assessed by online survey to determine the participant's perception of ability to adequately care for others while traveling. This was believed to be the first study solely focused on the implementation of blended or hybridized learning as related to the WEMT curriculum.

Approval was obtained before implementation of the study by the institutional review board at the researcher's university. It was deemed that the study was exempt from institutional review board review under US Department of Health and Human Services regulations at 45 CFR 46.101 (b)(2). Data were collected and analyzed for relevance and significance using SAS software (SAS Inc, Cary, NC) and Fisher's exact test (the FREQ procedure in SAS; version 9.3). Differences between groups were deemed to be statistically significant if the probability value was less than .05.

A retrospective quantitative analysis was conducted with 65 course participants who completed either a hybrid or conventional face-to-face WEMT or an advanced WEMT course. A purposive sample was obtained from both groups. An online survey of 25 questions was used for data collection related to postcourse satisfaction, perceived knowledge, and NREMT certification pass rates. A total of 26 respondents completed the survey (response rate of 40%). The only statistically significant result was related to the hybrid format being more flexible (Figure; $P = .03$). The hybrid format may also be associated with convenience and increased NREMT pass rates; however, further research is needed. All of the respondents stated they were satisfied with their WEMT course. Interestingly, although 69.2% of respondents passed their NREMT certification examination, 26.9% never attempted the certification examination.

The most significant limitation to this study was the sample size. Numerous attempts were made to encourage participants who completed a WEMT course, either hybrid or conventional, between January 1, 2011, and December 31, 2012, to complete the online survey. The initial survey was sent to the participants on January 1, 2013, with reminder e-mails sent on January 14, 2013, and January 21, 2013. There were a total of 65 participants available for query of which 26 participants responded, with 1 declining to participate for unknown reasons. Threats to internal validity included limited number of course participants and a relatively homogeneous study population, as well as a survey instrument that was not validated. Threats to external validity included the inability to generalize this study to a larger population and that the principal investigator works at the vendor for the 12-day hybrid WEMT and advanced WEMT programs.

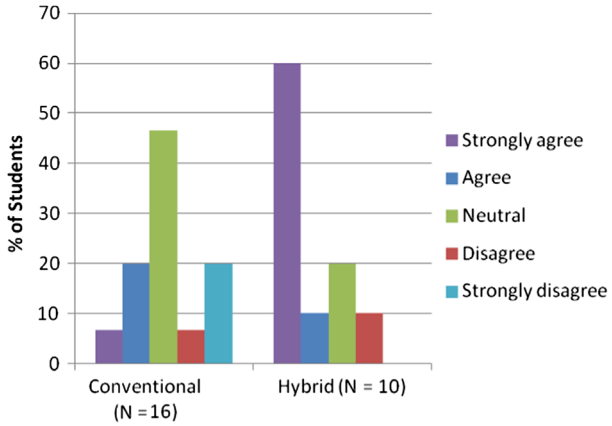

Figure. Flexibility of the hybrid Wilderness Emergency Medical Technician course ($P = .03$).

Overall, the results revealed similar outcomes between hybrid or blended learning WEMT courses and conventional face-to-face WEMT courses. Wilderness EMT programs, which have traditionally been taught for 30 days, can be taught effectively over a shortened duration in a hybrid or blended learning format with the same, if not better, satisfaction levels, perceived knowledge levels, and NREMT pass rates. This shortened on-site course format may be more appealing to the increasing number of international travelers to remote areas. Both conventional and hybrid participants reported that they were taught effectively and prepared to respond to emergencies abroad. When course participants were queried on whether they felt confident that they could assess, diagnose, and treat the most common medical emergencies while abroad, to include cardiovascular, upper respiratory, gastrointestinal, and traumatic injuries, both groups stated that they felt prepared. Also, both groups described the content and curriculum as being clearly defined with requirements outlined in a manner that was understandable.

