

International Telemedicine Activities in Thailand

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ABSTRACT

The development of information and communication technology has had a dramatic impact on people's lives, including medical matters. The Internet has made it possible for telemedicine to be implemented with excellent image quality at low cost; such telemedicine was first applied between Japan and South Korea in 2002. The technology is not restricted to advanced countries: it can also be applied in developing nations, and it has expanded rapidly to other parts of Asia and beyond. In 2005 Thailand became the seventh country to be associated with the Telemedicine Development Center of Asia (TEMDEC). As of 2017, TEMDEC operates 144 programs in Thailand, mainly in endoscopy (55, 38%) and surgery (40, 28%): 17 hospitals or medical institutions are active members, and there are 165 telemedicine connections. Siriraj Hospital, Mahidol University was the first participant; it has 71 telemedicine connections; King Chulalongkorn Memorial Hospital became the second participant; it has 52 such connections. These two hospitals account for 74.5% (123/165) of all telemedicine activities in Thailand. Compared with outside Bangkok, the number of telemedicine connections is 14 times (154/11) greater and the number of such connections per hospital is 10 times (15.4/1.6) greater in the capital-even though the number of hospitals is only 1.4 times (10/7) greater in Bangkok. To efficiently meet local needs, we strongly hope that telemedicine will expand into rural parts of Thailand and into more medical specialties through ongoing technological development.

Keywords: Telemedicine; remote medical education; internet; endoscopy; surgery (Siriraj Med J 2018;70: 471-475)

Dawn of Practical Telemedicine Between Japan and South Korea

There have been many scientific and industrial revolutions in history. Just a few examples of major inventions include the origins of paper in ancient Egypt, the electric light bulb, usually credited to Thomas Edison, the steam engine and the industrial revolution it ushered in, and the first flight by the Wright brothers. It is undeniable that the recent development of information and communication technology represents another revolution: it has totally changed our way of living. The Internet has enabled humans to connect instantly with one another around

the world, and many people cannot live without emails or smartphones.

Applying this new technology to medicine began in the 1990s. However, the start was not easy. That was mainly because medical imaging requires much higher resolution than that typically used in daily life. To demonstrate surgical procedures, for example, medicine demands videos at high frame rates of 30 frames per second; that is technically very demanding. Satellite technology offers some advantages over the Internet in terms of quality; however, the huge cost is prohibitive. This situation hampered the progress of telemedicine,

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and for about a decade telemedicine remained at just an experimental stage.^{1,2}

That situation changed completely in 2002, when the World Cup was cohosted by Japan and South Korea; then, the two countries became linked by an extremely high-speed Internet connection. The bandwidth rose to 2 Gbps, which was 250 times greater than the conventional bandwidth at the time. That development had a great effect on telemedicine: instead of practitioners struggling to find better compression technology so that medical images could be transmitted through confined channels, huge content, such as movies, could be sent as original, uncompressed files via the wide-broadband Internet. Accordingly, there was no loss in image quality at remote receiving sites; at that point, it became possible to apply telemedicine at a practical level.³ Another essential technology that permitted the implementation of telemedicine is called the digital video transport system. It is easily downloadable, costs nothing, and it has eliminated the need to purchase expensive, specialized equipment to practice telemedicine.⁴

Expansion to Elsewhere in Asia and Beyond

After the two major problems of quality and cost were overcome, telemedicine underwent a dramatic rise: this occurred not only in Japan and South Korea but also in many other countries in Asia and around the world.⁵ This development has been ascribed to the establishment of the high-speed part of the Internet called the Research and Education Network (REN) in many countries.⁶

As of December 2017, we at the Telemedicine Development Center of Asia (TEMDEC) have organized over 800 programs, involving collaborations with 566 institutions in 60 countries. Of those countries, 23 (38%) were in Asia; that proportion was followed by Europe (22%), Latin America (15%), and Africa (10%). The dominant fields were endoscopy (32%) and surgery (20%); however, the remaining 48% comprised various disciplines, such as pediatrics, gynecology, transplantation, cardiology, neurology, dentistry, nursing, and medical student education, among many others.⁷

