Department of Surgery
WESTERN UNIVERSITY

13th ANNUAL RESEARCH DAY

Friday, June 23, 2017
Shuttleworth Auditorium, D0-104
St. Joseph’s Hospital
7:00a.m. – 3:00 p.m.

Dr. Robert Zhong Lecture
“Achieving Surgical Quality: Observations from the American College of Surgeons”
Dr. Clifford Ko, Director National Surgical Quality Improvement Program, and Division of Research and Optimal Patient Care American College of Surgeons
Department of Surgery
Western University

This Program was Supported in Part by Educational Grants from the Following:

Silver Level Sponsor
Medtronic

Bronze Level Sponsors
Perfuse Medtec
Ethicon Canada Johnson & Johnson Medical Companies
Baxter
3M
Department of Surgery  
Western University  

13th Annual Research Day 
Friday, June 23, 2017  

TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>1. Program at a Glance</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4-5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2. Dr. Robert Zhong Bio</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>3. Poster Session (a.m.)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7-33</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>4. Oral Presentations (a.m.)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>34-50</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>5. Robert Zhong Lecture, Bio (p.m.)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>51-52</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>6. Group Interactive Session (p.m.)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>53</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>7. Index of Presenters by Last Name</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>54-55</td>
</tr>
</tbody>
</table>
RESEARCH DAY 2017
Shuttleworth Auditorium, St. Joseph’s Hospital
Friday, June 23, 2017
Morning

7:00 a.m. Registration and Coffee

7:30 – 9:00 a.m. Poster Session

9:00 – 9:05 a.m. Opening Remarks: Dr. Emil Schemitsch, Department of Surgery

9:05 – 10:15 a.m. Division Award Winning Resident/Fellow Research Papers

10:15 – 10:45 Break

10:45 – 11:00 a.m. Outstanding Scientist in the Department of Surgery

11:00 – 11:20 a.m. Award Winning MSc Student Colloquium Presentations

11:20 – 12:00 p.m. Outstanding Researchers in the Department of Surgery

12:00 – 1:00 p.m. Lunch
RESEARCH DAY 2016
Shuttleworth Auditorium, St. Joseph’s Hospital
Friday, June 23, 2017
Afternoon

1:00 – 2:00 p.m.  Robert Zhong Lecture
                 Dr. Clifford Ko

2:05 – 2:30 p.m.  Group Interactive Session: Merits of Simulation
                 Based versus Hands on Operative Training of
                 Residents in the Face of CBME and Quality
                 Based Outcomes

2:30 – 2:40 p.m.  Research Award Presentations

2:40 – 2:45 p.m.  Closing Remarks: Dr. Emil Schemitsch

2:45 – 3:00 p.m.  Completion of Participation Evaluation Forms
The Robert Zhong Department of Surgery Research Day was named in honour of Dr. Robert Zhong, a brilliant scientist and colleague who passed away in 2006.

Dr. Robert Z. Zhong was born in Shanghai, China on January 16, 1946. He graduated from Shanghai No 1 Medical University and was then assigned by the government to work as a general surgeon in a community hospital. Dr. Zhong attended a seminar led by Dr. Sun Lee – considered to be the founding father of experimental microsurgery – and whom he would later credit to be one of the most important mentors of his life. Dr. Zhong arrived in Canada first as a research fellow under the supervision of Drs. John Duff and Calvin Stiller in 1984. His persistence and vision led to a full-time appointment in microsurgical animal models that would be applied in human transplantation clinical practice.

Recognizing that molecular biology and transplant immunology were critical to the future of transplantation, Dr. Zhong began his study of these fields in Canada to become one of the world's leading experts in transplantation and microsurgery. He went on to become a Tier One Canada Research Chair in Transplantation and Experimental Surgery in 2004 and was appointed a full Professor in the Departments of Surgery, Pathology, and Microbiology & Immunology at The University of Western Ontario. Dr. Zhong was a scientist at the Robarts Research Institute; Director of the Microsurgery Laboratory at LHSC; and a scientist at the Lawson Health Research Institute.

Dr. Zhong’s influence into the fields of transplantation and microsurgery were profound and far-reaching. He was Past President of the International Society of Experimental Microsurgery; a member of the Canadian Society of Transplantation, American Society of Transplantation; and the American Society of Transplant Surgeons. Dr. Zhong was awarded the Lifetime Achievement Award by the Canadian Society of Transplantation posthumously in 2007.

Dr. Zhong published over 180 peer-reviewed publications and achieved millions of dollars in research grant funding. He supervised more than 70 graduate students and fellows and trained over 70 microsurgeons worldwide during his 21-year career at Western. His superb leadership and vision were recognized as having created an internationally renowned program in experimental transplantation. A brilliant scholar, teacher, and mentor, Dr. Zhong is also remembered as a man of great humility, kindness, and respect.

Dr. Robert Zhen Zhong passed away in London, Ontario on September 8, 2006.

BASIC SCIENCE POSTER ABSTRACTS
Poster #01

Poster Category: Basic Science

The Promotion of Adipogenesis in a Rat Model of Radiation Induced Fibrosis of the Mammary Fat Pad

Truong J, Wong E, Turley E, Yazdani A
Division of Reconstructive and Plastic Surgery

Background:
Radiofibrosis of breast tissue ultimately compromises breast tissue reconstruction by interfering with tissue viability and healing; autologous fat transfer has recently been shown to reduce radiotherapy-related tissue injury, thought to be attributed to the presence of adipose-derived pluripotent stem cells. We have identified a novel gene HMMR/RHAMM, whose expression decreases adipogenesis and increases fibrosis. We have developed RHAMM peptide mimetics (NPI-0110) to block RHAMM signalling, and it is thought that the injection of such a peptide will promote adipogenesis and decrease fibrosis in mammary tissue in rats.

Materials and Methods:
High frequency ultrasound was used to assess volume through thickness measurements and 3D reconstruction of mammary fat pads in 20 retired breeder female rats that were non-irradiated, irradiated, treated, and not-treated with peptide NPI-0110 at days 0, 7, 14, and 21. Rats were euthanized at Day 21, and mammary fat pad tissues were processed for expression of fibrotic and adipogenetic markers using real-time polymerase chain reaction and immunohistochemistry.

Results:
Volume estimates of fat pad and expression of fibrotic markers such as Collagen-1, Collagen-3, and TGFβ-1, and adipogenetic markers such as PPARγ, adiponectin and perilipin were ameliorated by peptide NPI-0110 and radiotherapy when quantified via qPCR and immunohistochemistry.

Conclusions:
Results from this study may aid in therapies in the human patient population which decrease the significant morbidity associated with a very challenging and common clinical problem – reconstruction in previously radiated beds in general and breast cancer specifically.
Poster #02

Poster Category: Basic Science

Overexpression of MT1-MMP promotes microparticles release and decreased extravasation of prostate cancer cells
Xinyang L¹, Mario C²
¹Department of Surgery, Schulich School of Medicine, Western University
²Department of Biology, Faculty of Science, Western University

Introduction:
Membrane-Type-1 Matrix Metalloproteinase (MT1-MMP) is transmembrane protease which plays a key role in cancer metastasis. The relationship between MT1-MMP expression and microparticle release and extravasation, and whether it is an effective therapeutic target in metastatic prostate cancer is still unclear.

Materials and Methods:
BPH, LNCaP, DU145, PC3, PC3MLN4 cell lines were assayed for MT1-MMP expression and ECM degradative capability via western blot, and fluorescent gelatin degradation, respectively. The in vivo extravasation efficiency and microparticle release of BPH and PC3 MLN4 cells (benign and metastatic prostate cancer cells, respectively) was quantified after overexpression of fluorescently tagged MT1-MMP and injection into ex ovo chicken embryos.

Results:
BPH (benign prostate cell line) demonstrated higher level of MT1-MMP and gelatin degradation ability, but had low extravasation efficiency in vivo. In contrast, PC3MLN4 (metastatic prostate cancer) had higher extravasation rates, despite decreased MT1-MMP expression and gelatin degradation ability. Concurrently, BPH cells produce more microparticles during extravasation, compared to PC3 MLN4 cells, which is enhanced in both cell lines by forced expression of MT1-MMP.

Conclusion:
Low expression of MT1-MMP is optimal for metastasis of prostate cancer cell lines, as higher levels correlate with failed extravasation and increased microparticle release. This work highlights that modest expression of MT1-MMP better correlates with the metastatic potential of prostate cancer cells.
Poster #03
Poster Category: Basic Science
Bio-modulation of Primary Human Tenon’s capsule fibroblasts Using a Novel Application of Coated Magnesium
Xiangji Li, Hong Liu MSc1,Cindy ML Hutnik
Department of Ophthalmology, University of Western Ontario, Ivey Eye Institute, St. Joseph’s Hospital

Background:
Glaucoma is the second most common cause of blindness, and leading irreversible blindness. Recently, more and more glaucoma patients were treated by glaucoma drainage devices. But permanent and inert metals as foreign body induces inflammation stimulation under the tenon’s capsule, cause fibroblast proliferation and surgical failure. Magnesium alloys have attracted much attention as biodegradable implant materials due to its excellent biodegradable and biocompatibility. The purpose of this study was to evaluate the biocompatibility and antiproliferative potential of different coated magnesium alloys as a novel drainage device material in glaucoma surgery.

Materials and Methods:
The pure magnesium was cut into disks of 14.5 mm diameter and 1 mm thickness, coated with Hydroxyapatite, Dicalcium phosphate dihydrate and DCPD-Stearic acid, respectively. The primary HTCFs were seeded on DCPD, DCPD+SA, and HA disks in 24-well culture plates for Day 2 to Day 7. The glass was used as control. The MTT and LDH assay was used to determine cellular metabolic activity and cytotoxicity during the logarithmic phase of HTCFs, respectively. The BrdU assay was used to evaluate cell proliferation.

Results:
The trend of cellular metabolic activity of different coated magnesium alloys gradually decline during the logarithmic phase of HTCFs, and each type of coated magnesium alloy significant decrease metabolic activity of HTCFs to compare with control (p=0.00). The trend of cytotoxicity of different coated magnesium alloys slightly increase during the logarithmic phase of HTCFs, and the group of DCPD+SA is no significant different which compare with control (p=0.932).Significant inhibition of proliferation was observed for group of DCPD+SA(p=0.47).

Conclusions:
Cellular activity of HTCFs will be modulated by direct exposure to coated magnesium metal. The coating of DCPD+SA could significantly inhibit fibroblasts proliferation and its cytotoxic profile was the same as glass.
Poster #04

Poster Category: Basic Science

The Systemic Effect and The Absorption Rate of Aerosolized Intra-peritoneal Heparin With or Without Hyaluronic Acid in the Prevention of Postoperative Abdominal Adhesion.

Ahmed Almamar MD, MSc, FRCSC; Christopher M. Schlachta BSc, MDCM, FRCSC, FACS; Nawar Alkhamesi MD, PhD, FRCS (Gen. Surg.), FRCS, FRCSEd, FRCSC, FACS, FASCRS

Department of Surgery, Schulich School of Medicine and Dentistry, Western University and Canadian Surgical Technologies & Advanced Robotics (CSTAR)

Introduction:
Adhesions are a known cause of morbidity following abdominal surgery. Multiple approaches have been evaluated to prevent or minimize the occurrence of adhesions. Aerosolized heparin and hyaluronic acid is an effective method to prevent postoperative adhesions whether they were used independently or in synergism. However, concern rose regarding the systematic absorption and hemorrhagic effect of heparin given intra-peritoneally. The purpose of this study was to evaluate the systemic effect and the absorption rate of heparin with or without hyaluronic acid in the prevention of postoperative abdominal adhesion.