Joshua D. Martin, DNP, WEMT-P
Sound Physicians & Northern Cairn LLC
Petoskey, MI

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Hornet Stings Presenting to a Primary Care Hospital in Anuradhapura District, Sri Lanka

To the Editor:

Hymenopterid stings and consequent allergic reactions are common indications for emergency medical

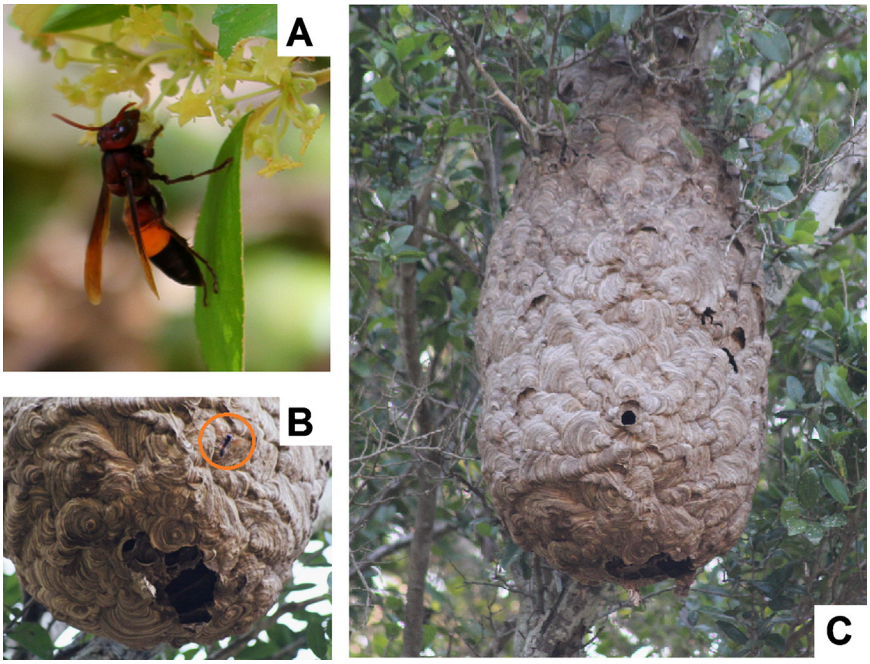

Figure. A, Lesser-banded hornet *Vespa affinis* (25 mm). B, Orange circle indicates a hornet flying near the large nest. C, Large elongated-shape nest (~2 feet long).

care visits and a substantial public health issue globally.[1,2] Multiple hornet stings can sometimes lead to fatal anaphylaxis and fatal multiple organ failure.[3] Sri Lanka, being a tropical country, has a large assortment of forests from wet montane rain forests to tropical dry mixed evergreen forests.[4] Anuradhapura is the largest district of Sri Lanka situated in the dry zone, and most of the area is covered with tropical dry mixed evergreen forests, with a mean annual rainfall ranging from 1250 to 1500 mm.[4] The average temperature fluctuates between 29° and 38°C. The district is predominantly rural, and the residing population often lives in close proximity to the wildlife.[4] The lesser-banded hornet *Vespa affinis* (Figure, A), the black-bellied hornet *Vespa basalis,* the Asian giant hornet *Vespa mandarinia,* and the greater-banded hornet *Vespa tropica* are the documented species of hornets found in Sri Lanka.[5] All these species are a distinct genus (*Vespa*) of social wasps. Among them, *Vespa mandarinia* is the largest hornet capable of injecting the greatest amount of venom and is responsible for many of the systemic reactions.

With the restoration of peace after 30 years of civil war and the resumption of historical agricultural practices including deforestation to support chena cultivation techniques, the growing population of the predominantly agricultural district of Anuradhapura identified hornet stings as an emerging environmental hazard for agricultural workers and others. The objectives of this retrospective report were to describe the demographics, presenting clinical manifestations, and outcomes of human hornet sting cases admitted to a rural, regional hospital in Anuradhapura during a 1-year observation period.

Methods

We conducted a hospital-based prospective study from October 2011 to September 2012 in a divisional hospital in Tammannawa, a primary-care hospital (PCH) close to more than 20 farming communities (1244 admissions and 16,128 outpatient visits during the year 2011). The study area is located at latitude 8.37° N and longitude 80.59° E. All consecutive patients admitted to the PCH with a history of hornet sting, who recognized the insect as a hornet and gave informed written consent, were included in the study. During the recruitment procedure, photographs of the abovementioned hornet species were shown to sting victims, and the characteristics of their colony (Figure, B, C) were obtained to exclude misidentification with other common species of hymenopterans such as the bees (giant honeybee *Apis dorsata,* dwarf honeybee *Apis florae,* and honeybee *Apis cerana indica*) and paper wasp, which are also common in this study setting. An interviewer-administered questionnaire was used to obtain demographic details, exposure factors, and clinical characteristics. A detailed clinical

examination was conducted by the first author (in-charge medical officer at the hospital during the study), and all abnormal findings were recorded.