Telemedicine Activities in Thailand

Thailand became associated with TEMDEC as the seventh country in 2005, when the first telemedicine was demonstrated with the support of ThaiREN, the REN in Thailand.⁸ This program took place when the first meeting of the Asia-Pacific Advanced Network (APAN), the consortium of RENs in these regions, was hosted in Thailand.⁹

Table 1 lists the 17 hospitals and medical institutions in

Thailand that had joined TEMDEC-organized telemedicine programs by the end of 2017. Those programs comprised 165 telemedicine connections. Siriraj Hospital, Mahidol University was the first institution to participate, and it has the largest number of telemedicine connections (71). Two years later, in 2007, King Chulalongkorn Memorial Hospital became the second hospital to join; it has 52 telemedicine connections. Vajira Hospital joined in 2013, and it has the third-highest number of telemedicine connections (14). The top two hospitals in terms of number of connections—Siriraj Hospital, Mahidol University and King Chulalongkorn Memorial Hospital—account for 74.5% (123/165) of all telemedicine activities in Thailand; when the third-placed institution, Vajira Hospital, is added, that proportion rises to 83.0% (137/165). In addition to the hospitals and medical institutions listed in Table 1, TEMDEC also has telemedicine connections with five hotels and convention centers (e.g., Amari Watergate Bangkok and Queen Sirikit National Convention Center); in all, 18 telemedicine sessions have taken place in medical meetings and congresses in Thailand.

Table 2 presents a geographic comparison of telemedicine activities with respect to locations in Bangkok and outside the metropolitan area. In Bangkok, the number of telemedicine connections is 14 times greater (154/11) than outside; the number of telemedicine connections per hospital is also around 10 times higher (15.4/1.6) in Bangkok—even though the number of hospitals is only 1.4 times greater (10/7). In Table 3, telemedicine activities are divided into two periods: before and after their expansion beyond Bangkok. It is evident in that table that the number of hospitals increased by a factor of 3.4 (17/5) and the number of telemedicine connections rose by a factor of 3.7 (35 to 130).

A breakdown by type of practiced telemedicine appears in Fig 1. Among 144 programs organized in Thailand, endoscopy (55, 38%) and surgery (40, 28%) constitute the two largest fields; the remaining 34% cover a variety of areas. Live demonstrations of endoscopy or surgery are performed in 30 (21%) programs. Photographs depicting one such program appear in Fig 2.

Future Direction

A characteristic feature of our worldwide telemedicine activity is that the number of sites connected within one program has increased dramatically in recent years. According to Kudo et al.,¹⁰ although more than five institutions participated only in 21% of telemedicine programs in 2011, that figure rose to 54% in 2015 and in addition, 22% of the programs had more than 10 connected sites in one program. One reason for this

TABLE 1. Hospitals and medical institutions that joined telemedicine programs and number of telemedicine connections.

Institution	Location	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	Total
Siriraj Hospital, Mahidol University	Bangkok	1	4	4	4	3	1	1	6	10	7	6	12	12	71
King Chulalongkorn Memorial Hospital	Bangkok	-	-	3	1	3	3	4	4	2	8	8	10	6	52
Rajavithi Hospital	Bangkok	-	-	-	-	-	2	-	-	-	-	1	2	2	7
Phramongkutklo Hospital	Bangkok	-	-	-	-	-	1	-	1	-	-	-	-	-	2
Ramathibodi Hospital, Mahidol University	Bangkok	-	-	-	-	-	-	-	1	1	-	-	-	-	2
Chiang Mai University Hospital	Chiang Mai	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Klang Hospital	Bangkok	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Vajira Hospital	Bangkok	-	-	-	-	-	-	-	-	1	1	5	4	3	14
Prince of Songkla University Hospital	Hat Yai	-	-	-	-	-	-	-	-	-	1	1	2	1	5
Thai Red Cross Society	Bangkok	-	-	-	-	-	-	-	-	-	-	1	-	-	1
Samutprakarn Hospital	Samut Prakan	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Paholpolpayuhasena Hospital	Kanchanaburi	-	-	-	-	-	-	-	-	-	-	-	1	-	1
National Cancer Institute of Thailand	Bangkok	-	-	-	-	-	-	-	-	-	-	-	1	2	3
Buriram Hospital	Buriram	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Ratchaburi Hospital	Ratchaburi	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Rambhaibarni Rajabhat University	Chanthaburi	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Samitivej Sukhumvit Hospital	Bangkok	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Total		1	4	7	5	6	7	5	13	15	17	22	34	29	165