Material and Methods:
A cross-sectional study comparing thirty rats (n=30) divided into 3 groups, each consisting of 10 rats. First group (n=10) received aerosolized intra-peritoneal heparin (IPH). Second group (n=10) received intra-peritoneal heparin with hyaluronic acid (IPHHA). Intravenous heparin (IVH) was given to the third group (n=10). Serum heparin levels were measured and compared between the groups over 120 minutes period.

Results:
None of the rats had intra-operative bleeding. The level of serum heparin was significantly lower in the IPHHA group compared to IPH and the IVH at all points of measurements (30, 60, 90 and 120 min)(p<0.0001). The serum level of heparin of all groups peaked at 90 minutes. Area-under-the-curve (AUC) 0-120 was significantly lower in the IPHHA group as compared to both IPH and IVH (p<0.0001).

Conclusion:
The aerosolized intra-peritoneal administration of heparin or heparin with hyaluronic acid resulted in minimal systematic absorption rendering it safe for the use as method to prevent intra-peritoneal adhesions. Human studies are planned next.
Poster #05

Poster Category: Basic Science

Novel models of rare cause human nephrolithiasis in Drosophila melanogaster
Aymon N Ali, Thamara K Dayarathna, Ranjit S Padda, Hon S Leong, Hassan Razvi
Division of Urology

Background:
Nephrolithiasis involves the aggregation of stone-forming salts consequent to solute supersaturation in urine. The lack of practical pre-clinical models for this complex multifactorial disorder has hindered understanding of nephrolithiasis on the molecular level and thus the development of novel anti-lithogenic compounds. Here, Drosophila melanogaster (DM), an emerging translational model for calcium oxalate nephrolithiasis was investigated as a novel disease model and drug discovery platform for uric acid and cystine nephrolithiasis.

Materials and methods:
Knockdown fly lines targeting SLC7A9/SLC3A1 homologues and genes encoding for Urate oxidase were generated utilizing the GAL4/UAS system and fed stone forming diets (high protein or yeast rich medium). Flies were dissected at 7-14 days and fly Malpighian tubules were subjected to confocal microscopy along with SEM/EDX against wild-type controls. A fecal birefringence assay was employed to screen potential drug candidate efficacy from a drug library of 360 candidate small molecules.

Results:
Confocal microscopy revealed brilliant birefringence in the Malpighian tubules and fecal matter of both Uricase and SLC7A9/SLC3A1 homologue knockdown fly lines indicating the presence of calculi. No birefringence was visualized in wild-type control flies. Gene knockdown efficiency of target genes was confirmed by qRT-PCR. SEM/EDX studies of isolated calculi were of mixed composition, indicating possible sample contamination.

Conclusions:
Diffuse brilliant birefringence in the Malpighian tubules and fecal matter of each fly line confirmed the presence of calculi. Although further characterization of calculus composition by SEM/EDX is warranted, these models hold great potential as novel platforms for high throughput screening of candidate compounds.
Poster #06

Poster Category: Basic Science

Metastatic Efficiency is Dependent on Cell Volume Loss from Microparticle Release During Cancer Cell Extravasation

Kim Y\textsuperscript{1}, Poon A\textsuperscript{1}, Lucien F\textsuperscript{2}, Gomes J\textsuperscript{1}, Padda R\textsuperscript{1}, Deng F\textsuperscript{2}, Arora M\textsuperscript{2}, Le C\textsuperscript{2}, Leong H\textsuperscript{1,2}

\textsuperscript{1} Department of Pathology and Laboratory Medicine, Western University
\textsuperscript{2} Department of Surgery, Western University

Background:
Metastasis is the main cause of mortality and morbidity in cancer patients. Tumor cells from primary tumor enter the bloodstream (intravasation) and cross the vessel wall (extravasation) to form secondary colonies. Thus, targeting extravasation is a good candidate for halting cancer metastasis. Surprisingly, cancer cell microparticle release during extravasation caused significant cell volume loss affecting metastatic colony formation rates. Since induction of necroptosis resulted in a significant increase in microparticle release, we hypothesize that inducing cancer cell necroptosis leads to cell volume reduction and inhibition of cell extravasation and metastasis.

Materials and Methods:
Invasive human breast/prostate cancer cell lines were cultured and injected into the chorioallantoic membrane of chicken embryos. We performed intravital imaging of cancer cell microparticle release and extravasation and used a nanoscale flow cytometer to quantitate microparticles released from cancer cells.

Results:
An increase in cancer cell microparticle release significantly reduces extravasation and metastatic colony formation rates of cancer cells. Although pro-apoptotic cancer cells released elevated amounts of microparticles that resulted in reduced extravasation rates, extravasating cancer cells showed the absence of caspase-3 activity on microparticle release. Pro-necroptotic cancer cells showed an increase in cancer cell microparticle release, reducing cell volume and decreasing cancer cell extravasation rates.

Conclusions:
A reduction in cell volume by microparticle release facilitates extravasation, at the cost of reduced efficiency in forming secondary colonies. Although the pro-apoptotic process of cancer cells can stimulate more microparticle release, results from the pro-necroptotic process implicates that necroptosis is a more important regulator of cancer metastasis.
Poster #07

Poster Category: Basic Science

Surface-modification of urinary device material to prevent uropathogen adherence
MacDonald K, Cillero A, Denstedt J, Razvi H, Burton J.
Division of Urology, Department of Surgery, Western University.

Background:
Bacterial infection of stents and catheters remains a major concern in clinical urology. These surfaces are ideal environments for irreversible bacterial attachment and biofilm formation. Many techniques have been studied for their ability to decrease bacterial adhesion to these devices, however clinical success remains limited. The purpose of this project was to study the efficacy of urinary device material modified with surface modifying molecules (SMMs) in preventing uropathogen adherence. These SMMs passively and permanently modify the surface of a manufactured device, creating beneficial functional characteristics, without relying on direct killing of the uropathogens.

Materials and Methods:
Polyurethane rods were modified with a variety of SMMs, or left unmodified as control surfaces. Control and SMM-modified rods were incubated with different uropathogen species (Escherichia coli, Proteus mirabilis, Staphylococcus epidermidis) in different media (PBS, artificial urine, or human pooled urine [HPU]) for a variety of time periods. After incubation, rods were washed and sonicated to release attached bacteria, then enumerated by culture plating. Surface Electron Microscopy (SEM) was also conducted on several samples to observe adhered bacteria and biofilm formation.

Results:
From a panel of seven SMMs, one formulation was selected based on its ability to significantly decrease the attachment of all uropathogens studied. Rods modified with this SMM had a significant reduction (> 1.5 log) in E. coli adhesion in HPU up to 3 days (p < .01) compared to controls, which was verified by SEM.

Conclusions:
We have identified a SMM formulation capable of significantly reducing uropathogen adhesion in vitro, with potential applications for preventing bacterial infection of urinary devices in humans.
AP39 mitigates the effects of normothermic organ preservation and ex vivo renal transplantation following donation after cardiac death

Departments of Surgery, Microbiology and Immunology and Pathology, Western University.

Background:
Ischemia-reperfusion injury (IRI) can cause delayed graft function and early graft loss following transplantation. Optimal hypothermic (4°C) organ preservation with University of Wisconsin (UW) solution can mitigate the effects of IRI, however, normothermic preservation alternatives are being investigated in hopes of improving graft viability. Hydrogen sulfide (H$_2$S) has been shown to ameliorate tissue injury. In this study we investigate the effects of a novel, mitochondria-targeted H$_2$S donor molecule (AP39) in an ex vivo normothermic renal IRI model.

Materials and Methods:
Using a clinically relevant porcine DCD model, pig kidneys underwent renal pedicle clamping for 60 min. The left kidney (control) was flushed with and stored in hypothermic UW solution for 4 h (current standard of care). The right kidney was flushed with UW+200nM AP39 and then perfused at 21°C with non-stressed blood+200nM AP39 for 4 h. Both kidneys were then perfused ex-vivo with stressed blood at 37°C for 4 h to simulate renal transplantation. Urine output, blood flow, blood pressure and total urine protein were analyzed. Apoptosis and acute tubular necrosis (ATN) were subsequently evaluated using histopathology.

Results:
Kidneys treated with UW+AP39 had a greater mean total urine output of (104.3 mL) compared to UW preserved kidneys (388 mL). In addition, UW+AP39 kidneys showed less mean urine protein excretion (0.99 g/L) compared to the UW only kidneys (2.63 g/L), suggestive of diminished glomerular injury. Histopathological data supported these findings with decreased apoptosis and ATN in the UW+AP39 group.

Conclusions:
We demonstrate, for the first time, that normothermic preservation with AP39 leads to superior graft function and reduced tissue injury compared to hypothermic organ preservation in UW solution, and therefore suggest an alternative to the current standard of clinical care.
Poster #09
Poster Category: Basic Science

Daily supplementation with hydrogen sulfide during urinary obstruction enables renal recovery following decompression
Division of Urology

Background:
Ureteral obstruction (UO) can lead to renal injury and renal dysfunction. Hydrogen sulfide (H2S) has been shown to ameliorate tissue injury. We have previously demonstrated that daily H2S treatment can reduce renal injury in unilateral ureteral obstruction (UUO). The current study employs UUO followed by reimplantation to investigate the effects of H2S on renal function following decompression.

Materials and Methods:
The left ureter of Lewis rats was ligated. From post-operative day (POD) 1 to 13, rats received either daily intraperitoneal injection of phosphate buffered saline (PBS) or 200μmol/kg of GYY4137 (H2S donor) in PBS. On POD14, the ligature was removed and the left ureter was reimplanted into the bladder. A right nephrectomy performed on all animals. Urine and serum were collected. On POD30, the left kidney was removed and tissue sections were stained with hematoxylin and eosin.

Results:
67% of control rats, compared to 100% of H2S-treated rats, lived until POD30. Cortical thickness of control rats was significantly decreased (P<0.0001) when compared to Sham rats, which was significantly rescued upon H2S treatment (P<0.0001). Control rats had significantly higher SCr when compared to Sham (P<0.05); H2S treatment drastically decreased SCr when compared to control post-reimplantation. Proteinuria is higher in both control and treatment groups post-reimplantation when compared to Sham (P<0.05), however, H2S treatment markedly decreased proteinuria.

Conclusion:
We demonstrated that daily H2S therapy rescues renal function and architecture following UO. H2S may become a clinically viable pre-emptive therapy against renal injury and help improve renal function in patients with UO.
Poster #10

Poster Category: Basic Science

Triple positive microparticles as a “liquid biopsy” for risk stratification of prostate cancer.

Brar H, Pautler S, Power N, Leong H
Department of Surgery, Urology

Background:
PSA alone cannot risk stratify prostate cancer. Tissue biopsy is the only method of risk stratification. However, 4% of males undergoing biopsy may require hospitalization for serious life-threatening urosepsis amongst other side effects.

Prostate cancer releases fragments known as prostate cancer microparticles (PCMPs). Using nanoscale flow cytometry, we can enumerate specific tumor markers on the surface of these microparticles in plasma. Previous studies in Dr. Leong’s lab have shown results that accurately detect patients with Gleason Score (GS) of 8 or greater prostate cancer from controls.

