

# Perfusion Education in the Internet Era

*Kuna Kim*  
*South Korea*

Members of the Academy, guests, and friends, let me first say that it is a great honor and privilege for me to be here today to deliver this lecture in memory of Charles Reed. Who would have thought seven years ago that a newly trained perfusion nurse from South Korea would be standing in this position to talk about the perfusion practice in Korea? I am not a great experienced perfusionist, as are some of the people you have heard during the meeting, but I would like to talk to you from the heart about something that I believe in and pursue.

## **Charles C. Reed**

Unfortunately, I did not know or work with Mr. Reed, but I think I know him in a different way. In 1998, I started my perfusion career. My two-year-experienced chief perfusionist trained me at that time. After three months, I did my first CABG case. At that time, this textbook of Mr. Reed was the main theoretical recourse for me. I did not know who the original owner of this book was. Maybe one Korean surgeon got this book when he finished his training at some hospital in the United States. The perfusionist who worked with that surgeon made a copy of this book. After the fourth or fifth time of copying the book, I had my own copy.

Maybe you can ask why we kept illegally copying this book instead of buying a new one. At that time, it was difficult to buy the English-written perfusion textbooks. Some of the senior perfusionists already contacted bookstores to get perfusion textbooks. However few were familiar with this new area and were not interested in importing perfusion textbooks. Nowadays, with the Internet, most perfusionists can buy perfusion textbooks written by Mora, Gravlee and others Korean books. With this multi-copied textbook of Charles Reed, I learned most of the fundamental perfusion knowledge and skills. During the winter break, I came back to the Reed book to prepare my talk today. Mr. Kurusz and other friends sent me various materials about Mr. Reed. I found one common thread in reviewing things that had been written in his textbook. Mr. Reed was a facilitator. He was loyal to the clinical perfusion practice. He had a strong vision of perfusion education. He did not look for credit for a lot of things that he did. He wanted to see us become a professional entity in which we could take pride.

These findings gave me strong pride that it would be a great honor for me to talk about my beliefs and thoughts in the memory of Charles Reed.

Before starting my talk about the perfusion practice in Korea, first I want to thank you for the privilege of being your speaker and second, I am proud to be a member of the American Academy of Cardiovascular Perfusion. Since I already heard from my colleagues about their inspiring learning experience at the Academy meeting, I always wished to have a chance to attend the Academy meeting. I always felt reverence for the pioneers of our field of perfusion and hoped to meet them in person and to learn from their experiences. Because of its unique design and nature, the Academy meeting is one of the well known perfusion meetings in my country and most of Korean perfusionists know that the Academy meeting affords perfusionists the opportunity to come together, to share knowledge, and to seek new advances that we as perfusionists must consider our obligation to our patients and our profession.

## **Overview of South Korea**

For the next several minutes, I would like to briefly introduce Korea. Since Korea has its own unique culture, I think you can better understand Korean perfusionists in the context of Korean Confucian culture. South Korea occupies the southern half of the Korean Peninsula, which extends about 1,000 km southward from China. The total area of South Korea is about 99,000 km<sup>2</sup>, including about 3,000 islands. Mountains and hills make up about 70 percent of the country. Since 1945, as a result of the Cold War, the peninsula has been divided into two parts: the democratic Republic of Korea, or South Korea, and the communist Democratic People's Republic of Korea, or North Korea. South Korea occupies the southern half of the peninsula. It is separated from North Korea by a four-kilometer wide Demilitarized Zone (DMZ).

The population is heavily urbanized. Over 10 million people live in Seoul alone, making it one of the ten largest cities in the world. The Korean people form a homogenous ethnic group of Mongolian descent that is quite distinct from the Chinese and the Japanese. Koreans are highly nationalistic and intensely proud of our language, cuisine, dress, architectural and artistic heritage, all of which differ

from those of China and Japan. The capital city is Seoul. There are four distinct seasons of which spring and autumn are the most pleasant. Summer is hot and humid with July and August the hottest and also the wettest months. Winter is cold with moderate snowfall.

