Origins of the Cardiothoracic Surgery Network (CTSNet)

Robert L. Replogle, MD

During the 1995 Christmas season, Robert L. Replogle, MD (Fig 1), then The Society of Thoracic Surgeons (STS) Vice President, was on holiday with his family on Grand Cayman Island. The youngest Replogle daughter, a junior in college at the time, was working on a research paper. From the vacation condo, she linked to her college library over the phone for access to the entire library resources. Impressed, Dr Replogle asked his daughter how she did this, and she showed him the “Internet” and the “World Wide Web.” He immediately recognized that the possibilities for education would be enormous, particularly for a field like thoracic surgery where the “students” are widely distributed rather than in a lecture hall.

A few weeks later, at the 1996 STS Annual Meeting in Orlando, Dr Replogle was elected STS President and hosted a dinner for as many leaders of cardiothoracic surgery from around the world as possible. His goal was to promote the idea of a comprehensive educational World Wide Web for cardiothoracic surgery; his hope was that these leaders would also recognize the educational possibilities and come on board to help build a plan. The response was overwhelmingly favorable.

At the same meeting in Orlando, Dr Replogle received a message from William A. Baumgartner, MD, who had heard of the plans for a World Wide Web for cardiothoracic surgery and suggested that Dr Replogle contact a recent graduate of the cardiothoracic surgery residency program at The Johns Hopkins University School of Medicine. Dr Baumgartner thought that the resident could be very helpful in such a project. This was a fateful message, because that recent graduate was Peter S. Greene, MD (Fig 2), who became the real engineer and the key ingredient to the future success of the Cardiothoracic Surgery Network (CTSNet).

In March 1996, an assortment of people interested in and contributing to the concept of CTSNet met at the Replogle home in Chicago. They included Kim Alley, daughter of Ralph Alley, MD, and a principal in a commercial internet company; Thomas B. Ferguson, MD, Editor of The Annals of Thoracic Surgery; Carol Blasberg, Administrative Editor of The Annals; and young surgeons John R. Liddicoat, MD, MBA, David B. Campbell, MD, and Dr Greene.

The consensus was that the Web presence should have an international focus, emphasize cardiothoracic surgery education of all kinds, allow easy and free access, and provide all the information that both senior and trainee cardiothoracic surgeons might need—a daunting mission. Dr Greene and Dan Jacobsen, a software engineer, wrote the code that enabled launch of a Web “presence” containing basic STS information. The goals set out at the

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initial meetings and in subsequent weekly telephone conference calls included (1) building a comprehensive information repository for cardiothoracic surgery, and (2) creating an online forum to promote the mission and goals of the Society.

Dr Greene and Jacobsen quickly wrote the additional necessary code, and www.sts.org was launched after approval by the STS Council. Around the same time, Medtronic awarded STS a $10,000 unrestricted educational grant to provide support for what was then known as STSnet.

An early relationship with the Community of Science (COS) also developed. Founded in 1988 by The Johns Hopkins University in Baltimore, COS was creating a collection of online databases for the public and the research community and was developing a Web presence devoted to publishing online journals. The Annals was offered online through COS beginning in 1996. COS offered support for an editorial office, and this permitted Jacobsen to dedicate more effort to STSnet.

During the summer of 1996, weekly phone conference calls continued, developing the basis for a comprehensive Web presence for cardiothoracic surgeons. The next milestone was at the September 1996 European Association for Cardio-Thoracic Surgery (EACTS) annual meeting in Prague. At that time, Paul Sergeant, MD, who was the European equivalent to Dr Greene, joined the surgical group and quickly proved to be indispensable.

It was in Prague that the consensus to make this new online cardiothoracic surgery network an international effort became a reality, and the name CTSNet was coined. The initiative was born of STS, and until that time, STS had been its sole financial source. But in Prague, the leaders of STS, the American Association for Thoracic Surgery (AATS), and EACTS took the bold move to collaborate so that CTSNet would be governed by all of the organizations and not be the property of any one group. Hence in 1997, CTSNet was officially founded by STS, AATS, and EACTS. It took until 1999 to complete work on a formal structure.