Material and methods:
We have obtained plasma samples of various GS’s post-radical prostatectomy from the GU Biobank at Princess Margaret Hospital in Toronto and the Ontario Tumor Bank (OICR). We will use the Apogee Nanoscale flow cytometer to detect triple positive microparticles within patient plasma. We intend on looking at 3 different combinations of surface markers that are known to be found on PCMPs (PSMA, STEAP1, GHSR1a, GRPR, and CD151).

Results:
Previous experiments have shown that prostate specific membrane antigen (PSMA) can accurately identify patients with GS 8 or higher from patients of lower risk disease and BPH. We expect by analyzing two more surface markers along with PSMA, we can differentiate patients who have GS 3+3, GS 3+4 and GS 4+3 prostate cancer.

Conclusion:
A liquid biopsy that can enumerate triple positive microparticles from prostate cancer patient plasma will allow us to risk stratify prostate cancer. This will ultimately limit the the need of repeat tissue biopsies and the risks associated with it.
Aberrant Polysialylation of Proteins Potentially leads to Prostate Cancer Metastasis

Padda RS\textsuperscript{1,2}, Williams K\textsuperscript{1}, Kim Y\textsuperscript{1,2} and Leong H\textsuperscript{1,2}

\textsuperscript{1}Lawson Health Research Institute, London Ontario (Canada)
\textsuperscript{2}Department of Pathology and Laboratory Medicine, University of Western Ontario, London Ontario (Canada)

Introduction:
Glycosylation is post-transcriptional modification, the process which links glycans to terminal ends of proteins mainly through N-linkage and O-linkage. It provides functional diversity to the proteins for variety of biological functions. However, glycosylation pattern undergoes dramatic alterations in tumor microenvironment allowing neoplastic cells to invade and spread to distant sites in the body. Polysialylation is a specific type of glycosylation in which sialic acid chains are enzymatically introduced onto the cell molecules with help of polysialyltransferases (PTs). We hypothesize that aberrant polysialylation of proteins gives metastatic potential to primary tumor cells.

Methods:
PTs levels were determined in classical prostate cancer cell lines (PC3, LNCap, DU145) and compared with benign prostate cells (BPH) as control. The levels of genes encoding PTs in different cell lines was evaluated by RT-qPCR. The PTs protein expression was determined by immunofluorescence and western blotting.

Results:
PTs genes levels in different prostate cancer cell lines were 5 to 25-fold higher compared to benign prostate cells. Likewise, there was upregulation in PTs protein expression in different prostate cancer cell lines compared to the control.

Discussion:
Abnormal polysialylation of cancerous cell molecules occur in prostate cancer, shown with upregulation of PTs at both genes and proteins level. It would be interesting to perform cell extravasation assay with cancer cells having intact and knocked down expression of genes encoding for PTs. It will show that polysialylation gives metastatic potential to the primary tumor cells by supporting cancer cell survival and migration.
Poster #12  

Category: Basic Science  

Cancer progression mechanisms via extracellular vesicles: EV fractions and cellular uptake, or both?  

Andrew C. Poon$^{1,2}$, Thamara K. Dayarathna$^{3}$, Hon S. Leong$^{1,2,3}$  

$^1$Department of Pathology and Laboratory Medicine, Western University, London, ON  

$^2$Department of Microbiology and Immunology, Western University, London, ON  

$^3$Department of Surgery, Division of Urology, St. Joseph’s Hospital, London, ON  

§ Authors contributed equally to this work.

Background:  
Extracellular vesicles (EVs) are submicron cargos released by cells that participate in intercellular cross-talk by transporting cell mediators like DNA/microRNA fragments and other metabolites. Their enumeration through ‘fluid biopsies’ holds promise in cancer detection; however, the selection mechanisms of EVs by receiving bodies remain poorly understood. Our study examines EV-mediated cancer progression mechanisms in recipient cells.

Methods:  
We modeled the selective interactions of EVs in non-cancerous cell fractions using EVs released by fluorescent tagged metastatic prostate (PC3-LM-N4-GFP) and murine melanoma (B16-F10-mEmerald) cells under different conditions. We stratified size-specific EV fractions by nanoscale flow cytometry (A20) and their acceptance by healthy cells with confocal microscopy. To elucidate EV specificity, we looked for cancer-elevated membrane protein interactions within androgen-sensitive prostate cells by mass spectrometry.

Results:  
We found that <1% of non-cancerous cell populations accept cancerous EVs in a time-dependent and compartment-specific manner, targeting the membrane, cytosol, and nuclei of receiving cells. Confocal images show that these EVs deliver microRNA, histones and DNA fragments to these cells, and we observed multiple size subpopulations by A20. We also found, through mass spectrometry on in vitro cultures, membrane, matrix proteins and histones in EV-mediated intercellular communication.

Conclusions:  
The heterogeneity of EVs and their contents: lipids, proteins, RNA, DNA and histones, could be a principal targeting factor in subcellular compartmentalization. Their acceptance by few cells may indicate a cellular/organ specificity in metastatic cancer. Future studies are directed towards investigating EV metabolite composition and their interactions with selected receiving cells for potential therapeutic targets.
CLINICAL SCIENCE
POSTER
ABSTRACTS
Poster #13

Poster Category: Clinical Science

Development of a microparticle-based tool as an indicator of the effectiveness of dialysis treatment

Gomes J¹, Lucien F², Leong H¹,², and McIntyre C³

¹Department of Pathology and Laboratory Medicine, University of Western Ontario
²Department of Surgery, University of Western Ontario
³Department of Medical Biophysics, University of Western Ontario

Introduction:
Chronic Kidney Disease (CKD) is a debilitating disease that affects ~2.6 million Canadians. CKD can progress to End Stage Renal Disease (ESRD), which requires dialysis. Dialysis is unfortunately accompanied by various cardiovascular complications, and results in endothelial dysfunction, leading to microparticle release. These extracellular vesicles contain antigen markers of their donor cell and can be detected within patient plasma. They represent a novel approach to creating a non-invasive diagnostic tool. We hypothesize that a microparticle based assay has the potential to indicate the severity of disease and overall impact of dialysis treatment on patient health.

Methods:
Microparticles were assessed and enumerated by Nanoscale Flow Cytometry by staining with endothelial (CD31, CD62e, CD62p), leukocyte (CD62l, CD45), platelet (CD41a) and erythrocyte (CD235a) fluorophore-conjugated antibodies. By creating a standard operating procedure for microparticle analysis, we will ensure consistent validation and quality of data generated. We will use cultured cell lines and conditioned media as positive controls for specificity of antibodies. Additionally, we will use patient plasma that was serially collected (prior, during, and post) from dialysis patients (n=15) to assess microparticles.

Results:
We expect differences in microparticle levels between the patient samples collected prior, during, and post dialysis treatment. Due to endothelial dysfunction, we expect an increase in microparticles in post-dialysis plasma.

Conclusion:
Blood-borne microparticles have the potential to act as a tool to monitor the endothelial dysfunction within dialysis patients. This assay could be further used to assess the effectiveness of clinical trials that are being done to improve dialysis treatment.
Poster #14

Poster Category: Clinical Science
Poster withdrawn

Poster #15

Poster Category: Clinical Science

Significance of atypical cytology in the evaluation of patients with ESRD for transplantation
Department of Urology

Introduction and Objectives:
Our goal was to determine the incidence of urothelial carcinoma and the significance of urinary atypia in ESRD patients being investigated for transplantation and to establish if it was necessary to perform cystoscopy on all ESRD patients with atypical cytology.

Methods:
We reviewed all patients with ESRD for renal transplantation at our institution from January 2000 to December 2015. A total of 1289 patient charts were retrospectively reviewed.

Results:
8 patients of 1289 (0.62%) patients were found to have urothelial carcinoma (6 males: 2 females), 6 of which were found on pre-transplant surveillance and 2 of which developed subsequent urothelial carcinoma several years after transplant. Mean age of patients who had urothelial carcinoma (65.6±10.1 years) was significantly greater than those who did not (50±14.2 years; p=0.0018). Of these patients, 67% had a history of smoking but all had microscopic hematuria at presentation. Of the 1289 patients, 494 ESRD patients had available screening urinary cytology, 180 (36%) had urinary atypia; subsequent cystoscopy revealed cancer in 6 patients (3%). All tumors were treated with TURBT/ fulguration ± mitomycin instillation. Pathology showed papillary non-invasive urothelial carcinoma. No patient required subsequent cystectomy or radiation therapy. All patients who had urothelial carcinoma discovered pre-operatively eventually underwent renal transplant and only one of these patients has had recurrent disease requiring further treatment.

Conclusion:
The urinary atypia rate is higher in ESRD patients but the incidence of urothelial carcinoma is lower compared to the general population.
Poster #16

Poster Category: Clinical Science

Neuromuscular stimulation leads to improved lower limb edema and blood flow compared to standard TED stockings and compression devices following kidney and pancreatic transplantation

Bijad AlHarbi1,3, Shahid Aquil1,3, Omar Ali1,3, Manujendra Saha1,3, Mounirah May1, Patrick Luke1,3, Alp Sener1,3

Departments of Surgery1 and Microbiology and Immunology2; Matthew Mailing Center for Translational Transplant Studies3. Western University, London, Ontario, Canada.

Introduction:
Kidney and pancreas transplant recipients undergo significant fluid shifts in the post-operative period leading to significant lower limb edema, weight gain and are at high risk for thromboembolism due to immobility. Many institutions utilize TED stockings and intermittent pneumatic compression (IPC) devices to mitigate these risks, however improper fitting, inappropriate use of device, peroneal nerve injury, discomfort, excessive heat and sweating under the inflatable cuffs limit the use of TED+IPC units. The Geko Plus device, is a novel, internally powered calf neuromuscular stimulator, which has previously been shown to have beneficial effects in improving blood flow and skin capillary perfusion. Its role in transplantation has not previously been assessed.

Methods:
We performed a prospective, randomized, controlled, single-centre, study where 101 patients were randomly assigned to wear TED+IPC (Group 1, n=55) or the Geko Plus device (Group 2, n=46) post-operatively until day 6 after surgery. We measured patient weight and lower leg and thigh circumferences daily. Ultrasound Doppler of the allograft and of the lower limbs was carried out on post-operative days 1 and 5 to assess venous flow and velocity in the femoral vein. Also, we monitored total urine output, serum creatinine levels. Patients fill bowel assessment and physical activity questionnaires. Also, satisfaction questionnaire filled day 3 and day 6 after surgery.

Results:
93 patients underwent kidney transplantation and 8 underwent kidney and pancreas transplantation. There were no differences in the BMI of the recipients in either group. Donor type were as follows: Group 1: 15 DCD, 26 NDD, 14 LD and Group 2: 14 DCD, 19 NDD, 13 LD. We observed a significant increase in calf circumference following transplantation in Group 1 by 7.9% (2.3 +/- 2cm) compared to Group 2 which showed no change from baseline (0.33%, 0.05 +/- 0.95 cm, p <0.0001). Thigh circumference also followed a similar trend with only Group 1 showing a significant increase (6%, 2.4 +/- 2cm) from baseline compared to Group 2 (p <0.001). Doppler US showed a remarkable increase in mean flow velocity in the Geko Plus patients of 21cm/s whereas the TED+IPC patients showed lower velocities 12cm/s (p <0.0005). Patients were more satisfied with the use of Geko plus device than TED+IPC. There was no significant difference between groups in serum creatinine, weight change, urine output, and resistive index of the allograft. Also, there was no difference in bowel function and physical activity between the two groups. There were no complications in either group.

