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## CASE REPORT

### Typhoid intestinal perforation: Point-of-care ultrasound as a diagnostic tool in a rural Ugandan Hospital



#### *Perforation intestinale au cours d'une fièvre typhoïde : l'échographie au point de service comme outil de diagnostic dans un hôpital rural ougandais*

Jordan Chanler-Berat<sup>a,\*</sup>, Alfunsi Birungi<sup>b</sup>, Brad Dreifuss<sup>c</sup>, Ronald Mbiine<sup>b</sup>

<sup>a</sup> Department of Emergency Medicine, New York Methodist Hospital, Brooklyn, NY, USA

<sup>b</sup> Nyakibale Hospital, Uganda

<sup>c</sup> Global Emergency Care Collaborative, University of Arizona, Tucson, AZ, USA

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**Introduction:** Point-of-care ultrasound (POCUS) in resource-limited areas has demonstrated utility in the hands of physicians and may be useful for non-physician providers to learn as well.

**Case Report:** An 11 year old male presented with abdominal pain and diffuse abdominal tenderness to a remote Emergency Centre (EC). An Emergency Care Practitioner, a non-physician emergency care provider with limited ultrasound training, used bedside ultrasonography and alerted the on-call surgeon of complex intraperitoneal fluid representing perforated typhoid, which expedited the patient's care.

**Discussion:** There is scant literature involving cases of non-physician use of POCUS, particularly in the emergency care setting. This case demonstrates the potential benefits of training these providers in POCUS.

**Introduction:** L'échographie au point de service (EPS) dans les zones à ressources limitées a démontré son utilité lorsqu'elle est effectuée par des médecins, mais son enseignement à des fournisseurs non-médecins peut également se révéler utile.

**Case Report:** Un garçon âgé de 11 ans s'est présenté avec des douleurs abdominales et une sensibilité diffuse de l'abdomen à un centre d'urgence (CU) éloigné. Un praticien de soins d'urgence, fournisseur non-médecin de soins d'urgence disposant d'une formation limitée en échographie, a utilisé l'échographie au chevet du malade et a alerté le chirurgien de garde concernant un fluide intrapéritonéal complexe caractéristique d'une perforation due à la typhoïde, accélérant les soins administrés au patient.

**Discussion:** La littérature impliquant des cas d'utilisation de l'EPS par des non-médecins est peu abondante, en particulier dans le cadre des soins d'urgence. Ce cas démontre les avantages potentiels de la formation de ces fournisseurs à l'EPS.

#### African relevance

- This case demonstrates the utilisation of bedside ultrasound for complications of a tropical infectious disease.
- It focuses attention on the potential to increase African healthcare provider skills using bedside ultrasound.

#### Introduction

The utility of point-of-care ultrasound (POCUS) in austere environments has been demonstrated in the literature. Particularly in settings where advanced imaging is either lacking or extraordinarily difficult and costly to obtain, ultrasound can help providers rapidly screen and diagnose patients. We report a case in which a non-physician trained in POCUS

was able to detect bowel perforation with ultrasound. We believe this demonstrates the potential utility of teaching bedside ultrasound to all providers in resource-limited Emergency Centres (ECs).

#### Case report

An 11-year-old male with no reported medical history presented to the EC complaining of abdominal pain for one week associated with anorexia, dark emesis, diarrhoea, and intermittent fevers. He had been started on treatment for typhoid by a local outpatient clinic though antibiotic choice, dose, and compliance was not reported. The patient came to the EC because of worsening abdominal pain. Vital signs were documented in the EC as temperature of 36.2, pulse of 109, blood pressure of 100/90, respiratory rate of 32, and oxygen saturation of 91% on room air.

The patient was appearing ill but alert. He appeared dehydrated. Neck was supple. His abdominal exam revealed mild

\* Correspondence to Jordan Chanler-Berat. [belgian126@gmail.com](mailto:belgian126@gmail.com)

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distension, decreased bowel sounds, and moderate diffuse tenderness without acute peritoneal signs. The emergency care practitioner (ECP), a non-physician clinician trained in emergency medical care and POCUS, performed a FAST (Focused Assessment with Sonography in Trauma) to assess for free fluid in the peritoneum.

The bedside ultrasound revealed findings consistent with free fluid. The fluid was complex (echogenic and heterogeneous) and was visualised bathing the liver in the right upper quadrant (see Fig. 1). Other images showed complex fluid in the peri-splenic view as well as anterior to aperistaltic small bowel. The complexity and large volume of free fluid concerned the ECP, who had learnt during training that this could represent bowel contents. He immediately called the surgeon. Radiographs were unavailable at that time. In his discussion with the surgeon, the only physician covering the 169-bed hospital, the ECP noted his concern for the ultrasound findings and believed the patient required emergent laparotomy. The surgeon came to the EC within 25 min. Based on his assessment supplemented by the ultrasound findings, the patient was taken for immediate laparotomy. The patient was given intravenous fluids and antibiotics and sent directly for the operation after spending approximately 2.5 h in the EC. He remained haemodynamically stable.

The surgical findings were intraperitoneal “gas and purulent, foul smelling peritoneal fluid [2 L] with faecal matter.”

