

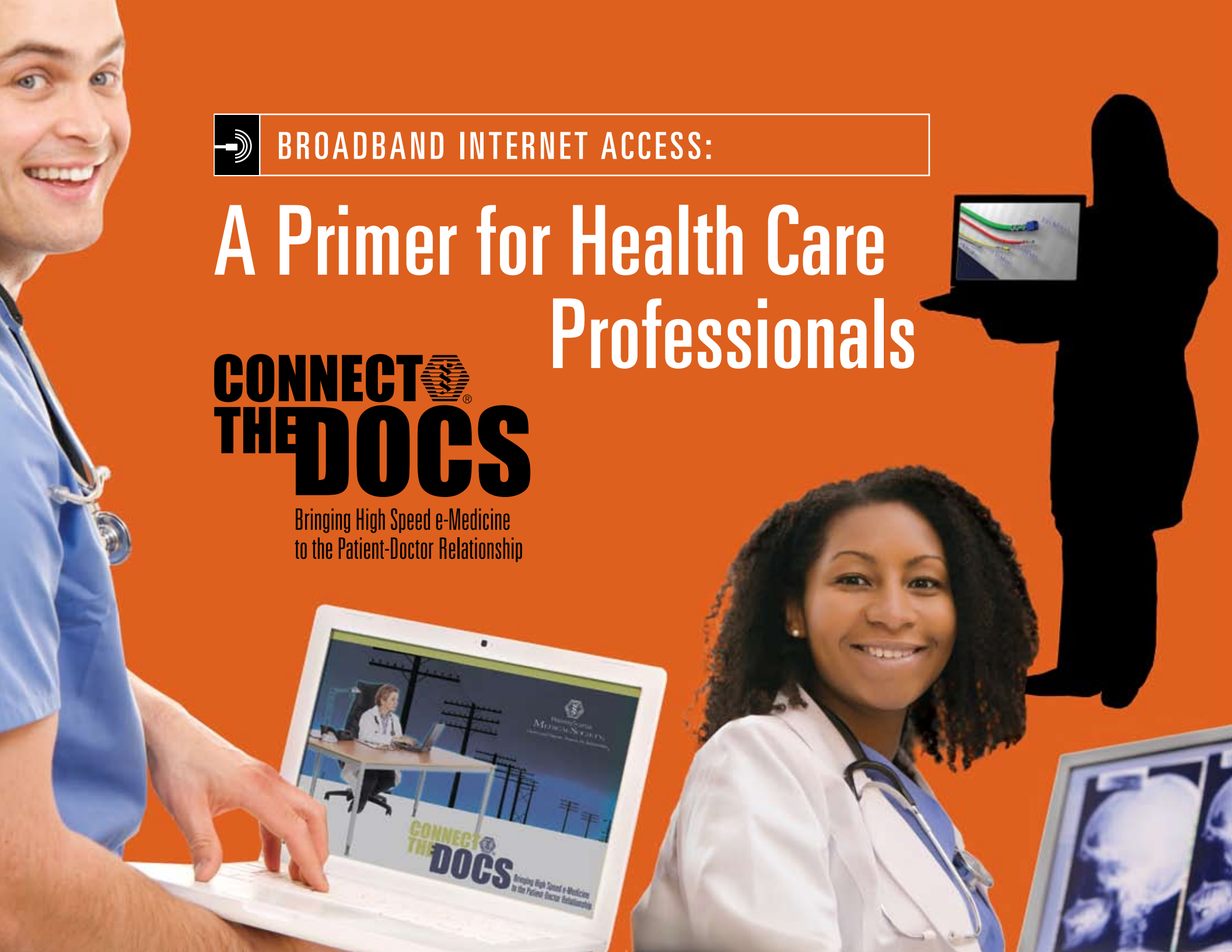


BROADBAND INTERNET ACCESS:

A Primer for Health Care Professionals

**CONNECT
THE DOCS**

Bringing High Speed e-Medicine
to the Patient-Doctor Relationship





An obstetrician in a north central county would like to provide his patients with a genetic counseling consult via videoconference. An emergency physician in a southwestern PA small town hospital needs a trauma center radiologist to look at a spinal fracture. A practice manager in suburban Philadelphia knows electronic health records, which would vastly improve the efficiency of her office, will soon be affordable thanks to economic stimulus funds.

What do all these people have in common? They are hampered and hindered by Internet access that is insufficient to enable them to perform these increasingly simple health care tasks.

They need broadband Internet access.

Why Care About Broadband?

Part of the rapidly changing health care environment is a drive to apply the tools of information technology to help improve care and lower costs. In theory, putting health information into digital format will increase access to the information critical to health care decision making when and where it is most needed. This movement to improve health care through information technology is often labeled eHealth, and the underlying information technology has been labeled Health Information Technology (HIT).