Conclusion:
The use of the Geko Plus device in the immediate post-operative period leads to an improvement in lower limb edema and in venous flow, and better patient satisfaction in kidney and pancreas transplant recipients compared to standard TED+IPC.
Poster #17

Poster Category: Clinical Science

The impact of neuromuscular stimulation on incisional wound healing compared to standard TED stockings and compression devices in kidney and kidney-pancreatic transplant recipients.

Shahid Aquil\textsuperscript{1,2,3}, Bijad Alharbi\textsuperscript{1,2,3}, Hemant Sharma\textsuperscript{1,2,3}, Patrick P. Luke\textsuperscript{1,3,4}, Alp Sener\textsuperscript{1,3-6}

\textsuperscript{1}Department of Surgery, Division of Urology, \textsuperscript{2}Western University Schulich School of Medicine and Dentistry, \textsuperscript{3}Multi-Organ Transplant Program, London Health Sciences Center, \textsuperscript{4}Matthew Mailing Center for Translational Transplant Studies, London Health Sciences Center, \textsuperscript{5}Department of Microbiology and Immunology, \textsuperscript{6}Center for Human Immunology, Western University, London, Ontario, Canada

Introduction:
Kidney and pancreas transplant recipients undergoing wound infections are a major cause of postoperative morbidity. The Geko plus™ device increases venous, arterial and microcirculatory blood flow in the lower limbs, reduces edema and increases TCpO\textsubscript{2}, promoting conditions favorable to wounds healing from the inside. Its role in transplantation has not previously been assessed.

Methods:
We performed a prospective, randomized, controlled, single-centre, study where 40 patients were randomly assigned to wear TED+ IPC kidney and kidney-pancreatic transplant recipients (Group 1, n=22) and Geko Plus device (Group 2, n=18). Incisional wound healing images were taken by Modica at 3\textsuperscript{rd}, 5\textsuperscript{th} and 30\textsuperscript{th} day post-operative in kidney and kidney-pancreatic transplant patients. The wound healing was assessed by using Southampton scoring system.

Results:
32 patients underwent kidney transplantation and 08 underwent kidney and pancreas transplantation. There were no differences in the BMI of the recipients in either group. At the 3\textsuperscript{rd} day, TED S cohort had no significant wound score difference in comparison to Geko cohort. At the 5\textsuperscript{th} day, TED cohort had significant higher wound score (≥ 2 in comparison to Geko cohort (The Pearson chi-square 6.88, P = 0.0008)/ Standardized Residual +1.81 for TED group compared to Geko). At the 30\textsuperscript{th} day, Geko had significant lower wound score (complication 1 and sub category 0 in comparison to TED cohort (The Pearson chi-square 6.20, P = 0.01)/ Standardized Residual +1.84 for Geko compared to TED cohort). Patients were more satisfied with the use of Geko plus device than TED+IPC. There were no complications in either group.

Conclusion:
The use of the Geko Plus device in the immediate and late post-operative period leads to an improvement in wound healing at the 5\textsuperscript{th} and 30\textsuperscript{th} day post-operative and better patient satisfaction in kidney and pancreas transplant recipients compared to standard TED+IPC.
Poster #18

Poster Category: Clinical Science

Donor Warm Ischemic Time >80min is an Important Predictor of Kidney Graft Survival from Donors after Cardiac Death

Jingwen Chen¹, David M. Mikhail¹,², Hemant Sharma³, Ahmed Hijazi¹, Derek A. Nap¹, Larry Stitt⁴, Jeffrey Jevnikar⁵, Patrick P. Luke¹,², Alp Sener¹,²
1 Schulich School of Medicine and Dentistry, Western University, London, ON, Canada;
2 Urology, Western University, London, ON, Canada;
3 General Surgery, Western University, London, ON, Canada;
4 LW Stitt Statistical Services, London, ON, Canada;
5 Faculty of Engineering, Ryerson University, Toronto, ON, Canada

Introduction:
We analyzed UNOS data to determine how donor warm ischemic time (WIT), donor age, donor BMI, donor hypertension (dHTN), cold ischemic time (CIT), and use of vasopressin (ddAVP) in the peri-donation period influenced outcomes of kidney transplants from donors after cardiac death (DCD).

Methods:
We evaluated all DCD-kidney transplants performed in the United States from 1988-2013. We excluded transplants with no recorded WIT, or with incomplete values required to calculate KDRI (Kidney Donor Risk Index). This left a total of 11907 transplants. The effects of donor traits on graft and recipient survival were evaluated using Cox Regression and the Kaplan-Meier method. Logistic regression was used to evaluate effects on delayed graft function (DGF).

Results:
Donor WIT predicted graft survival (p<0.05). WIT<60 min and WIT 60-79min had similar rates of graft failure (HR 0.95, 95%CI 0.67-1.37), whereas kidneys with WIT ≥80min experienced 1.66 times more failure (HR 1.66, 95%CI 1.16-2.38). 1-year (90%±0.3%, 87%±2.7% vs. 82.1%±4.2%) and 5-year (69.4%±0.6%, 79%±4% vs. 62%±6.8%) survival were greater with WIT<60 and 60-79, compared to WIT≥80min, respectively.

Donor BMI (p<0.0001) and organ CIT (p<0.0001) correlated with increased odds of DGF, while ddAVP reduced DGF odds sizeably. Interestingly, dHTN increased recipient mortality (HR1.19, 95%CI 1.02- 1.38, p<0.05), but did not affect DGF or graft failure. Donor age was a significant predictor of all endpoints (p<0.0001).

Conclusion:
In conclusion, donor WIT and CIT are predictors of DCD-kidney graft survival, while CIT, donor BMI, and ddAVP are predictors of DGF post-transplant. DCD-kidneys with WIT <80min may be acceptable without compromising graft survival.
Poster #19

Poster Category: Clinical Science

The Impact of Patient, Disease, and Treatment Related Factors on Survival in Patients with Adrenocortical Carcinoma

Nahid Punjani\textsuperscript{1}, Roderick Clark\textsuperscript{1}, Jonathan Izawa\textsuperscript{1,2}, Joseph Chin\textsuperscript{1,2}, Stephen E. Pautler\textsuperscript{1,2}, Nicholas Power\textsuperscript{1,2}

\textsuperscript{1}Division of Urology, Department of Surgery, \textsuperscript{2}Division of Surgical Oncology, Department of Oncology, Western University, London, Ontario, Canada

Introduction: Adrenal cortical carcinoma (ACC) is a rare and aggressive endocrine tumor. Most present with advanced disease and have poor prognosis. Optimal treatment includes complete surgical resection. There is limited evidence for the efficacy of chemotherapy and radiation at different stages in this disease. There remain many inconsistencies with respect to diagnosis and work-up. There is a lack of uniform guideline recommendations and consensus data.

Methods: We performed a retrospective chart review of all patients at London Health Sciences Center between 1990 and 2015 using ICD coding. All paper and electronic charts were reviewed and data was collected. Statistical analysis and survival curves were performed.

Results: A total of 29 patients were included in our study. Median age was 55 (IQR 45-63), 14 (48\%) were male and 15 (52\%) were female. Approximately half (14 or 48\%) of our patients presented symptomatically. Almost half (41\%) of tumors were metabolically active producing hormones. Most (88\%) underwent surgical intervention. Surgical margin status was available in about half of patients, and lymphadenectomy was performed in a third (n=8) of open adrenalectomy patients. A third received mitotane treatment (8(73\%) adjuvant and 3(27\%) palliative) and a third of patients received radiation. Two and five-year median overall survival was 53\% and 27\%, respectively.

Conclusion: ACC is a rare and aggressive tumor. This is the largest Canadian series reported to the best of our knowledge. Limited data for guidelines exists and treatment and work-up patterns are inconsistent. Collaborative randomized and prospective studies on a global basis are needed.
Poster #20

Poster Category: Clinical Science

Longer Functional Warm Ischemic Times Do Not Impact Donation After Cardiac Death Renal Allograft Outcomes

Heena H.K. Singh, Melissa J. Huynh, Corinne Weernick, Alp Sener, Patrick P. Luke*

*Division of Urology, Department of Surgery, Western University and Multi-Organ Transplant Program, London Health Sciences Centre, London, Ontario, Canada

Introduction & Objectives:
Donation after circulatory death (DCD) renal transplants are associated with long-term outcomes comparable to that of donation after neurological donor death (NDD) transplants, but the effect of longer functional warm ischemia time during withdrawal is unknown. Nevertheless, a hard cutoff of 2 hours warm ischemic time has been used to exclude the use of DCD donors.

Methods:
We retrospectively analyzed the impact of mean arterial pressure (mAp) <55 during donation for different time points (30, 45, 60, and 90mins) on delayed graft function time (DGF), creatinine clearance (CrCl) at 1 year and overall graft survival. A total of 190 single donations after DCD renal transplants were performed at our institution between July 2006 and June 2016. Outcome variables such as CrCl, hospital stay, readmission rate, DGF and overall graft loss and rejection were compared between groups using the Student t-test and the Pearson chi-square test. A linear regression model was also used.

Results:
Mean age of recipients and donors were 54.7 and 44 years old respectively and 13% of the population were expanded criteria donors. Patients were followed for a median of 39 months (range 1 - 122 months). The mAp<55 was not associated with DGF ($X^2=0.06$, $p=0.81$), patient death ($X^2=0.81$, $p=0.34$), graft failure ($X^2=0.40$, $p=0.53$), cell mediated ($X^2=0.84$, $p=0.36$) or antibody-mediated rejection ($X^2=1.25$, $p=0.26$) of the graft. Independent multivariate regression model looking at mAp<55 as an independent predictor of Cr Cl at 7 days ($p=0.10$), 1 month ($p=0.20$), 3 month ($p=0.09$) or 1 year ($p=0.63$) and patient survival ($p=0.82$), graft survival ($p=0.17$), length of stay ($p=0.35$), length of readmission ($p=0.24$) did not show any significance. However higher total warm ischemia time ($R^2=0.16$, $F(3, 105)=6.99$, $p <0.05$) was an independent predictor of CrCl at 7 days.

Conclusions:
The duration of actual and functional warm ischemic time was not associated with DGF, patient death, graft failure or rejection nor for patient or graft survival. The CrCl at 1 week was an independent prognosticator of actual warm ischemic time but not for functional warm ischemic time. Utilization of selected DCD donors with warm ischemic times > 2 hr should be considered.
Poster #21

Poster Category: Clinical Science
Clinical correlation of patient-derived xenograft model using the ex-ovo avian embryo to predict targeted therapy tumor resistance in renal cell carcinoma.
Melissa Huynh, Matthew Lowerison, Victor McPherson, Hon Leong, Nicholas Power
Urology

Background:
Tyrosine kinase inhibitors (TKIs) are the mainstay of treatment for metastatic renal cell carcinoma (mRCC), with up to 20% exhibiting de novo resistance to TKIs. Currently, there is no method of predicting response to systemic targeted agents. We present a descriptive study of a prospective cohort of mRCC patients & the correlation of clinical outcomes to responses predicted by patient-derived xenograft (PDX) models in the ex-ovo avian embryo.

Methods:
We collected demographic, pathologic, & clinical data on 26 mRCC patients undergoing cytoreductive nephrectomy. PDX models were tested in 5 patients. Six biopsies were taken from each primary tumor. Cores were sectioned & engrafted onto embryonic day 9 chorioallantoic membranes of avian embryos & treated with topical sunitinib or DMSO control. On day 6 post-engraftment, Doppler & contrast-enhanced ultrasound assessed the vascularity & perfusion of the tumours. A composite score was obtained to determine the presence or absence of response to TKIs compared to control. Tumours showing a response in ≥4 cores were considered TKI-sensitive. Those with responses in ≤3 cores were considered TKI-resistant. Clinical progression on CT scan was based on RECIST criteria.

