

## CONCEPTS

## Imaging

# Some recollections of early work with bedside ultrasound in emergency medicine: the first 10 years

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## Abstract

The early history of ultrasound in emergency medicine has remained for the most part undocumented up to this time. This piece represents personal recollections of the evolution of point-of-care ultrasound from its origins in the late 1980s in the United States. A description of ultrasound equipment, resistance to widespread implementation, the evolution of training, and fellowship programs with subsequent publications and committee developments are examined in detail. Special attention to the advancement of trauma ultrasound is also examined from the viewpoint of an early adopter. The purpose of this manuscript is to recognize the persistence and dedication of some of the early founders of emergency ultrasound, thus gaining a deeper appreciation for the scope of practice and meaningful use that emergency physicians are now using on a daily basis.

## KEYWORDS

history, perspective, POCUS, ultrasound

## 1 | INTRODUCTION

Diagnostic ultrasound was first used successfully in medical practice in the 1950s. The first commercially available machines were produced in the 1960s and portable 2D real-time ultrasonography became available in the early 1980s. In the United States, the use of ultrasound was predominantly restricted to radiologists, cardiologists, and obstetricians with little interest in bedside use by other physicians until the mid-1980s.<sup>1,2</sup>

In 1982, Dr. Herbert Jehle, while teaching physics at the Max Planck Institute and the University of Munich, set up tours of the hospitals, where ultrasound machines were noticed to be widely available for patient evaluation on the wards. This was radically different from the care being delivered in the United States and somewhat of an epiphany for emergency physicians who were considering bringing ultrasound

into the emergency departments (EDs) in America. In the early to mid-1980s, emergency physicians had limited access to ultrasound in the ED. In 1985, however, 2 emergency medicine groups in Pittsburgh, Pennsylvania were able to obtain a ScanMate II (Circadian, San Jose, CA and Dymax Corp, Pittsburgh, PA) ultrasound machine (Figures 1 and 2).

## 2 | EARLY EQUIPMENT

The ScanMate II was a very small mechanical sector machine with no freeze frame button. The pictures were obtained by positioning a Polaroid Instamatic camera in front of the screen to document images. Patricia (Patty) Prince, RDMS, RVT, RT was an ultrasound tech who was instrumental in assisting physicians with image interpretation at

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**FIGURE 1** Controls for the ScanMate II ultrasound machine included: a toggle knob for the time gain compensation; 3 depth settings at 10, 14, and 18 cm; power on/off switch; and adjustments for scan angle, contrast, and brightness

Allegheny General Hospital in Pittsburgh, PA. She had training in radiology, neurosonology, vascular, and obstetrical/gynecology ultrasound and was elected the Chair of the Board of Directors of the American Registry for Diagnostic Medical Sonography from 2009 to 2011.<sup>3</sup> In 1987, Dr. Claude Joyner, who was Chief of Cardiology at Allegheny General Hospital and had performed seminal studies in the ultrasound of mitral valve disease in 1963, provided the ED with a minimally used larger J&J cardiac ultrasound machine (J&J, Hitachi Aloka, Wallingford, CN) with a single mechanical sector probe and improved image quality. The group at the University of Pittsburgh also used the ScanMate II, and the Hennepin County site used an EKO 5010 (Ekoline, Sunnyvale, CA) ultrasound machine during this time period (Figure 3).<sup>4</sup>

### 3 | EARLY EMERGENCY MEDICINE PRESENTATIONS AND PUBLICATIONS

Some of the first presentations on bedside ultrasound by emergency physicians in the United States occurred in 1987:

1. Dr. Dave Plummer and his group at Hennepin in Minneapolis, Minnesota presented the use of single view cardiac ultrasound in the evaluation of pericardial effusions and electromechanical dissociation at the May 1987 University Association for Emergency Medicine meeting in Philadelphia, Pennsylvania and published this work in *Annals of Emergency Medicine* in 1988.<sup>4</sup>
2. Dr. Mike Heller and his associates at the University of Pittsburgh presented a feasibility study of the use of ultrasound in the ED at the American College of Emergency Physicians (ACEP) *Scientific Assembly* in San Francisco, November 1987, as a scientific exhibit.
3. Dr. Dietrich Jehle and his colleagues from Allegheny General Hospital in Pittsburgh, PA presented “Emergency Department Sonography by Emergency Physicians” at the ACEP *Scientific Assembly* in San Francisco November 1987. This study assessed the ability of emergency physicians to identify: (i) presence and size of pericardial effusions, (ii) presence or absence of organized cardiac activity in patients with electromechanical dissociation, (iii) the presence



