POON, TRUEMAN & BOYD
RESEARCH EVENING 2018

SEASONS IN THE PARK
QUEEN ELIZABETH PARK
W 33RD AVE
WEDNESDAY, JUNE 13, 2018 @ 5:30 PM
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SUMMARY

AWARDS PRESENTED

The Dr. Peter Poon Memorial Research Award
The Dr. Gordon E. Trueman Radiology Residents & Fellow Research Awards
The Dr. Robert Wallace Boyd Research Fund for Young Investigators

ADJUDICATORS

Faisal Khosa, MD
Clinical Instructor
Department of Radiology
Vancouver General Hospital
University of British Columbia

Phillip Blanke, MD
Assistant Professor
Department of Radiology
Saint Paul’s Hospital
University of British Columbia

LEARNING OBJECTIVES

1. Appreciate the diversity of resident research and the associated medical and imaging background within a Canadian Radiology Residency Program.
2. Critique and optimize experimental design, from hypothesis to conclusion, of the presented projects.
3. Provide feedback to the speakers in assurance of high quality of the oral presentation of their research in a limited time period.
It is with great pleasure that I welcome you all to the 2018 Dr Peter Poon Memorial, Dr. Robert W. Boyd and Dr. Gordon Trueman UBC Radiology Research Evening, a part of our yearly tradition in our Department for over 35 years. This event recognizes the major contributions of Residents and their Faculty mentors to research in the Department of Radiology, contributions that have led to a number of national and international awards and publications in peer-reviewed journals and the development of a stronger academic Department. Due to the efforts and talents of the Residents, and those of the Radiology Residency Research Director, Dr. Jonathon Leipsic, this year we look forward to another very successful Research Evening. A total of 6 papers are being presented by radiology residents this evening.

I would like to thank our benefactors who kindly fund the prizes, Dr. Jonathon Leipsic for organizing the event and supervising the research efforts of the residents and the Residency Program Office staff for their support, and most of all, the Radiology Residents, Fellows for their most impressive scientific contributions.

It is my privilege to welcome UBC Radiology residents, fellows, faculty, and honoured guests, to the 2018 UBC Radiology Residency Research and Grad Evening. This event over the years has become the highlight of the academic year, as we celebrate resident, fellow, and faculty participation in imaging and intervention research and salute the final year residents in their last official departmental event.

Special thanks to the Poon, Goodacre, Boyd and Trueman families for their support in establishing the Dr. Robert W. Boyd and the Dr. Gordon Trueman awards. Their support has played a significant role in advancing our research program, which we sincerely appreciate.

The support of the Chairman, Dr. Bruce Forster and to the Program Director, and Assistant Program Director, Drs. Cameron Hague, and Tony Sedlic is most appreciated.
To the residents, fellows, faculty, judges, honoured guests and friends of the UBC Radiology Residency Program, we warmly welcome you to the 2018 UBC Radiology Residency Research Evening. This event is part of an annual tradition in our program and is the one of the last official events of the academic year. We are proud to showcase the talents and hard work of our residents and we are sure you will find the presentations stimulating and thought provoking. Presentations focus on research in the hypothesis stage (Dr. Robert Wallace Boyd category), works in progress (Dr. Peter Poon Memorial research category), completed projects (Dr. Gordon E. Trueman category) and any research work in the field of intervention (Dr. Brian W. Goodacre Memorial category).

On behalf of the residents, I thank the entire faculty for their active support and in particular, Drs. Leipsic and Forster for their commitment to residency education and research. In addition a large thanks to the families of Drs. Boyd, Poon, Trueman and Goodacre for the continued support of the UBC radiology program and radiology research.

It is our pleasure to present to you the work of the residents of the UBC Radiology Residency Program. Please enjoy the presentations.

On behalf of the residents, I thank the entire faculty for their active support and in particular, Drs. Leipsic and Forster for their commitment to residency education and research. We also thank the adjudicators for today’s presentations and Dr. Jonathon Leipsic for moderating.