Results:
All tumours showed heterogeneous responses to TKIs in the PDX model. Using the criteria for TKI-resistance (≤3 cores), patients 1 & 2 continued to progress despite switching to alternative agents. A good response was expected in patient 3 (response in ≥4 cores), who does not have evidence of clinical progression after 5 months on sunitinib. Patient 3 also had 3 cores engrafted from a metastatic deposit, which all responded to sunitinib in the PDX model. Patients 4 & 5 have not started systemic therapy.

Conclusion:
Larger studies are warranted to explore the potential of the PDX model to serve as a novel phenotypic biomarker in predicting targeted therapy tumor resistance in mRCC.
Poster #22

Poster Category: Clinical Science

Incidence and management of vascular trauma: a Canadian experience
Smith S, McAlister V, Parry N, Power A, Vogt K
Division of General Surgery

Background:
The Prospective Observational Vascular Injury Treatment (PROOVIT) registry captures vascular trauma injuries and outcomes. The applicability of these findings to Canada is unclear given the differences in trauma populations.

Methods:
The medical records of London Health Sciences Centre were searched for patients with traumatic vascular injuries. Adult trauma patients with injuries to named arteries or veins from 1 January 2011-31 December 2015 were included. A total of 127 patients with 147 vascular injuries were captured.

Results:
70.1% of patients were male with an average Injury Severity Score of 21.8. 61.4% were blunt injuries. Vascular injuries to the neck (20.4%), thorax (20.4%), abdomen/pelvis (19.7%), upper extremity (24.5%), and lower extremity (15.0%) were identified. Hypotension (SBP < 90 mmHg) was present in 11.3%. Prehospital tourniquets were used in 12.2% of extremity arterial injuries. Diagnostic modalities included CT angiography (58.3%), operative exploration (35.4%), traditional angiography (3.9%), MR angiography (1.6%), and transesophageal echo (0.8%). Non-operative intervention was undertaken in 39 patients (28.3%). Damage control techniques were used in one patient and no intravascular shunts were used. There were 12 deaths (9.4%), and 3 amputations (2.4%). Physicians of 13 disciplines managed vascular injuries including: vascular surgery (77 patients), plastic surgery (11 patients), interventional radiology (11 patients), and general surgery (9 patients).

Conclusion:
Patients at this centre had similar demographics and injury severity to the PROOVIT patients; however, blunt mechanism was more common. Tourniquets and damage control techniques were seldom used. Thirteen different disciplines treated vascular trauma patients, which should be considered in dissemination of future findings and trauma systems design.
Poster #23

Poster Category: Clinical Science

Risk factors for progression of conservatively treated Degenerative Lumbar Spondylolisthesis

Cushnie D, Urquhart J, Gurr K, Bailey C
Orthopaedic Surgery

Background:
Degenerative lumbar spondylolisthesis (DS) is a common radiographic finding that may lead to spinal stenosis and is associated with chronic pain. However, evidence is lacking to guide clinical decision making as to which slipped vertebrae will progress without operative stabilization. This study examines which commonly available radiological and clinical metrics predict slip progression in patients with non-operatively treated DS.

Methods:
Patients presenting with DS with spinal stenosis and neurological symptoms were recruited into a progressively followed cohort. Radiographic metrics of sagittal balance, pelvic obliquity, facet joint morphology, and biometric demographics were analyzed using univariate and logistic regression to identify predictors of spondylolisthesis progression identified on radiographs obtained at least 5 years later.

Results:
Sixty-six patients completed a minimum of 5-years follow-up and provided the required imaging and questionnaire assessments. Those who progressed were younger, with significantly more progressing participants <65 years old (64.4% vs 28.6%; p<0.01), more frequently obese (61.9% vs 26.8%; p=0.012), with greater mean disc height (9.72mm [95%CI 8.35-11.09 mm] vs 7.61 mm [95%CI 6.55-8.66 mm]; p=0.015), and segmental angles (20.6° [95%CI 17.6-23.6°] vs [95%CI 13.6-18.2°]; p<0.014). Stepwise logistic regression confirmed younger age, obesity, male gender, smaller initial slip, and greater segmental angle as significant risk factors (p<0.05).

Conclusions:
Obesity, younger age, male gender, greater segmental angle, and smaller initial slip predicted slip progression in DS. Initial mean disc height was higher in progressing cases, likely through its correlation with male gender and age, but was not independently predictive of progression in multivariate regression analysis.
Poster #24

Poster Category: Clinical Science

Is Patient Satisfaction Improved by Showing Patients Their CT and Angiographic Images Prior to Undergoing Vascular Surgery?
LeBlanc D¹, Power A¹, DeRose G¹, Duncan A¹, Dubois L¹,².
¹.Division of Vascular Surgery, Western University, London, Ontario, Canada
². Department of Epidemiology and Biostatistics, Western University, London, Ontario, Canada.

Objectives:
Patient-based decision aids and other multimedia tools have been developed to help enrich the preoperative discussion between surgeon and patient. Use of these tools, however, can be time consuming and logistically challenging. We investigated whether simply showing patients their images from preoperative CTs or angiograms would improve patient satisfaction with the preoperative discussion.

Methods:
Consecutive patients undergoing either elective AAA repair or lower limb revascularization were randomly assigned to either standard perioperative discussion or perioperative discussion and review of images (CT or Angiogram). Primary outcome was patient satisfaction with the preoperative discussion as measure by a validated 7-item scale (score 0-28), with higher scores indicating improved satisfaction. Secondary outcomes included: patient understanding, anxiety, trust, and length of preoperative discussion. Scores were compared using t-test.

Results:
Overall 51 patients were randomized, 25 to the intervention arm (discussion + imaging) and 26 to the control arm. Most patients were male (69%) and average age was 70 years. Patient satisfaction with the discussion was generally high with no added improvement when preoperative images were reviewed (mean score 24.9 ±3.02 vs 24.8±2.93, P=.88). Similarly, there was no difference in patient anxiety, level of trust, or knowledge when the imaging review was compared to standard discussion. There was a trend towards longer preoperative discussions in the group that underwent imaging review (8.18 vs 6.35 mins, P=.07).

Conclusions:
Showing patients their CT or angiographic images during the preoperative discussion does not improve patient satisfaction. Similarly, there was no effect on patient trust, knowledge, or anxiety level. Unless patients specifically request imaging review, we would suggest against doing this routinely as it may lengthen the preoperative discussion unnecessarily.
Poster #25

Poster Category: Clinical Science

Effect of mesh type and fixation method on early pain and surgical outcomes post laparoscopic ventral and incisional hernia repair.

Ahmed MA¹, Tawfic QA², Bierer J¹, Schlachta CM¹, Alkhamesi NA¹
¹Canadian Surgical Technologies & Advanced Robotics (CSTAR), London Health Sciences Centre and Department of Surgery, ²Department of Anesthesia and Perioperative Medicine, Schulich School of Medicine and Dentistry, Western University, London, ON, Canada.

Background:
Post Laparoscopic ventral and Incisional Hernia Repair (LVIHR) pain have been largely attributed to the method of mesh fixation. This study aims to compare post-operative pain and early surgical outcomes with absorbable tacks (AT) and non-absorbable tacks (NAT) mesh fixation techniques.

Materials and Methods:
This is a retrospective study of patients who underwent LVIHR between September 2011 and August 2016, at LHSC. Two types of tacks: Absorbable and non-absorbable, and two types of mesh were used. The groups were compared with respect to early postoperative pain using Visual Analogue Score (VAS), incidence of seroma/hematoma, and early recurrence rates.

Results:
Fifty-six patients with LVIHR were enrolled (41 in AT and 15 in NAT group), PhysioMesh™ was used in 12 and Proceed™ mesh in 46 patients. Mean VAS was significantly higher in the AT as compared to NAT group, 5.75 vs 4.4 at 6 hours; p= 0.02 and 5.4 vs 4.4 at 24 hours; p=0.04. Mean pain score was similar after 24 hours and at 4 weeks postoperatively. The fixation method had no effect on the incidence of seroma and hematoma, however, they were significantly higher with PhysioMesh; p=0.02. Operative time and hospital stay were similar in all groups. Recurrence rate was higher in PhysioMesh as compared to Proceed (p=0.01) independently from methods of mesh fixation.

Conclusions:
AT mesh fixation was associated with higher postoperative pain intensity during the first 24 hours independent of mesh type. However, It was similar at 4 weeks with AT and NAT groups. PhysioMesh was associated with higher recurrence rate.
Poster #26

Poster Category: Clinical Science

Does recession of the posterior cruciate ligament influence outcome in total knee arthroplasty?
Dion C, Howard JL, McAuley JP
Orthopaedic Surgery

Introduction:
For a PCL-retaining TKA to function suitably, proper soft tissue balancing, including the PCL, is required. Yet, when a recession of the PCL is needed, there is still a debate as to whether a CR TKA should be converted to a PS TKA due to the concern of instability and poorer clinical outcomes. The objective of this study was to determine whether recession or release of the PCL adversely affects clinical outcomes in patients who undergo PCL-retaining total knee replacement.

Methods:
Six hundred and seventy-seven PCL-retaining total knee arthroplasties of the same design performed by the senior author (JPM) were reviewed to identify whether the PCL was retained, partially recessed or completely excised during the TKA. Clinical outcome measurements were collected and included the WOMAC score, the Knee Society Clinical Rating System, SF12 PCS/MCS and revision rates.

Results:
Of the 677 CR total knee replacements, the PCL was retained in 540 cases, partially recessed in 24 cases and completely released in 113 cases. There were no significant differences in clinical outcome when the PCL was retained, partially recessed or completely released during PCL-retaining total knee arthroplasty (WOMAC: p=0.54, KSCRS: p=0.42, SF12-MCS: p=0.89, SF12-PCS: p=0.527).

Discussion/Conclusions:
This study presents evidence of similar clinical outcomes when the PCL is retained or released during PCL-retaining total knee arthroplasty, providing attention is paid to appropriate soft tissue balancing. This suggests that PCL-retaining TKAs undergoing partial or complete release of the posterior cruciate ligament should not routinely be converted to a PCL-substituting knee design.
ABSTRACTS FOR AWARD WINNING RESIDENT/FELLOW RESEARCH PAPERS
Presentation #01  
Presenter: Dr. Sajjid Hossain  
Division: Vascular Surgery

Point of Care Ultrasound (POCUS) use as adjunct to physical exam and its impact on arteriovenous fistula maturation

Sajjid Hossain MD, Amit Sharma, Luc Dubois MD, Audra Duncan MD, Guy DeRose MD, Adam Power MD  
Vascular Surgery

Background:  
Point of Care Ultrasound as a preoperative assessment tool may help identify anatomical factors predictive of fistula maturation, decrease costs to the health care system and decrease time to access creation as compared to formal vein mapping. We sought to determine the impact of POCUS as an adjunct to physical exam on arteriovenous fistula maturation.

Methods:  
All consecutive patients undergoing dialysis access creation over a 7-year period were retrospectively reviewed. Surgeons that routinely use POCUS to assess preoperative maximal vein diameter and quality were compared to surgeons that only relied on physical exam. All access and patency definitions were in accordance with the Society for Vascular Surgery reporting standards. The effect of POCUS on fistula maturation rate and fistula abandonment was analyzed using multivariate logistic regression.