There were two small (<1 cm) perforations of the terminal ileum and diffuse fibrinous exudates covering the small bowel and mesentery. The findings were consistent with perforated intestine secondary to *Salmonella typhi*, which was the surgeon’s final diagnosis. The patient had ileal resection and ileo–transverse anastomosis following large volume saline peritoneal lavage and was started on broad spectrum antibiotics.

At 10 days post-op the patient had improved dramatically. He had been tolerating his diet, his fever had resolved, and he was ambulating. The patient was subsequently discharged from the hospital feeding well and without fever, significant pain, or any other complications.

## Discussion

We have established a unique training programme teaching non-physician emergency care in a rural, resource-limited hospital setting within sub-Saharan Africa. The curriculum includes 12 h of didactic teaching in POCUS as well as hands-on clinical teaching by visiting emergency physicians from the United States. Once trained, these providers often independently utilise these skills in order to add important information to their clinical decision making. The clinical setting and detailed curriculum of our programme has been described elsewhere.<sup>1</sup>



**Figure 1** Morrison's pouch view demonstrating large-volume complex free fluid around the liver.

The FAST is one of the most commonly utilised ultrasound modalities in low-income countries.<sup>2</sup> The FAST was initially validated to detect peritoneal blood in blunt trauma, but has demonstrated utility in detecting multiple sources of free peritoneal fluid.<sup>3</sup> Understanding the broad indications for FAST is an aspect of ultrasound training our ECPs receive. Perforation of the intestine is a known but rare complication of typhoid fever with an incidence of 3% worldwide and can be difficult to detect. Perforated typhoid can occur in a patient with only vague abdominal tenderness and distension, confounding the diagnosis, especially since abdominal rigidity may not be present.<sup>4</sup>

In this case, POCUS indicated perforation based on the direct finding of complex free fluid (echogenic fluid filling the potential space of the peritoneum). The ECP utilised training on how to detect free peritoneal fluid using the FAST exam. He did this independent of direct guidance, demonstrating the confidence and skill that the ultrasound training provided. The ECP had very high suspicion for perforated intestine secondary to typhoid, which led to rapid consultation of the surgeon. Without access to a non-physician emergency provider trained to perform and interpret a FAST, this patient would likely have been placed in the ward overnight. This was standard prior to our education programme. He would not have received the definitive emergent surgical intervention.

In the case we have reported, an ECP with limited experience detected a surgical emergency using POCUS. While there are various studies and reports showing the clear benefits of POCUS in the hands of physicians in resource limited settings, this training may also benefit non-physician providers, such as in this case.<sup>5-8</sup> Previously, our unique training programme reported the clinical utility of POCUS and an ECP diagnosing intussusception using POCUS.<sup>9,10</sup> There is a paucity of literature, however, of similar cases reporting non-physician utilisation of POCUS despite their increasing prevalence as providers.

### Conclusion

POCUS is a valuable diagnostic tool in low resource settings. Its utility in the hands of physicians in these setting has been demonstrated and published. This report suggests that non-physician clinicians trained in POCUS may also be capable of using this tool to aid clinical decision making and expedite care. Further systematic study of POCUS use by these providers is warranted.

### Conflict of interest

The authors declare no conflict of interest.

### Dissemination of results

This case report was presented through a poster presentation at NY Methodist Hospital's research forum and informally discussed in teaching rounds at Nyakibale Hospital.

### Author contributions

J.C.-B. collected data from the chart review and drafted the report. A.B. collected ultrasound imaging and performed text editing. B.D. performed draft revision and content review. R. M. provided surgical details and a review of the case follow up.

### References

1. Hammerstedt H, Maling S, Kasyaba R, et al. World health assembly resolution 60.22. *Ann Emerg Med* 2014;**64**(5):461-8.
2. Heller T. Focused assessment with sonography for HIV-associated tuberculosis (FASH): a short protocol and a pictorial review. *Crit Ultrasound J* 2012;**4**(1):21.
3. Coppolino FF, Gatta G, Di Grezia G, et al. Gastrointestinal perforation: ultrasonographic diagnosis. *Crit Ultrasound J* 2013;**5** (Suppl. 1):S4.
4. van Basten JP, Stockenbrügger R. Typhoid perforation. A review of the literature since 1960. *Trop Geogr Med* 1994;**46**(6):336-9.
5. Sippel S, Muruganandan K, Levine A, et al. Review article: use of ultrasound in the developing world. *Int J Emerg Med* 2011;**4**:72.
6. Bussmann H, Koen E, Arhin-Tenkorang D, et al. Feasibility of an ultrasound service on district health care level in Botswana. *Trop Med Int Health* 2001;**6**(12):1023-31.
7. Hernwood PC, Rempell JS, Liteplo AS, et al. Point-of-care ultrasound use over six-month training period in Rwandan district hospital. *Ann Emerg Med* 2013;**62**(4):S77-78.
8. Van Hoving DJ, Lamprecht HH, Stander M, et al. Adequacy of the emergency point-of-care ultrasound core curriculum for the local burden of disease in South Africa. *Emerg Med J* 2013;**30** (4):312-5.
9. Stolz LA, Kizza H, Little K, et al. Intussusception detected with ultrasound in a resource-limited setting. *Lancet* 2013;**381** (9882):2054.
10. Stolz LA, Muruganandan KM, Bisanzo MC, et al. Point-of-care-ultrasound education for non-physician clinicians in a resource-limited emergency department. *Trop Med Int Health* 2015;**20** (8):1067-72.