Korea's economic success was originally based on industries such as shipbuilding, automotive, textiles and steel but in recent years Korea has become a world leader in such sectors as semi-conductors and electronic products. South Korea is placed 13th in world GDP rankings, the fourth largest in Asia, after Japan, China and India.

Like all agricultural societies, Korean life has always centered on tightly knit families. The Confucian system was imported from China and made the official state belief system in about 1390. Order and authority are the hallmarks of Confucian thought. Traditionally, older people are accorded honor. Anyone older must always be addressed with honorifics, even among acquaintances. No one would think of calling an older person by his or her first name, much less a grandfather or grandmother. Bowing to them is the really traditional way of greeting. Hard work, obedience to family, protection of the family, and proper decorum among family members are very much Korean values, even in the modern world.

Today, women are in every occupation, from government officials to business persons and professors, and of course, perfusionists. In traditional Korean society, women were expected to stay at home, to raise children, keep house and prepare meals. When women married, they came to live in their husbands' houses, but always kept their own family names. Once in their husbands' homes, women became a part of the extended families.

Buddhism, Christianity and Confucianism are the three major religions in Korea. About fifty-one percent of Koreans are Christians. The Roman Catholic religion arrived in the 17th century. Christianity was prohibited by many of Korea's rulers and some Christians were martyred. After World War II, however, Catholicism grew rapidly, but not as fast as Protestantism. The first Protestant missionaries arrived in Korea in 1884. They began programs of education for young Koreans, many of whom would become leaders of the country. After the Korean War, the number of Protestants rose dramatically. Today, almost forty percent of Koreans are Protestants, divided into 113 denominations. Of all philosophical systems, the one attributed to the Chinese wise man called Kung Fu-Tse, or Confucius, had perhaps the greatest influence on Korean ideas. Confucianism is not exactly a religion, but is a political/social system based on subordination - sons

to fathers, wife to husband, people to rulers. It emphasizes proper rituals, ceremonies, and conformity to decorum, or standards of correct conduct.

All across Korea, the eldest sons of the family will clean and prepare the burial mounds of their most recently deceased ancestor. Even in these modern times ancient symbolism remains important in burial and memorial traditions.

### **Ajou University Hospital**

I would like to give you a short introduction of my hospital and myself. I had been an ICU nurse for three years. In 1996, I attended the Acute Care Nursing Training Program at the Cleveland Clinic Foundation in Cleveland Ohio. For two months, I had learned how to take care of the patient with a Heartmate™. Circumstances led me to become a "pump nurse" at a time when little formal training was available. I started my perfusion career in 1998 at the Ajou University Hospital. The surgeons and senior perfusionists with whom I started out could tell me what results they wanted, but they could not always tell me how to achieve those results. I believe that these are many of the small questions only a perfusionist could love and it is worth to discuss their presumed causes. Finally we will be able to answer these questions along the way.

Naturally, I referred various researches from the *Journal of Extra-Corporeal Technology* and *Perfusion*. I found that some authors were actively conducting interesting researches regarding my questions. So I emailed them and asked questions. Most of them were good resources who were willing to share their advanced knowledge and clinical perfusion experience with us. They provided the concrete references elucidating the new techniques and theories applicable to our daily practices. I only wish to point out that the perfusion practice of that time still had a long way to go. Indeed, the more I learn, the more I realize how far I still have to go.