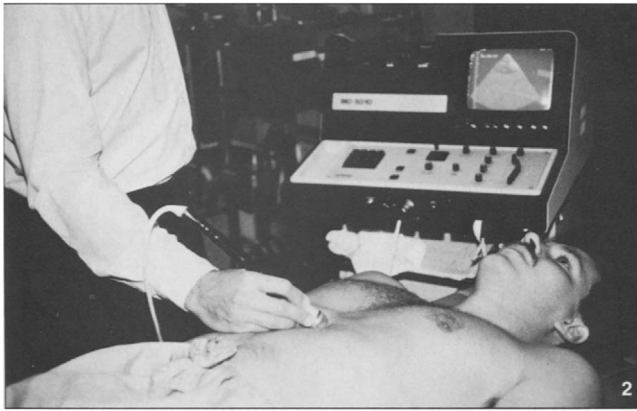
**FIGURE 2** Images were obtained by positioning the Polaroid Instamatic camera at a set distance in front of the screen to document images. There was no freeze frame. The probe was a mechanical sector probe that would occasionally get air bubbles trapped inside that would interfere with imaging. There was an Allen wrench provided that would open up the probe housing and allow the operator to “top off” the probe fluid to expel air bubbles

or absence of an intrauterine pregnancy in pregnant patients with lower abdominal/pelvic complaints, (iv) the position of an intrauterine device in patients with suspected uterine perforation, (v) the presence of gallstones and focal tenderness in patients with suspected biliary disease, and (vi) the presence and size of abdominal aortic aneurysms in patients with pulsatile masses or unexplained abdominal pain. This was published in the *American Journal of Emergency Medicine* in 1989.<sup>5</sup>

The first published reported use of ultrasound to guide pericardiocentesis for cardiac tamponade by emergency physicians in the United States was performed at Allegheny General Hospital in 1989 and was published in the *Journal of Emergency Medicine* in 1991 by Mazurek, Jehle, and Martin.<sup>6</sup>

### 4 | RESISTANCE TO IMPLEMENTATION

Initial attempts to work with the American Institute for Ultrasound in Medicine in the early 1990s proved to be somewhat futile. In the early



**FIGURE 3** Ultrasound machine used at Hennepin County site for cardiac imaging. Image courtesy of Plummer et al<sup>4</sup>

1990s, the American Institute for Ultrasound in Medicine had been represented most heavily by radiology and somewhat by obstetrics and gynecology. The issues were territorial, payment, and very restrictive credentialing. The concept of point-of-care ultrasound (POCUS) remained foreign to this group for a number of years, and the relationship between emergency medicine and the American Institute for Ultrasound in Medicine took almost a decade to warm up.

There was significant resistance to performing ED ultrasound from our radiology colleagues. An early recollection includes a phone call from the Chairman of Radiology from an Ivy League medical school announcing that he would be first in line to testify against emergency physicians if there was ever a legal case involving the use of emergency physician-performed ultrasound. The reply was that Harvard was more open to new ideas 40 years ago when Dr. Herbert Jehle was teaching there in the Physics Department. The Radiology Chairman at the University at Buffalo would no longer permit any of their staff to participate in a joint Radiology/Emergency Medicine/Pathology Clinical Case Conference following several successful conferences in 1991.

Resistance also came from some of our own colleagues in emergency medicine; an ACEP national panel discussion regarding the role of emergency medicine bedside ultrasound got fairly heated in 1993. Within our own specialty, there were leaders who felt strongly that there was no role for the emergency physician performing ultrasound in the ED.

## 5 | NATIONAL ULTRASOUND COMMITTEES

The ACEP Ultrasound section was started in 1990 with Mike Heller as the inaugural Chair. At that time, ACEP released a position statement supporting appropriate use of ultrasound by emergency physicians who were properly trained, although this training lacked definition at the time.<sup>7</sup> The Society for Academic Emergency Medicine (SAEM) Technology Committee helped oversee the formation of the SAEM Ultrasound Interest Group. As members of the SAEM Technology Committee, Dietrich Jehle, Mike Heller, and Dave Plummer played lead roles in getting this new interest group up and running. SAEM

further endorsed the ACEP position statement and appealed for the development of a training curriculum in 1991.<sup>8</sup>

## 6 | INAUGURAL TRAINING COURSES

ACEP sponsored multiple 3-day ultrasound courses in Cincinnati, OH (May 1991), Chicago, Illinois (November 1991) and St. Louis, Missouri (April 1992, January 1993, and May 1993) with contributors from across the United States. Drs. Plummer, Heller, Jehle, Overton, Mateer, and others instructed these courses that served as the POCUS launching pad for many emergency physicians who are now leading the ultrasound initiative at the national level. SAEM sponsored a hands-on course for academic emergency physicians in May of 1994 in Washington, DC. Mateer started the first emergency ultrasound fellowship in 1993. Some of the initial graduates from the first emergency ultrasound fellowship at the Medical College of Wisconsin in Milwaukee included Drs. Thomas, Valley, and Phelan.<sup>9</sup> Many of the inaugural fellow graduates went on to become national leaders in ultrasound research and education, and include other such as Mike Blaivas, Chris Moore, Christian Fox, and David Bahner. Several of the early Fellow graduates pioneered the incorporation of ultrasound into undergraduate medical education.<sup>10</sup>