In practice, however, for eHealth information to make a difference in improving care and lowering the cost of that care, the information has to be:

To make eHealth information available outside the doctor's office (i.e. a physician's residence, across hospital systems, or between providers and pharmacies) it must be moved electronically from where it resides to the people who need it. This is accomplished by transmission over some form of telecommunications connection via an external network.

The amount of information to be transmitted determines the bandwidth (the speed) of the transmission path. Health information applications are becoming increasingly dependent upon what is called "rich media content" like images and videos, especially in high definition. Information is no longer represented simply as words or numbers. Text is increasingly combined with audio and video data to present clearer images and more complete information.

This technology has transformed the entertainment industry. It is transforming how people work and learn throughout our society. And it is transforming how health care is delivered.

So to deliver eHealth, doctors must be connected. Their connection may be through the Internet or over a private network. But the underlying telecommunications technology for either will be the same. That technology is known as broadband.

Shareable
Available
Secure

What Is Broadband?

If broadband is defined as high-speed telecommunication transmission, then how fast is “high speed”? What speeds define broadband? Speeds vary widely by type of service. Are they all broadband?

Some would say that broadband is in the eye of the beholder. In other words, broadband is what you need in order to do what you want to do over the Internet or over a telecommunications network. For some, with limited needs, the speed needed is also low; as technology changes and as their needs grow, so do their speed requirements. But let’s take a look at some differing definitions of broadband.

According to one provider, for example, broadband is anything faster than dial-up. But according to an extensive study undertaken by the Communications Workers of America, it is anything over 3 Mbps. Act 183, the Pennsylvania legislation that applies to telecommunication utility regulation, defined broadband for education networks as a minimum of 10 Mbps. While the current median broadband speed in the U.S. is 2.3 Mbps, Canada’s is about 7.6 Mbps. Japan boasts 63 Mbps, while South Korea has announced plans to boost its broadband speed to 1 Gbps by 2012.

These examples illustrate why the definition of broadband is an evolving standard. And it will continue to evolve so that today’s broadband will someday seem as outdated as dial-up as new technologies and applications are developed. The key to understanding broadband, then, is to understand the need for flexibility and scalability in whatever telecommunications service you select to fulfill your current needs.

For health care providers, their definition of broadband depends upon how they need to use it. That need is a function of the applications they use and the number of people (concurrent users) who need to use one or more applications (concurrent applications) at the same time.

Here are some examples from our 2007 ConnectTheDocs¹ Survey and Assessment report:

- 1) ePrescribing can be easily accomplished with a basic DSL connection. However, as the number of concurrent users increases on that connection, delays in transmission can occur and lead to a perceived application slow-down.
- 2) PACS² systems can adequately utilize cable modems for their increased download capacity, but this only applies when concurrent use is limited.
- 3) Quality telemedicine applications require at least a T1 connection to maintain quality of service and a medically satisfactory experience.

Minimum Bandwidth for Limited Concurrent Utilization (examples)

Bandwidth	Application	Max. Concurrent Users
DSL	eRx; EHR (data only); remote monitoring	5-10
Cable / FiOS	DSL Applications plus: Teleradiology (clinical only); EHR w/ images (PACS)	3-7
T1 or greater	Cable/FiOS Applications plus: Telemedicine; Teleradiology (diagnostic) (PACS ²)	1-2

Even for health care providers, then, there is not a single, definitive answer to the question, “What is broadband?” Broadband technology is evolving at multiple levels to meet the needs and demands of health care providers as they evolve in their use of eHealth tools.

1 ConnectTheDocs is a Pennsylvania Medical Society project funded by the Commonwealth of Pennsylvania through a Broadband Outreach and Aggregation Fund grant from the Department of Community and Economic Development in cooperation with the Pennsylvania Department of Health.

2 PACS is an acronym for Picture Archival and Communications System. PACS handles images from various medical imaging instruments, such as ultrasound, magnetic resonance, PET, computed tomography, endoscopy, mammograms and X-rays.

The Bottom Line

Broadband needs to be flexible and scalable in order to meet the changing needs of health care today and tomorrow. The other important attribute of broadband is that it be **affordable**. The best strategy for achieving affordability is **demand aggregation** in which physicians work with others in the health care community and in their local communities to form a type of “buyers club” in order to attract competitive service providers of broadband. You want and need broadband providers to offer their competing services for broadband delivery where you need it and at prices you are willing to pay to obtain it. The Pennsylvania Medical Society through the ConnectTheDocs program has facilitated such demand aggregation projects. We are prepared to offer advice and assistance to our members and to others in the health care community in order to insure that your broadband is all that you need it to be as the ways you deliver quality health care to your patients change over time.

A Brief Telecommunications Primer: Translating the Jargon

BPS—Telecommunications connections vary in size and capacity. Size and capacity are quoted as transmission speeds expressed as the number of information bits-per-second (bps) that can be sent and received.