We had a Perfusion Department of two full-time perfusionists. We worked as one team and play a role as a primary and secondary perfusionist. We annually performed about 200 cases of open-heart surgery. Since our hospital is a university-based hospital and a tertiary medical center with 1004 beds, we are dealing with complicated cases including both congenital and acquired cases. We are using Cobe and Sarns 8000 heart-lung machines. Our disposables are Bentley/Jostra "Spiral Gold" and Terumo Capiiox 18R based on customary circuits. We use Minimax and Capiiox 10R for pediatric cases. We use the Affinity or Bentley adult arterial line filter and Terumo filter for pediatric cases. Surgeon's preference is a major reason for using these particular

brands of disposables. Our prime volume is 1400-1500 ml for adult cases and 400-800 ml for pediatric cases. In this prime, we have mannitol, albumin, bicarbonate, antibiotics, and porcine heparin. The priming solution is Plasmalyte A. We routinely use aprotinin for adult cases. We use blood cardioplegia, which is modified Buckburg solution. We deliver it chilled or warmed at a 4:1 ratio using a Terumo BCD set. We do not use vacuum assisted venous drainage. We employ nonpulsatile flow for all cases. We employ total circulatory arrest and retrograde cerebral perfusion for aortic aneurysms or dissections.

### **Open Heart Surgery in Korea**

Cardiac surgery was clinically introduced in Korea fifty years ago. There are two university hospitals claiming the first open heart surgery. The first successful open heart surgery was performed in 1961. Shortly after, a few other surgical teams in different hospitals began with cardiac surgery. In 1963, an ASD was repaired with a CPB device, sigma motor pump and bubble oxygenator. Eight months later, another ASD surgery was successfully done with Zuhdi-Dewell pump. With the advent of the nationwide public insurance and the Korean Heart Foundation in the late to early 1980s, the number of open-heart surgeries increased. Currently, there are about 100 perfusionists working in 50 different hospitals and performing annually 10,000 cases of open-heart surgery.

### **Perfusion Practice in Korea**

Cardiovascular perfusion is a relatively young profession in Korea. Many of the early perfusionists were surgical residents, anesthesiologists and even cardiac surgeons. As the field of cardiac surgery grew so did the need for pump technicians. Laboratory technicians, engineers, nurses or anyone with a keen interest and desire to become involved in this new and challenging field of perfusion were trained to operate the heart-lung machine. During this period, perfusionists were dedicated to work with surgeons and anesthesiologists, because of their courage to face new challenges without guidance or precedence, without sophisticated monitors or equipment and with only their intelligence and clinical experience to contribute to the surgical outcome. Almost every operation was a new experiment and every experiment was relevant. And the perfusionists in the early days had no teachers, and learned from empiricism. It was a day of glass and stainless steel. They learned from failures and negative experiences and developed better equipment and techniques. By the early to mid 1970s, we saw the evolution of pump

technicians into perfusionists. Perfusion was evolving into a profession. Formalized hospital-based training programs were emerging. Since it became more and more difficult for perfusionists to make improvements without external contacts and information from more experienced persons in this field, they started to meet and share their knowledge and skills. Although there were several trials to start a national organization, they could not establish a society until 1980.

In the early days, people with various backgrounds took care of clinical cardiopulmonary bypass. However, the amount of technological changes and continuous growth of information automatically led to a need for well-educated specialists in this field. In the mid 1980s, a group of surgeons started to work with people with nursing backgrounds in the ICU or the OR. This new perfusionist group was mostly female and had at least a Bachelor's Degree in Nursing with an excellent academic record and some had a Master's Degree in Cardiac Nursing. After several successful classes of these nurse perfusionists, the demand for the female perfusionists increased. Currently, 44% of KoSECT members are female perfusionists.

Despite many differences, these two groups of perfusionists have worked for formal recognition of perfusion as an allied health profession, credentialing and certification for professional status and accreditation for training and educating their successors in their programs.