It is our pleasure to present to you the work of the residents of the UBC Radiology Residency Program. Enjoy!
# SCHEDULE OF EVENTS

**POON, TRUeman & Boyd**  
**Research Evening 2018**  
**Moderator: Dr. Jonathon Leipsic, Vice Chair Research**

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<thead>
<tr>
<th>Event</th>
<th>Time</th>
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<tbody>
<tr>
<td>Welcome Introductions</td>
<td>5:30 PM - 5:35 PM</td>
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<tr>
<td>By Drs. Bruce Forster and Jonathon Leipsic</td>
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<tr>
<td>Dr. Peter Poon Memorial Award</td>
<td>5:35 PM - 5:55 PM</td>
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<td>Evaluation of the Diagnostic Accuracy of VaIR for the Interpretation of Abdominal CT Scans, with the Radiologist's Findings in the Finalized Report, Serving as a Gold Standard Presented by Dr. William Parker</td>
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<td>The Utility of a 3D-Printed Aortic Model for Facilitating Hands-On Training in Interventional Radiology Medical Education. Presented by Dr. Jun Wang</td>
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PGY 5 GRADUATION DINNER

6:45PM – 7:30PM
Reception

7:30PM – 8:30PM
Dinner

8:30PM – 10PM
Radiology Research Evening Awards
Teaching Awards
PGY 5 Resident Graduation Ceremony

Graduating PGY 5 Residents:
Dr. Nicolas Bilbey
Dr. William Guest
Dr. Trenton Kellock
Dr. Teresa Liang
Dr. Pedro Lourenco
Dr. Jason Motkoski
Dr. Andrew Van Der Westhuizen
Dr. Peter Yui-Chee Poon was born on November 2, 1939, in Hong Kong. He attended the University of Hong Kong, where he obtained his MD degree in 1966. From 1967 to 1968, he undertook his first studies in radiology at Queen Elizabeth Hospital in Hong Kong. The following year, he immigrated to Regina, Saskatchewan, Canada, where he completed another year of internship at Regina General Hospital and 1 year of internal medicine at the University of Manitoba, Winnipeg Health Sciences Center.

From 1970 to 1971, Dr. Poon was a general practitioner in Scarborough, Ontario, Canada, before returning for a radiology residency at McMaster University, Hamilton, Ontario, Canada, from 1971 to 1974. In 1975, he received his first academic appointment at the University of Toronto, Ontario, Canada, as a lecturer. He began his career as a staff radiologist at the Princess Margaret Hospital, Toronto. He steadily moved up the academic ladder to the rank of associate professor. In 1987, he transferred to St Michael's Hospital in Toronto and had a major role in the establishment of one of the first magnetic resonance imaging units in Ontario.

In 1992, Dr. Poon moved to Vancouver to assume the position of head of radiology at the British Columbia Cancer Agency, Vancouver Cancer Centre and was promoted to professor at the University of British Columbia. He was intimately involved in the delivery of cancer care in British Columbia and was the provincial practice leader for diagnostic imaging. He was vigorously involved with the agency until his death.

Throughout his career, Dr. Poon was an enthusiastic teacher to both medical and graduate students and consistently promoted research. One of his proudest achievements was being voted Best Teacher of the Year by the radiation oncology residents at the British Columbia Cancer Agency in 1999. He was a reviewer for several radiology journals. He authored more than 50 papers and four book chapters and spoke at numerous national and international meetings. He was greatly respected and well liked throughout the Canadian radiology community.

Dr. Poon enjoyed traveling with his wife, jogging with his dog Page, and the occasional game of golf or squash with his sons. He will be sorely missed by his wife, sons, and friends. He is survived by his wife, Myrna; and four sons; Ferdinand, Ian, Emmet, and Daniel.

The Peter Poon Award aims to encourage original hypothesis-driven research in which residents are the principal investigator or co-investigator.
EVALUATION OF THE DIAGNOSTIC ACCURACY OF VAIR FOR THE INTERPRETATION OF ABDOMINAL CT SCANS, WITH THE RADIOLOGIST'S FINDINGS IN THE FINALIZED REPORT, SERVING AS A GOLD STANDARD.

