

## Original Article

# Eleventh Annual George Daicoff Lecture: Pediatric Cardiac Surgery: It's a Wonderful Life†

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**G**OOD EVENING, EVERYONE. IT IS A SINCERE honour to be here and to have been asked to deliver the George Daicoff lecture. George has been a real leader in our specialty and has been a friend of mine for decades.

George is a man for whom I have great respect. He is one of the founding members of the CHSS. I first met George at one of the CHSS annual meetings; I was invited to give a presentation as a Thoracic Surgery Resident at Michigan.

George is also a Hoosier! He grew up in Gary, Indiana, and, as a boy, worked in his Dad's hamburger shop. In the summers, during high school, he worked in the Gary steel mills in Gary, Indiana. He went to Indiana University (IU) on a scholarship, got into and graduated from the IU School of Medicine, and completed his general and cardiothoracic surgical training at University of Chicago in 1963. He thereafter did 3 years of cardiovascular fellowship in Chicago, London, and later with John Kirklin at the Mayo clinic. He started his independent CV surgical career in Gainesville and was there from 1967 to 1977, and he rapidly ascended to become the chief of CV surgery at the University of Florida. In 1977, he moved here, to St. Petersburg. He started the adult and congenital heart programmes and later hired Jim Quintessenza and Jeff Jacobs. George paved the way for the kind of progress in our field for which the presentations at this meeting have given testimony.

It's a privilege to be giving this talk, here in Florida tonight, because I feel I am among colleagues

and friends. Many of you I've known for many years. Most of the surgeons here come from a common background of training and experience.

All of you here tonight have dedicated yourselves to one of the most difficult and challenging subspecialties in all of medicine. Ours is one of the longest and most demanding training programmes in medicine and we often care for the most critically ill and the smallest of patients. Our years of education and training were extensive. Our commitment to pursue a career in paediatric cardiac medicine was not a solitary one. It was a commitment our spouses and families made as well. The requirements of training, the unrelenting demand on our time, and the total emersion of our physical, emotional, and psychological beings into patient care, all of that came with a price to ourselves and our families. There have been missed anniversaries, birthdays, children's ball games, and countless dinners with our spouses and children. There have been many times when we've had to say "no" to someone near and dear to us so that we could fulfil our obligations to our patients.

For those of you who have stood by us – our spouses, our children, and friends – we know there has been an inordinate demand on you to be flexible, patient, understanding, and forgiving. "Thank you". You've made great sacrifices too.

And so, when I told Carol Ann, my wife of 45 years, that I was entitling my talk tonight "Pediatric Cardiac Surgery: It's a Wonderful Life", her first response was, "Really! For Whom?" Then she suggested that after I finished my talk, she would receive 5 minutes of time for rebuttal...

Nevertheless, though it may have been an arduous path, I firmly believe that my career as a paediatric heart surgeon could be summed up with this phrase, It's a Wonderful Life. I believe this because Pediatric Cardiac Surgery is FILLED WITH WONDER. CV

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surgery, *This Wonderful Life*, has filled my 40 years as a heart surgeon with wonder, mystery, and awe. For me, CV surgery is not just a career; it's personal and something for which I have great passion. In the next few minutes, I'd like to share some of my reflections on what I consider the seven wonders of our specialty. Because I think, if you'll forgive the pun, these seven wonders are at the Heart of what a life as a paediatric CV surgeon is all about.

### **Wonder #1: the wonder of our profession to change us**

I would be less than truthful if I said that this talk didn't challenge me to go outside my comfort zone. Instead of presenting a surgical technique or clinical research outcomes, this is the first talk of my career in which I am speaking about my thoughts and deepest feelings about what I do.

Preparing for this talk has been a journey of reflection. I have come to appreciate that CV surgery has allowed me to experience the vast array of the human emotion – from the darkest feelings of disappointment, despair, and failure, if a child dies or has a bad complication, to the most elating and rewarding feelings of accomplishment, success, and happiness, when a very sick child recovers from a complex repair.

The extreme clinical swings that often happen with a single patient can take the cardiac surgeon and the child's family on an emotional roller coaster that neither can escape until the ride is finished.

Examples of these swings of emotion would include the sudden cardiac arrest of a neonatal Norwood or the rare and unexpected stroke or paraplegia after a seemingly successful congenital repair. At the opposite end of the emotional spectrum is having a child survive after a seemingly hopeless set of circumstances.

I can remember one neonate with terrible heart function who after a successful coronary reimplantation needed to be placed on ECMO. Over the course of the next 2 weeks, I was back in this baby's chest eight times to deal with problems related to ECMO. He is alive and well today, 10 years later.