### **KoSECT (Korean Society of Extracorporeal Technology)**

Korean Society of Extracorporeal Technology or KoSECT was founded in 1980. However, we still do not have official educational programs. Perfusion training is still directly linked to the workplace. Many of our in-service training programs have a clear goal to meet the manpower and specific skills needed in the operation room. After accomplishing our basic training, most perfusionists are continuing their own independent study through journal review, weekly cardiac conference, semi-annual surgery conferences, and perfusionist meetings. On the contrary to this training system, in the hospital setting, perfusionists are expected to catch up with rapid technological developments. However, the legislative process for perfusion education and certification is retarded due to lack of proper understanding of our profession and some ongoing political struggle within our organization.

As an active member of KoSECT, I came to realize that it is true that if one is not a part of the solution, one is part of the problem. Some people choose to leave an organization rather than work to

make changes. That is understandable and perhaps even logical. However, historically, our society has had the benefit of having a small number of dedicated perfusionists that have worked for the perfusion education and practice as a combined objective to advance our profession. They continued to educate themselves, stay current, read the literature and communicate with other perfusionists. These perfusionists have been the strongest potential of our organization. In June 2001, a senior perfusionist Won Yon-sung opened the homepage of KoSECT. I think this provided the first opportunity for all perfusionists, old, young, male or female, to talk freely about our profession. This communication opened the door for perfusionists to address real issues dealing with the profession and the political issues in a democratic way. In Korea, under the new Internet culture, most users are expected to interact in a democratic way using respectful language, men or senior users should respect women and young users in the world of the Internet. Within one month, about 80% of Korean perfusionists joined the KoSECT website membership.

As a result of these democratic organizational activities through the Internet, KoSECT could get out of its passive behavior for decades and could bring about abrupt progress. It could hold the first nationwide official educational meeting that same year. Three active members of the society presented the results of their studies. With its first success, KoSECT could hold this meeting twice a year, where the members have an opportunity to interact face-to-face and strengthen their unity.

### **www.perfusionkorea.org**

I would like to talk about how I created the perfusionkorea website. It was originally started from my perfusion department homepage in 2001. I put our perfusion manual on the website with a bulletin board. With the postings and emails, I could communicate with my colleagues. That made me realize how strongly we wished to talk about our practice and to enhance our professional image. After several updating processes, it became the major perfusion website in Korea. There are about 250 members including perfusionists, allied professionals, medical and nursing students, manufacturers and the public. It is a non-profit organization, which is designed, built, sponsored and managed by yours truly. It is intended to provide comprehensive, web-based information on perfusion practice and to form a unique electronic community of perfusionists.

There are several sections of perfusionkorea. "What is perfusion" explains what perfusion is, what perfusionists are doing and the scope of perfusion

practice. This selection also explains the brief history of cardiopulmonary bypass and the first perfusionist. The aim of this section is to give simple and clear information about perfusion practices and to enhance professional perfusion images to others.

"Perfusion in the world" is intended that members will be well informed and have well-balanced opinions of perfusion practices throughout the world. There are thousands of perfusionists all over the world, many working in vastly different and sometimes difficult work environments. An opportunity to interact and share experiences with other perfusionists around the world would be a powerful source of encouragement. It talks about foreign perfusion societies and their goals and current activities. The first story is about the Netherland Society and experiences of Mr. Dick de Jong. His thoughts echoed a poignant perspective that we must be contributing participants in our profession. This had made us more aware that the government legislation process and perfusion education must have cooperation. The second story was about Ms. Maria Helena L. Souza from Brazil who started the famous perfusion website "perflin."

"Perfusion Resources" is the most useful section for users. It includes: Basic CPB, such as cannulation, oxygenators and pumps; CPB & Hemostasis; Conducting CPB; and Congenital Defects. "How to Speak" is about the English language. Many Korean perfusionists show a great deal of interest in other perfusion societies around the world and are eager to communicate with each of them. However, as English is not our native language, we have difficulty conversing in the English language. This section helps Koreans learn English expressions related to perfusion practice.