The need for STS to maintain a majority position in CTSNet was defined in an internal memo from Dr Replogle to participants:

There needs to be an umbrella organization with accountability for content and technology. Each organization on the common link will be affected by the content and the appearance of all the others. Without some central management and oversight, there arises the possibility of misunderstandings about the focus and use of the individual organizational pages. Each organization will have representation on the Web Site Editorial Board, with a voice in all deliberations. However, as every surgeon knows, sooner or later someone must be responsible for the final product, whether it is a Web site or a cardiothoracic operation. Diversity is our goal within the structure of publishing excellence.

As noted by Bruce Keogh, FRCS, Medical Director of the United Kingdom National Health Service, in a 1998 editorial:

"The success of The Society of Thoracic Surgeons (STS) Web site, and the vision of Past President Bob Replogle for an international community of cardiothoracic surgeons, stimulated the formation of the Cardiothoracic Surgery Network (CTSNet) in May 1997. Together with the Community of Science, the publishing partner for CTSNet, the STS has encouraged and fostered the development of a collaborative, coordinated, and truly international Web site" [1].

Keogh went on to emphasize the value of the international vision: “Herein lies one of the strengths of CTSNet, which functions on a hub and spoke model with generic, worldwide interests being centralized while regional interests and local issues are focused in organizational sectors of the Web.”

Among the most enthusiastic supporters of CTSNet were participants from international organizations, especially those from low-income economy countries, where access to current cardiothoracic surgery literature and textbooks had always been challenging.

At that time, Dr Ferguson was determined to publish current, complete editions of The Annals on CTSNet—for free. He set about the task of persuading Elsevier, the journal’s publisher, to permit this new technology. Free journal content would quickly become the most popular feature of CTSNet. It took the next few years to work through the mechanisms of publishing archived editions of The Annals online and work out the maze of legal and financial conditions. Because the online education features were so new, the team was continually facing challenging questions. Legal guidance and opinion were often needed and perfectly provided by STS General Counsel Rob Wynbrandt, JD, then of Jenner & Block in Chicago, and beginning in 2002, STS Executive Director & General Counsel. And, according to Dr Replogle, “There were also times when the group just went ahead and did what needed to be done.”


Proposals were requested from Elsevier, Mosby, and HighWire Press to host the journals. HighWire Press at Stanford University was ultimately selected, and a portal was opened in January 2000. This was a unique and groundbreaking achievement, making cardiothoracic surgery one of the few specialties, perhaps even the only specialty, to have the journals of its major professional organizations all on the same portal and providing access to search across all content. A common taxonomy was developed for the journals, and a single sign-on contributed to making this breakthrough possible. Journal subscriptions remained the responsibility of the individual organizations. The Asian Cardiovascular & Thoracic Annals, the Interactive CardioVascular Thoracic Surgery journal, and the Multimedia Manual of Cardiothoracic Surgery also participated.

Another online publishing innovation was CTSNet’s ability to offer access to the classic textbook, Cardiac Surgery in the Adult. This was achieved in 1999 through the deput negotiations with the publisher by the book’s editor, L. Henry Edmunds, Jr, MD. The content was offered at no
charge, an arrangement that lasted for 13 years. Free content from *State of the Heart*, by Larry W. Stephenson, MD, and *Lung Cancer*, by Clifton F. Mountain, MD, and colleagues were also offered on CTSNet.

An early and important development on CTSNet was the introduction of individual profile pages. Each profile page included the name of the surgeon, a brief educational background, and detailed contact information. Combined, the pages created an invaluable directory of anyone and everyone who was part of the cardiothoracic surgery community.