Author: William Parker

Co-Authors: Dr. Savvas Nicolaou, Dr. Sabeena Jalal, Brian Lee, and Dr. William Parker

Evidence based development of Augmented Intelligence Algorithms used during the radiologist’s assessment of abdominal CT scans are in need. There is a dearth of peer reviewed literature on the segmentation and classification of Abdominal CT scans. A basic machine learning setup is in use, with an NVIDIA Titan Xp GPU installed on a PC running Ubuntu Linux OS, NVIDIA’s DIGITS software with a Tensorflow framework, the MIRC Clinical Trials Processor Software, and Microsoft VoTT image Annotation Software. This setup is being used to train an open source convolutional neural network with a data set acquired at Vancouver General Hospital, to which we call VAIR (VGH Augmented Intelligence for Radiologists). An evaluation of the diagnostic accuracy of VAIR for the interpretation of abdominal CT scans will take place, and the Radiologist’s findings in the finalized report will serve as the gold standard. VAIR will assign a CTAS (Canadian Triage Acuity Score) score the image study to facilitate and assist the Radiologist in triage. The VAIR’s outcomes will be cross tabulated against the Radiologist’s findings, and diagnostic accuracy, sensitivity, and specificity will be calculated in addition to the Receiver Operating Curve (ROC) analysis.

Current Results:
We have applied the neural network framework to non-medical images and have had promising success with the classification and segmentation of structures. We are applying similar principles to abdominal CT scans in order to facilitate efficient information allocation and CTAS triage to support the radiologist’s assessment.

Use of Funds:
If we are chosen to receive award funding, it will be used to cover the large costs required to conduct data analysis and dataset optimization. We hope to bring on more individuals to the team to assist us with dataset optimization, as well as to improve the computer hardware setup to increase efficiency and throughput. A data specialist would be very helpful, to increase our dataset labelling and creation abilities, which are currently being done manually by one person. Increasing the size of our team would increase our abilities to create more algorithms to help radiologists. Also, we have been awarded one computer, which costs approx. $2000 USD, and thus receiving funding to help us purchase a second computer would essentially double our efficiency, as well. At this time, our priority is on dataset optimization, but more hardware is also a secondary priority.
UTILITY OF GADOLINIUM IN PROSTATE MRI FOR DETECTION OF CLINICALLY SIGNIFICANT CANCER: IS IT NECESSARY?

Author: Hisham-Al Shikarchy

Co-Authors: Hisham Al-Shikarchy, Laurent Doucet, Abigail Arnold, Emily Pang, Silvia Chang

Objectives:
The role of dynamic contrast enhanced sequences (DCE) in multiparametric prostate MRI (mPMRI) for detection of clinically significant prostate cancer is controversial. Studies have shown that it does not improve detection rate but this has only been evaluated at 3.0T. The aim of our study is to attempt to verify these findings on 1.5T, which to our knowledge has not been done before.

Materials & Methods:
Retrospective analysis of pre-biopsy mPMRI of 78 patients who underwent targeted fusion biopsy of lesions detected on MRI. A total of 106 lesions were evaluated by two GU radiologists both with a conventional multiparametric pMRI protocol and without the DCE sequence obtained at 1.5T without endorectal coil. Lesions were scored according to PI-RADS v2 criteria both with and without DCE. Significant prostate cancer was defined as a histologic Gleason score ≥3+4 and a positive lesion on MRI was defined as PI-RADS 4 or 5. The scores for each reader were then compared to results from pathology and data analysis was conducted to test for accuracy.

Results
The addition of contrast did not statistically significantly alter PIRADS scores (p>0.05). Cancer was diagnosed in 43.4% (46/106) of lesions, of which 28.3% (30/106) were significant. For reader 1, diagnostic accuracy, sensitivity, specificity and negative predictive value respectively measured 73.6%, 75.8%, 71.4% and 88.7% for non contrast and 67%, 79.1%, 62.3% and 88.8% for DCE. For reader 2, diagnostic accuracy, sensitivity, specificity and negative predictive value respectively measured 71.7%, 69%, 72.7% and 86.1% for non contrast and 68.8%, 75.9%, 66.2% and 87.9% for DCE. Kappa values for non contrast and contrast were 0.576 and 0.500 respectively (moderate interrater agreement). One significant peripheral zone cancer (3.3%) was not detected on non contrast protocol. Results from analysis of an additional 157 patients (230 lesions) are pending.
Dr. Gordon Edward Trueman was born in 1913 in Winnipeg to Harry and Eliza Trueman. His four older brothers, John, Mark, Jim and Stan, all born in England, referred to him as the kid. Despite harrowing adventures as a boy while skating on the Red River (he was brought home twice by the police) and canoeing hundreds of miles with the YMCA, he survived and went on to study Mathematics and Physics at the University of Manitoba.