TABLE 2. Comparison of telemedicine activity between Bangkok and other cities.

	Bangkok	Other cities
Number of hospitals	10	7
Starting year	2005	2012
Number of telemedicine connections	154	11
Number of telemedicine connections per hospital	15.4	1.6

TABLE 3. Comparison of telemedicine activity before and after expansion beyond Bangkok.

	2005–11	2012–17
Duration (years)	7	6
Number of hospitals	5	17
Number of telemedicine connections	35	130
Number of telemedicine connections per hospital	7.0	7.6

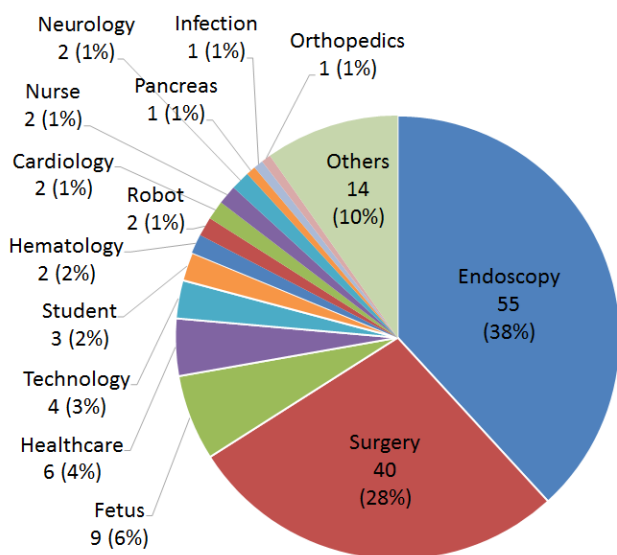


Fig 1. Type of telemedicine conducted in Thailand.

development is the availability of satisfactory Internet bandwidth (both REN and commercial Internet)-even in developing countries and rural areas. Another reason is that new, handy teleconferencing systems have become available.^{11,12}

With telemedicine in Thailand, the great majority of participating sites are located in Bangkok. However, telemedicine is now technically available in small cities; accordingly, its expansion into local areas should be



Fig 2. Teleconference view of minimally invasive surgery in 2015, organized by Siriraj Hospital, Mahidol University team in Thailand (f) and conducted with (a) the University of Malaya in Malaysia, (b) King Chulalongkorn Memorial Hospital in Thailand, (c) University of California, San Francisco in the United States, (d) Vajira Hospital in Thailand, and (e) St. Luke’s Hospital in the Philippines.

expected. Telemedicine is also likely to expand into various medical specialties other than endoscopy and surgery.^{13,14,15,16}

Toward initiating and improving telemedicine, workshops have been organized with the support of TEMDEC in such places as Indonesia and the Philippines, allowing doctors and engineers from around the country to discuss medical needs and technical issues. In Indonesia, that has resulted in monthly teleconferences being started,

involving 11 major university hospitals and remote islands. Similarly, in the Philippines, telemedicine programs have been launched and undergone expansion beyond metropolitan Manila.^{17,18}

We at TEMDEC hope that telemedicine will expand across Thailand, offering its great benefits to medical providers and patients.

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