

# Military Family Physicians' Perceptions of a Pocket Point-of-Care Ultrasound Device in Clinical Practice

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**ABSTRACT** Point-of-care ultrasonography with a pocket ultrasound device, General Electric Medical Systems Vscan (Milwaukee, Wisconsin), has been shown to be effective and easy to learn. However, no studies to date have evaluated its use in the military primary care setting where its portability and value in bedside diagnosis would be especially beneficial. We tested the feasibility of the Vscan in the day-to-day care of patients by family physicians in their clinic, inpatient wards, and its potential for use in the military-deployed setting. Participants were trained and credentialed in the use of the point-of-care ultrasonography. Then, participants were provided with a pocket ultrasound device to use in their normal day-to-day practice. Additionally, participants completed surveys and provided ratings on their perceptions regarding the use of the device. According to the survey analysis, participants found the devices to be easy to use, valuable in discerning a diagnosis, and were not prohibitively time consuming. Moreover, patients were perceived by the participants to have been satisfied with the use of the device. Overall, participants had high satisfaction with the Vscan and perceived that the device would be highly valuable in the military-deployed setting.

## INTRODUCTION

For years, primary care physicians have relied on the same diagnostic tools at the bedside including stethoscopes, otoscopes, and ophthalmoscopes. Although these have long served as the standard tools of the physical examination, technology is advancing at a rapid pace. Though it would be difficult to imagine a primary care physician examining a patient without a stethoscope in hand, it would surely be better for them to actually see images of organs instead of just listening to them. Imaging devices, such as ultrasound, help physicians “see” inside of patients, but traditionally have required coordination with a radiologist with the equipment and expertise.

Ultrasound machines are becoming much smaller and less expensive. As this trend continues, these devices are likely to play a larger role in assisting with the physical examination. Point-of-care ultrasound can give the examining physician the ability to answer directed questions about the patient they are examining in real time, but does not require the years of training that one needs to perform a full diagnostic examination. This may allow for more rapid diagnosis and in many cases may eliminate the need for referral.

It is easy to see how these benefits would be especially useful in the military. Military primary care physicians often care for patients in battalion aid stations in war zones with no diagnostic testing capabilities. These physicians could potentially decrease the number of service members that needed to be evacuated for diagnostic testing with the availability of point-of-care ultrasound. Medical evacuations require move-

ment through unsecured areas, which poses risk to the patient and those transporting them, by increasing exposure to enemy fire and improvised explosive devices. Furthermore, evacuations are time consuming. There is potential to decrease this lost time and manpower when examinations are normal and the patient may otherwise be rapidly returned to duty. Finally, when providing medical support to combat missions, portable ultrasound allows physicians to more accurately triage injured soldiers by allowing point-of-care evaluation for life-threatening complications such as pneumothorax or intra-abdominal bleeding.

The General Electric Vscan pocket ultrasound was introduced to the U.S. market<sup>1</sup> in 2010. Its small size (73 mm × 128 mm × 28 mm)<sup>1</sup> allows it to fit into a pocket of a white coat. It uses a low-frequency phased array transducer to display images on a handheld liquid crystal display (Fig. 1). Several studies have demonstrated the Vscan's effectiveness in medical practice. It has been shown to be comparable to traditional ultrasound equipment in the hands of specialists,<sup>2,3</sup> and to be beneficial even to those with minimal experience with ultrasonography. It has even improved the clinical diagnosis of medical students and junior physicians after only a 2-hour bedside tutorial.<sup>4</sup> A single study has been published demonstrating the efficacy of the Vscan in the primary-care setting. A group of Norwegian general practitioners were able to perform assessments of left ventricular systolic function that were comparable to cardiologist examinations after only minimal training.<sup>5</sup>

Given the potential advantages of pocket point-of-care ultrasonography for primary care physicians, it is unclear why there has not been more interest in the literature. It is possible that primary care physicians may have fears about their ability to easily incorporate such devices in their daily practice. It is important to determine the perceptions of primary care physicians that are trained to use and using such devices in their daily practice to encourage more widespread

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**FIGURE 1.** General Electric Vscan Pocket Ultrasound.

integration into mainstream military medicine. This study aimed to test the perceptions of primary care physicians that were actually using pocket point-of-care ultrasonography in clinic practice.

## MATERIALS AND METHODS

The study protocol was granted exempt status by the Human Use Committee at Tripler Army Medical Center (TAMC). Investigators adhered to the policies for protection of human subjects as prescribed in 45 Code of Federal Regulation 46.

Twenty GE Vscan pocket ultrasounds were purchased from the manufacturer for \$7,000 per unit. Primary-care physicians were trained in the use of point-of-care ultrasonography. Participants included family medicine residents and faculty of the Department of Family Medicine at TAMC. Participants attended a 16-hour training session that was presented by experts in the field of point-of-care ultrasound. The trainers had no reportable financial conflicts of interest. Additionally, a SonoSim (simulated point-of-care ultrasound training device) (SonoSim, Santa Monica, California) was utilized for continued, self-directed education and available to participants on request. The SonoSim presented participants with hands-on simulation modules and didactic modules that were also reviewed in large groups during morning

reports. All participants obtained credentialing in point-of-care ultrasonography from the TAMC credentials committee through standard procedures. This involved an initial application for “with supervision” credentials in which case all examinations were observed by a fully credentialed physician. Once 25 examinations were completed in a single examination type and the applicant was deemed to be competent by a credentialed physician, an application for full, independent credentialing for that examination type was submitted. The participants were provided with a pocket-ultrasound device to use in their normal day-to-day practice.

