

VINCENT'S VALENTINE'S SENSE

This month Valentine's Day is upon us. In this issue of the Links we have exciting and innovating summaries for the love of what we do and for our children. The focus is on the machinations and miniaturizations of mechanical circulatory devices and care of our pediatric population with much cordial or heartfelt attention from abroad. In the spotlight, Martin Schweiger steers our attention to the first Core Competency Course on Pediatric MCS in San Diego. From across the borders with European Networking from the ECTTA meeting Drs Masetti and Carbone share their experience for us. From Belgium, Fabienne Dobbels provides us with the Many Faces of e-Health and its Application in End-Stage Organ Failure and Transplantation in via a Webinar free to us. From Germany, Dr Potapov gives us a race as a way for life by comparing with each heart beat the various ventricular assist devices. From Italy, Dr Amodeo shares with us a report on LVAD as Destination Therapy for Patients with Duchenne Muscular Dystrophy. From the North American front, Dawn Christensen informs us about ICCAC – the International Consortium of Circulatory Assist Clinicians, while Dr West furnishes us with a Current Review of Pediatric Mechanical Circulatory Support. Along with these spectacular summaries provided by our members near and far, we have a few extras from Dr Weill and Dr Khalid. With much heart and attention, we know you will enjoy this truly global and timely issue of the Links.

IN THE SPOTLIGHT: Looking Forward to San Diego: 1st Core Competency Course on Pediatric MCS

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While the cold and icy winter has us firmly in its grip, we are looking forward to the warm and sunny San Diego, where the annual scientific meeting will take place. Besides the weather, there are some other good reasons to be excited about the upcoming conference. Especially the pediatric community caring for congenital heart disease (CHD) patients supported by mechanical circulatory support (MCS) can rejoice. The proportion of children bridged to transplantation with MCS has been steadily increasing over the past years, reaching 38% of all pediatric heart transplant recipients. Accompanying this is an increased use of ventricular assist devices (VAD) and total artificial hearts (TAH). The armamentarium of VAD options for adults has expanded drastically over the last decade and the pediatric population has benefited greatly by the surge in device development, with increased miniaturization of device design allowing for implantation in smaller patients. Nevertheless, there are huge differences between adult patients supported with VAD and children and adults suffering from CHD and needing MCS. Therefore, for the first time ever, there will be a core competency course on pediatric MCS.

Angela Lorts and Holger Buchholz chair this ISHLT academy, which is scheduled for April 4, 2017 from 7.45 a.m. to 5.15 p.m. Care providers of all experience levels, who are working in this growing field with a huge amount of unique challenges, are welcome to join.

Led by the two chairs, the program committee and many involved in the field of pediatric MCS have put together a very interesting program. Of course, the indications and use of pulsatile VADs—namely the Berlin Heart EXCOR®, which is the mainstay of support for children of all ages—will be discussed. Temporary device options as well as data on durable centrifugal flow devices initially designed for adults and increasingly used in adolescents and small children will be presented. Surgical implantation techniques and considerations will be presented by well-known surgeons in the field. Important aspects of peri- and postoperative management will be given some attention. There will be an own session focusing on hematologic management, including complications especially on thromboembolic events. Children on durable VAD support can be discharged home and may resume regular activities of daily living. However, compared to adults, this topic is in its infancy. Hence, an independent session on how to start a pediatric VAD program and how to send the kids home is part of the program. Also part of the program will be sensitive topics like destination therapy and palliative care. Case reports will boost discussions among the participants. The goal is to learn from didactics but also allow for discussion in order to share experiences and learn from each other as the numbers at each centre are small.

The fact that there will be sessions on not only pediatrics but also adult patients suffering from CHD in need of MCS might also attract some of the adult MCS community and round off this excellent program.

I am looking forward to meeting so many experts and friends at this special core competency course. I wish to express my gratitude to those who invested so much effort in this for finally having a core competency course on pediatric MCS.