Results

Of the 811 total admissions to the hospital during the study period, 78 (9.6%) were attributable to hornet stings, which included 51 (65.4%) males and 27 (34.6%) females. The mean age of the population was 37 years (SD, 13 years), with the majority (46.2%) belonging to the 30- to 45-year-old age group (Table 1). More than half of the study participants (n = 40, 51.3%) were farmers. Most of the cases (n = 40, 51.3%) of hornet stings were reported from June to August. Stings occurred mostly in paddy fields or chena cultivations (n = 35 [male 29, female 6], 44.9%) and during farming activities (n = 28 [males 23, females 5], 35.9%).

One third (34.6%) of the victims presented to the hospital within an hour, another 34.6% presented within 1 to 6 hours, and the remainder delayed for more than 6 hours before coming to the hospital. Only 59% of people tried first aid, of which 37.2% tried home remedies (applying vinegar, juices of lime or onion) and 21.8% tried Ayurvedic medicines (applying a paste made from herbal plants including *Murraya koenigii* and *Desmodium triflorum*).

Pain (n = 77, 98.7%), swelling (n = 75, 96.2%), and fright (sudden intense fear of threat to life; n = 61, 78.2%) were the most common clinical features observed (Table 2). Systemic signs were rare. The upper limb was the most commonly stung part of the body.

Five victims (6.4%) had developed anaphylaxis. All of them were treated with intramuscular adrenaline 0.5 mL (1:1000), intravenous chlorpheniramine 10 mg, and intravenous hydrocortisone 200 mg. All 5 victims had multiple stings ranging 12 to 16 all over the body. All of them reached the hospital within less than 1 hour of the sting. Of the 5 victims, 2 were agricultural workers and another 2 were housewives. After stabilizing, they were transferred to a tertiary-care unit for further investigation and tertiary care.

There was no sting-related deaths during this period. As this is the only healthcare facility available in the

Table 1. Demographic details and circumstance of the sting

	Single sting		*Multiple stings*	
Variable	*n*	*%*	*n*	*%*
Demographic characteristic				
Educational attainment				
Secondary level or above	0	0	67	85.9
Postprimary level or less	2	2.6	9	11.5
Occupation				
Agriculture	0	0	40	51.3
Housewife	0	0	16	20.5
Student	1	1.3	9	11.5
Other/unemployed	1	1.3	11	14.1
Circumstances of the sting				
Location of sting event				
Indoors	2	2.6	6	7.7
Near water resource	0	0.0	6	7.7
Paddy field/chena cultivation	0	0.0	35	44.9
Backyard	0	0.0	12	15.4
Road	0	0.0	11	14.1
Forest	0	0.0	6	7.7
Activity at the time of sting				
Walking	0	0.0	10	12.8
Working	0	0.0	30	38.5
Farming	0	0.0	28	35.9
Resting/sleeping	2	2.6	8	10.3
Time of sting				
Morning (6:00 AM–11:59 AM)	1	1.3	42	53.8
Day (noon–5:59 PM)	1	1.3	33	42.3
Evening (6:00 PM–11:59 PM)	0	0.0	1	1.3

Table 2. Signs, symptoms, and site of hornet sting

	Single sting		*Multiple stings*	
Variable	*n*	%	*n*	%
Signs and symptoms				
Pain at the local site	2	2.6	75	96.2
Swelling at the local site	2	2.6	75	96.2
Fright	1	1.3	60	76.9
Difficulty in breathing	0	0.0	6	7.7
Difficulty in swallowing	0	0.0	3	3.8
Oliguria	0	0.0	2	2.6
Vomiting	0	0.0	1	1.3
Site of sting				
Head and neck	0	0	65	83.3
Upper limb	1	1.3	66	84.6
Trunk	0	0	28	35.9
Lower limb	1	1.3	9	11.5

area, we admitted all the sting victims and kept them under observation for possible complications. Forty-six (59%) of sting victims had 24 to 48 hours of hospital stay. Eight (10.3%) sting victims left against medical advice even though the possible complications (anaphylaxis, renal failure, cardiac arrhythmias) were explained to them. On account of unbearable pain and fright, 71.8% sought medical care, whereas 25.6% sought care because of others' advice to seek medical care. Only 2.6% of victims knew the potential complications of sting and sought medical care.