Results:  
A total of 316 patients were included in the study. 250 patients were assessed with physical exam only and 66 underwent POCUS. The primary failure rate in the ultrasound group was 17% as compared to 47% (p<0.001) in the group of patients who did not undergo ultrasound examination. In patients without preoperative ultrasound there were higher rates of requiring new access creation (31% vs 9% p<0.001) and fistula abandonment (66% vs 39% p<0.001). Multivariable analysis showed absence of preoperative US was associated with a 3.56 greater risk of failure (95% CI 1.67-7.59, P=0.001) when compared to physical exam alone.

Conclusions:  
POCUS for dialysis access patients leads to decreased rates of primary failure, new access creation and fistula abandonment compared to patients who undergo physical examination only.
Presentation #02  
Presenter: Dr. Sanjay Patel  
Division: General Surgery  

Rectal cancer outcomes: the impact of multidisciplinary team meetings on 5-year survival  
Patel SVB, Gilani SO, Brackstone M, Ott M  

Background:  
Multidisciplinary team meetings are used in developing treatment plans for patients with rectal cancer, however these meetings require a significant investment in healthcare resources and how these meetings impact oncologic overall outcomes are poorly described. There is evidence suggesting that patients are more accurately staged, are more likely receive neoadjuvant treatment or improved surgical margins, but these studies look at only a select group of patients and not all patients as a group. Regional policy recommends presenting all rectal cancer patients at MDT despite this lack of evidence. The aim of this study was to evaluate to impact MDT has on survival on patients diagnosed with rectal cancer.  

Methods/Results:  
A cohort analysis was performed using prospectively collected data from a tertiary cancer hospital evaluating the role of multidisciplinary team meetings and five-year survival. A Cox proportional hazard model with adjustment for confounding variables was used to analyze the data. A total 797 were treated electively for rectal cancer during the 9-year study period. Of these patients 167 were presented at a multidisciplinary team conference, where treatment decisions were finalized. The multivariate adjusted analysis did not show a 5-year survival advantage with multidisciplinary team presentation (HR 0.80, 95% CI: 0.50 – 1.30, p = 0.366).  

Conclusions:  
Presentation of all rectal cancer patients at a multidisciplinary team conference does not show a significant 5-year survival advantage. A subset of rectal cancer patient may benefit from these discussions but these groups have yet to be clearly defined.
Presentation #03  
Presenter: Dr. Melissa Huynh  
Division: Urology

Clinical correlation of patient-derived xenograft model using the ex-ovo avian embryo to predict targeted therapy tumor resistance in renal cell carcinoma.

Melissa Huynh¹, Matthew Lowerison²,⁴, Victor McPherson¹, Hon Leong¹,⁵,⁶, Nicholas Power¹,³  
¹ Department of Surgery, Division of Urology, Schulich School of Medicine and Dentistry, University of Western Ontario, London, ON, ² Department of Medical Biophysics, University of Western Ontario, London, ON, ³ Department of Oncology, Schulich School of Medicine and Dentistry, University of Western Ontario, London, ON, ⁴ Robarts Research Institute, University of Western Ontario, London, ON, ⁵ Department of Pathology and Laboratory Medicine, University of Western Ontario, London, ON, ⁶ Department of Microbiology and Immunology, University of Western Ontario, London, ON

Introduction and objectives:  
Tyrosine kinase inhibitors (TKIs) are the mainstay of treatment for metastatic renal cell carcinoma (mRCC), with up to 20% of tumours exhibiting de novo resistance to TKIs. At present, there is no method of predicting response to systemic targeted therapy. We present a descriptive study of a prospective cohort of mRCC patients & the correlation of clinical outcomes to the responses predicted by patient-derived xenograft (PDX) models using the ex-ovo avian embryo.

Methods:  
We prospectively collected demographic, pathologic, & clinical data on 26 patients with mRCC undergoing cytoreductive nephrectomy. PDX models were tested in 5 patients. Six core biopsies were taken from each primary tumor. Cores were sectioned & engrafted directly onto embryonic day 9 chorioallantoic membranes (CAMs) of avian embryos & treated with topical sunitinib or a DMSO control. On day 6 post-engraftment, Doppler & contrast-enhanced ultrasound were performed to assess vascularity & perfusion of tumours grown on the CAM models. A composite vascularity & perfusion score was obtained and used to determine the presence or absence of a response to TKIs compared to the control. Tumours were considered TKI-sensitive if there was a response in ≥4 cores. Tumours with responses in ≤3 cores were considered TKI-resistant. Clinical progression on CT scan was based on RECIST criteria.

Results:  
Results are summarized in Table 1. All tumours demonstrated heterogeneous responses to TKIs in the PDX model. Using the criteria of ≥4 cores responding to TKI therapy, we would expect a good response in patient 3, who demonstrated clinical evidence of oligo-progression after 6 months of pazopanib, but currently continues on maintenance with pazopanib, for a total of over 11 months. Moreover, patient 3 had 3 cores engrafted from a metastatic deposit, which all responded well to sunitinib in the PDX model. Patients 1 & 2 continued to show signs of progression despite switching to alternative agents, and both have discontinued systemic therapy due to intolerable side effects or enrolment in another clinical trial respectively. Patient 4 has not started on systemic targeted therapy. Patient 5 has been started on sunitinib as part of a clinical trial.

Conclusions:
Further studies in a larger population are warranted to explore the potential of the PDX model to serve as a novel phenotypic biomarker in the prediction of targeted therapy tumor resistance in RCC.

Presentation #04
Presenter: Dr. Kitty Wu
Division: Plastics & Reconstructive Surgery

An Anthropometric Assessment of Proximal Hamate Autograft for Scaphoid Proximal Pole Reconstruction
Kitty Wu, Clare Padmore, Emily Lalone, Nina Suh

Purpose:
Fragmentation of the proximal pole of the scaphoid presents a difficult surgical problem. This can occur secondary to avascular necrosis following traumatic scaphoid proximal pole fractures or from Preiser’s disease. This anthropometric study assesses the fit of the ipsilateral proximal hamate for use as autologous bone graft for scaphoid proximal pole reconstruction.

Methods:
Twenty-nine cadaveric specimens (15 males, 14 females; mean age 70 ± 11.28 years) underwent computed tomography and 3D reconstruction of the carpus and distal radius. The height of the scaphoid was measured and a third of its length was used to delineate the proximal pole of the scaphoid. This height was then used to simulate resection of the proximal pole of the scaphoid and the level of hamate osteotomy. Using computational modelling, the proximal scaphoid and hamate were divided into 6 sections for comparison: dorsal, middle, and volar radioscapoid, and dorsal, middle, and volar scaphocapitate segments. These 6 areas were compared using an iterative point-to-point distance algorithm to determine average distance between the surfaces. An inter-bone algorithm was also used to assess the effect of the hamate autograft on radioscapoid joint congruency.

Results:
The mean length of the scaphoid was 27.9mm and the mean length of the divided proximal pole and proximal hamate was 9.3mm. The hamate was typically wider than the scaphoid in the radioulnar dimension (24 of 29 specimens), but the scaphoid was wider than the hamate in the volar to dorsal dimension (28 of 29 specimens). The mean absolute distance was the largest in the dorsal scaphocapitate (0.675mm), volar radioscapoid (0.736mm), and dorsal radioscapoid segments (0.751mm). Without osteotomy, the hamate autograft may cause impaction in the dorsal radial aspect of the distal radius. Nine hamate autografts with mean absolute distances of greater than 1mm were classified as poor fitting. These poor fitting specimens had a wider hamate in the radial-ulnar dimension (mean 12.6mm vs. 10.3mm, p = 0.007), wider scaphoid in the radial-ulnar dimension (mean 10.9mm vs. 9.6mm, p = 0.004), and wider scaphoid in the volar-dorsal dimension (mean 18.6mm vs. 16.0mm, p = 0.0005) compared to the remaining better fitting specimens. The hamate autograft shifted the maximal pressure point of the radioscapoid joint towards the dorsal radial position.

Conclusions:
The proximal hamate may be a suitable anthropometric autograft for scaphoid proximal pole reconstruction in patients with a radial-ulnar hamate width of less than 10mm, radial-ulnar scaphoid width of less than 10mm, and a volar-dorsal scaphoid width of less than 16mm. Pre-operative CT scanning with sagittal and coronal sections are recommended to aid in patient selection and operative planning.
Presentation #05  
Presenter: Dr. Supriya Singh  
Division: Orthopaedics

A prospective, randomized controlled trial on the impact of written discharge instructions for post-operative opioids on patients’ pain satisfaction and on minimizing opioid risk exposure in orthopedic surgery  
Supriya Singh (Western University, PGY-3), Collin Clarke, Abdel Rehman Lawendy, Mark Macleod, David Sanders, Christina Tieszer

Purpose:  
Prescription narcotic abuse and overdose is a rampant issue with long term consequences on our patients and society. The purpose of this study was to evaluate the role of a post-operative pain guideline pamphlet on patient’s pain satisfaction, on number of patients seeking a renewal prescription and on disposal of leftover prescription medication.

Methods:  
This prospective, randomized controlled trial includes patients aged 18-65 undergoing elective foot and ankle surgery, who are opioid naïve and have no pre-existing chronic pain conditions. Exclusion criteria were chronic pain syndromes, chronic kidney disease, complex regional pain syndrome, fibromyalgia, psychogenic pain, patients with allergies to our standardized protocol medications or patients with previous opioid abuse. Patients consenting to participate were divided into low, medium and high use groups according to anticipated post-operative prescription narcotic usage. The low use group included simple hardware removal, ankle arthroscopy, excision of ganglia and 2nd to 5th MTP joint surgery. The medium use group included 1st MTP surgery, tendon transfers, osteotomies and forefoot reconstructions. Finally, the high use group included midfoot, subtalar and ankle joint fusions. Patients in each group were randomized to either receive written discharge instructions for management of their post-operative pain or no written instructions. The control group received no pamphlet, whereas the intervention group received a pamphlet outlining post-operative pain expectations and recommendations for opioid medication indication, usage, and disposal. Both groups received equivalent prescriptions targeted to the use group (low, medium or high). At the 4 week post-operative mark, a telephone interview was conducted to evaluate the primary outcome of pain satisfaction using the modified brief pain inventory. Secondary outcomes included renewal of opioid prescription and disposal method of leftover medication. Statistical analysis was done using two sample t test.

Results:  
A total of 80 patients were recruited for this study. Out of the 80 patients, 22 were low use, 45 were moderate use and 13 were classified as high use group. Out of the 80 patients, 41 received post-operative pain instructions and 39 did not. On average, pain satisfaction post-operatively was 8.192 out of 10, where 10/10 represents completely satisfied. Interference scores averaged 27.175 out of 70. Interestingly, only 7 patients (6 moderate use and 1 high use) used the entirety of their prescription and only 5 patients required a renewal of their prescription. Only 5 patients returned their surplus medication to the pharmacy despite 41 patients receiving direct instructions to do so.