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New Webinar Now Available On Demand Free to ISHLT Members

We are pleased to announce the latest addition to the ISHLT Webinar Series:

The Many Faces of e-Health and its Application in End-Stage Organ Failure and Transplantation

Presented by: Fabienne Dobbels, PhD, Academic Centre for Nursing and Midwifery, KU Leuven, Belgium

Duration: 1 hour

[Click here to register](#)

LVAD as Destination Therapy for Patients with Duchenne Muscular Dystrophy

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Typically, patients with Duchenne muscular dystrophy (DMD) are not considered candidates for heart transplantation because of the global nature of their skeletal muscle disease with high likelihood of respiratory failure. An alternative treatment for end-stage heart failure in dystrophinopathies we have explored at the Bambino Gesù Children's Hospital in Rome is the use of left ventricular assist devices (LVAD) as destination therapy (DT). To date we have treated seven DMD patients with a Jarvik 2000 LVAD as destination therapy (DT). The main advantage of this device in DMD is related to the positioning of the power cable exit site from the retroauricular area. For wheelchair-dependent patients we believe this provides a lower risk of infection compared with an abdominal driveline exit site.

Accurate and appropriate selection of DMD patients suitable for LVAD is important. This group of patients presents significant challenge with every single step characterized by a fine balance between the risks and benefits, and different variables play an important role. This class of patients requires a series of clinical and surgical precautions and maneuvers that are possible only in centers with a high level of experience with DMD patients, especially in the postoperative phase. Our experience shows that postoperative care can be extremely challenging and is often burdened by unexpected complications. The presence of comorbidities such as severe kyphoscoliosis and respiratory muscle weakness may increase intraoperative risks as well as the risk of postoperative complications. We strongly suggest the use of early postoperative non-invasive ventilation because it allows for the reduction of postoperative respiratory insufficiency. Furthermore, particular care for even routine maneuvers like chest tube placement is warranted due to the potential risk of abdominal organ damage with chest wall deformity and abnormally elevated diaphragms. Finally, postoperative anticoagulation management can be challenging in patients with DMD.

Despite these features we have observed satisfactory outcomes for our patients with DMD who received DT-LVAD therapy. All patients survived to hospital discharge and resumed normal activities. At median follow-up time of 25 months (range 11-50 months) we had 3 late deaths. One patient died after 45 months for sepsis due to *Staphylococcus aureus* lung infection, one patient with tracheostomy died after 28 months in a peripheral hospital for tracheal bleeding due to an inappropriate otorhinolaryngology maneuver, and one patient died after 15 months after cerebral hemorrhage. Our longest surviving patient is over 4 years from LVAD placement.

In summary, the prolonged life expectancy of DMD patients up to the third or fourth decade of life incurs the problem of DCM being the main cause of death. Preoperative patient selection and an accurate surgical strategy with multidisciplinary postoperative management are mandatory to ensure good early and midterm results. According to the basic philosophy of palliative care, which is to

achieve the best quality of life for patients even when their illness cannot be cured, the use of VAD as DT may be a palliative, time-limited therapy for the treatment of patients with no other therapeutic options.

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Current Review of Pediatric Mechanical Circulatory Support

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Mechanical circulatory support with a ventricular assist device (VAD) is often lifesaving in the setting of circulatory collapse. VAD use as a bridge to heart transplant has been shown to decrease waitlist mortality. Pediatric VAD use has increased over the last decade in the US, especially with the FDA approval of the Berlin Heart EXCOR. The Berlin Heart is the first pediatric specific VAD. Next generation adult VADs are also being used for older pediatric patients.

Unlike the adult experience, there are few multicenter studies of pediatric patients. Knowledge in the pediatric VAD field is moving quickly and there have been a number of publications of interest in the last 12 months. Below are synopses of two key articles, the first by Elizabeth Blume and the second publication by Marie Steiner. I have also provided a list interesting articles for further reading.

Article Reviews:

The Pediatric Interagency Registry for Mechanic Circulatory Support is a multicenter registry of pediatric patients requiring temporary and durable mechanical circulatory support. The registry is supported by the NIH. Patient enrollment began in 2012 and now includes over 200 patients. Several articles were published recently using the Pedimacs registry [1,3,4].

From September 2010 through June 2015, 200 patients received 222 durable ventricular assist devices (VAD). 109 patients received continuous flow devices and 91 received pulsatile devices. 15% were under 1 year of age, 34% between 1-10 years of age, and 51% > 10 years of age. 97% of continuous flow devices were implanted in children over 6 years of age; 70% of pulsatile devices were in children less than 6 years of age [1]. Those who received continuous flow devices were older (15 yrs vs 2 yrs; $p < 0.0001$), more likely to have a cardiomyopathy (83% vs 62%) less likely congenital heart disease (10% vs 26%; $p = 0.0083$), less likely to have had previous cardiac surgery (24% vs 55%; $p < 0.0001$), and less likely to have required ECMO (7% vs 24%; $p = 0.0009$) [1].