In 1939, he graduated in Medicine at the University of Manitoba, interned at Vancouver General Hospital and then trained in Diagnostic Radiology making him the fourth radiologist in British Columbia. He was a Major in the Royal Canadian Army Medical Corps in World War II and went overseas leaving Carol with three children under the age of four. Twelve days after D-Day he landed in Normandy with the 12th General Hospital. Although always reluctant to discuss the war, late in life he spoke of the Falaise Gap, starvation in Holland and the Battle of the Scheldt. He came home from the war with tuberculosis. After many months of hospital care, he was sent to the TB sanatorium at Tranquille, near Kamloops. Upon recovery, he joined the Irving Clinic and founded the Department of Radiology at the Royal Inland Hospital. Gordon and Carol described their five years in Kamloops as the best years of their lives. In 1952, he returned to Vancouver to continue the practice of medicine.

In 1976, he retired as Associate Professor at the University of British Columbia and Head of Radiology at Vancouver General Hospital. Gordon served on many community boards and gave generously to a wide variety of charities, including the University of British Columbia. He and Carol were founding and active members of the Arbutus Club where they were involved in social events and avid curlers. Along with others, Gordon and Carol founded the community of Maracaibo on Salt Spring Island where he designed and built a vacation home. He and Carol spent many happy times sharing Maracaibo with their family when they were not travelling in Portugal and Spain, vacationing in Hawaii or fly fishing on the rivers and lakes of British Columbia. In his last five years at Arbutus Manor he participated on the Council and contributed stories to the Manor’s paper. He found particular pleasure in hosting many lunches, dinners and visits with all members of the family.

The Trueman Award is awarded to those individuals’ completed projects which are considered the most deserving, based on content, scientific methodology, and presentation.
GADOLINIUM DEPOSITION IN DEEP BRAIN STRUCTURES: RELATIONSHIP WITH DOSE AND IONIZATION OF LINEAR GADOLINIUM-BASED CONTRAST AGENTS.

Author: Tony Kang, PGY2

Co-Authors:
Heejun Kang MD, Megan Hii, Megan Le, Roger Tam PhD, Andrew Riddehough, Anthony Traboulsee MD, Shannon Kolind PhD, Mark S. Freedman MD and David KB. Li MD.

Background and Purpose: To determine if greater exposure to linear gadolinium-based contrast agent administration is associated with higher signal intensity in deep brain structures on unenhanced T1-weighted MRI. Secondarily, to compare signal intensity differences between ionic and nonionic linear gadolinium-based contrast agents.

Materials and Methods: Subjects with secondary progressive MS originally enrolled in a multicenter clinical trial were studied retrospectively. 80 subjects (greater-exposure cohort) received 9 linear gadolinium-based contrast agent administrations (30 nonionic/50 ionic) between week -4 and year 1 and a tenth administration by year 2. 115 subjects (lesser-exposure cohort) received 2 administrations (40 nonionic/75 ionic) between week -4 and year 1 and a third administration by year 2. Signal intensities were measured on unenhanced T1WIs by placing ROIs on dentate, globus pallidus, caudate, thalamus, pons and white matter, and were normalized using ratios: dentate/pons, globus pallidus/white matter, caudate/white matter, and thalamus/white matter.

Results: Between week -4 and year 1, subjects in the greater-exposure cohort showed increases in signal intensity ratios in all regions (p<0.01) while the lesser-exposure cohort only showed an increase in the dentate (p=0.003). Between year 1 and year 2, when both cohorts received only 1 additional gadolinium-based contrast agent, no significant changes were observed. In the greater-exposure cohort, significantly higher signal intensity ratio changes were observed in subjects receiving linear nonionic than linear ionic gadolinium-based contrast agent.