CTSNet staff, led by Carol Blasberg, worked tirelessly to encourage surgeons and others (known as associates) to participate, collecting data and taking photos at major meetings and conferences around the world. These profile pages, which foreshadowed social media sites that came much later, became the heart of the cardiothoracic surgery community.

The publication resources available on CTSNet continued to be invaluable in helping surgeons learn the technicalities of the specialty, but the individual profile pages provided a vast worldwide network of human resources, easy accessibility by phone or e-mail to fellow surgeons, who could provide personal insights. The profile also allowed surgeons to stay connected on a very personal level and helped make cardiothoracic surgery a highly interactive and closely knit specialty that would stand together during the challenges that would face the specialty in the coming years.

The original mission of CTSNet, “to provide for cardiothoracic surgeons a comprehensive, instantaneous, and integrated repository of information, and a forum for the exchange of ideas and advancement of the field” so that they might provide the best care for their patients, was a daunting task. It not only required complex software programming to develop the site but also meant that there needed to be some consensus on the information to be included, and security obligations necessary for privacy issues had to be met.

It was decided to let regional, national, and local surgical associations provide the screening of a surgeon's legitimacy through their membership lists. To accomplish this, however, participation in CTSNet was free of charge to all organizations. Resources were expected to come from educational grants, sponsorships, and advertisements—a successful strategy that contributed to the rapid growth of CTSNet. One year after the initial introduction, 6,000 cardiothoracic surgeons from 102 countries were registered on the site, and 5 years after the beginning of CTSNet, more than 25,000 surgeons in 147 countries were represented. By 2012, more than 34,600 surgeons were participating in CTSNet—at a time when the specialty suffered from steadily declining numbers of resident applications—as well as more than 11,500 non-surgeon associates. Fully 75% of CTSNet participants today are based outside the United States.

New technology always seems to come easier to the young, so it is not surprising that residents and surgeons fresh from residency were actively involved in the development of CTSNet. Shortly after the official launch of the STS website in April 1996, it became apparent that this Web-based platform would be particularly useful to the cardiothoracic surgical resident community.

Drs Liddicoat and Greene, along with John R. Doty, MD, approached the STS leadership about developing a subsection of the main website dedicated to residents, and Medtronic Inc was instrumental in supporting the endeavor.

The three initial main goals of the Residents Section were education, board certification, and employment. The educational component was devised to use the unique multimedia aspects of the internet, including high-resolution graphics and video. Donald Doty, MD, was generous in providing most of this material, donating the syllabus portion of his annual Core Curriculum Review course, and many of his personal operative videos. The syllabus was restructured as CTSNotes, an online series of outlines for review of all major topics in cardiothoracic surgery. Each outline had several associated images for study and eventually evolved into the CTSNet Wiki Notes, which can be edited and enhanced by the residents during their study. The initial videos were digitized and available in streaming format, with several dozen additional videos added over time.

The board certification component hinged upon the development of an electronic method for case entry and submission to the American Board of Thoracic Surgery (ABTS). The existing paper-based system for tracking operative experience and application to the ABTS was cumbersome and time-consuming. The Operative Log was developed over a 2-year interval using a Web-based series of forms to access a centralized CTSNet database. At the conclusion of residency, residency directors were able to simply review each resident’s operative log and electronically submit these records to ABTS. The Operative Log was officially adopted by ABTS in 1998, and the cardiothoracic surgical community thus became the first in the nation to develop and move to an electronic case record system. The Operative Log was subsequently adopted by the European Board of Thoracic and Cardiac Surgery and is also used by surgeons in practice for maintenance of certification.

The employment component of the website was the third major initiative and cumulated in the development of the Job Center. This area was initially designed as a common location for residents to find a job after residency and for potential employers to use in posting open positions. Residents were able to upload their curriculum vitae and search for jobs or fellowship positions. The Job Center went through several iterations and was subsequently moved from the Residents Section to the main CTSNet website as the Career Center, where a wider range of careers and job opportunities are now posted.