The most common diagnosis was cardiomyopathy (73%) with only 18% diagnosed as congenital heart disease. 15% of patients required ECMO before VAD. 1 Mechanical assist device was LVAD in 81%, Bi-VAD 15%, RVAD 2%, and total artificial heart 3%. 93% of patients were listed as bridge to transplant or bridge to candidacy [1].

The most common adverse events were bleeding, rehospitalization, and infection. Serious adverse events were rare. Neurologic dysfunction occurred at an early event rate of 4.1 per 100 patient months and late event rate of 0.8 per 100 patient months [1,4].

Overall survival was 93% at 1 month, 85% at 3 months, and 81% at 6 months and 12 months after VAD [1,3]. The most common cause of death was multisystem organ failure (39% 6 months after

VAD, 58% of patients had undergone heart transplant. At 12 months, 75% of patients had undergone heart transplant.

The Berlin Heart remains the mainstay of pediatric ventricular assist device for young patients. A report from the Berlin EXCOR IDE study investigators reporting the anticoagulation results from the Investigational Device Exemption study. The study included 68 patients at 17 centers in the US and Canada. Cohort 1 was 44 patients had a BSA < 0.7 m². Cohort 2 24 patients had a BSA ≥ 0.7 m² < 1.5 m². Cohort were older, taller, and weighed more on average than cohort 1. Otherwise, there were no significant differences in regards to demographics between the groups.

Both groups showed wide variability in unfractionated heparin, low molecular weight heparin, and antiplatelet drug doses. Low molecular weight heparin was in target dose ~ 50% and unfractionated heparin was in target range ~ 30% of time. Antiplatelet affect with dipyridamole or aspirin was in target range ~ 30%. By 2 weeks, low molecular weight heparin achieved target dose range ~ 60% of patients.

Adverse event of major bleeding occurred in ~ 40% of patients. ~ 20% Patients with major bleeding had anticoagulation above target range and ~ 25% had antiplatelet affect above target. ~ 28% of patients had a neurologic event. ~ 50% of patients had an episode of major infection. ~50% of patients required pump changes. There were 5 deaths in the study, 4 for which were due to thrombosis.

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Racing as a Way of Life

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Almost four years ago ([see here](#)), I dreamed about a competition between the ventricular assist devices that were commercially available at the time. Now Abbot (previously Thoratec) has carried out a comparison between HeartMate 2 and HeartMate 3.

The study shows that the new technology is not worse than the old. But is it better? So far it seems that the new system produces less pump thrombosis, while overall early survival remains similar. However, the study is still running and it may discover some survival advantages for the HeartMate 3 during the long-term follow-up.

This study, although meticulously conducted, compared two pumps from the same company and, moreover, let technology from the past century run against the new one. No real competition. And, to be honest, the time for HeartMate 2 is gone, with or without long-term results.

Further development of the HeartMate 3 is currently underway, to create a smaller pump, correct the position of the metal part of the outflow tract and modify other features.

The main question today remains the comparison between the two most frequently implanted pumps – HeartMate 3 and the HeartWare HVAD. My personal impression after one year of implanting both pumps is that the two pumps, although having different complication profiles, are similar in short-term outcome.

The most intriguing question for the near future is the clinical use of transcutaneous energy and data transfer.

In my personal opinion, the company which introduces this option first would gain the increased attention of surgeons, referring cardiologists and, most importantly, of patients, as long as the performance of the pump itself equaled that of the existing pumps.

I hope that the race for TET between the major players in the field will be accelerated, since both companies now, after acquisition, have enormous experience with similar technology. However, one of the smaller companies may be set to overtake them and may come up with a solution in the near future.

I also hope that readers of ISHLT Links will take the time to react to this piece and to send me by email their comments, which we will discuss during the next ISHLT meeting.

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ICCAC (Eye-Kak) what? I keep hearing about this group? Who are they, what do they do, and why do I care?

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The International Consortium of Circulatory Assist Clinicians (ICCAC) is a partner organization of ISHLT and continues to be actively involved with ISHLT MCS Council initiatives. The ICCAC was founded in 2007 and was created to serve as a professional mentoring organization of mechanical circulatory assist device clinicians whose mission is to share information, educate and support individuals in this field to achieve optimal outcomes for patients requiring mechanical circulatory support, and to support efforts in the area of device clinical research and development. Members of the group include international VAD coordinators, Surgeons, Physicians, Engineers, Industry Members and anyone who is dedicated to the care of patients and advancement of all aspects the MCS field.

The group has grown in the past 10 years. We have many ongoing and several new programs available to MCS professionals. For anyone not familiar with the group, we thought that it would be a great time to introduce you to the activities and initiatives happening now and what to expect in the next year.

Mentorship Program – The ICCAC provides an active formal mentorship program for VAD coordinators. The goals of the program are to:

- Help VAD Coordinators develop their professional careers.
- Promote the highest possible quality of care to VAD patients throughout the world by enriching knowledge.
- Increase international collaboration in research in the field of VADs.

Mentors and Mentees are paired and Mentors commit to at least a year of participation in the program.

Meetings – The ICCAC provides meetings with specific content geared toward the VAD coordinator. Our annual meeting is held every year in conjunction with ISHLT. It will take place this year on **Wednesday, April 5th from 7:30 to 10:00pm**. We also sponsor VAD coordinator specific content with other international partner organizations throughout the year. For more information about the annual meeting or any other offering please visit our website at www.vadcoordinator.org.

ISHLT MCS Committee – ICCAC Collaborative Symposium – For the past several years the ICCAC and ISHLT MCS council have worked together to provide collaborative symposia at the ISHLT annual meeting. This year's joint symposium will be held at the ISHLT annual meeting on **Wednesday, April 5th from 8:00-10:00am**. These symposia represent collaborative content that

is essential as the MCS field moves forward. The importance of integrated content to foster the team approach to VAD care continues to be at the forefront of these collaborative sessions.

Online Resources – The ICCAC has an interactive website providing online collaboration forums and resources as well as all of the information you need to know about what is happening with the group. Visit the website by going to www.vadcoordinator.org.

E-Newsletter and Best Practices Documents – The informatics committee is working hard to create “real life” documents based on the latest available research to help incorporate the latest best practices into your program. These are benefits of joining the group and are available to all members.

MCS EMS Field Guides and NCCP Collaboration - The ICCAC has taken over the ownership of the MCS field guides that are available for anyone to download and use on MyLVAD.com. This document is updated annually and is a color coding system for emergency VAD device care. The plans for development of the guides into a mobile app are underway. We hope to see this active sometime in the next year.

Pediatric Group – The pediatric group was created two years ago to provide a forum and resources for the quickly growing pediatric VAD coordinator population. Headed by current ICCAC President, Jodie Lantz, they are making a home with ICCAC and working hard to create an infrastructure for providing pediatric resources and support to the MCS community.

Research Committee – The ICCAC research committee is active and helping to coordinate multicenter research initiatives specific to VAD coordinator practice. The committee also offers an annual **research grant** to support research in the field. For more information on how to apply visit the ICCAC’s website under the awards tab.

Exchange award – In an effort to bring the international community together, and help to understand the differences in programs and practice related to VAD care throughout the world, the ICCAC has developed a Coordinator exchange program. The program is available to members of the group and funds are provided for travel to support an exchange of coordinators from centers on different continents. The first exchange occurred this past year and will be presented at the ICCAC annual meeting in April.

Core Curriculum – The ongoing process of developing the core curriculum of knowledge that is essential to be able to function as a VAD coordinator continues to progress. This has been a long and difficult endeavor but continues to be one of the highest priorities of the group. Without a defined practice structure and a definition of a core set of essential knowledge, we will continue to have a very high turnover rate of VAD Coordinators. Only with a defined practice structure can we move forward within the field.

MPV Course – Last year the ICCAC piloted a course focused on development of critical thinking skills surrounding VAD troubleshooting and emergency intervention. We entitled it the MCS Proficiency Verification Course and the pilot run took place last June. The course targets nurses,

surgeons, physicians, engineers, and anyone else who works with MCS supported patients. The format of the course is targeted MCS Interactive group scenarios (MIGS) designed around a problem based learning construct. The course is run similar to the ACLS megacode concept. Small groups are given a scenario and must work through the problems that are presented. Faculty members present the case and allow the group to progress through the scenario independently identifying and discussing critical concepts as they arise. We will be running 2 MPV courses this year; one in the US in June and one in Europe in September. For more information about how to participate check the ICCAC website.