Conclusions: Hyperintensity in deep brain structures from gadolinium deposition is related to the number of doses and type of linear gadolinium-based contrast agent (nonionic greater than ionic) administration.
EVALUATION OF THE PROXIMAL CORONARY ARTERIES IN SUSPECTED PULMONARY EMBOLISM: DIAGNOSTIC IMAGES IN 51% OF PATIENTS USING NON-GATED, DUAL SOURCE CT PULMONARY ANGIOGRAPHY

Author: David Thomas, PGY 3

Co-Author: David M. Thomas, MD, Patrick D. McLaughlin, MD, FRCPC, James P. Nugent, BSc, Sarah A. Barrett, MD, FRCPC, John R. Mayo, MD, FRCPC, Ana-Maria Bilawich, MD, FRCPC, Graham C. Wong, MD, FRCPC, Savvas Nicolaou, MD, FRCPC

Objectives
This retrospective study reports the frequency and severity of coronary artery motion on dual source high pitch (DSHP), conventional pitch single source (SS) and dual source dual energy (DE) CT pulmonary angiography (CTPA) studies.

Background
Advances in rotation time, detector coverage and pitch allow modern CT systems to produce motion free images of the coronary arteries even in the absence of ECG synchronization. The authors have anecdotally observed obstructive coronary artery lesions during CTPA scans acquired using a DSHP technique, more frequently than compared to other CTPA techniques.

Methods
288 consecutive patients underwent CTPA scans for suspected pulmonary embolism between Sept 1, 2013 and Jan 31, 2014. 194 at DSHP scans, 57 SS scans, and 37 DE scans were analyzed. Coronary arteries were separated into nine segments, and coronary artery motion was qualitatively scored using a scale from 1-4 (non-interpretable to diagnostic with no motion artifacts). Signal intensity, noise, and signal to noise ratio (SNR) of the aorta, main pulmonary artery, and paraspinal muscles were also assessed.

Results
DSHP CTPA images had significantly less coronary artery motion, with 30.1% of coronary segments being fully evaluable compared to 4.2% of SS segments and 7.9% of DE segments (p<0.05 for all comparisons). When imaging with DSHP, the proximal coronary arteries were more frequently evaluable than distal coronary arteries (51% versus 11.3%, p<0.001). Without ECG synchronization and heart rate control, the distal left anterior descending coronary artery and mid right coronary artery remain infrequently interpretable (7% and 9% respectively) on DSHP images.

Conclusion
DSHP CTPA dramatically reduces coronary artery motion artifacts and allows for full evaluation of the proximal coronary arteries in 51% of cases. The study highlights the increasing importance of proximal coronary artery review when interpreting CTPA for acute chest pain.

CONDENSED ABSTRACT
Advances in CT technologies have allowed for non-gated CT pulmonary angiography (CTPA). This study compared the frequency and severity of coronary artery motion on dual source high pitch (DSHP; n = 194), conventional pitch single source (SS; n = 57) and dual source dual energy (DE; n = 37) CT pulmonary angiograms in patients with suspected pulmonary embolism. DSHP CTPA dramatically reduces coronary artery motion artifacts and allows for full evaluation of the proximal coronary arteries in 51% of cases. The study highlights the increasing importance of proximal coronary artery review when interpreting CTPA for acute chest pain.
INFLUENCE OF ACADEMIC PRODUCTIVITY ON GENDER DISPARITY IN ACADEMIC INTERVENTIONAL RADIOLOGY.

Author: Jun Wang, PGY 3

Co-AUTHORS

PURPOSE
This study aimed to determine the impact of academic productivity on gender disparity in academic Interventional Radiology employing parameters including h-index, number of publications and citations, and years of active research.

METHODS
Publicly available data on faculty members in Interventional Radiology departments across academic institutions in Canada and the United States was collected. Gender, academic ranking, leadership position (if any), publication history, citation number, years of active research, and h-index was collected for each faculty member and this data was used to create a prediction equation.

RESULTS
420 Interventional Radiology faculty members met inclusion criteria for this study. Women constituted a minority of Interventional Radiology faculty across all academic ranks (9.5% of assistant professors, 11.8% of associate professors, and 5.3% of full professors). They were also the minority in leadership positions: 9.7% of first-in-command positions (defined as head, chief, chairperson, or program director) and 11.1% of second-in-command positions (associate director or associate/deputy/vice chairperson). No significant difference was found between women and men in academic achievement metrics however female gender was an independent predictor of h-index with a negative correlation.