The Residents Section has fulfilled the original goals of its designers and continues to serve the unique needs of the cardiothoracic surgical resident community. Through the input and work of the very residents it serves, additional features have been added to the website. The site now serves as an important voice for the Thoracic Surgery Residents Association (TSRA) and contains profiles of
residency programs, interviews with pioneering surgeons, clinical cases, and even two textbooks written by the residents. The Residents Section illustrates the very best of integrated Web-based education by both the leadership and the membership of the thoracic surgical community.

In 2000, officials at The Johns Hopkins University Medical School, who were determined to build a comprehensive educational website, found the technology and educational mission exhibited by CTSNet to be a superior example of an educational website. The Hopkins officials suggested a collaboration between the school and CTSNet, whereby CTSNet would remain independent, but the two entities would share in the development of software and support services. The new organization would be called “Medbiquitous” and was housed in the World Trade Center in Baltimore.

Hopkins and CTSNet shared offices and software development. Funding came largely from Hopkins. There followed an amazing spurt in Web development, led by Dr Greene, who was, by this time, a busy cardiac surgeon at Hopkins while he continued to be the Executive Editor and Chief Architect for the CTSNet organization. The support staff, Editorial Director Cheryl Cohen, Chief Architect Rob Oberteuffer, Managing Editor Carol Blasberg, and Maud Zingmark, were outstanding and deserve much of the credit for CTSNet successes. And more than anything, or anybody, Dr Greene was inspirational. He was motivated by Drs Sergeant and Ferguson—who became CTSNet Editor after completing a 16-year term as Editor of The Annals—as well as Torkel H. Aberg, MD.

In the wake of the recent economic recession, and after the retirement of Dr Ferguson as CTSNet Editor, the organization began experiencing financial difficulties. Consequently, the CTSNet Board of Directors began considering ways to streamline CTSNet’s services and operations. It also sought proposals from several organizations, including STS, to provide it with management services.

At its January 28, 2012, meeting in Fort Lauderdale, the CTSNet Board of Directors approved a plan for reconfiguring CTSNet and for STS to take on the administration of the organization. Therefore, in a homecoming of sorts, the Society—the originator of CTSNet—began providing management services to CTSNet in late February 2012, with STS Director of Information Services Grahame Rush, PhD, serving as its Executive Director. CTSNet remained an entirely separate organization, with the identical and autonomous governance structure reflecting the participation of its three Member Organizations: STS, AATS, and EACTS; the only change was that STS, rather than a staff employed directly by CTSNet, was now providing administrative management services.

The retention of STS to provide management services for CTSNet coincided with decisions made by the three major specialty journals—The Annals of Thoracic Surgery, the European Journal of Cardio-Thoracic Surgery, and the Journal of Thoracic and Cardiovascular Surgery—to withdraw support for the CTSNet-managed joint electronic journal platform. Each journal’s publisher provided alternative Web platforms; thus, the online Annals and its continuing medical education program shifted from CTSNet to Elsevier’s Health Advance in June 2013.

Since late February 2012, the STS staff has set about implementing the CTSNet Board’s plan for reconfiguring the enterprise to make it more financially viable and better focused in the services it provides. The plan involves the streamlining of CTSNet’s many online tools, the removal of CTSNet from the role of hosting the websites of Participating Organizations around the world, and the migration of CTSNet.org to a new Web platform. During this transitional period, the STS staff has assisted CTSNet in generating and maintaining a steady flow of revenues and the reconfiguration of benefits for Participating Organizations.

“We are at the threshold of the single greatest leap forward in communication since Marconi invented the radio” [2]. This comment from Dr Replogle’s 1996 President’s Page in The Annals was more prescient than he could have imagined. The power of the Internet and its application to online education continues to grow almost exponentially. The future and potential of CTSNet are still unfolding.

References