I wanted to leave you with some final thoughts. The ICCAC has several committees and is always looking for people to participate. We all have very busy schedules, but those of us who continue to participate, have witnessed first-hand how important this group has become and how far we have developed the role of the VAD coordinator within the MCS community in the past 10 years. I would challenge you at the very least to check out the online resources available and participate in any way that you can to help bring issues that you face in your daily practice to the table. If we all work together to identify common themes, we work together to make barriers in daily practice as VAD coordinators and MCS Professionals a little easier to overcome.

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Education and Science Across the Borders: European Networking at ECTTA Meeting

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Last October, the second European Cardio Thoracic Transplant Association (ECTTA) Meeting took place in Barcelona, Spain.

This small part of European Society for Organ Transplantation (ESOT), born in 2013, organizes every other year a congress in Europe (the first took place in Budapest in 2014). The birth of this Society originated from two necessities: the need of representing the scientific issues of heart and lung transplantation and mechanical circulatory supports within ESOT, and the aim of improve the network between European people working in this field. One of the main goals of ECTTA, like the other international scientific societies, is to encourage research networking and the exchanges programs between young people within the small Europe.

Beside the objectives of the Society, last ECTTA Meeting was stimulating both from the point of view of a young member attending the Meeting for his first time, and for an expert senior physician in the field of heart and lung transplantation.

For a young member, of great interest was the core competence course about heart and lung transplantation, that preceded the Meeting; main topic treated were: heart or lung procurement primary graft dysfunction, the role of antibodies in rejection and different sensitization protocols. In the talk "immunology for dummies", the basic mechanisms involved in transplant immunology were explained by Dr Carbone; in the afternoon, the interactive discussion of difficult clinical cases within small groups facilitated the exchange of opinions between experts and young faculties.

In the following two days, the sessions were organized with the joint participation of EDTCO, the European Organization of Transplant Coordinators, and ETAHP, the European Healthcare Professionals Association, another initiative with the goal of spread the knowledge about transplant. Dr Stehlik presented the latest reports from ISHLT Registry, underscoring the importance and the limits of registries.

Some specific invited talks from non-European and European guests raised great interest. Kiran Khush, from Stanford University, gave an outstanding talk about the role of immune monitoring and of circulating cell free donor-derived DNA analysis in rejection prediction and their possible application for a personalized immunosuppressive approach. The role of genetics in the complex

mechanisms of rejection needs to be further studied in dedicated high volume centers, but again the great potential of data derived from AlloMap registry has been evocated. Another fascinating presentation was given by Phillip Halloran, from Edmonton University: in his talk, he underscored the role of molecular biology in characterizing the different phenotypes of cellular, antibody mediated or mixed rejection. The molecular basis of cardiac rejection appears to be quite similar to other organs, like in the kidney, where they have been more investigated, thus suggesting the presence of shared, stereotyped mechanisms regardless of the organ system. The use of molecular biology appears to be more sensitive than histology in characterizing some types of rejection, and maybe in guiding medical treatment. Preliminary data of INTERHEART project, where different European and non-European centers were involved, seem to support this hypothesis.

Peter MacDonald, after giving insights about pathophysiology of brain death and of donations retrieved after cardiac death (DCD), gave a very important talk about the role of machine perfusion in optimizing the quality of the donor heart, both in extended DBD and DCD donors.

Regarding lung transplantation, the main topics were different lung allocation systems in Europe, the role of ECMO in lung transplantation and of ex vivo lung perfusion. Dr Haverich from Hannover gave a very interesting and pioneering talk about fully implantable artificial lungs.

Several abstracts were awarded, through travel grant and funds, mainly dedicated to young people, both in the field of heart and lung transplantation, like primary graft failure, ex vivo lung perfusion, bridging to transplant with a MCS, risk stratification after heart transplant, antibody mediated rejection.

In conclusion, this small and newly born section of ESOT, even if it still needs to grow in several issues, is oriented to be a very open society, encouraging the participation of various professional figures working in different fields, and it promises to be a valid tool to improve medical knowledge and scientific connections within Europe. In the contemporary times, where national interests seem to overcome the international views, ECTTA experience represented a small boost to improve networking across the borders.