After an evaluation phase of variable length (maximum of 6 months), participants completed anonymous surveys and provided ratings on their perceptions of the Vscan. Participants’ perceptions were evaluated regarding the ease of learning the Vscan, the ease of use in clinical situations, the amount of time to diagnosis, the perceived improvements in accuracy of initial diagnosis, and patients’ satisfaction with use of the device. Participants’ prior experience in the deployed setting and the Vscan’s feasibility of use in this setting were evaluated. Satisfaction with performing specific point-of-care examinations was evaluated. Details were also collected on the settings where the device was used.

Finally, the results for the question, “I believe that using Vscans would be useful in the deployed, operational setting,” were tallied a second time for the subgroup of participants who had reported being deployed as military physicians.

## RESULTS

A total of 15 participants from the Department of Family Medicine completed the evaluation phase including completion of the anonymous survey. Fifty-three percent of the participants were faculty, 13% of the participants were first-year residents, 13% of the participants were second-year residents, and 20% of the participants were third-year residents. Most of the participants used the Vscan in the outpatient setting with 60% conducting more than 75% of their examinations there. The remainder were conducted in the inpatient setting.

Table I depicts the length of time participants reported using the Vscans during the evaluation phase, which differed for each participant. Table II depicts the average amount of time spent performing the different types of examinations that were performed with the Vscans. Table III depicts a summary of the Likert scale responses of participants’ perceptions of using the Vscans. The final question from

**TABLE I.** Length of Evaluation Phase

Length of Time (Weeks)	Percent of Participants
0–5	27
6–10	13
11–15	27
16–20	20
More than 20	13

**TABLE II.** Average Time Spent Per Examination

Type of Examination	1–5 Minutes (%)	6–10 Minutes (%)	11–15 Minutes (%)	>20 Minutes (%)	Never Performed (%)
Limited Obstetrical	67	27	0	0	7
Limited Echocardiography	13	20	7	0	60
Focused Assessment Sonography in Trauma	20	13	0	0	67
Abdominal Aorta	20	13	0	0	67
Limited Biliary	20	13	0	0	67
Musculoskeletal Ultrasound	40	7	7	7	40

**TABLE III.** Likert Scale Perceptions of Vscan Ultrasounds

Survey Question	Percent That Chose Strongly Agree (5)	Percent That Chose Tend to Agree (4)	Percent That Chose Neither Agree or Disagree (3)	Percent That Chose Tend to Disagree (2)	Percent That Chose Strongly Disagree (1)	Average Response Score
It Was Easy to Learn How to Provide Point-of-Care Exams Using the Vscan	40	53	7	0	0	4.3
The Training I Received Was Adequate	40	40	7	0	0	3.8
The Time and Effort in Learning to Use the Vscan Was Worthwhile	60	13	7	0	0	3.7
The Vscan Reduced the Amount of Time It Took for Me to Make a Clinical Diagnosis	27	40	20	0	0	3.5
The Vscan Improved My Ability to Make an Accurate Diagnosis	33	27	27	0	0	3.5
Using the Vscan Was Not Overly Time Consuming in My Daily Practice	40	20	27	7	0	3.7
Patients Who Were Examined Using the Vscan Were Satisfied With Their Care	67	0	27	0	0	4.1
Overall, I Was Satisfied With the Vscan in My Practice and Would Use in the Future	53	33	7	0	0	4.2
I Believe That Using the Vscan Would Be Useful in the Deployed, Operational Setting	80	13	7	0	0	4.7

Table III was tallied for the subset of participants who had experience being deployed as military physicians. They agreed that the Vscan would be useful in the deployed setting. Their average response score was 4.8 on the Likert scale.

**DISCUSSION**

After only a 16-hour initial-training session, supplemented by additional self-directed learning, participants felt that it was easy to learn to use the Vscan and that the training they received was adequate. The study participants' perceptions of the Vscans were positive. On each measure, the average response fell in the positive range on the Likert scale (>3).

Patients were also perceived to have been satisfied with the use of the Vscan. Participants perceived that the Vscan improved their ability to provide clinical care by improving their ability to make an accurate diagnosis. Participants did

not feel that using the Vscan was prohibitively time consuming. They felt that it actually decreased the overall time required to make a diagnosis, although this was not objectively measured.

The Vscan was also perceived to be likely to be useful in the deployed setting. This held true even when evaluated by the subset of participants who had deployment experience as military physicians.

This study's limitations included that it was conducted with a convenience sample. There was no control group to which this group's results could be compared. The participants in this group were from one department and worked closely with the principal investigator. Although, the surveys were anonymous, it is possible that they could have felt pressure to respond positively. However, the purpose of this study was to test the perceptions of the use of pocket point-of-care

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ultrasonography in the military primary care setting and that was done despite the scientific shortcomings of the study. Future studies are needed to help validate this study with scientific evidence of the effective use of these devices in this setting. Our plans are to evaluate primary-care providers' use of the Vscan on specific clinical uses, after brief training, to determine the effectiveness compared to a gold-standard examination performed by a radiologist or other specialist.

### **CONCLUSION**

In this study, primary care physicians perceived that the pocket point-of-care ultrasonography is easy to learn, can be used efficiently in the outpatient and inpatient setting, and has high potential to be an effective tool in the deployed setting. Time constraints and patient perceptions do not appear to be barriers to its use.

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