At the institutional level, the University at Buffalo started hosting a 14-day “mini ultrasound fellowship” in 1991 for academic faculty interested in developing their bedside ultrasound skills. Early adopters who attended included Dr. Anthony Dean, who later went on to become the Chairman of the SAEM Ultrasound Section and Director of Ultrasound at the University of Pennsylvania.

In 2002, Heller et al<sup>11</sup> developed the Scope of Training Task Force, which represented an expert consensus report supported by 7 professional organizations.

## 7 | ULTRASOUND IN TRAUMA

In 1990, Dr. John Border, who was Chief of Trauma at the University at Buffalo, authored a blunt trauma text that included a chapter from Tiling describing his work in ultrasound in trauma over the past 10 years.<sup>12</sup> Dr. Tiling was referred to as the “Grandfather of Trauma Ultrasound” in Europe and this was his first publication on the topic in English. Of note, Dr. James Mateer did a sabbatical working with Dr. Tiling in Germany in 1990. Then in 1991, Jehle et al<sup>13</sup> started performing trauma ultrasound studies in Buffalo, New York with a focus on cardiac imaging, the right upper quadrant, and the use of Trendelenburg positioning to improve sensitivity. Meanwhile, trauma surgeons at Shock Trauma in Baltimore, Maryland were also beginning to use trauma ultrasound.<sup>14</sup> The first study of the ED use of ultrasound in trauma by emergency physicians was presented and submitted in 1992 and published in 1993 in the *American Journal of Emergency Medicine*.<sup>13</sup> In 1992, the group at Hennepin published an important retrospective study demonstrating improved outcomes with the use of emergency department echocardiography in penetrating cardiac

injuries.<sup>15</sup> Dr. Mateer et al<sup>16</sup> authored the first large ED study of the use of ultrasound in trauma in 1995 with a sensitivity of 87% and specificity of 100% for detecting free fluid. This led to a paradigm shift as further research continued to solidify the ability of emergency physicians as well as surgeons to adequately assess for hemoperitoneum and hemopericardium. The term “FAST” was first used in the mid-1990s, and it originally stood for “Focused Abdominal Sonography in Trauma” until the FAST Consensus committee expanded its role to include evaluation of the heart and chest, renaming it the “Focused Assessment with Sonography for Trauma” in 1997.<sup>17</sup> Mike Heller and Dietrich Jehle edited the first textbook on ultrasound in trauma for ACEP, which was published in 2003.<sup>18</sup>

## 8 | ADDITIONAL PUBLICATIONS AND BOOKS

The first larger series of pregnant patients evaluated with transvaginal ultrasonography was completed at the Medical College of Wisconsin by Dr. James Mateer in 1993.<sup>19</sup> Dr. Mateer and multiple national colleagues helped spearhead the publication of the initial “Core Curriculum for Ultrasound Training in Emergency Medicine” in 1994, which was incorporated into the core content requirements for graduation from an emergency medicine residency in 1996.<sup>20,21</sup> In 1995, Drs. Heller and Jehle edited and published the first book on “Ultrasound in Emergency Medicine.”<sup>22</sup>

## 9 | LOOKING FORWARD

The early history of ultrasound in emergency medicine has remained for the most part undocumented up to this time. Physician leaders in emergency medicine ultrasound laid out a foundational roadmap for other emerging practices that are on the cutting edge of clinical care within the specialty. Literature related to POCUS has transitioned from case reports and sub-specialty commentaries (“turf wars”) to large prospective clinical trials published in renowned medical journals.<sup>22</sup> Comprehensive position statements, specialty-specific educational guidelines to facilitate both practice-based and residency-based training and credentialing, and dedicated emergency ultrasound fellowships have led the way to an upcoming focused practice designation.<sup>9,23–25</sup> It is vital for new adopters to understand the path that emergency ultrasound has taken so they may learn from the trials and tribulations of early ultrasound founders. The battles that they fought to legitimize meaningful use have opened the realm up to young and bright minds who are realizing the benefit of learning and practicing this vital skill, and the rest is history.

### CONFLICT OF INTEREST

The authors declare no conflict of interest.

### AUTHOR CONTRIBUTIONS

DVKJ takes responsibility for the paper as a whole.

