



## Editorial

## Ultrasound confirmation of nasogastric tube placement in the pre-hospital setting: So why is this of any interest?

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In this issue, Chenaitia et al. describe a new point-of-care ultrasound (POCUS) application brought into the pre-hospital arena that has potential for improving patient outcome and impacting care on arrival at the receiving facility.<sup>1</sup> High positive predictive value of focused ultrasound assessment of nasogastric (NG) tube tip positioning in the stomach was accomplished by physicians on ambulances who responded to critically ill patients, all of whom required intubation at the scene. Emergency intubations are frequently associated with significant stomach distention from 'bagging' the patient to maintain oxygenation prior to tracheal intubation.<sup>2</sup> Use of adjunct airways, such as the laryngeal mask airway, before tracheal intubation is even more likely to result in a distended stomach.<sup>3</sup> Despite the non-randomized, focused nature of this research and lack of any outcome data, the study merits additional comment.

Why should anyone care that ultrasound can be used to confirm nasogastric tube position in the pre-hospital setting? To colleagues who see patients only several days after hospital admission, it may have little relevance. For those who are on the front lines in emergency departments (EDs), intensive care units (ICUs), and operating suites this is an important topic. There is no doubt that intubated patients arriving in an ED can benefit greatly from an accurately placed NG tube and evacuation of the stomach. A stomach that is full of partially digested food and fluid presents a constant risk of aspiration, even in the presence of a correctly placed tracheal tube.<sup>4</sup> The air filled, distended stomach decreases chest compression efficacy in patients undergoing CPR.<sup>5</sup> Additionally, oxygenation, coronary blood flow and venous return are impaired, which can tip the balance in an unstable patient.<sup>6</sup> The growing obesity epidemic in westernized countries means that clinicians are frequently faced with 150 kg patients with round torso shapes that make the delivery of effective ventilation and chest compressions almost impossible. The presence of a distended stomach makes the challenge even greater, with some patients being effectively resistant to CPR efforts. Evacuation of the stomach can have a significant effect on patient resuscitation, especially in such challenging patients.<sup>7</sup>

Over the last century, prehospital medicine has advanced more slowly than hospital-based practice. There was good reason for this: most equipments were massive, costly and could be located only in a hospital. The classic model just 50 years ago was placing patients into little more than a delivery van and transporting them to whatever care was available nearby. Emergency departments hardly existed, and trauma centres were something of the future. However, there has always been recognition that some disease processes benefit from rapid, expert and critical intervention. This includes definitive airway management, vascular access, CPR and advanced trauma care, among others. Many patients in the pre-hospital setting would also benefit from advanced imaging, and in fact any imaging at all. While plain X-ray, CT and MRI are unlikely to ever be found in an ambulance or a provider's hip pocket, ultrasound is already there.<sup>8</sup>

To date, ultrasound in the prehospital setting has been used to improve care for trauma patients, direct CPR, confirm tracheal intubation and assist in vascular access.<sup>9–12</sup> However, prehospital ultrasound use is still in its infancy. By contrast, in hospital-based medicine, POCUS is now found from the ED to the operating room and ICU. Regardless of where it is used, one of the greatest impacts of POCUS is in the acutely ill or unstable patient. POCUS enables rapid patient assessment and the provider is able to rule out multiple critical pathologies and even guide resuscitation efforts as well as other procedures.<sup>13,14</sup> It is clear to me, as someone who resuscitates patients every day, that for some key disease states, earlier intervention can bring the best results. This includes tension pneumothorax, respiratory arrest, cardiac arrest, severe hemorrhage from a wound and multiple other examples. However, in the vast majority of cases, hospital based physicians are the second or third set of providers that the unstable patient encounters. Much like releasing a tension pneumothorax before it caused cardiac arrest, emptying an air and fluid filled, distended stomach can help tremendously downstream in the patient's care.

There are many parts of the world where physicians are rarely found on ambulances, either ground or air. This is the case in the United States. In fact, there is great variability in the type of care provided by the EMS, depending on location and available funding. Some systems are capable of rapid sequence induction and intubation, and high-end resuscitation efforts, while others rarely secure the airway or obtain vascular access. Thus, the question of whether point-of-care ultrasound could be used by EMS systems without physicians could be considered open and is not addressed in this study. However, previous work has shown that EMTs are able to adequately learn POCUS techniques and can use

them in the field.<sup>15</sup> They are able to perform FAST examinations and rule out pneumothorax.<sup>10</sup> This one critical ability could eliminate unneeded needle thoracostomies in a surprisingly high percentage of patients.<sup>16</sup>

In this study, ultrasound had a positive predictive value of 100%. This is critical when introducing something new to the pre-hospital arsenal. Recent years have seen a call for the return of the 'scoop and run' approach after several disappointing pre-hospital studies refocused attention on the utility of pre-hospital interventions.<sup>17</sup> Specifically, there is concern about any possible delay to definitive treatment that may result from failed attempts at advanced procedures and interventions. The ability to directly visualize the tip of the NG tube in the stomach and have a 100% positive predictive value should reassure anyone that NG tube placement could be accurate and as safe as in a hospital setting. While more research needs to be performed to study the effect on outcome of POCUS use in the pre-hospital setting, it clearly has some potential use already. There are still critical questions about training standards and skill retention for EMTs as well as physicians who practice POCUS in the pre-hospital setting. Future research will have to answer whether or not NG tube placement and stomach evacuation in the field result in significant delays and what impact this has on patient outcome. Since ultrasound image and video transmission from ground and air ambulances is already possible and live operator guidance has been confirmed using basic technology this may be a way to augment the skills and experience in the prehospital setting by consulting a more experienced hospital-based physician in real time.<sup>18</sup> There are multiple efforts under way to create more functional ultrasound units for austere environments like crash scenes, disasters and tactical situations. These will likely include automation that can direct the user and will one day help analyze the images obtained. Confirmation of NG tube placement may also be a natural addition to the EFAST that has been well described and fits many prehospital needs. Regardless of its ultimate use distribution, this application and study is a reflection on the robustness of modern prehospital care.

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