### **Wonder #2: the resilience for life of our patients**

You cannot be a physician in our line of medicine and not observe the fact that life is fragile and can be very fleeting. You and I come face to face every day with children whose lives are hanging on by a thread. Their bodies are so tiny and their hearts so deformed and feeble. Their families are hoping and praying that the arterial switch, Norwood, Ross, or, yes, a heart transplant will give their child a chance at life that they otherwise will not have. The wonder that never

ceases for me is the strength and resilience of our paediatric patients – the tiny infants and children we care for. These little miracles, who can weigh as little as 1 lb seem to be able to fight through the toughest of conditions, tolerate the intolerable, and recover more rapidly than adults. I know beyond a doubt that the strides we've made in cardiovascular survival would not have been possible without this wonder of their resilience and will to live.

I'll never forget my amazement and wonder during my first neonatal heart transplant 25 years ago. The circumstances surrounding this particular transplant were filled with mystery. Interestingly, the donor and recipient were neonatal twins, a boy and girl, each weighing about 2 kg. To my knowledge, this is the only twin heart Tx that's ever been performed. The sister had HLHS and needed a heart transplant, and here's the mystery. The brother was born brain dead due to birth asphyxia, but had a normal heart. The donor heart of the brother was about the size of a strawberry with a long stem, the donor's aorta. The donor heart had been floating in ice water for nearly 2 hours. Even though I knew from my experience with heart transplants in adults and older children that this transplant should work, it was almost impossible for me to believe that it would. I knew that this transplant would take a long period of circulatory arrest because I needed to transplant the donor's aorta in addition to his tiny heart. The circulatory arrest time was 80 minutes, twice as long as I am comfortable with today. Seeing that newly transplanted tiny heart beat vigorously in the donor's sister was awesomely powerful. What a wonder! She continues to do well 25 years later, thanks to her brother's heart. A true testament to the resilience and mystery of life.

### **Wonder #3: surgical intuition "the force"**

My youngest patients have also taught me the wonder of surgical intuition. Surgical intuition is when logical thinking and science would indicate one path and yet something deep inside directs us to choose an alternate path, as if by instinct. Many factors comprise intuition, including knowledge and experience. But the most important factor is to be attentive. Attentive to the patient as a whole, and not treat just the numbers we get back from our monitors, ECHO, and the laboratory. There have been times in my career when the situation wasn't looking good. When it appeared, from all the numbers, the patient was on a terminal course. My own intuition had to rise above logic and reason and choose an unconventional course of action. I've learned not to easily give up. Early in my career and before the days of ECMO and nitric oxide, I had an infant who had arrested in the ICU from a pulmonary hypertensive crisis. I opened her

chest in the ICU and began to massage her heart with my fingers. I continued to squeeze her heart for 3 hours. I knew her heart was fixed, it had been a good operation. The only thing compromising her recovery was a spasm in her pulmonary arteries. I believed if I could break the spasm the baby would survive. The ICU staff around me thought my efforts were futile and that I should have quit 2 hours earlier. But something inside compelled me to persevere. That something can be called many things; I call it intuition. I've received a Christmas card from that family every year for the last 30 years. Each year they thank me for not giving up on their daughter when all seemed lost. Each year as I read their card, I'm thankful that early on their daughter taught me the wonder of intuition.

#### **Wonder #4: the opportunity to innovate**

The tremendous variety and complexity of congenital heart malformations demand that the paediatric CV surgeon be innovative. This opportunity to innovate is a wonder. For me "Necessity has truly been the mother of invention". My patients have presented me with an infinite variety of complex, anatomical abnormalities. These challenge me to adapt and expand my surgical skills. I am constantly learning. Heart valve repair, coronary artery anomalies, and fluctuations in pulmonary vascular resistance are constant problems that demand our attention. The Ross aortic valve replacement, the repair of complete AV septal defect, the reconstruction of the right ventricular outflow tract are three examples of surgical procedures that require ongoing, on the spot, innovation and modification.

Over the course of 12–15 years, a patient can grow from 2 lbs at birth to 250 lbs. Innovation is especially important with children, because these children have their whole lives ahead of them. Our repairs need to give these young children an optimal chance at a normal life as much as possible without needless reoperations. Replacing a young child's aortic valve with an artificial or mechanical valve may not be a wise choice since these valves have no growth potential. The paediatric CV surgeon must constantly take into consideration the growth of the patient and his cardiac structures and adapt our surgical repairs to fit their needs. This challenge to innovate is a wonder because it is a "constant quest" to figure it out. Every day in the OR is a new adventure and I never fail to be surprised.

#### **Wonder #5: the sacred trust our patients' families place in us**

While our paediatric patients are the primary focus of our efforts, we know that strong and healthy families

are key to the best outcomes for our patients, and thus our attention to the patient's family is vitally important.

One of my observations in working with parents is that they often feel tremendous guilt for their child's cardiac abnormality. They feel that sometime during the child's conception or the pregnancy, they made a bad choice, which caused their child's congenital heart defect. They sometimes feel God is punishing them for a prior "sin". It is during these conversations with parents I have a golden opportunity and indeed an obligation to allay this deep sense of guilt. After receiving my assurance that their "behaviour" could not cause their child's heart condition, the parent's relief is almost palpable. This conversation can have a very positive effect on their marriage, and ultimately affect the success of their child's recovery.