Thirty-four victims identified the hornet species as the lesser banded hornet *Vespa affinis* with the help of photographs and details of the colony and size of insects. The rest of the victims identified the insect only as a species of *Vespa,* but they were convinced that the insect was not a bee (giant honeybee *Apis dorsata,* dwarf honeybee *Apis florae,* honeybee *Apis cerana indica*) or paper wasp.

Discussion

Sri Lanka is experiencing an increasing number of health events associated with rapid deforestation and disturbances to the ecological system. Elephant attacks and snakebites on humans are well known in Sri Lanka for their lethal outcomes. Giant honeybee stings also have gained attention during the past few years. However, hornet stings have not been described as an environmental health hazard probably because they are presented mostly to PCHs in rural areas, where scientific reporting is not in practice. The present paper from a small PCH shows that hornet stings accounted for 9.6% of hospital admissions during a year, showing a much greater healthcare burden than one might have expected.

Hornets, unlike bees, can sting multiple times and can be induced to swarm and attack in waves on exposure to pheromones. They do not die after stinging as seen in bees because their stingers are not barbed and are not pulled out of their bodies. A majority of the stings we observed were in agricultural workers who got stung while they were working in paddy fields near the forest or performing chena cultivation. (Chena involves the clearing of either primitive or second-growth jungle land every year for cultivation on a rotational basis, which is associated with rapid deforestation.) Stings among women were associated with collecting firewood for energy in the backyard or forest. The highest incidence of stings occurred in August, which is the time hornets tend to increase their colony size. August is also the time where chena cultivators clear forest areas for their work, putting humans in close contacts with a hornet.

Several studies have shown that prognosis of hymenopterid sting victims depends on the number of stings and the duration to reach the hospital after a sting.[6] We observed that only 34.6% of sting victims reached the hospital in less than 1 hour. The key reason for the delay was attempting first aid methods. This lack of knowledge and delay in seeking care might lead to severe anaphylaxis reactions.

Only 6.4% of victims required admission to tertiary-care hospitals with laboratory facilities and patient monitoring devices available. It is vital to identify sting victims who need rapid emergency care by primary-care providers to control and manage possibly fatal reactions. This work shows that knowledge about the management of hornet stings (and other probable stings and bites) is

crucial in the primary-care setting, which is not usually addressed in undergraduate training in tertiary-care hospitals.

One of the limitation of this study was the lack of data on previous history of a systemic reaction to hornet, wasp, or bee sting, which is a serious risk factor for developing anaphylaxis with a second sting.[2] This study is based on observations from a single hospital. A multicenter study would provide a complete epidemiological profile of hornet stings in Sri Lanka.

In conclusion, this study shows that the burden of hornet stings in rural Sri Lankan settings could be as large as 9.6% of total admissions and the anaphylaxis reactions to hornet stings are not rare. Proper training of primary healthcare physicians on managing anaphylaxis and availability of emergency drugs are essential in this setting to prevent life-threatening situations.

Buddhika T.B. Wijerathne, MBBS, Dip ICT
Department of Forensic Medicine
Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka
Saliyapura, Sri Lanka

Geetha K. Rathnayake, MBBS
Teaching Hospital Anuradhapura
Anuradhapura, Sri Lanka

Suneth B. Agampodi, MBBS, MSc, MD, MPH
Department of Community Medicine
Faculty of Medicine and Allied Sciences, Rajarata University of Sri Lanka
Saliyapura, Sri Lanka

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Out of Body Experiences

To the Editor:

In the Wilderness Essay "Out-of-body experience in the Karakorum," Avinash Aujayeb relates his experience.[1] He rightly mentions Joe Tasker, lost on the northeast ridge of Everest in 1982. From my "Words from on High" collection of quotations, there are scores of mountaineering authors who have reported out-of-body vignettes. Tasker was the best, poetically encapsulating the medical problem that Aujayeb and others felt[2]:

> *I would snap out of this delusion, to realise that I had to keep control of my imagination, that tiredness combined with the altitude and hunger were inducing hallucinations, then I would be caught up in them again, an observer, not a participant, my mind roaming independently of the automaton movement of my limbs.*

Then there is this light-hearted one from Raymond Greene[3]:

> *A rather elderly porter named Kipa who was convinced that he had died at Camp VI and was brought back to life by a sharp kick on the behind followed me about the camp, in his eyes the adoration of one who has been restored to life by an effective if somewhat indelicate miracle.*

Harvey V. Lankford, MD
Endocrinology
Richmond, VA

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