it seemed to be reasonable to assume those were resumed promptly. However, it has to be recognized, that providers were obviously instructed to minimize interruptions. How should this be trained, and how much training is
Table 1
Core elements of introductory course training including Resuscitation Ultrasound, minimum time requirements in Germany Society of Ultrasound in Medicine (DEGUM), Emergency Ultrasound, Society of Anesthesiology and Intensive Care Medicine (DGAi). Note that this does not imply competence and proficiency at this stage.

<table>
<thead>
<tr>
<th>Intervention / Procedure</th>
<th>ERC 2015 recommendations</th>
<th>Novel ERC resuscitation ultrasound workshop format</th>
<th>Scientific data for CPR available</th>
<th>Minimum time for introductory training within German systems (hrs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A: Ultrasound for tracheal (and esophageal) tube detection</td>
<td>X</td>
<td>X (priority)</td>
<td>X</td>
<td>1.5 (0.5 theory, 1 hands-on)</td>
</tr>
<tr>
<td>B: bi- or unilateral ventilation (lung sliding, lung pulse, B-Lines, rule out or in PTX)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>1 (0.5 + 0.5 theory, hands-on)</td>
</tr>
<tr>
<td>C: peri-arrest cardiac ultrasound (subxiphoidal sweep with 4-chambers view to IVC, short axis and back)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>4 (2 theory, 2 hands-on) within a one-day (8 h) course</td>
</tr>
<tr>
<td>Training of combining and processing</td>
<td>not yet</td>
<td>X</td>
<td>Lien et al. [14]</td>
<td>1 + 1</td>
</tr>
<tr>
<td>A-B-C (Airway Ultrasound exam plus C)</td>
<td></td>
<td></td>
<td></td>
<td>11</td>
</tr>
</tbody>
</table>

As the training, so should our scientific efforts shift away from the imaging back to train continuity of the ALS and quality of CPR but not erase image acquisition and interpretation training. There it is, our most important outcome measure.

Conflict of interest
There are no conflicts of interest to declare.

References


Domagoj Damjanovic
Department of Cardiovascular Surgery, University Heart Center Freiburg, Faculty of Medicine, University of Freiburg, Germany

Tobias Schröder

Raoul Breitkreutz
Scientific Network SonoABCD at Emergency Department, Klinikum Frankfurt Hoechst, Academic Teaching Hospital of the University of Frankfurt and Dept. of Anaesthesiology, Vulpiaus Klinik, Bad Rappenau, Academic Teaching Hospital of the University of Heidelberg, Germany

⁎ Corresponding author.