During my preoperative conversations with the patient's family, I admit that I cannot guarantee them the surgical outcome we all want for their child. But, I promise them to care for their child with the same dedication that I would my own child or grandchild. Many parents and grandparents have told me days or even years later that, at that critical moment, my promise meant everything to them. For the parents and grandparents, their child is the most precious thing in their lives. Yet, they entrust that child to our care believing we can fix their hearts. This is a sacred trust. And it is another wonder of our speciality. As their child's surgeon, I strive each day to be worthy of their trust. Trust is an awesome wonder.

#### **Wonder #6: the wonder-filled operating room**

The operating room is a wonder-filled place. Miraculous things happen there, but not all that is miraculous involves the heart repair. An important miracle that has to be present before anything happens is a fully invested OR team. I can vividly remember my decision to become a paediatric cardiac surgeon. I had had several surgical rotations as a junior medical student and had liked them all. As a senior student, I took an elective on the paediatric CV service. I watched Dr Harold King, my predecessor, perform several repairs on infants with complex cardiac malformations, and I was awestruck. I thought to myself, "If I could do anything in medicine, I want to do what he does". That rotation truly inspired me. I was committed to this profession. I was hooked. I soon realised that there was a lot more going on in that OR than just the centre stage of the surgeon and patient. Dr King modelled for me the kind of OR I wanted to work in. He was respectful of the OR staff and appreciated each of their roles. The atmosphere was tranquil, confident, and organised. He never raised his voice, yet he effectively directed the entire operation. The surgeon sets the rhythm and tone. Dr King taught

me the OR was no place for drama! The OR should always be about the patient, not the caregivers. An interesting chemistry exists in the OR and I've observed that it works something like this. When the surgeon conveys an appreciation and respect for the OR staff, he creates a mutual commitment to a positive workspace. Each member inspiring the other to give 100% each day. Everyone has their oar in the water to propel the patient to recovery. I like to compare the cardiac OR to a Symphony Orchestra where, when everyone plays their part, a beautiful melody, the patients' recovery, emerges. When the OR team is committed and invested, the operating room is a wonder-filled place to work.

### Wonder #7: the wonder of risk taking and the evolution of CV knowledge

In the field of cardiac surgery, we truly stand on the shoulders of giants. When I look back on the early years of cardiac surgery and the pioneers of our field – John Gibbon, Lillehi, Kirklin, Castenada, Norwood, and, our own George Daicoff – what strikes me is the wonder of risk. All these pioneers were risk takers. This risk taking came at a great price. I'm reminded that John Gibbon, the inventor of the heart lung machine, in the mid 1950s lost four of his first five children following closure of an ASD. ASDs today can be closed in the Cath Lab at almost zero risk. Lillehi and Kirklin in the 1950s lost many early patients following correction of congenital lesions that you and I repair today at very low mortality. Much of the improvement in care over the last 50 years has come with better diagnostic imaging, improved bypass circuits, and intraoperative myocardial protection. We have far superior drugs like PGE1 to keep the ductus open when needed, nitric oxide to treat pulmonary hypertension, and Milrinone to strengthen cardiac function when it is depressed. None the least, we have mechanical support for our children like ECMO and VADs that have allowed many struggling children to survive. All of these improvements occurred because someone took a risk in order to advance cardiac care. We owe a great deal to all those who preceded us. Their courage and resolve are wonders to ponder, because the evolution of cardiac care will only continue if we are allowed to take risks and dare to do the impossible.

From my perspective, as a veteran of this specialty, the opportunity to learn from others, share our knowledge, teach residents and fellows, and exchange best practices are the delights and rewards of our profession. But nothing is more gratifying to me than "improving the life of a child".

I received a Christmas card last year from the parents of baby I'd done an arterial switch on a few months before. The father of the child included a poem he had written. The words of the poem capture the HEART, of what this wonderful life is all about. The poem read:

My family received our Christmas gift early  
this year,  
Arriving while days were hot and Christmas  
wasn't near.  
The gift came wrapped in a small package of  
joy,  
His name is Samuel, a strong, sweet boy.  
The Gift wasn't the child, but something much  
more,  
The gift was the scar that the child proudly  
wore.  
This delicate scar represented the miracle of life,  
Performed by Dr Brown with a small blessed  
knife.  
You see that wonderful scar means everything  
to me,  
It means he will grow up and be able to climb a  
tree.  
Playing ball in the park and throwing sticks to  
the dogs, Visiting grandma's house to fish and  
catch frogs. So here's a toast to Samuel our new  
little star,  
He's a very special boy with a beautiful scar. He  
has joined a large family, both loving and warm,  
Many Christmases will come with Happiness  
the Norm.

You see, embedded in this poem and the experience that inspired it, are all the seven wonders: innovation, intuition, risk and sacred trust, and all the rest. It's all there, to bring about what the father called "The Miracle of Life", and we get to participate.

That's why, after 40 years as a paediatric heart surgeon, I still love my job. That's why all of us involved with paediatric CV medicine do what we do. Because "It's a Wonderful Life!"