"Back to the basics" includes basic knowledge needed to our daily practice. It deals with major medications, their indication, dose and useful comments. It also has basic physiologic issues. Since most of Korean perfusionists have the Internet access in the OR, they can look up some basic information at this database whenever they need. It is a short and effective reminder for the perfusionists. "Multimedia Resources" includes images, flash animations, video clips and other multimedia information.

Whenever I attended a perfusion conference and met many perfusionists, I tried to share my experiences from the meeting with Korean colleagues. Later on, I presented brief overviews of interesting studies of the conference and showed video clips of famous speakers. I introduced the IABP training program in India and wrote the Korean IABP manual. I concentrated on the physiology of the cardiac cycle, history of counterpulsation and preparation and monitoring of IABP. When I visited

other hospitals, I introduced this different setting to my colleagues. I concentrated on clinical setting, including overview of the hospital, purpose of visiting, their pump setting and rationales and perfusionists.

In 2003, I was an invited guest of the FECECT meeting in Portugal. To introduce Korean perfusion society and perfusionkorea website, I made 80 demonstration CDs for FECECT meeting attendees. Whenever I met perfusionists, manufacturers and speakers, I gave them this demonstration CD and showed an overview of my website with my laptop. Later on, I could develop new contacts with people from various areas in Europe. I also introduced the FECECT meeting, interesting presentations, and social events to my Korean colleagues. Since I believe that Korean perfusionists will hold our first international perfusion meeting in the future, I paid attention to how to organize the international meeting including call for abstract, conference auditorium, broadcasting devices, hotels, registration and other relevant detail matters.

In my department, whenever we have a new device, we thoroughly review the operator's manual. Later we record additional information such as troubleshooting and history of service and maintenance. I made an online manual of our new heart lung machine to discuss with colleagues and engineers. Therefore, I could have comprehensive information on my machine.

I think heart failure and mechanical circulatory support is one of the main issues of our practice. I was also interested in the trial-and-error history of these supporting devices. With classification and a brief overview of each device, we could get more comprehensive knowledge and new ideas for our practice. After studying the flow of product development, I could take a more integrated view of mechanical circulatory support systems.

### **Cyber Education & Organizational Activity**

I have been a member of the computer programming community for seven years. Since I was interested in developing effective educational material, I learned various computer skills from many programmers and graphic designers through the Internet. Every year, I attended the IT forum in Seoul, Korea. Two years ago, Bill Gates from Microsoft was one of the speakers and gave a lecture on "The Digital Decade." He mentioned the remarkable development of the Korean Internet industry and also suggested many interesting applications of the Internet to each professional and educational area. At the subgroup meeting of that forum, I met a group of programmers who were studying cyber education. After that meeting, we

have developed both personal and professional relationships.

I introduced the perfusion profession and our educational issues. They thought that perfusionists could be the best candidates for the cyber education. They understand perfusionists' scope of practice, working schedule and on-call system. Since perfusionists are medical professionals and need continuous education and active communication within an organization, they suggested that the cyber education and organizational activity would be most effective way for our professional development. They helped me to program the perfusionkorea website as a database rather than individual web pages. Once the database was built, there could be lots of technical possibilities and easy updating and maintenance process.

Website maintenance and resource management are very important factors for the long-term survival of the website. I applied a log analyzer to get statistical data. The log analyzer is a computer program checking every detail individual characteristics such as when they log in, how many times they log in for one day, which page got the highest hits, or the lowest hits, and which information they mostly want to download. In conjunction with registration information such as sex, age, profession, nationality, I can get the comprehensive information which helps me figure out users' needs and estimate the future directions of the website.

Perfusionkorea was begun with the theory of Lipnak & Stamps (1997). They defined a virtual organization as a group of people who interact through interdependent tasks guided by a common purpose that work across space, time, and organizational boundaries with links strengthened by webs of communication technologies. Perfusionists can meet at perfusionkorea any time of day, regardless of time and geographical limitations. They are bonded by a common goal and voluntarily come together to advance perfusion practice on an ongoing basis. They communicate and coordinate their work through computer technology. With three years of experience as a webmaster, I certainly think this website has become a catalyst by encouraging communication through the dissemination of perfusion-related knowledge. Indeed, these were the premise and purpose, as I understand it, for the establishment of perfusionkorea.

I have used Microsoft Producer, which is available for free download at the Microsoft website. This software combines and synchronizes audio, video, HTML and PowerPoint slide presentations. I recorded the audio and video narration, synchronized audio and video with PowerPoint

slides and posted this presentation at the perfusionkorea website. These cyber presentations showed the most interest and got the highest number of hits from the users.

After attending several perfusion meetings, I found that some perfusionists in Asia, including Korean perfusionists, have difficulties in reaching the desired level of professional acceptance, due to the fact that too many members of the organization are scientifically isolated by not being able to communicate in English. It is probably fair to say that delivering presentations in English is a real advantage for the native English speakers but quite a burden and challenge for those who must use English as their second language. In addition, most of the scientific papers are published in English, and the majority of scientific meetings all over the world are using English as the main language to communicate with the audience.

As a foreign perfusionist, I have observed that some foreign speakers had linguistic difficulties in delivering their presentation. Their presentation was difficult to understand not because of the contents of the presentation itself but because of the speaker's foreign accent or pronunciation. If we selectively use this presentation method, which has speaker's narration and captions, the audience can overcome the language barrier to some extent and will have a better understanding of the presentation. In addition, owing to unavoidable circumstances, the speaker might not be able to attend the meeting.

For example, in 2003, a group of Chinese perfusionists could not attend the FECECT meeting in Portugal because of SARS (Severe Acute Respiratory Syndrome). However, the FECECT committee did not give up the Chinese presentation. They hooked up the speaker through the telephone. Therefore the audience did not lose the precious chance to hear the Chinese presentation. I was very impressed by the committee's efforts. Furthermore, I would like to suggest that we can apply this new technique of presentation. So the speaker is still able to deliver presentations at any circumstance. It can bring mutual benefit to both the audiences and speakers.

Finally, I would like to think about our colleagues who back us up when we attend this meeting. After coming back to them, we would share our experience at the meeting in many ways. We could talk about the meeting showing the pictures or share the Proceedings of the meeting. I made a series of postings about the Asian and FECECT meetings' presentations and social events and shared them with my colleagues. Most of them could figure out what was going on at the meeting. I suggest that in the future, perfusion organizations can publish the

Proceedings with the CD including the cyber presentations of the speakers. After the meeting, perfusionists can still share their experiences from the meetings with their colleagues with the original speaker's presentation.

Since most of the international meetings already applied sophisticated broadcasting devices such as digital camcorders and recording devices, the additional editing process will be needed to make the presentation CD. Some of you may be concern about the cost and technical difficulty of applying new technology to our area. But I would like to ask you to remember the case of PowerPoint. When PowerPoint came onto the market for the first time, few people were good at dealing with it. Some speakers had to ask a secretary to make their slides. Nowadays, most of speakers make their own presentation slides and more and more user-friendly functions help make this process easier.

I knew that several versions of the cyber presentation were tried by several perfusion organizations in conjunction with computer companies, but the cost-effectiveness of the project was not favorable. I do believe that, like we make our PowerPoint slides now, we will be able to make and edit our cyber presentation in the near future at the minimum expenses. How all of this new technology will relate to each perfusionist and perfusion societies is what I hope to point out here today, rather than to claim Microsoft Producer as a panacea for perfusionists. To improve the quality of patient care and to get the clinical perfusionist more recognized, I hope that perfusionists will be able to explore all of the possibilities by being open to new ideas and by eliminating any restrictions which might limit our vision of the way things can be.

### **Future Plans**

In 2000, I gave birth to a healthy son. Although I was not fully recovered from the Cesarean Section, I had to come back to the O.R. and run the pump three weeks after my surgery, because of a manpower problem. I always believe that we, perfusionists, know what it means to wear a pager and to response to all the emergency calls for 24 hours a day and 365 days a year. I am sure that all of our sacrifices necessary to become a perfusionist will entitle us to be professionals. On my way home, I imagined that sometime in the future, if my son asked me why I spend so much time at the hospital rather than staying with him and playing with him, what will be my answer? If I tell him that I am a perfusionist and I need to run the pump for the patients who need heart surgery, can he understand my profession in the context of Korean society, in which people hardly know this profession?

This was the first time to think about my professional identity. I hope that my son will be proud of his mother and understand my profession when he grows up. My question ought to be answered and it became the most powerful motivation for me to actively involve KoSECT. After years of efforts, I could see lots of meaningful outcomes including organizing committee, building KoSECT website and hosting an educational meeting. I always believed that as we were getting to understand each other, we would see a dramatic increase in our productivity as a professional perfusionist playing a crucial role in the heart surgery team. We needed to learn to collaborate. I did believe that this creative cooperation of perfusionists could create new options and that even in those situations where true cooperation was not achievable; our sincere trying would usually result in more effective relations. We should stop wasting time finding fault with our national professional organizations.

Personally, as I look back over the past seven years and the changes that have shaped my life, I found that to a great extent, I have grown up with the profession. First, I became confident that cardiopulmonary support could replace temporarily the body's own function and try to maintain whole body homeostasis. At the same time, cardiopulmonary support has to be conducted with minimal disruption to cellular and physiological mechanisms. The patient's cognitive functions, memory, emotions and everything about my patient are contained in that fragile vessel. How can I fulfill this responsibility, which can make all of the difference in the world for the patient?

Being a perfusionist is much more than building a pump circuit and conducting cardiopulmonary bypass. I know that to be a clinical perfusionist is to belong to a quality control profession. For the well being of my patients, I cannot make a mistake. When mistakes are made, it is just as devastating to the perfusionist as it might be to my patient and his or her loving people. I am an integral part of the decision-making affecting perfusion. Therefore, I have concluded that I could be a professional when I have a formal education system, a legal license and a professional organization. I frequently shared my thoughts with my close friends and colleagues.

As I mentioned before, I am fortunate in having a very supportive husband. He understood this situation and supported me to attend perfusion school for two years. He would take care of all the family works. We knew that I could come back to the family during the winter and summer break, therefore, we could live together at least five months in a year. Some said how could we sacrifice our private life for the profession. However, we thought that it could be a privilege rather than sacrifice and it would be a different way of life. In addition, Mr. Robert Fallow and my other professors at the Cleveland Clinic Foundation were so supportive that they clearly understood my study plan and allowed me to study at their excellent program.

Since I was most interested in perfusion education and I have continued to develop perfusion educational material on my own, I wanted to be a perfusion student with a different perspective, who is interested in both learning and teaching perfusion. While studying at the perfusion school, I can continuously share my experiences with my colleagues through my website and develop a model of educational system with them, which will be needed in Korea in the future. To study at the Cleveland School of Perfusion as a student is certainly one of the high points of my career and, it has been all the more appropriate as it comes at a time in my career when I am growing myself in the profession. As a Christian, I believe that God has his own plan for me and will show me the right way. Like I never dreamed of my presentation today, I will never know what the future will bring to me. I just try to concentrate on here and now. This is the only specific plan I have right now.

Members of the Academy and friends, I thank you again for the great honor and privilege of being here today and to deliver this presentation. I hope my presentation could show you another technical possibility of the presentation in the near future and perfusion practices and organizational development in Korea. As I mentioned, Korean perfusionists have known Mr. Reed by his great books and we have learned a lot from him. He was one of the key people who has shaped the growth and development of cardiopulmonary bypass. We, Korean perfusionists really appreciate his valuable teaching and legacy. Thank you.