

Clinical Utility of Point-of-Care Ultrasound at a Western Himalayan Clinic and in the Backcountry: A Community Experience

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Abstract

The Himalayan Health Exchange's Wilderness Medicine program took place June 8-28, 2024, in the Western Himalayan village of Tuan, Himachal Pradesh, India. Three U.S. emergency medicine physicians led the program and facilitated healthcare students' learning and application of wilderness medicine skills. Notably, students learned the basics of point-of-care ultrasound (POCUS) through a lecture and a practical skills session. Students then had the opportunity to observe the physicians' use of POCUS at a clinic that the group held for local villagers. The emergency medicine physicians primarily used POCUS to assess abdominal and thoracic complaints. Depending on the findings, patients were given reassurance, medication, or instructions to follow up at the nearest appropriate hospital for further evaluation. Students also learned how POCUS can be used in the backcountry. Since POCUS is lightweight and can be packed on backpacking trips, it may be used to assess someone with a medical emergency. A backcountry ultrasound may help determine whether a person should evacuate and seek definitive medical attention. My greatest takeaway is that POCUS has great clinical utility because it can enable providers to quickly and non-invasively assess the severity of a patient's condition and make an informed decision in a resource-limited setting.

Introduction

Program Overview: The Himalayan Health Exchange's Wilderness Medicine program took place June 8-28, 2024, in the Western Himalayan village of Tuan, Himachal Pradesh, India. The program aimed to educate healthcare professional students about wilderness medicine knowledge and to gain experience with practical skills. In addition, the students and their three emergency medicine physician leaders held a few clinic days for the local villagers. Both the learning and clinic components took place in the Western Himalayan backcountry, with the nearest hospital roughly 40 km away.

Learning POCUS: As part of the experiential learning, students learned the basic features of POCUS, including its operating instructions, normal findings, and how to assess for abnormal imaging. When learning POCUS, the physicians taught the students the setup, and the operating instructions. Then, students learned two types of POCUS exams: the extended Focused Assessment of Sonography for Trauma (eFAST) and a general cardiac exam.

POCUS Exam: The eFAST evaluates the right and left upper abdominal quadrants and pelvic window for free peritoneal fluid (or hemorrhage), the subxiphoid view of the heart for pericardial tamponade, and the thoracic window for pneumothorax and hemothorax.¹ The general cardiac exam evaluates the integrity of heart structures and blood flow. Each student had the opportunity to practice the eFAST exam on other group members.

POCUS Applications: POCUS has a variety of uses in resource-limited settings. It can help providers make a patient's care plan in a rural clinical setting. For instance, POCUS can help determine whether a patient needs a referral to a hospital, medication, or reassurance. Additionally, POCUS can be used on a backcountry trip when a person experiences a medical emergency. POCUS findings can help determine whether a person can continue their trip or needs to evacuate and seek definitive medical attention.

Materials

Our physicians used a Butterfly iQ+ probe ultrasound device. This digital model plugs into a smart phone or tablet to project the scan. The Butterfly iQ+ has an app that can be downloaded onto a smart device. The app contains all the ultrasound controls and the viewing window.

Learning Experience



Location: village of Tuan, Himachal Pradesh, India



Students learning POCUS at a cabin in the village of Tindi, Himachal Pradesh, India. We camped here for one night while en route to our camp in Tuan.



Group picture of physicians, students, and some of the Himalayan Health Exchange staff.

Community Experience



Students learned how to use the Butterfly iQ+ probe. The physicians used this device to assess the patients at our clinic.



Dr. Juliana Thong performing POCUS on a patient at the clinic in Tuan



Students taking a patient history with Himalayan Health Exchange staff serving as a translator

Discussion

At the clinic, the physicians mainly used POCUS to assess patients with abdominal or thoracic complaints, such as pain. None of the patients' ultrasounds had abnormal findings. These patients were given medications or reassurance to manage symptoms. Patients were advised to follow up at the nearest appropriate hospital if medications did not alleviate their symptoms or if their symptoms worsened.

Advantages to POCUS:

1. Portable ultrasound devices cost a few thousand dollars and are relatively less expensive than other medical imaging devices.
2. The compactness of Butterfly iQ+ makes it convenient for long-distance travel and backpacking trips. Since the device is easily portable, it can be used for immediate assessment at the patient's side.
3. In a resource-limited setting, POCUS can assess for major medical emergencies, such as major abdominal hemorrhage, cardiac tamponade, or pneumothorax.
4. POCUS findings can help providers make an informed decision about a patient's treatment plan. On a backcountry trip, POCUS findings could determine whether one can continue on their trip. In a rural clinical setting, POCUS findings can guide the provider's decision to refer a patient to a hospital that could be hours away, give medications, or provide reassurance.

Challenges to POCUS:

1. Portable ultrasounds have a limited battery life. At our campsite in Tuan, our ultrasound was charged with portable battery banks. However, there was an instance where a patient had to wait about an hour for the ultrasound to charge to a functioning level.
2. POCUS is only helpful to providers with adequate training.

All medical students, physicians, and Himalayan Health Exchange staff remained relatively healthy and did not need POCUS assessment during the trip.

Future Directions

1. Encourage physicians at resource-limited clinics to obtain the necessary POCUS training and a compact device.
2. Expose medical students to POCUS outside of a hospital setting to expand their understanding of the technology's clinical utility.
3. On backpacking trips, ensure that providers have 1-2 additional battery packs to charge the ultrasound device and smartphone or tablet.

References

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