

## An Initiation of a Regional Telemedicine Network for Enhancing a Surgical Telemedicine Education

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**Abstract.** Telemedicine is influencing surgical training, allows mentoring, proctoring and teleconferencing. In addition, telemedicine is increasingly being applied to carry out remote surgical procedures. It is anticipated that teleconsultation will bring significant value to health care delivery by increasing professional collaboration, education, and information sharing around individual patient care issues while decreasing the need for patient travel and diminishing professional isolation. This paper presents an initiation of a regional telemedicine network for a surgical telemedicine education, and two examples are briefly introduced.

**Keywords:** telemedicine network , surgical telemedicine education

### 1 Introduction

Telemedicine usually refers to the use of information-based technologies, such as computer and communications systems, to provide healthcare across geographic distances [1]. It is becoming an important component in the provision of healthcare by improving access, quality of services, and reducing cost. Surgical telementoring represents an advanced form of telemedicine, whereby an experienced surgeon can guide and teach practicing surgeons new operative techniques utilizing current enabling video, robotics, and telecommunications technology. Surgical telementoring is very significant because it can offer a technological solution to surgically underserved areas by potentially increasing the availability of expert consultation to surgeons serving a rural community during their actual operative procedures. It can also potentially enhance surgeons' education, increase patients' access to experienced surgeons, and decrease the complications due to inexperience with new procedures. In the recent decade, efforts to implement the concept of surgical telementoring have greatly increased. Telemedicine is influencing surgical training, allows mentoring,

proctoring and teleconferencing. In addition, telemedicine is increasingly being applied to carry out remote surgical procedures. It is anticipated that teleconsultation will bring significant value to health care delivery by increasing professional collaboration, education, and information sharing around individual patient care issues while decreasing the need for patient travel and diminishing professional isolation. This paper presents an initiation of a regional telemedicine network for a surgical telemedicine education. Two examples are briefly introduced and discussed.

## 2 Telemedicine Network Initiation for a Surgical Telemedicine Education

IT-assisted surgical telementoring is becoming a new field of surgical telementoring supported by the advanced technology. It may be defined as an experienced surgeon's active involvement (assistance) in a operative-site operation. A good example of such active involvements is that an experienced surgeon assists an operation in a operative area by manipulating instruments through the use of remotely controlled robots for handling the laparoscopic view. With the increasing accessibility of telecommunication, telementoring has been demonstrated that it improves medical decision making, patient outcomes and medical training [2]. Rosser et al. [3] gave an overview of telementoring and teleproctoring, and Eadie et al. [4] reviewed the current effects on telementoring in surgery. Hoznek et al. [5] also reviewed the use of telementoring and it especially focused on the advantages and limitations of all available training modalities in minimally invasive surgery. Marescaux et al. [6] provided an overview of the most important advances and issues developing from the use of computer and robotic technologies in surgery as well. Initial reports of surgical telementoring introducing robotics technology were published in 1994 by Kavoussi et al. [7]. Figure 1 shows the overview of the proposed telemedicine network initiation for a surgical telemedicine education.

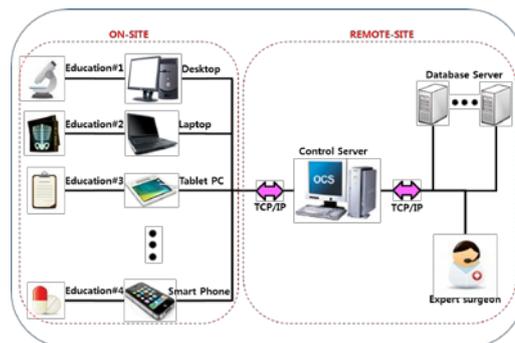
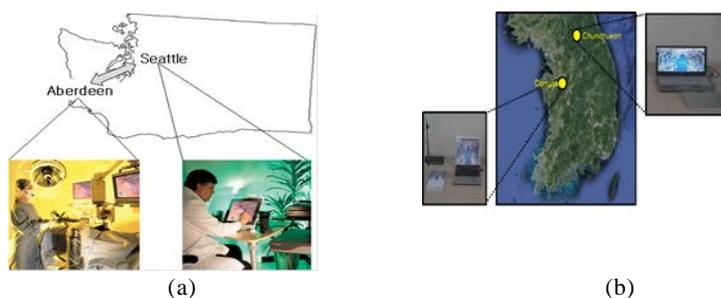


Fig. 1. Overview of the proposed telemedicine network initiation for a surgical telemedicine education.

### 3 Results and Discussion

**Examples:** the first example as the results is the system based on real-time interactive video-endoscopic telementoring support and robotic assistance. The remote site is located at University of Washington Medical Center (UWMC) in Seattle, Washington (USA). The system as telemedicine link is installed between Grays Harbor Community Hospital in Aberdeen which is the regional Seattle: the operative site is about 115 mile across the state in the operating room (OR) at Grays' Harbor Community Hospital in Aberdeen, Washington (USA). A surgically dedicated industrial system, the SOCRATES™, has been provided to the both sites. The both sites are enhanced with experienced surgeon's active involvement in a operation by using the system. Three surgical telementoring cases between Seattle and Aberdeen took place as the preliminary clinic trials: a case of bowel obstruction, a laparoscopic cholecystectomy, and an umbilical hernia repair. The second example is the system based on real-time interactive video telestration support. The remote site is located at Hallym Medical Center in Chuncheon, South Korea. The operative site is about 200 mile across the nation in the operating room (OR) at Community Hospital in Dongtan, South Korea. Instead of the SOCRATES™ used in the first example, we developed and built inter-hospital system for ourselves, a part of the entire system, as shown in Fig. 1. Both sites are enhanced with experienced surgeon's active involvement in a operation by using the system. Surgeons at both locations were able to see the tissues accurately enough to discriminate the color and texture quite well. The zoom capability of the overhead camera for external view allowed excellent closeup views with adequate lighting, and the telestrator, that allows annotation and drawing on the screen, also worked satisfactorily. Planned procedures will take place approximately 4 to 5 times per month initially, with an anticipated increase in utilization over the period to 8 to 10 times per month. Figure 2 shows the two examples based on the proposed surgical telemedicine education network.



**Fig. 2.** Examples of the proposed surgical telemedicine education network: (a) telemedicine link between Seattle and Aberdeen, USA (b) telemedicine link between Chuncheon and Dongtan, South Korea.

**Robust utilization and integration:** a single site program does not provide cost-effective use of expensive equipment and telecommunications costs. Rather, robust utilization of equipment and transmission modes must be realized in order to justify

the costs. With this in mind, the current program is now under expansion to the regional telementoring network into the second stage.

**Technology cost reduction:** most of the problems with sustainability of telemedicine (including telementoring) have been related to technology costs (equipment and line). In this case, rural (operative) sites will have obtained connectivity to the telemedicine network through the statewide (nationwide) educational network. This allows the operative sites to have great potential to maintain telecommunication lines beyond grant funding, and removes the per-call disincentive of toll charges so that sites will be financially better off in fully utilizing and sustaining their participation beyond initial grant funding.

## 4 Conclusions

This paper reported on a surgical telementoring initiation of a regional telemedicine network with its two preliminary results linked between Seattle and Aberdeen, WA, USA, and between Dongtan and Chuncheon, South Korea. They have attempted to combine the well-established telemedicine networks (the WWAMI program) with a FDA-approved, surgically-dedicated industrial system for improving patients' healthcare and enhancing surgical educations in the operative sites. Those programs have potential to bring enormous benefits to patients who will, in effect, be obtaining consultation and supportive care from highly experienced surgical specialists, while remaining within the care of their local surgeons and institutions. Healthcare providers and their institutions will also gain access to valuable education and experience in new procedures, while keeping their patients together with their families in their home communities.

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