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### REFERENCES

- Mateer J, Jehle D. New developments: ultrasound in emergency medicine. *Acad Emerg Med.* 1994;1(2):149–152.
- Meyer RA. History of ultrasound in cardiology. *J Ultrasound in Med.* 2004;23(1):1–11.
- The American Registry for Diagnostic Medical Sonography. Patricia Ann Prince elected as chair of the ARDMS Board of Directors. Press Release; November 2009.
- Mayron R, Gaudio, FE, Plummer D, et al. Echocardiography performed by emergency physicians: Impact on diagnosis and therapy. *Ann Emerg Med.* 1988;17:150–154.
- Jehle D, Davis E, Evans T, et al. Emergency department sonography by emergency physicians. (ACEP Scientific Exhibit Abstract) *ACEP Conference Proceedings* Oct 1987; (paper). *Am J Emerg Med.* 1989;7(6):605–611.
- Mazurek B, Jehle D, Martin M. Emergency department echocardiography in the diagnosis and therapy of cardiac tamponade. *J Emerg Med.* 1991;9:27–31.
- American College of Emergency Physicians. *Council Resolution on Ultrasound.* ACEP News 1990;9(11).
- Society for Academic Emergency Medicine. *Ultrasound Position Statement.* SAEM Newsletter 1991;Summer.
- Society of Clinical Ultrasound Fellowships. “About Us: The Beginning”. Accessed February 16, 2020. <https://eusfellowships.com/about-us/>
- Dinh VA, Fu JY, Lu S, Chiem A, Fox JC, Blaivas M. Integration of ultrasound in medical education at United States medical schools: a national survey of directors’ experience. *J Ultrasound in Med.* 2016;35(2):413–419.
- Heller MB, Mandavia D, Tayal VS, et al. Residency training in emergency ultrasound: fulfilling the mandate. *Acad Emerg Med.* 2002;9(8):835–839.
- Tiling T, Bouillon B, Schmid A, et al. Ultrasound in blunt abdominotheracic trauma. In: Border J, ed. *Blunt Multiple Trauma, Comprehensive Pathophysiology and Care.* New York: Marcel Dekker; 1990: 415–433.
- Jehle D, Guarino J, Karamanoukian H. Emergency department ultrasound in the evaluation of abdominal trauma. (Abstract), *Ann Emerg Med* 1992; 21(5):597. (Paper) *Am J Emerg Med.* 1993;11(4):342–346.
- Tso P, Rodriguez A, Cooper C, et al. Sonography in blunt abdominal trauma: A preliminary progress report. *J Trauma.* 1992;33:39–44.
- Plumber D, Burnett D, Asinger R, et al. Emergency department echocardiography improves outcome in penetrating cardiac injury. *Ann Emerg Med.* 1992;21:709–712.
- Ma OJ, Kefer MP, Mateer JR, et al. Evaluation of hemoperitoneum using a single vs. multiple view ultrasound examination. *Acad Emerg Med.* 1995;2:581–586.
- Scalea TM, Rodriguez A, Chiu WC, et al. Focused Assessment with Sonography for Trauma (FAST): Results from an International Consensus Conference. *J of Trauma* 1999;46(3):466–472.
- Jehle D, Heller M. *Ultrasonography in Trauma: The FAST Exam.* Dallas, Texas: ACEP; 2003.
- Mateer J, Aiman EJ, Brown M. Ultrasound evaluation of ectopic pregnancy by emergency physicians (abstract). *Ann Emerg Med.* 1993;22:210.
- Mateer J, Plummer D, Heller M, et al. Model curriculum for physician training in emergency ultrasonography. *Ann Emerg Med.* 1994;23(1):95–102.
- Lewis, R, Pearl, M, Nomura J et al. CORD-AEUS: consensus document for the emergency ultrasound milestone project. *Acad Emerg Med.* 2013;20:740–745.

22. Heller M, Jehle D (co-editors): *Ultrasound in Emergency Medicine*. Philadelphia: W.B. Saunders; 1995 (1st Ed), West Seneca NY: Center Page, Inc; 2002 (2nd Ed).
23. American Board of Emergency Medicine. Advanced EM Ultrasonography, Focused Practice Designation in Advanced EM Ultrasonography. Accessed February 16, 2020. <https://www.abem.org/public/become-certified/focused-practice-designation/advanced-em-ultrasonography>
24. Smith-Bindman R, Aubin C, Bailitz J, et al. Ultrasonography versus computed tomography for suspected nephrolithiasis. *N Engl J Med*. 2014;371(12):1100–1110.
25. American College of Emergency Physicians. Ultrasound guidelines: emergency, point-of-care, and clinical ultrasound guidelines in medicine. *Ann Emerg Med*. 2017;69(5):e27–e54.

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