Kbps, Mbps and Gbps—A transmission speed lower than one million bits-per-second (< 1 Mbps) is expressed as a number of kilobits-per-second transmitted, abbreviated as “Kbps.” A speed of one million bits-per-second or more is expressed as a number of Mbps, or sometimes referred to as “meg(s).” For one billion bits-per-second or more, we express as the number of gigabits-per-second (Gbps) or “gig(s).”

Asymmetrical services—Telecommunications connections may also provide different speeds of transmission in each direction. In other words, the sending speed (Upload) may be different than the receiving speed (Download). Connections that provide different speeds for Upload and Download are known as asymmetrical.

These services generally advertise their speed as “up to” some number, usually the fastest speed, which is the download speed. Asymmetrical services include DSL, Cable, and residential fiber (such as Verizon’s FiOS service) and are generally intended for residential or small businesses. When considering an asymmetrical service for Internet connection, it is important for you to get the service provider’s specification for both upload and download speeds. How much speed you need in each direction depends upon whether you primarily receive, or download data, or if you also send, or upload, large data files. Teleradiology images are an example of a large data file. If you only need to receive such images, then a fast download is most important; if you also send such images, then it is also important to have a fast upload speed.



Symmetrical service—If the telecommunications service transmits at the same speed in both directions, it is called symmetrical. Symmetrical services are generally used to provide dedicated connections between two or more locations forming a private network. Such private networks are used to connect multiple office locations for large medical practice groups or within a hospital's health system. A symmetrical service may also be used to provide all locations in a private network to the Internet through a single Internet connection.

Broadband connections—Broadband connections can be provided via multiple transmission technologies, including standard copper cable, fiber optic cable, and wireless (fixed or licensed wireless). Any and all of these technologies can provide reliable, broadband connectivity, either separately or in combination. So called “fiber” speeds have been achieved in the other transmission technologies, and these technologies are constantly evolving and improving.

Internet service—Following are some common types of Internet service:

Dial-up connection—Transmitting at no more than 56 Kbps, dial-up speed is suitable for only the most basic types of information transmission. It is not broadband.

DSL—Digital Subscriber Line (DSL) for residential service ranges in speed from 128 Kbps to 7 Mbps. DSL has continued to improve its speeds and should continue to get faster. But DSL is also distance sensitive; users who live further from the provider's central switching office may experience degraded performance. While DSL is and should continue to be the slowest of the asymmetrical service technologies, it may be suitable for some HIT users, especially early in their adoption and use of HIT.

Cable—Speeds of cable connections vary widely. A typical provider's service advertises up to 16 Mbps bandwidth for downloads and up to 2 Mbps for uploads. The “up to” is an important caveat for cable because of the way cable service is provided. At busy times, as more users come on-line, cable speeds may be slower than at other times. Again, as with DSL, cable providers have made improvements to their technologies, and their speeds have continued to increase. They have also made changes to limit the loss that occurs during busier traffic periods. Cable is aggressively updating its technologies in order to compete with telecommunications companies and their fiber-based services.

Fiber Optics—Services such as FiOS are currently being advertised and priced at multiple service levels: 15 Mbps Down/5 Mbps Up; 25 Mbps Down/15 Mbps Up; and 50 Mbps Down/20 Mbps Up. Again, these speeds are “up to” speeds and individual experience may be lower. However, the technology is not subject to the same “busy time” changes that can occur with cable, and it is not distance sensitive as is DSL. Although fiber optics is the fastest, it is also the most expensive (see comparison chart under Additional Background, below). However, most cable companies are upgrading their networks to compete with fiber. For example, Comcast has introduced plans with up to 50 Mbps download speeds in select U.S. cities.



Additional Background

Quick Comparison of DSL, Cable & Fiber Optic Internet Access

If you live in a major population center of the United States, then your choice for broadband is currently between three major types of Internet access—DSL, cable, and fiber optics. This comparison chart on the main types of residential high speed Internet access should give you a fair idea of the speeds and costs involved. In most areas, the speeds shown below for DSL and cable are the most common.

Quick Comparison

Compare >>	DSL Internet	Cable Internet	Fiber Optics
Download (Min)	768 Kbps	4 Mbps	10 Mbps
Download (Max)	7.1 Mbps	16 Mbps	50 Mbps
Upload (Min)	128 Kbps	384 Kbps	2 Mbps
Upload (Max)	768 Kbps	1.5 Mbps	20 Mbps
Connection	Phone Line	TV Cable	Fiber Optic Lines
Monthly Price	\$20 to \$45	\$40 to \$55	\$45 to \$145



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For more information about
ConnectTheDocs call
(800) 228-7823, email
connectthedocs@pamedsoc.org,
or find us on the Web at
www.connectpadocs.org

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777 East Park Drive, PO Box 8820, Harrisburg, PA 17105-8820
(717) 558-7750
www.pamedsoc.org