Conclusion:  
Written instructions may influence post-operative pain satisfaction and opioid use. Orthopedic patients commonly have leftover prescription medication which they do not dispose of. Overprescribing narcotic medication may contribute to the issue of opioid abuse. As Orthopedic Surgeons, we should consider our role in minimizing opioid prescriptions post-operatively.
Presentation #06  
Presenter: Dr. Sayf Gazala  
Division: Thoracic Surgery

Survival of Lung Cancer Patients Who Underwent Invasive Mediastinal Staging Not Adherent to National Guidelines  
S Gazala, J Bierer, A Warner, D Palma, R Inculet, D Fortin, R Malthaner

Purpose:  
Invasive mediastinal staging (IMS) is recommended for staging of all non-small cell lung cancer undergoing surgery except for peripheral stage 1a lesions. It was hypothesized that Non-Guideline Directed IMS does not affect survival in PET staged patients undergoing lung cancer resection.

Methods:  
152 lung cancer patients (2010-2011) that had T1-T3/N0-N3 non small cell lung cancer (NSCLC), treated by pulmonary resections were reviewed. Patients were clinically staged based on physical exam, PET and body/head CT. The selective use and indication for IMS was at the discretion of each of the experienced most responsible surgeons. We compared the overall survival Kaplan-Meier estimates by IMS status using the Log-rank test in SAS version 9.4.

Results:  
152 patients were identified as meeting study criteria. 93 % had a PET scans and 85% had CT scans of the head. Only 36 (24%) patients underwent IMS. Cervical mediastinoscopy was used in all but one patient that had an EBUS. 84% of patients underwent thoracotomy and 94% had an anatomical resection. 14% of the IMS group were upstaged by post-operative pathological nodal status vs. 24% in the non-IMS group. The overall survival favoured the non-IMS group (HR 1.77 95% CI:1.14 to 2.79; p=0.018).

Conclusions:  
Lung Cancer Patients whom National Guidelines recommended invasive mediastinal staging, were not disadvantaged, by a strategy of discretionary Non-guideline based indications for IMS. Further study is required to understand the factors that influenced the surgeon’s decision to proceed or not with IMS.
Presentation #07
Presenter: Dr. Morgan McWilliam
Division: Paediatric Surgery

A simulated training model for laparoscopic pyloromyotomy: is 3D printing the future?

M. McWILLIAM, A. WILLIAMS, J. AHLIN, J. DAVIDSON, M. QUANTZ, A. BÜTTER

Purpose:
Hypertrophic pyloric stenosis (HPS) is a common neonatal condition treated with open or laparoscopic pyloromyotomy. 3D-printed organs offer realistic simulations to practice surgical techniques. The purpose of our study was to validate a 3D HPS stomach model using a Global Operative Assessment of Laparoscopic Skills (GOALS) and assess the model’s reliability and surgical realism.

Methods:
Medical students, general surgery residents, and adult and pediatric general surgeons were recruited from a single center. Each participant was videotaped three times performing a laparoscopic pyloromyotomy using box trainers and 3D-printed stomachs. Each attempt was graded independently by three reviewers using GOALS and task specific assessments (TSA). Participants were surveyed using the Index of Agreement of Assertions on Model Accuracy (IAAMA).

Results:
Of 30 participants, 27 had all three attempts recorded. Participants reported their experience levels as novice (22%), inexperienced (26%), intermediate (18.5%), and experienced (33%). Inter-observer variability was not significant between raters for both overall average GOALS and TSA scores. There was a significant improvement in GOALS (p<0.0001) and TSA scores (p=0.03) between attempts and overall. These improvements were not significant when examined by participant experience level. The majority of participants felt the model accurately simulated a laparoscopic pyloromyotomy (82%) and would be a useful tool for beginners (100%); although this was not statistically significant.

Conclusions:
A 3D-printed neonatal stomach model for simulated laparoscopic pyloromyotomy is a useful training tool for learners to improve their laparoscopic skills. It is also a useful tool to assess intraoperative laparoscopic skills with minimal intra-observer variability.
PRESENTATION BY OUTSTANDING SCIENTIST IN THE DEPARTMENT OF SURGERY

Title: What does the microbiome mean to a surgeon?
Presenter: Dr. Jeremy Burton
Division: Urology

The vast and diverse collection of microorganisms that not only occupy the intestinal tract but also many other places once considered sterile makes up our microbiome. Surgeons understand the role of bacteria in infection and antibiotic resistance. Some are also aware that the microbiome may be involved in the development of diseases that may ultimately require surgical intervention. There is now growing evidence that the microbiome is likely to be important following surgical procedures with regard to the modulation of inflammation and how patients respond to therapeutic agents. We present examples of our own research using next generation bacterial 16S rRNA gene sequencing data and other microbiological techniques. These studies show that we are not devoid of bacteria at sites where we once thought were sterile, such as the urinary tract. We also illustrate that bacteria do not always respond to medications, such as antibiotics, as expected and that the microbiome may influence the efficacy of non-antimicrobial therapeutic agents. In the future, it may be beneficial for patients to receive a microbiome analysis prior to surgery and drug regimens to determine what therapeutic agents they will respond best towards and whether they may benefit from microbiome therapeutics like probiotics or faecal microbiome transplant.
PRESENTATIONS BY AWARD WINNING MSc STUDENT COLLOQUIUM PRESENTERS
MSc in Surgery Student: Dr. Richard Ng

Resiliency in the Operating Room: Exploring Trainee Stress During Surgery and the Role of Individual Resilience

Richard Ng, MD, FRCSC, Saad Chahine, PhD, Brent Lanting, MD, MSc, FRCSC, James Howard, MD, MSc, FRCSC

Introduction:
Trainees experience significant stress in the operating room, with negative effects on surgical performance and learning. Psychological resilience suggests why some individuals excel despite severe stress and adversity. The purpose of this study was to explore the relationship between trainee resilience and intraoperative stress. A new instrument was developed to assess Surgical TRainee Experiences of StresS in the Operating Room (STRESSOR).

Methods:
Focus groups and a literature review were used to develop STRESSOR, with 31 questions assessing eight domains of stress. STRESSOR was used in a survey of orthopaedic residents in Canada and of surgical residents at the University of Western Ontario. Resiliency was assessed using the 10-item Connor-Davidson Resiliency Scale (CD-RISC-10). Responses were analysed to evaluate instrument reliability and validity, trainee resiliency, and the relationship between resiliency and stress.

Results:
Responses were obtained from 167 subjects with a 38 percent response rate. The STRESSOR instrument had strong reliability (Cronbach’s α=0.91) and demonstrated construct validity with good fit statistics (CFI=0.89, RMSEA=0.06) using confirmatory factor analysis.

The mean CD-RISC-10 score was 38.8, which is in the 90th percentile of the general population. Increasing resilience correlated with lower intraoperative stress (R²=0.16, p<0.001). Residents with higher stress were more likely to have seriously considered leaving residency (R²=0.14, p<0.001), with resilience protective against quitting.

Conclusion:
Most surgical trainees are highly resilient, and increased resilience is protective against intraoperative stress. Resiliency training may help trainees manage the high stress environment of the operating room, potentially improving surgical performance and learning while reducing resident attrition.
MSc in Surgery Student: Dr. Shane Smith

Combat Vascular Trauma: From Characterization to Innovation
Smith S.
Division of General Surgery

The Improvised Explosive Device (IED) killed more soldiers in Afghanistan than any other weapon. The combat injury pattern caused by antipersonnel IEDs was characterized and a novel device to treat non-compressible vascular injuries was developed and tested. The vascular trauma experience of a Canadian Level I trauma centre was examined to characterize to find if there is domestic applications of this technology. The injury pattern of 100 consecutive IED victims was recorded. Multiple amputations occurred in 70% of IED victims: 5 quadruple amputations, 27 triple amputations, and 38 double amputations. Pelvic fractures occurred in 21 victims and severe perineal injuries were present in 46 patients. The casualty fatality rate was 19%. A novel device for aortic occlusion and hemorrhage control was designed. A balloon is inflated by CO2 up the femoral artery occluding the aorta. It can navigate injured vasculature and is simple to use. It was tested on model aortas, intact and injured cadaveric porcine aortas, and a perfused human cadaveric model. Vascular trauma at a Canadian Level I trauma centre from 1 January 2011- 31 December 2015 were retrospectively reviewed. The mean Injury severity score was 21.8 and blunt mechanism accounted for 61.4%. Vessel injuries to the neck (20.4%), thorax (20.4%), abdomen/pelvis (19.7%), upper extremity (24.5%) and lower extremity (15.0%) were identified. Thirteen different subspecialty disciplines managed vascular trauma at this centre. Antipersonnel IEDs cause multiple amputation and severe pelvic trauma. A novel device to control non-compressible hemorrhage has been developed and this new technology may be useful in combat as well as in Canada.
PRESENTATIONS BY OUTSTANDING RESEARCHERS IN THE DEPARTMENT OF SURGERY
Abstract #01
Presenter: Dr. Nicholas Power
Division: Urology

Retroperitoneal Lymph Node Dissection: Anatomical and Technical Considerations from a Cadaveric Study
Beveridge TS¹, Allman BL¹, Johnson M¹, Power A², Sheinfeld J³, Power NE⁴
¹Department of Anatomy and Cell Biology, Schulich School of Medicine and Dentistry, Western University, London, Ontario, Canada.
²Vascular Surgery Division, Department of Surgery, London Health Sciences Centre, London, Ontario, Canada.
³Urology Division, Department of Surgery, Memorial Sloan Kettering Cancer Center, New York, New York.
⁴Urology Division, Department of Surgery, London Health Sciences Centre, London, Ontario, Canada; Surgical Oncology Division, Department of Oncology, London Health Sciences Centre, London, Ontario, Canada.

Background:
Metastatic testis cancer in the retroperitoneum presents a technical challenge to urologists in the primary and post-chemotherapy settings. Where possible, bilateral nerve sparing retroperitoneal lymph node dissection should be performed in an effort to preserve ejaculatory function. However, this is often difficult to achieve, given the complex neurovascular anatomy. We performed what is to our knowledge the first comprehensive examination of the anatomical relationships between the sympathetic nerves of the aortic plexus and the lumbar vessels to facilitate navigation and nerve sparing during bilateral retroperitoneal lymph node dissection.

Materials and Methods:
The relative anatomy of the infrarenal vasculature (lumbar vessels, right gonadal vein and inferior mesenteric artery) was investigated in 21 embalmed human cadavers. The complex relationships between these vessels and the sympathetic nerves of the aortic plexus were examined by dissection of an additional 8 fresh human cadavers.

Results:
Analysis of the infrarenal vasculature from 21 cadavers demonstrated that the position of the right gonadal vein and the inferior mesenteric artery may be useful to locate the right superior lumbar vein and the first pair of infrarenal lumbar arteries as well as the common lumbar trunk (vein) and the second pair of infrarenal lumbar arteries, respectively. Furthermore, the lumbar splanchnic nerves supplying the aortic plexus were most often positioned anteromedial to the respective lumbar vein.

Conclusions:
The current study describes the complex neurovascular relationships that are crucial to performing successful nerve sparing retroperitoneal lymph node dissection. Surgical techniques are also discussed.
Abstract #02
Presenter: Dr. David O'Gorman
Division: Orthopaedics

Toward point-of-care detection of *P. acnes* infection
Athwal G.A.1, Faber K.J. 1 and O’Gorman D.B. 2
Surgery divisions: Orthopedics1 and Plastic Surgery2

**Background:**
Contamination with *Propionibacterium acnes* (*P. acnes*), an aerotolerant and anaerobic bacterial commensal of the skin, is now considered the most common microbial cause of failed shoulder surgeries. To improve upon routine anaerobic culture-based detection, which typically requires several days, we developed a polymerase chain reaction (PCR)-restriction fragment length polymorphism (RFLP) assay that can sensitively and specifically detect *P. acnes* DNA in shoulder tissue biopsies in less than a day1. Our current aim is to leverage the specificity of this assay to develop a point-of care (POC) assay that can detect *P. acnes* infection while the patient is still in the operating room.