CONCLUSION
Women remain the minority among Interventional Radiology faculty and leadership positions. Those who do enter IR achieve the same publication metrics as men despite female gender being an independent and negative correlation variable for h-index.
Dr. Robert Wallace Boyd was born on May 30, 1906 in Lumsden, Saskatchewan. Wallace spent his youth in Medicine Hat, AB before attending the University of Alberta and Medical School at McGill University. Following internship at Vancouver General Hospital in 1932, Wallace became interested in a newer specialty, radiology and over the next 40 years became a pioneer in the development of diagnostic and therapeutic radiology in Canada.

After a Radiology Residency at VGH (1933-35), he worked at VGH as an Assistant Radiologist (1935-37). He moved to Calgary in 1937, where he practiced radiology and radiotherapy at the Holy Cross Hospital and at the Radium and X-Ray Institute, until 1942. Between 1942 and 1945, he served as a consultant radiologist, in the Directorate of Medical Services, Royal Canadian Army Medical Corps, with the rank of Lieutenant Colonel, at the National Defense Headquarters in Ottawa. In this capacity, he was in charge of the radiology training programs in Canada and went to England to advise them on their programs.

In 1946, he returned to VGH as the Associate Director of the Radiology Department, and then became its Director in 1951, a post he held until 1971. In 1976, he became a Clinical Associate Professor Emeritus of Diagnostic Radiology, UBC. He had eleven publications between 1938-1966.

Since his retirement he found interest in following the careers of the numerous radiologists who received resident training at VGH. Wallace was an active member of Shaughnessy Heights United Church and shared many summer days with family and friends at the family cottage on Bowen Island.

Dr. Boyd is remembered by all those who have met him as a leader in Radiology and as a quiet and kind individual.

The Robert Wallace Boyd Award winner is preselected to the event and is based on a resident’s abstract submission.
THE UTILITY OF A 3D-PRINTED AORTIC MODEL FOR FACILITATING HANDS-ON TRAINING IN INTERVENTIONAL RADIOLOGY MEDICAL EDUCATION.

AUTHOR: Jun Wang, PGY 3

CO-AUTHORS: D. Fenton

BACKGROUND:
The use of 3D printing has been established in the literature primarily for surgical planning purposes, predominantly in the fields of cardiovascular surgery, orthopedics and head and neck surgery (1). There have been few studies evaluating the utility of 3D printing for hands-on training in vascular/interventional radiology (VIR) and endovascular techniques. Given the technical skills required in the practice of VIR and endovascular surgery, a model that allows trainees a hands-on platform to improve endovascular skills, in addition to learning in patients, could be of significant benefit. A proof-of-concept study has established the feasibility of creating a 3D printed aorta model that allows the use of sheaths, catheters and guidewires (2). However, no study has evaluated the impact of using such a model for training residents and fellows interested in a career in VIR or endovascular surgery.

HYPOTHESIS/OBJECTIVES:
The aim of this study is to evaluate the utility of a transparent 3D printed model of the aorta for educational purposes by facilitating hands-on training in Vascular/Interventional Radiology and Endovascular surgery techniques.

PROPOSED DESIGN/MATERIALS AND METHODS:
A hollow, transparent 3D-printed model of the aorta mounted on a baseplate that allows for insertion of a sheath, catheter and guidewire will be created as previously described (2). Importantly, the origins of the aortic arch vessels and main abdominal vessels (celiac, superior mesenteric, inferior mesenteric and renal arteries) will be included in the model. The model can be filled with water and allow hands-on training with important endovascular techniques such as catheter forming, guidewire-catheter exchanges, and selective vessel catheterization. Junior radiology residents and vascular surgery residents (if interested) can be trained with the model prior to their first VIR/Endovascular surgery rotation. A pre- and post-training survey using a Likert scale will be used to gauge the benefit of the training model. If found to be beneficial for trainee learning, the model can be utilized by the Department of Radiology as a supplemental teaching tool for direct 1-on-1 learning during VIR rotations or utilized during academic half day sessions.

APPENDIX:
$2000: Creation and printing of a 3D aorta model.
$500: Endovascular materials required for teaching, e.g. sheaths, catheters and guidewires.

REFERENCES: