The
Academy
NEWSLETTER

THE AMERICAN ACADEMY
OF
CARDIOVASCULAR PERFUSION
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SUMMER 2016

Inside This Issue

2017 Annual Meeting

In 1982 a band called The Clash release a song called “Should I stay or should I go “? I don’t love the song but the lyrics have echoed in my head many times over the years. The new guy on staff just caught an aortic transection from the EW on a young MVA victim, I guess I stay. Coworker’s new baby is really sick, I guess I stay. The AACP meeting is in San Diego in January? I HAVE TO GO or at least that’s what I hope that you are thinking.

So what makes a perfusionist decide to spend the time and money to travel to a national perfusion meeting? I have been thinking about that question a lot lately. With the advent of web casting both ours and others, perfusionists can stay or they can go. So what motivates us go? I have attended many professional meetings over the years and in my view the Academy meeting is unique. Beside the fact that the content is always very good, you get to see many of the same people every year. You have the opportunity, especially if you serve on a committee, to get to know some people quite well. In fact, some folks have called our meeting “the big reunion”. Frankly, I see nothing wrong with that. I just came back from an anesthesia meeting were I spent the majority of the time by myself. That was an interesting change for me and clearly not an Academy meeting. The Academy is truly a fellowship. The bonds that develop when you get to know people and share knowledge and experiences over time should really not to be taken for granted. Spending time with folks with similar values, who are dedicated to what they do, care about the profession or are just learning the profession renews that enthusiasm and interest that made you become a perfusionist the in the first place.

But the other good reason to attend the meeting is the exceptional content and the Program committee (listed below) has been working hard on that very issue. Initially I had thought that the theme of this year’s meeting should be safety. A recent article from Johns Hopkins cited medical errors as the third leading cause

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of death in the US. Over 250,000 patients per year die in health care facilities. That number is just unacceptable. But the program committee has resourced so many good ideas and two of those ideas capitalize on our strongest suit our Academy members.

The leading ideas for scientific panels include:

Perfusion Near Misses and Misadventures
This panel features at least six AACP members presenting cases that did not go as planned. We all like to talk about our wins. These cases are not that, but cases that went terribly wrong. In fact, if you have a case that you would like to present to our fellow members please send me an e-mail at klilly@capecodhealth.org.

Pediatric Pro/Con Debate
Back by popular demand a repeat of an Academy classic. No Jimmy Beck – Jeff Riley rematch this year but six of our pediatric perfusionists will debate subjects that we can all learn from. Topics still a work in progress.

Future Trends in Adult and Pediatric Cardiac Surgery
Close friends advised me to avoid controversy but TAVR, Mitra^{R} Clips and Watchman^{TM} devices are not going away anytime soon. The program committee is working on a panel of invited speakers to help us map out a road to the future.

So, should you stay or should you go? Well, I can't promise you that anyone will smash a guitar on stage but the program in its early stages is shaping up to be a smashing good meeting.

Hope to see you in sunny San Diego.

Kevin Lilly
President, AACP

San Diego, California
January 19-22, 2017

2017 Annual Academy Meeting

Thursday, January 19, 2017

9:00 AM – 1:00 PM	Council Meeting
10:00 AM – 3:00 PM	REGISTRATION
2:30 PM – 4:30 PM	Fireside Chats (Session #1)
4:30 PM – 5:30 PM	REGISTRATION
5:00 PM	Opening Business Meeting *Fellow, Member, Senior and Honorary Members*
6:00 PM – 8:30 PM	Sponsor's Hands-On Workshop & Reception

Friday, January 20, 2017

7:00 AM	REGISTRATION
8:00 AM – 9:30 AM	Scientific Paper Session
9:30 AM – 10:00 AM	Break
10:00 AM – 11:30 PM	Special Scientific Session (Panel) *Perfusion Near Misses and Misadventures*
11:30 PM – 1:00 PM	Lunch
1:00 PM – 3:30 PM	Special Scientific Session (Panel) *Pediatric Pro/Con Debate*
3:30 PM – 5:30 PM	Fireside Chats (Session #2)
6:30 PM	Induction Dinner *All Attendees and Guests*

Saturday, January 21, 2017

7:00 AM	REGISTRATION
8:00 AM – 9:30 AM	Scientific Paper Session
9:30 AM – 10:00 AM	Break
10:00 AM – 11:30 AM	Memorial Session *Charles C. Reed Memorial Lecture* *Thomas G. Wharton Memorial Lecture* *Kevin Lilly, President, AACP*
11:30 AM – 1:00 PM	Lunch
1:00 PM – 3:30 PM	Special Scientific Session (Panel) *Future Trends in Adult and Pediatric Cardiac Surgery*
3:30 PM – 5:30 PM	Fireside Chats (Session #3)
5:30PM	Closing Business Meeting *Fellow, Senior and Honorary Members Only*

Sunday, January 22, 2017

8:00 AM – 10:00 AM	Scientific Paper Session
10:30 AM – 12:30 PM	Fireside Chats (Session #4)

The Student Section

IV Iron and EPO Utilization to Reduce Allogeneic Blood Transfusions Associated with Cardiac Surgery

Jenna M. Staffaroni

Milwaukee School of Engineering

Milwaukee, WI

The production of red blood cells (RBCs), a process called erythropoiesis, is regulated by a tightly controlled homeostatic feedback loop in the kidneys. When renal cells detect hypoxia they release erythropoietin (EPO) hormone that travels throughout the circulation and into the bone marrow where it activates RBC formation. This increases the oxygen carrying capacity of the blood which suppresses the loop. In addition to EPO, the body requires several nutrients to make hemoglobin (Hb) and RBCs, one of which is iron. Anemia, or low Hb levels in the blood, occurs when the body does not make or release enough erythropoietin hormone or if the body is suffering from an iron deficiency[1]. Patients with these conditions often require allogeneic blood transfusions (ABTF) as compensation, however this exposes them to the risks of transfusion transmitted diseases, allergic or febile reactions, transfusion-related immunomodulation, and is associated with exponential increases in postoperative infections when given in a perisurgical setting[4].

In an attempt to solve this predicament, researchers have extracted the EPO producing gene for its use in treating anemia. Therapy utilizing recombinant human erythropoietin (rHuEPO) has been approved for perisurgical adjuvant therapy without autologous blood donation in the United States since 1996[2]. Since this time clinical researchers have continued to explore the safety and effectiveness of using rHuEPO in other surgical settings as well. It was found that the body would produce dysfunctional RBCs when the process was initiated and did not have adequate iron stores, a condition known as functional iron deficiency[1]. This condition typically results in hypochromic red cells with dysfunctional Hb[3]. To prevent this occurrence, it is suggested that rHuEPO administration be superimposed with iron supplementation. Because developing RBCs require iron transfer at such a rapid rate, it is suggested that it be given intravenously before the administration of rHuEPO for maximum efficacy[1].

Currently, there are two FDA approved erythropoiesis stimulating agents (ESAs) available for clinical use, epoetin alfa (Procrit or Epogen) and darbepoetin (Aranesp). Though these synthetic forms of EPO differ in the structure of their complex carbohydrate chains, which aid in the molecules stability in the circulation, they still provide the same biological interactions that are needed to drive erythropoiesis[1]. It appears that the use of epoetin alfa is more popular among heath care industries because it is less expensive and shows greater efficacy[12]. A product comparison is made in Table 1.

It is important that iron supplementation be given to patients receiving rHuEPO because they will require iron at a rate that cannot be provided by normal physiological iron stores[9]. It has been suggested that when aiming to triple normal erythropoiesis rates, the serum iron should be maintained

Table 1 - Comparison of Erythropoiesis Stimulating Agents (ESAs) available for use in the US [13,14].

	Epoetin Alpha (Procrit/Epogen)	Darbepoetin Alpha (Aranesp)
Indications:	Treat anemia caused by CKD, chemotherapy, and AZT, and reduce perisurgical ABTF	Treat anemia caused by CKD and chemotherapy
Requirements:	Transferrin saturation >20% Ferritin >100 ng/mL	Not approved for reduction of ABTF in patients scheduled for surgery due to DVT
Dosage:	SC: 300 U/kg per day x10 days SC: 600 U/kg per week (x3 weeks preop x1 week postop)	SC: 2.25 mcg/kg weekly SC: 500 mcg/kg every 3 weeks (when receiving chemotherapy)
Half Life:	4 to 13 hrs (20% longer with CRF), peak concentrations after 5-24 hrs	IV: 21 hr CKD SC: 46 h (dialysis), 70 h (w/o) Chemotherapy SC: 70 hr
Side Effects:	Increased BP, seizures, thromboembolism, stroke, MI	Increased BP, Seizures, thromboembolism, stroke, MI, PRCA
Contraindications:	Uncontrolled HTN, albumin allergy, treatment of emergent anemia	Uncontrolled HTN, PRCA, Treatment of emergent anemia

Abbreviations: CKD, chronic kidney disease, AZT, zidovudine, ABTF, autologous blood transfusion, BP, blood pressure, DVT, deep vein thrombosis, CRF, chronic renal failure, MI, myocardial infarction, PRCA, pure red cell aplasia, HTN, hypertension

at approximately 100 µg/dL[9]. To increase the iron concentration in preoperative patients, IV iron solutions are typically used rather than oral supplements because their response is much faster. There are currently several IV iron solutions available for use in the US, which are compared in Table 2. It has been found that iron products made without the use of dextrans typically elicit fewer adverse effects than those containing dextrans, but still contain an inherent risk of anaphylactic reactions upon administration[5-8]. When these complexes are administered and digested, the available iron binds to transferrin which allows its transport within the plasma, while the carbohydrate groups are metabolized by the liver[10].

In order to reduce the amount of ABTF given to preoperatively anemic patients, it is suggested that patients with a hemoglobin concentration less than 10 g/dL receive 200 mg of IV iron sucrose followed by IV administration of 500 IU/kg of Procrit 24+ hrs before surgery. Subcutaneous administration of ESAs is common, but patients with cardiovascular disease are likely to have impaired circulation due to the probability of generalized arteriosclerosis[11], so maximum efficacy is believed to occur with intravenous administration.

Because of the negative aspects associated with ABTF, patients may have better postoperative outcomes with this therapy. The cost of this therapy

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Table 2 - Comparison of IV iron products available for use in the US [15-21].

Available drugs:	DexFerrum (HMW-ID)	InFed (LMW-ID)	Ferrlecit/Nulecit (Ferric gluconate)	Venofer (Iron sucrose)	Feraheme (Ferumoxytol)	Ferinject/Injectafer (Ferric carboxymaltose)
Requirements:	25 mg test dose	25 mg test dose				Dosage for >50 kg
Dosage/rate: (undiluted)	50 mg/min Max. 100 mg/day	50 mg/min Max. 100 mg/day	12.5 mg/min Max. 125 mg/day x8 sessions	200 mg over 2-5 min x5 sessions over 14 days (>300 mg daily not recomm.)	510 mg at 30 mg/sec repeated after 3-8 days	750 mg at 100 mg/min repeat after 7 days
Adverse effects:	Hypersensitivity Rxn (more common than LMW)	Hypersensitivity Rxn	Hypersensitivity Rxn, hypotension, cramps, nausea	Hypersensitivity Rxn, hypotension, cramps, nausea, headache	Hypersensitivity Rxn, hypotension, diarrhea, nausea	Hypersensitivity Rxn, hypertension
Additional Notes:	Dose calculated by BW and Hb	Dose calculated by BW and Hb	Less allergic reactions than dextrans		MRI alterations occurred as long as 3 months	Delayed FDA approval due to hypophosphatemia

would include $381/40,000 IU for epoetin alfa (Procrit), $63/200 mg for Venofer, along with the associated administration cost estimated to be $50/dose[12]. When compared to the cost of one unit of PRBC, which is approximately $200 in addition to storage/administration costs which often raise the price to $1,000+, this therapy appears to be financially feasible to implement.

Insurance agencies have recognized the use of ESA agents to treat anemia in preoperative patients in order to reduce ABTF during or after surgery, however these programs do not always cover this therapy in elective cardiac surgeries. It is possible that with time, it may become recognized and utilized as a standard practice in the global effort to reduce blood product transfusion and their related adverse effects.

Resources:

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[2] Goodnough, Lawrence T. et al: "Erythropoietin Therapy in the Perioperative Setting." *Clinical Orthopaedics and Related Research* 357 (1998): 82-88. Print.
[3] Madore F, et al: "Anemia in hemodialysis: variables affecting this outcome predictor." J Am Soc Nephrol 8 (12):1921-9, 1997.
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Important Academy Dates

The ACADEMY ANNUAL MEETING DEADLINES

ABSTRACT DEADLINE	**October 15, 2016**
MEMBERSHIP DEADLINE	**November 19, 2016**
PRE-REGISTRATION	**December 19, 2016**
HOTEL REGISTRATION	**December 19, 2016**
2017 ANNUAL MEETING	**January 19-22, 2017**

Others Meetings

17th European Congress on Extracorporeal Circulation Technology
Marseille, France
June 14-17, 2017
Website: www.fecect.org/invitation

Contact Information for Our Sponsoring Partners

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All About our Corporate Partners

40 Years of Bio-Pump and Bio-Console

In 1975, a surgeon and an engineer introduced a revolutionary centrifugal blood pump that was tested in a courageous human trial. 40 years later Bio-Pump™ centrifugal pump, along with Bio-console™ pump speed controller, has helped save countless lives, playing a transformative role in operating rooms worldwide.

In 1964, visionary co-inventors of the Bio-Pump, Dr. Harold Kletschka, cardiac surgeon, and Edson Rafferty, chemist and mechanical engineer, met at Syracuse University. They bonded over their common interest in developing an artificial heart.

DR HAROLD KLETSCHKA **EDSON RAFFERTY**
CARDIAC SURGEON CHEMIST/MECHANICAL ENGINEER
Images provided courtesy of the Bio-Pump's co-inventor, Edson Rafferty

Edson, inspired by a record player turntable, developed a prototype for a centrifugal pump design that would later evolve into the Bio-Pump. This first version was designed with and without impellers. In 1970, Bio-Medicus was founded by Kletschka, Rafferty and chemist Doug Olson. Their multidisciplinary approach to product development, testing and marketing would ultimately deliver the Bio-Pump to the world. Initial public stock sales rose 1.6 million in 1972, securing definitive funding for the Bio-Pump.

A Courageous Test
July 16, 1975 from 8:01 – 8:06 am. It was during these historic 5 minutes that the Bio-Pump was brought to life. Dr. Kletschka's sister Barbara selflessly volunteered to be the first human trial of the pump, which proved to be a successful milestone. In August of that year the first clinical use, at Texas Heart Institute, solidified the future of the Bio-Pump, giving birth to a large segment of modern healthcare. The next few years saw increased growth and interest in the centrifugal pump.

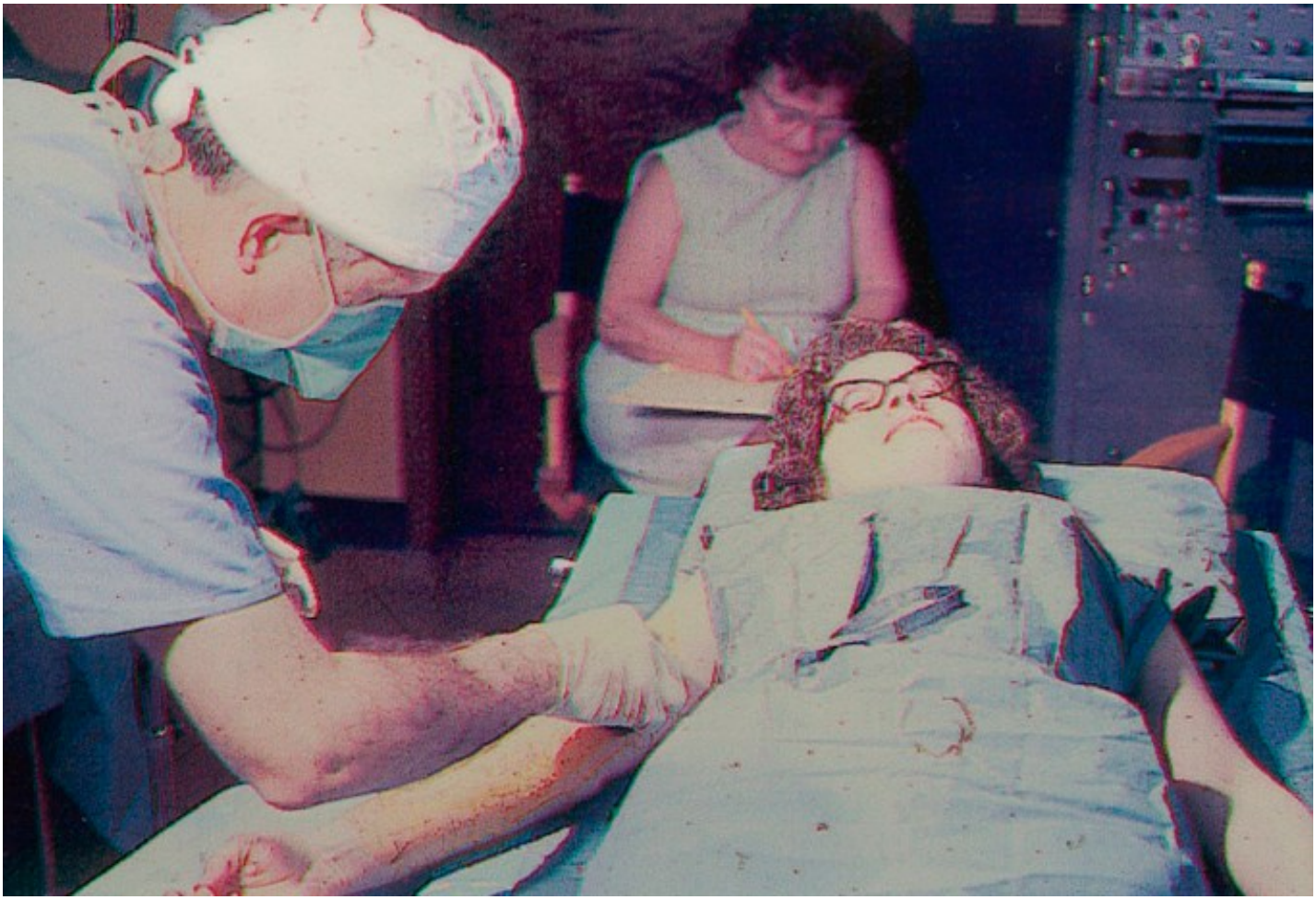


Image provided courtesy of the Kletschka Family

Subsequent years have seen the launch of a series of successful innovations in both the Bio-Pump and the Bio-Console, and a new Era began when Medtronic acquired Bio-Medicus in September of 1990. A major milestone was achieved in 1993. By that year, a staggering 1,000,000 patients had received care from the Bio-Pump and Bio-Console, proving the longevity and reliability of the patented centrifugal design.

And the legacy lives on today. For more information on Medtronic's full line of innovative products for cardiopulmonary bypass, visit: http://www.medtronic.com/us-en/healthcare-professionals/therapies-procedures/cardiovascular/perfusion.html

CAUTION: Federal Law (USA) restricts this device to sale by or on the order of a physician. For a complete listing of indications, contraindications, precautions and warnings, please refer to the Instructions for Use. For distribution only in markets where Bio-Pump and Bio-Console have been approved.

Bio-Pump and Bio-Console are trademarks of Medtronic.

All About our Corporate Partners

Patient Safety Techniques: Have You Thought of Everything?

Medtronic will be holding a Patient Safety Simulation Suite at the AATS Patient Safety meeting. This session will include hands-on use with devices and methodologies that benefit cardiopulmonary patient outcomes. Participants will test techniques that can have unrealized impact on patient safety and outcomes such as individualized heparin management, cerebral oximetry, vacuum assist and other surgical techniques. Use of a simulator along with other medical devices as laboratory instruments allow for practice and demonstrate how subtle techniques can be incorporated to make better decisions and improve patient outcomes.

Get your blood pumping! Both teams and individuals are encouraged to attend this highly engaging, interactive Patient Safety Simulation Suite! Register at the following link:
http://www.cvent.com/events/patient-safety-simulation-suite/event-summary-b197e88122c2458785c1ddcca443c347.aspx

Friday, June 24, 2016
10:00 am – 3:30 pm
Saturday, June 25, 2016
8:00 am – 5:00 pm
Renaissance Boston Waterfront Hotel, Atlantic 3

Sponsored by Medtronic. This is not an AATS accredited session and is not part of the AATS Surgical Patient Safety Course.

THE ACADEMY TO OFFER LIVE WEBCAST

The American Academy of Cardiovascular Perfusion will again be offering a live webcast of our 2017 Annual Meeting in San Diego. The General Sessions of the meeting will be broadcast in high quality streaming video. There will also be an opportunity for attendees to ask questions, thus qualifying for Category I CEUs from the American Board of Cardiovascular Perfusion.

ON Bypass

Immersive High-Fidelity Simulation as a Complimentary Teaching Method in Perfusion Education: Student's Perspective on Pre-Clinical Skill Development

Antony Corsino, BS, and **Alyssa Yurek**, BS,

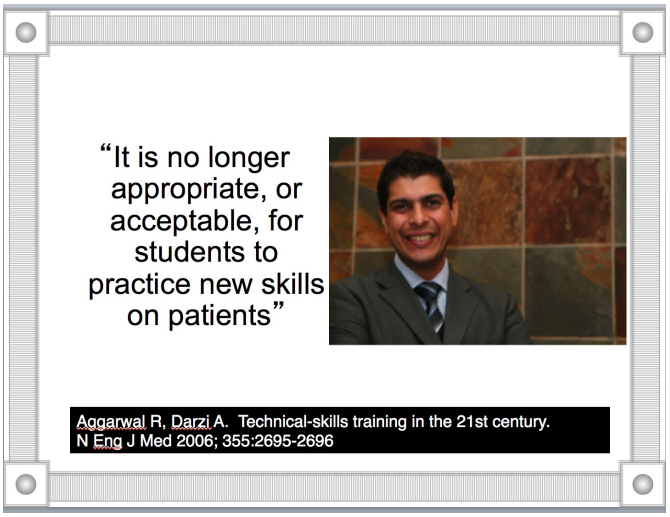
SUNY Upstate Medical University

Department of Cardiovascular Perfusion

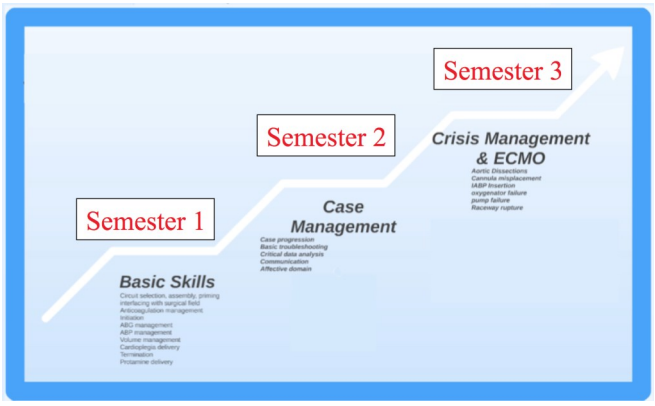
Class of 2016

Syracuse, New York

During the last decade, the use of simulation in medical education has grown at a tremendous rate. Fueling this emergence has been the rejection of the idea of novice student clinicians practicing new skills on patients, particularly in high-risk patient care. (1, 2) This paradigm shift away from using the century old-Halstedian apprenticeship model (see one, do one) to an objective driven competency-based model (see one, simulate many, do one) has been most evident in surgical residency education. In this realm, the effectiveness of simulation based training (SBT) has been demonstrated to improve trainee basic skills and performance in the clinical environment. (3)



What about the use of simulation in perfusion education? While one could argue that the use of simulation exercises in perfusion has a long history with the use of "bucket labs" and animal bypass, only recently has high-fidelity simulators become widely available. (4,5) According to the Perfusion Programs Directors Council (PPDC), most perfusion schools have simulators in their programs (personal communication), however, the role of simulation in the curriculum may vary considerably from school to school. (6-8) In fact, as perfusion students discussing our training with clinicians, it is apparent that the divergent perspectives, perceptions and assumptions about simulation have created difficulties in relating and communicating just how much the role SBT has played in our education. Therefore, the goal of this article is to describe semester-by-semester the pre-clinical immersive SBT model that was used in our program and how we felt that this training augmented our traditional clinical rotations.



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SUNY Upstate is a continuous 5-semester program. In the first 2 ½ semesters of our program, immersive high-fidelity simulation provides the backbone around which the didactic curriculum is woven. This arrangement was especially helpful to us as students as it allowed excellent alignment of the classroom content with the applied learning in the SimLab.

Semester 1

In semester 1, before we were even allowed access into the SimLab, we spent 5 weeks forging the very basic skills and knowledge (clamping, tubing connections, stopcocks and components). In that initial five weeks we in sequence, built our own tubing packs, learned to assemble this pack on pump consoles, learned to prime and de-air the circuit and do a pre-bypass checklist. Each week we went through competency checks. It was exciting to graduate to the SimLab where we built upon these fundamental skills of CPB including handing up lines, initiation, assessment of bypass, managing blood gases, running cardioplegia, and terminating bypass. This technique of deconstructing and repetitively practicing the fundamental skills of CPB without fear of patient harm was to us a major benefit. It is important to note that for psychological fidelity, the SimLab was to be at all times treated as an operating room (hats, masks, gloves, etc…) By the end of the first semester the fundamental skills were all joined together into a complete CPB case. Common perfusion challenges were introduced along the way such as occluded suckers, poor venous drainage, poorly placed arterial cannulation. Non-technical skills such as proper communication and standard precautions were also practiced and evaluated. Two SimLab competencies (at 10 weeks and 15 weeks) were performed on each of us in this semester. These are time of assessment where the faculty evaluates our individual performance on hundreds of elements on a standardized case. Failure to preform within 2 SD of the mean of all students could result in remediation and delay.

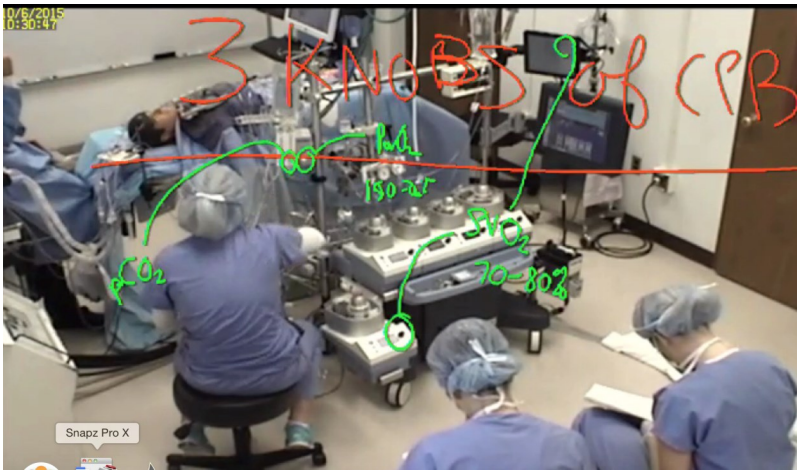
First Semester Totals

Fundamental Skills Training	Total
Circuit Set-up	71
Circuit Prime	57
Prime/CPB drugs	33
Pre-CPB Checklist	43
Hand lines to Field	38
Divide Lines, Advance, Test Arterial Cannula	50
Initiate CPB	50
Deliver Cardioplegia	31
Weaning & Termination of Bypass	49
Centrifugal pump	55
Roller pump	48

Semester 2

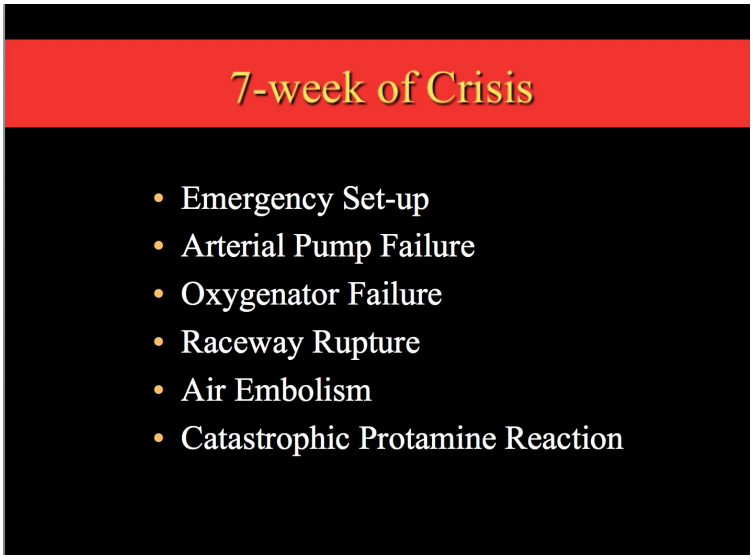
Now, in this semester, as we learn cardiac pathophysiology in the classroom, we begin to work in the SimLab on “full mission” cases where we are assigned pathology to the cases and work on more specific techniques involved in CABG, valve, and aortic surgeries. Elements such as VAVD, RAP, SACP, DHCA, and ultrafiltration are now taught in the classroom and practiced in the SimLab. Higher expectations are evident in basic CPB skills, conceptual understanding and troubleshooting. A powerful part of our learning actually occurred after our SimLab sessions though the use of video capure. Each of our cases are video captured for

review and reflection outside the lab (see screen shot). With the cognitive load diminished, it was amazing how much we could gain by watching the play-back, listening to the instruction and seeing the camera angles and the rendered notes. Like athletes' reviewing their video performance, we believe that this has been an immensely useful tool in our education.



Semester 3

In semester 3, for 7-weeks we focused on ECMO management and CPB crisis management. We performed scores of emergency set-ups, emergency re-initiations, pump failures, oxygenator change-outs and air embolism management drills. Not only did we practice these low-volume, high risk events, but we developed protocols around our experiences and continue to practice and refine these protocols. We learned how to handle emergencies independently as well as working and communicating efficiently in a group. We saw incredible gains in efficiency, for example our first oxygenator change-out took about 7 minutes, and after a week of practicing and fine tuning we were able to get it safely performed in under 2 minutes. The value of practicing these seldom occurring events was imprinted upon us.



Now, with our CPB skills demonstrated, as we prepared to go on our first of five 7-week clinical rotations, we felt nervous, but prepared to pump our first clinical cases.

Transitioning from the SimLab into the Clinical Environment

Regarding the transition from simulated cases to clinical cases, we all felt the skills learned in the simulation lab translated well into the OR. Positive feedback from clinical instructors showed that simulation helped

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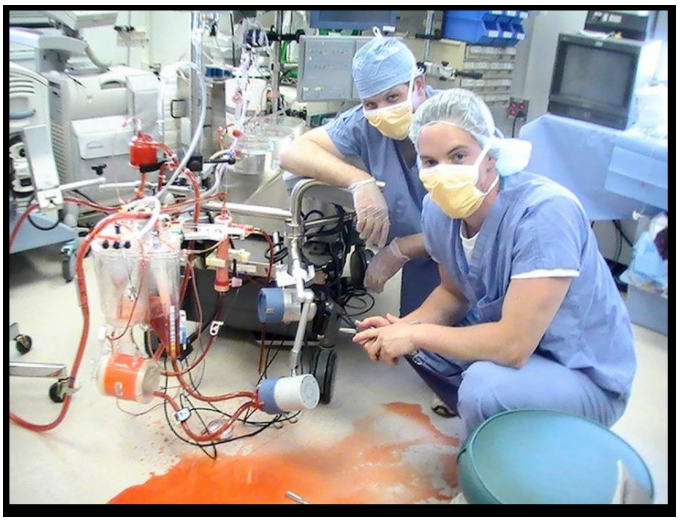
in shortening the learning curve, allowing us to adjust to the dynamics of an OR, surgical procedure and awareness, and the nuances of perfusionist preferences rather then just focusing on how to pump a case. With all the technical practice in the SimLab and the development of the concepts of bypass before the clinicals, we were more comfortable communicating right away, confident with problem solving during live cases, and our anxiety was reduced when faced with challenges previously encountered in the simulation. Our experiences in immersive simulation training was nothing but positive and we believe that the time spent in simulation training greatly complimented learning in our clinical rotations.

Comments from Clinical Affiliates

- *"... I've noted differences in both a higher starting point and a not-so-steep learning curve for first rotation students regarding their technical skill*
- *"... students who have engaged in a rigorous simulation experience are better prepared for their initial clinical experience.*



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