**Methods:**
We have modified our PCR primers, designed to amplify a region of the 16S rRNA gene sequence that is specific to *P. acnes*, for use in Polymerase Spiral Reaction (PSR) analyses2. PSR is a recently described breakthrough in isothermal technology which provides exceptionally rapid DNA template amplification.

**Results:**
*In-silico* analyses indicate that the PSR primers we have designed will specifically amplify a region of the 16S rRNA gene in *P. acnes* which contains a unique restriction enzyme site we have previously utilized for RFLP-based, secondary confirmation of *P. acnes* specificity. Optimization of this novel POC methodology is currently underway.

**Conclusions:**
A rapid and reliable POC assay that detects the presence of *P. acnes* DNA in tissue samples will provide valuable and timely information, and enhance a surgeon’s capacity to make informed decisions about surgical site contamination with *P. acnes*. 


Abstract #03  
Presenter: Dr. Brent Lanting  
Division: Orthopaedics  

Outpatient vs Inpatient Total Hip Arthroplasty: An RCT of Cost, Patient Outcomes and Complication Rates  
Lanting B, Howard J, Pollock M, Zomar B, Marsh J, Bryant D  
Orthopaedic Surgery  

Background:  
Total hip arthroplasty (THA) is a successful treatment for end stage hip arthropathy, but the economic burden is large. The economic impact of outpatient THA is not known in Canada. This study investigated patient outcomes, adverse event rates, and cost differences between patients randomized to outpatient or inpatient care pathways.  

Materials and Methods:  
Patients scheduled for a unilateral primary THA were randomly assigned using a modified Zelen technique to outpatient or inpatient groups. Proximity to the hospital, sufficient home supports, and an ASA less than or equal to three were required for inclusion. The primary outcome was serious adverse events within three months of surgery, with secondary outcomes of cost, patient reported outcomes, and caregiver assistance levels.  

Results:  
Interim analysis of the first 43 patients demonstrated no difference in patient sex, age or BMI. The median length of stay of the outpatient group was 8.4 (1.1) hours compared to 29.1 (6.0) hours in the inpatient group (p<0.001). One inpatient required an irrigation and debridement, and one outpatient had an analgesia overdose. In the outpatient, group hospital costs were $4403 (63) and Ministry of Health costs were $5901 (76), whereas the inpatient group costs were $5170 (348) and $6752 (412) respectively (p<0.05 for both costs). No difference in societal costs, patient reported outcomes, or serious adverse events were found.  

Conclusions:  
Significant cost savings were found using an outpatient care pathway compared to an inpatient group on an accelerated care pathway. No differences in patient outcomes or complications were found.
Abstract #04
Presenter: Dr. Xiufen Zheng
Division: General Surgery

Growth Differentiation Factor 15 (GDF15) Prevents Cold Ischemia Reperfusion Injury in Heart Transplantation
Division of General Surgery

Background:
Ischemia Reperfusion (I/R) Injury inevitably occurring in heart transplantation remains a major cause of graft dysfunction. In this study, we aim to determine the role of growth differentiation factor 15 (GDF15) in cold I/R injured tissue.

Materials and Methods:
The hearts were taken from donor mice, preserved in UW solution for 24h at 4°C, and followed by syngeneic heart transplantation. On day 3 post transplantation, heart grafts were taken for histopathological examination by HE staining, apoptosis by TUNEL Assay, neutrophil infiltration by MPO Assay, and gene expression. The effect of GDF15 on I/R injury was also investigated in vitro.

Results:
Cold I/R caused severe damage on heart grafts including the endocardium, epicardium and myocardium in C57BL/6 mice, whereas grafts from GDF15 transgenic mice showed less damage as demonstrated by decreased cell death, neutrophil infiltration and inflammatory molecules, and by the preservation of the normal structure of the heart. Upregulation of GDF15 in vitro using the H9C2 cell line displayed the same protective effects against I/R injury as the in vivo experiments.

The expression of phosphorylated Foxo3a was decreased in I/R injured heart grafts and H9C2 cells. The reduction in phosphorylated Foxo3a was abrogated in GDF15 over-expressing heart grafts and cells, whereas GDF15 siRNA further reduced phosphorylated Foxo3a.

Conclusion:
This study demonstrates that GDF15 plays a protective role in preventing cold I/R injury in heart transplantation through Foxo3 signalling, highlighting the role of GDF15 as a promising target for preventing cold I/R injury in heart transplantation.
THE ROBERT ZHONG LECTURE

We are very pleased to have Dr. Clifford Ko as our 2017 Dr. Robert Zhong Lecturer.

Dr. Clifford Ko is the Director of the Division of Research and Optimal Patient Care at the American College of Surgeons. He oversees all the quality improvement programs, including the Bariatric Surgery Accreditation Program, the Cancer Accreditation program, the Trauma Verification program, the Surgeon Specific Registry, the Pediatric Surgery Verification Program, and the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP). He also serves as the Director of ACS NSQIP, which recently was recognized with the Eisenberg Award from the National Quality Forum/Joint Commission.

Dr. Ko’s work focuses on surgical quality of care, including quality measurement, process improvement, value based care, and achieving high reliability in surgical care. He has served in advisory roles to national and international efforts for achieving higher quality and safety including the World Health Organization, the Institute of Medicine, the National Quality Forum, PCORI, amongst others. He has received millions of dollars in grant funding to study quality of care from sources that include the National Institutes of Health, the Centers for Disease Control and Prevention, the American Cancer Society, the Centers of Medicare and Medicaid Services, the Agency for Healthcare Research and Quality, and the Veterans Administration. He has published over 350 peer reviewed manuscripts and has written more than 20 book chapters. He is frequently invited to speak nationally and internationally, and was recognized by Becker’s Hospital Review as one of the top 50 experts leading the field of patient safety.

Current national initiatives for Dr. Ko include overseeing the writing of the ACS Quality Manual, implementation of surgical bundles into 1000+ hospitals, and development of a geriatric surgery quality program.

Clinically, Dr. Ko is a double board-certified surgeon with a practice currently focusing on patients with colorectal cancer. At UCLA, he is the Robert and Kelly Day Professor of Surgery, has won the
Faculty Teaching Award three times, and is recognized as one of the Best Doctors in America. He is also professor of health services at the UCLA School of Public Health.

Dr. Ko received his B.A (Biology), M.S. (Biological/Medical Ethics), and M.D. from the University of Chicago. He also received a Masters of Science Degree (Health Services/Outcomes Research) from the University of California, Los Angeles during his time as a Robert Wood Johnson Clinical Scholars Fellow at UCLA and RAND. Dr. Ko completed his General Surgery Residency at UCLA Medical Center, and obtained specialty training at the Lahey Clinic in Boston in Colon and Rectal Surgery.

Previous Robert Zhong Lecturers:

2016  Dr. Maston W. Linehan, MD, Surgeon-in-Chief, National Institutes of Health
2015  Dr. Ivar Mendez MD, PhD, FRCSC, FACS, DSc(hon), FCAHS
2014  Dr. Jonathan Meakins, retired McGill Professor and Chair of McGill's Department of Surgery, former surgeon-in-Chief of the MUHC and current director of the MUHC Heritage Centre
2013  Dr. Jeremy Nicholson, Head of the Department of Surgery & Cancer at Imperial College in London University, UK.
2012  Dr. Garth Warnock, C.N. Woodward Professor, Head of the Department of Surgery, University of British Columbia, Co-Director, Ike Barber Human Islet Transplant Laboratory and British Columbia Islet Transplant Program
2011  Dr. Amitai Ziv, Deputy Director, Chaim Sheba Medical Center; Director, Israel Center for Medical Simulation, Tel-Hashomer, Israel
2010  Dr. John Monson, Chief of Colorectal Surgery, Vice-chair, Department of Surgery The University of Rochester, Rochester, New York
2009  Dr. Anthony Atala, Professor and Chair of Urology, Director of Regenerative Medicine, Wake Forest University School of Medicine
2008  Dr. Richard M. Satava, Professor of Surgery, University of Washington
2007  Dr. James Shapiro, Wyeth-Ayerst Canada/CIHR Clinical Research Chair in Transplantation, Director, Clinical Islet Transplant Program, University of Alberta
GROUP INTERACTIVE SESSION

DEBATE: Merits of Simulation Based versus Hands on Operative Training of Residents in the face of CBME and Quality Based Outcomes

Dr. Ken Faber, Division of Orthopaedics & Dr. Rob Leeper, Division of General Surgery

Moderator: Dr. Neil Parry, Division of General Surgery
<table>
<thead>
<tr>
<th>Name</th>
<th>Page Number(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ahmed, Mooyad</td>
<td>.....32</td>
</tr>
<tr>
<td>AlHarbi, Bijad</td>
<td>.....23</td>
</tr>
<tr>
<td>Ali, Aymon</td>
<td>.....12</td>
</tr>
<tr>
<td>Almamar, Ahmed</td>
<td>.....11</td>
</tr>
<tr>
<td>Aquil, Shahid</td>
<td>.....24</td>
</tr>
<tr>
<td>Burton, Jeremy</td>
<td>.....42</td>
</tr>
<tr>
<td>Brar, Harmen</td>
<td>.....17</td>
</tr>
<tr>
<td>Chen, Jingwen</td>
<td>.....25</td>
</tr>
<tr>
<td>Cushnie, Duncan</td>
<td>.....30</td>
</tr>
<tr>
<td>Dion, Charles</td>
<td>.....33</td>
</tr>
<tr>
<td>Gazala, Sayf</td>
<td>.....40</td>
</tr>
<tr>
<td>Gomes, Janice</td>
<td>.....21</td>
</tr>
<tr>
<td>Hossain, Sajid</td>
<td>.....35</td>
</tr>
<tr>
<td>Huynh, Melissa</td>
<td>.....28, 37</td>
</tr>
<tr>
<td>Juriansingani, Simi</td>
<td>.....15</td>
</tr>
<tr>
<td>Kim, Yohan</td>
<td>.....13</td>
</tr>
<tr>
<td>Ko, Clifford</td>
<td>.....51-52</td>
</tr>
<tr>
<td>Lanting, Brent</td>
<td>.....49</td>
</tr>
<tr>
<td>Law, Jeffrey</td>
<td>.....22</td>
</tr>
<tr>
<td>LeBlanc, Daniel</td>
<td>.....31</td>
</tr>
<tr>
<td>Li, Xiangji</td>
<td>.....10</td>
</tr>
<tr>
<td>Liao, Xinyang</td>
<td>.....09</td>
</tr>
<tr>
<td>Lin, Shouzhe</td>
<td>.....16</td>
</tr>
<tr>
<td>MacDonald, Kyle</td>
<td>.....14</td>
</tr>
<tr>
<td>McWilliam, Morgan</td>
<td>.....41</td>
</tr>
</tbody>
</table>
Ng, Richard .....44
O’Gorman, David .....48
Padda, Ranjit .....18
Patel, Sanjay .....36
Poon, Andrew .....19
Power, Nicholas .....47
Punjani, Nahid .....26
Singh, Heena .....27
Singh, Supriya .....39
Smith, Shane .....29, 45
Truong, Jessica .....08
Wu, Kitty .....38
Zheng, Xiufen .....50