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Should I Accept This Heart? Addressing Uncertainty Associated with Increased Risk Donor Organs

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A 28 year old woman with no known past medical history is found down on a train with drug paraphernalia on her person. She is taken to the local hospital but unfortunately progresses to brain death by hospital day 3. Due to active intravenous drug use, she is deemed an increased risk donor, and you are offered her heart. Pertinent laboratory testing of the donor includes undetectable human immunodeficiency virus (HIV) and hepatitis C virus (HCV) nucleic acid tests (NAT), negative hepatitis B surface antigen, and negative hepatitis B core antibody. Do you accept the organ for a 45 year old woman with non-ischemic cardiomyopathy currently listed as a 1A at your center?

Scenarios such as this are becoming increasingly common, and transplant infectious disease providers are frequently asked, "How much risk does 'increased risk' pose?"

Part of this answer lies in the definition of "increased risk." In 2013, the United States Public Health Service (PHS) published guidelines for reducing the transmission of HIV, hepatitis B virus (HBV), and HCV through organ transplantation. In contrast to the previous 1994 PHS guidelines, which addressed prevention of HIV transmission through transplantation, the updated guidelines were expanded to include factors associated with an increased likelihood of recent HIV, HBV, or HCV infection and to assist in identifying donors who may be at increased risk for transmitting these infections to transplant recipients. Factors associated with increased risk of HIV, HBV, or HCV infection currently include hemodilution of the donor blood specimen and/or any of the following within the preceding 12 months: sex with a person known or suspected to have HIV, HBV, or HCV, men who have had sex with men (MSM), women who have had sex with a man with a history of MSM, sex in exchange for money or drugs, sex with a person who has had sex in exchange for money or drugs, sex with a person who has injected drugs for nonmedical reasons, nonmedical injection drug use, residence in lockup, jail, prison, or a juvenile correctional facility for ≥ 72 hours, and a new diagnosis or treatment for syphilis, gonorrhea, Chlamydia, or genital ulcers. The need for hemodialysis in the preceding 12 months is now considered a risk for HCV only. Among pediatric donors, increased risk includes birth to a mother known to be infected with or at increased risk for HIV, HBV, or HCV and breastfeeding from a mother known to be infected with or increased risk for HIV infection within the preceding 12 months [1].

Screening modalities for HIV, HBV, and HCV also play a significant role in conceptualizing the risk of disease transmission to the recipient. A shift from the use of enzyme immunoassays (EIAs) to nucleic acid tests (NATs) for identification of HIV and HCV infection, for example, has shortened the window period for detection of HIV from 22 days to 9 days [2] and from 66 days to 7 days for HCV [3]. For this reason, the 2013 PHS guidelines recommend that all potential organ donors should undergo NAT testing for HCV infection and that increased risk donors should be screened for HIV via HIV NAT [1].

The final question is whether the risk for disease transmission is the same among all increased risk donors with undetectable HIV and HCV NAT results. It ultimately appears that “increased risk” is variable and depends upon the underlying increased risk behavior. Kucirka and colleagues assessed pooled HIV and HCV incidence estimates from each category of increased risk behavior and calculated the risk of window period HIV and HCV infections. For HIV, the risk of window period infection ranged from 0.04-4.9 per 10,000 donors with NAT testing and was highest in injection drug users, followed by MSM, sex workers, incarcerated donors, donors exposed to HIV through blood, and individuals engaging in high-risk sexual encounters [2]. Similarly, the risk of window period HCV infection ranged from 0.027-32.4 per 10,000 donors by NAT testing and was highest in injection drug users, followed by commercial sex workers, individuals engaging in high-risk sexual behavior, MSM, incarcerated donors, and donors exposed to HIV-infected blood [3].

Overall, it appears that the risk of HIV, HBV, and HCV transmission from increased risk donors is relatively low (and significantly less than the 1 in 2000 risk of needing emergency treatment in the next year after being injured by a bed mattress or pillow, as reported by the British Medical Journal [4]). Nonetheless, the decision to use an increased risk donor organ requires informed consent from the recipient. Additionally, as the risk of infectious disease transmission is not zero, and rare transmissions have occurred, experts have recommended a modified recipient testing schedule at 1, 3, and 12 months post-transplant utilizing NAT testing for HIV and HCV as well as hepatitis B surface antigen testing [1].

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EDITOR'S CORNER: Lung Transplant Resourcing Scarce Resources

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Do you want to know what's keeping me up at night (besides of course the 2 AM donor call)? It's actually who is going to take that donor call in 5, 10 or 20 years.

Having been involved for more than 20 years in the education of fellows interested in lung transplantation, a transformation has occurred over the last several years. And not a good one. While at Stanford, a sharp decrease in the number of applicants for our lung transplant fellowship spot was noticed, despite that fact that we had the oldest and best established lung transplant training program anywhere, started by Jim Theodore. As the years went by and the number of people applying for the spot dwindled, I began to check around with my colleagues around the country who had a history of training fellows. Same problem everywhere. Although relieved to know it wasn't just a Stanford problem, some years we struggled to find even one person who wanted to train with us – this past July, for the first time in the twenty plus years of the Stanford fellowship program, there is no dedicated person training in lung transplantation. In the carefully chosen words of our new President: Sad.

So what's going on out there? Why aren't more people interested in focused training in lung transplantation, a field that holds endless fascination and satisfaction to many of us? I don't think it has much to do with the fine lung transplant people at Stanford or with someone like Marty Zamora who has historically trained a number of people who have gone on to have long careers in the field (although he rarely admits that I was his first trainee back in the early 1990s). No, instead, there are a number of other factors drawing young people away from the field. And I get this information not only from talking with doctors I tried to recruit to our fellowship program but also through my current work helping several transplant programs confront various challenges.

What are the challenges in trying to attract the interests of young physicians to our field?

First, lifestyle. Our patients are the sickest of the sick, can turn bad on a dime, and need us all the time. It's tough work and today's trainees have other options, all of which have good pay, controllable hours, and a more straight-forward patient group to take care of. Our patients are complex, to say the least, and caring for them requires some degree of comfort with uncertainty. At the risk of sounding 108 years old, it seems to me that younger physicians today are less comfortable with medical uncertainty than we were and less willing to trust their gut. If you want to be sure about everything all the time, lung transplant may not be for you.

Second, the training period is hard. We have 12 months to teach fellows how to do lung transplant. It's not enough time. So in our non-ACGME approved program, we worked them hard. And told them

before they signed up what we were going to. Most loved it but some considering the idea of training with us probably thought to themselves, "No thanks. Sleep medicine sounds good."

Third, and worse than not wanting to do the rigorous year of training, many prospective trainees tell me, "I don't want to do the fellowship, it looks like a beating, but to be honest, I don't want to do what you do either." And I think that's an indication that there is a real problem. Throughout the history of medicine, training younger physicians has been characterized by a "grand bargain:" the acceptance of some personal sacrifice during the training period with the expectation of a better life once the training was complete. That was the deal. But the deal falls apart when the those considering training with you don't want the training position AND they don't want your job either.

Okay, there are less people formally training to be lung transplant doctors: so what? In fact, it's a big deal. The number 1 problem with most programs that are struggling is simple: lack of properly trained lung transplant physicians, either young ones to handle the growing number of recipients demonstrating longer survivals or mid-career transplant doctors who have the vision, expertise, and commitment to lead programs in an ever more complex transplant environment. While this may sound okay for the lung transplant doctor reading this ("Great – job security!"), it's not good for the field. Lung transplant is getting harder, not easier. There are more programs doing more transplants. Some approaching numbers that I never thought a single program could do. And what is the common factor in all of these programs, both big and small? They nearly universally don't have enough physicians. Bad for patients who are cared for by harried providers and bad for the harried provider who is the proverbial hamster on a treadmill, all the while being asked to increase the number of transplants with better outcomes.

Okay what's the solution? I think the only solution is for transplant programs to implement a different model, a model based less on using physician trainees for getting most (or all) of the work done and more on utilizing mid-level practitioners who can implement and execute protocols and take on significant roles in the overall care of the patient. Using this model not only achieves a more rational life for the trainee but also provides patients with continuity of care, a familiar face that will be around long after the trainees have left for other pastures. The responsibility of getting the infrastructure needed to make the training environment more palatable will fall on the program directors who will need to make a convincing case to their hospital administrators that this route is the only way forward.

But want we still need trained transplant doctors to manage the mid-level providers and advance the field? Yes, of course. But to attract young doctors to the field, we will need to tell them, and they will need to see, that the entire burden of the mundane tasks involved in this complex clinical care won't fall on them. It will be a shared responsibility among everyone on the team. That may not be how you trained – it sure isn't how I trained. But it is the way the next generation of lung transplant physicians will need to be trained.