CUA 2023 Annual Meeting Abstracts – Poster Session 4: Transplant, Other

Saturday, June 24, 2023 • 16:10–17:40

Cite as: *Can Urol Assoc J* 2023;17(6Suppl2):S67-74. http://dx.doi.org/10.5489/cuaj.8412

MP 4.1

The effect of kidney preservation at 10°C with Hemopure and hydrogen sulfide donor, sodium thiosulfate, in a syngeneic rat renal transplantation model

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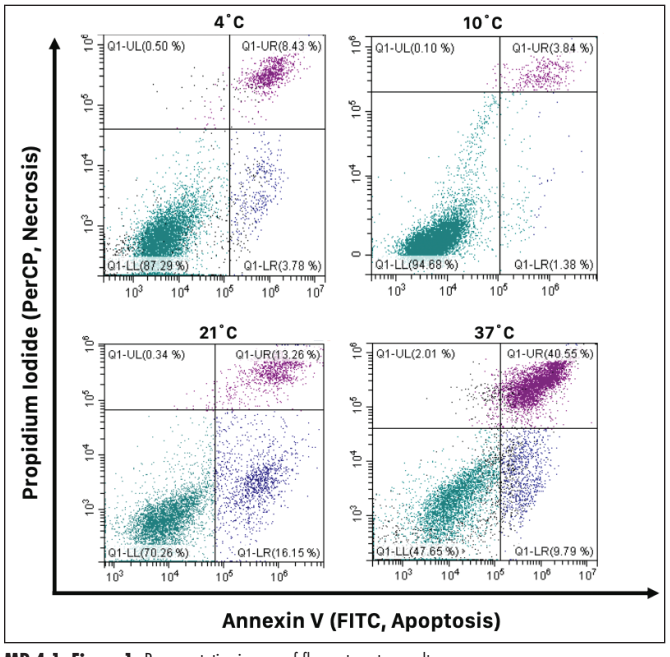
Introduction: Renal transplantation is preferred for patients with end-stage renal disease. Yet, donor kidney demand outweighs supply. Static cold storage (SCS) at 4°C is the gold standard for renal preservation. SCS contributes to renal damage through ischemia-reperfusion injury (IRI) involving cell death and inflammation. In porcine models of renal transplantation, we added non-FDA-approved hydrogen sulfide (H2S) donor, AP39, to blood substitute, Hemopure, at 21°C and 37°C, which improved renal graft quality; though, the experiment was costly to meet renal metabolic demand. In rats, we studied sodium thiosulfate (STS), an FDA-approved H2S donor, at 4°C and saw similar benefits. Still, there is a risk of cold IRI. Recent studies show that 10°C human organ preservation enhanced patient survival without requiring extensive oxygen during preservation. Therefore, we hypothesize that preservation solutions with STS and Hemopure at 10°C will reduce renal IRI.

Methods: With an in vitro model of rat renal IRI, we evaluated STS use at 4°C, 10°C, 21°C, and 37°C. We treated rat proximal tubular epithelial cells with 150 µM STS for 24 hours hypoxia to mimic ischemia, and 24 hours normoxia to mimic reperfusion. To assess cell viability, we used flow cytometry with Annexin-V and Propidium Iodide to determine apoptosis and necrosis levels, respectively.

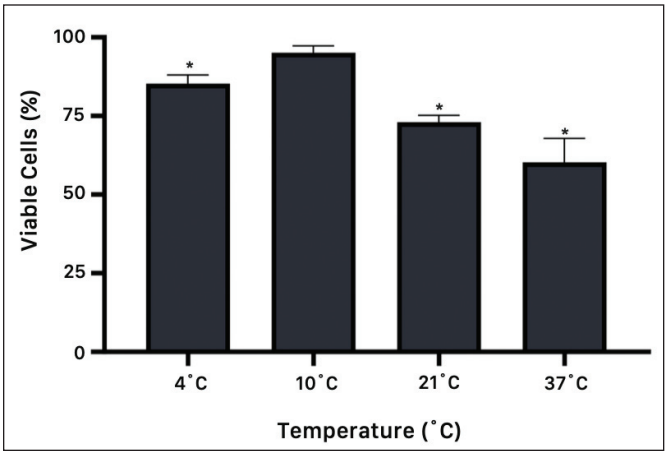
Results: STS significantly enhanced cell viability at 10°C compared to 4°C, 21°C, and 37°C, as determined by cell proportion negatively stained with Annexin-V and Propidium Iodide. STS also significantly decreased apoptotic and necrotic cells at 10°C compared to 4°C, 21°C, and 37°C, as shown by cell p positively stained with Annexin-V and Propidium Iodide (Figures 1–3).

Conclusions: 10°C STS treatment significantly protects rat proximal tubular epithelial cells from IRI. Our work may translate renal graft preservation at 10°C with STS and Hemopure into clinical practice to bridge the gap between supply and demand for donor kidneys.

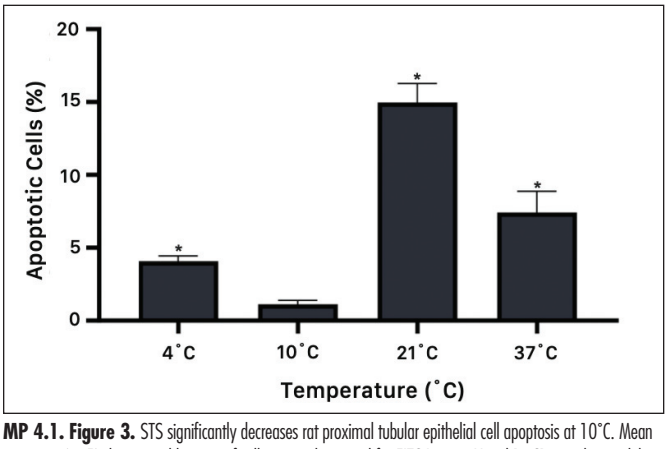
Acknowledgements: This work was supported by the Department of Surgery at Schulich School of Medicine and Dentistry and an Ontario Graduate Scholarship.



MP 4.1. Figure 1. Representative images of flow cytometry results.



MP 4.1. Figure 2. STS significantly increases rat proximal tubular epithelial cell viability at 10°C. Mean viability (n=5) determined by ratio of cells negatively stained for FITC-Annexin-V and PerCP-propidium iodide. Data represent mean ± SD. Means were analyzed using one-way ANOVA and Tukey's post-hoc test. *p<0.05 vs. 10°C.



MP 4.1. Figure 3. STS significantly decreases rat proximal tubular epithelial cell apoptosis at 10°C. Mean apoptosis (n=5) determined by ratio of cells positively stained for FITC-Annexin-V and PerCP-propidium iodide. Data represent mean ± SD. Means were analyzed using one-way ANOVA and Tukey's post-hoc test. *p<0.05 vs. 10°C.

MP 4.2

First-in-human clinical trial for the assessment of kidney transplant quality using photoacoustic imaging

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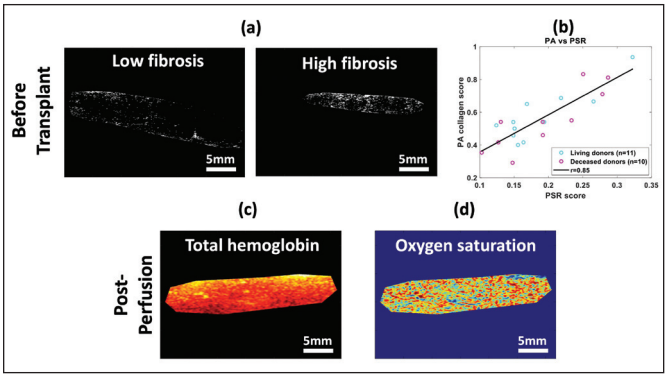
Introduction: While kidney transplantation has revolutionized the treatment of kidney failure, donor kidneys are in short supply. This leads physicians to accept kidneys from older and sicker donors. Many of these have pre-existing fibrosis and microvascular disease, which can cause damage and kidney function loss after transplantation. Unfortunately, current clinical tools for predicting graft outcomes fail to capture whole organ fibrosis and microvascular disease burden. Our group has developed quantitative ultrasound (US) and photoacoustic (PA) imaging to simultaneously measure collagen (the main component of fibrosis) and perfusion parameters. In this work, we investigated the use of US/PA imaging to non-invasively measure fibrosis and perfusion in human kidneys at the time of transplantation.

Methods: A VevoLAZR-X US/PA imaging system (680–930 nm, 15 MHz) was used for imaging. A unique spectral unmixing algorithm was implemented to simultaneously quantify collagen and perfusion parameters, such as oxygen saturation (sO2) and total hemoglobin (HbT). Donor kidneys were imaged before transplantation during cold storage to measure PA fibrosis scores and then after transplantation post-perfusion to measure PA perfusion parameters. For the primary outcome, PA fibrosis scores were correlated with fibrosis determined by PSR-stained biopsy sections. Clinical outcomes are also being collected for up to five years post-transplant.

Results: Twenty-one patients have been imaged and analyzed to date. These patients received either a living or deceased donor kidney transplant (LD n=11; DD n=10). As shown in Figure 1a, the resulting PA images provide the spatial distribution and estimates of collagen content within a high and low fibrosis kidney. Comparison with PSR-stained biopsies confirmed the accuracy of PA in assessing fibrosis (r=0.85, Figure 1b). Post-perfusion, sO2 and HbT estimates were acquired (Figure 1c), with the average sO2 increasing by approximately 20%.

Conclusions: This is the first in-human study applying PA imaging to non-invasively and accurately measure kidney fibrovascular disease burden at the time of transplantation. Next steps will be to correlate imaging scores with clinical outcome data. Once complete, we expect our results will help optimize donor kidney selection and matching to the most appropriate recipients.

Acknowledgements: Accepted for presentation at the 2023 AUA Annual Meeting.



MP 4.2. Figure 1. (a) Representative PA images showing kidney segments with low and high fibrosis visualized by an increase in white pixels. (b) A strong positive correlation between PA imaging and fibrosis determined by PSR-stained biopsies (r=0.85). Representative total hemoglobin (c) and oxygen saturation maps (d) generated after kidney perfusion.

MP 4.3

Duration of the agonal phase does not impact delayed graft function nor one-year renal function in donation after circulatory death kidney transplantation

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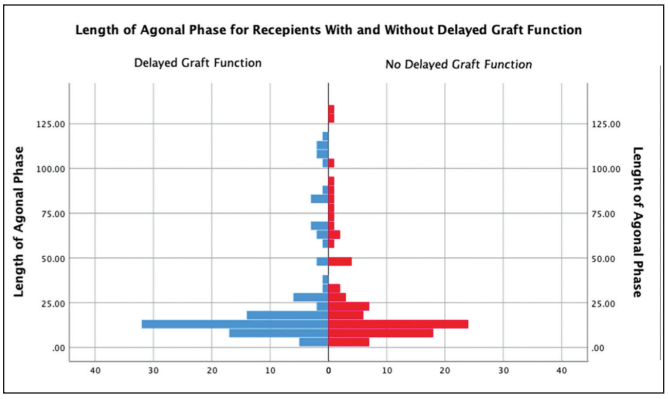
Introduction: Donation after circulatory death (DCD) has significantly expanded the limited pool of available kidney allografts. The agonal phase is measured between the withdrawal of life-sustaining treatment and the time of circulatory arrest. Due to concerns about ischemic kidney injury during the agonal phase, many transplant programs use a cutoff time of one hour before abandoning the kidney retrieval. Our center may use kidneys with an agonal phase for up to three hours. We evaluated how the length of the agonal phase influences graft outcomes.

Methods: We analyzed a single-center database of DCD renal transplant recipients from 2006–2020. Pediatric and donation after euthanasia donors were excluded. Data collected included recipient and donor demographics, surgery information, and outcomes up to one-year post-transplant. SPSS was used for statistical analysis.

Results: Of the 182 DCD kidney donations that were identified, 27 (14.8%) arrested after one hour, and 10 (5.5%) arrested after 1.5 hours. The mean agonal time was 25 minutes (Figure 1). The longest interquartile range was between 37 and 130 minutes. Binary logistic regression showed no significant association between time to arrest and delayed graft function (DGF) (p=0.79) or primary nonfunction (PNF) (p=0.50). The Chi-squared test also showed no significant association between DGF or PNF and donors who arrested in the longest quartile (X2=0.17, p=0.67), after one hour (X2=0.611, p=0.44), or after 1.5 hours (X2=0.161, p=0.69). Pearson correlation did show a weak association between time to arrest and a higher creatinine at three months (0.245, p=0.002) and six months (0.177, p=0.043), but this association was no longer present at one year (-0.032, p=0.77).

Conclusions: We found no association between the length of the agonal phase and DGF or one-year renal function after transplantation. This supports the use of kidneys from DCD donors with agonal phases of one hour and beyond.



MP 4.3. Figure 1. Length of agonal phase for recipients with and without delayed graft function.

MP 4.4

Functional warm ischemic time impacts short-term graft function in donation after circulatory death renal transplant recipients

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Introduction: Donation after circulatory death (DCD) has significantly expanded the limited pool of available kidney allografts. Total warm ischemia time (tWIT) is an essential consideration for ischemic injury, with various DCD protocols using predetermined cutoff times to cardiopulmonary arrest to exclude donation. It has been suggested that functional warm ischemia time (fWIT), which considers hemodynamic parameters, is a better parameter than total WIT for

ischemic injury. We defined fWIT as the time between when the donor's mean arterial pressure is less than 50 mmHg to the time of cold perfusion. We aim to evaluate if fWIT is a better predictor of early graft function.
Methods: This study was performed using a single-center database of all DCD kidney transplants from 2006–2020. Pediatric and donation after euthanasia donors were excluded. Data collected included recipient and donor demographics, surgery information, and outcomes up to one year post-transplant. SPSS was used for statistical analysis
Results: A total of 182 DCD kidney recipients with donor withdrawal data were identified. The mean tWIT was 40 minutes. Binary logistic regression showed no significant association between WIT and DGF (p=0.12) or PGF (p=0.46). Pearson correlation also showed no significant association between tWIT with creatinine at three months, six months, or one year. The Chi-squared test showed no significant association between DGF or PGF and donors with the longest quartile total WIT (X2=2.65, p=0.11). The mean fWIT was 24 minutes, the longest interquartile range between 26 minutes and 88 minutes. Binary logistic regression did show a significant association between fWIT and DGF (0.183, p=0.014) and creatinine at three months (0.170, p=0.05). The association was not seen for primary non-function, creatinine at six months, or one year. The Chi-squared test also showed a significant association between DGF and donors with the longest quartile functional WIT (X2=6.31, p=0.01).
Conclusions: We did not find tWIT to be predictive of short-term kidney graft function; however, fWIT was predictive of DGF and creatinine at three months. While tWIT has traditionally been used in clinical and research settings, fWIT is more representative of what is physiologically happening to the donor kidney and predictive of DGF. The upper limits of extended fWIT impacting long-term graft functional capacity are unclear.

MP 4.5
Point-of-care-ultrasound for the assessment of post-renal transplant recipients

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Introduction: Academic centers often lack access to immediate postoperative imaging for deceased donor renal transplants, as these surgeries typically occur after hours. This delay can be critical in identifying immediate postoperative complications. To our knowledge, there are no formal training programs for point-of-care ultrasound (POCUS) in this setting; therefore, the purpose of this study is to develop and validate a POCUS training program for the assessment of renal recipient kidneys.

MP 4.5. Table 1. Theoretical knowledge and skill confidence scores

	Pre-course	Post-course	p	d
Theoretical knowledge				
MCQ assessment (%)	57 (5.6)	74.3 (3.2)	0.001	–
Doppler control†	2.0 (0.6)	4.4 (0.5)	0.000	4.4
Skill confidence†				
Kidney POCUS	2.1 (0.7)	4.4 (0.5)	0.001	3.8
Bladder POCUS	2.3 (0.8)	4.5 (0.5)	0.001	3.3
Transplant POCUS	2.3 (0.5)	4.7 (0.50)	0.001	4.8

Standard deviation in brackets. †Confidence assessed via 5-point Likert data: 1=very unskilled (little to no experience), 2=unskilled (beginner proficiency), 3=intermediate performer (proficient), 4=skilled user (comfortable with use), 5=very skilled (expert)

Methods: Urology and nephrology transplant fellows and attending physicians completed a three-hour online course, followed by a five-hour hands-on seminar involving kidney, bladder, and renal transplant sonographic scanning. Simulated patients with transplanted kidneys were used. Course material was developed in conjunction with licensed ultrasound technologists, based on the Sonography Canada National Competency Profiles. Pre- and post-course surveys focused on user confidence, while pre- and post-course multiple-choice questionnaires (MCQ) assessed theoretical knowledge.
Results: Twelve participants comprising of six fellows and six attendings, half (6/12) being urologists, participated. Theoretical knowledge in POCUS improved significantly (p<0.001) (Table 1). Self-rated confidence in manipulation of ultrasound controls, doppler imaging, and POCUS of the kidney, bladder, and transplant kidney also improved (all p<0.001, d>2.0) (Table 1). All participants indicated that the course increased their likelihood of POCUS use in clinical practice and training should be integrated into a transplant fellowship training curriculum.
Conclusions: Our novel study has provided a new model for introducing POCUS in Canadian transplant programs. This reproducible and guideline-based training program, designed in conjunction with ultrasound educators, significantly improved theoretical knowledge and skill confidence in our cohort. These course modules and hands-on learning approach is an ideal model to increase collaboration across departments and academic institutions.

MP 4.6
The Ontario Anatomic Kidney Score (OAKS): Assessment of reproducibility among surgeons and trainees across Canada

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Introduction: The Ontario Anatomic Kidney Score (OAKS) is a quantitative, multifactorial score used to assess donor kidneys intraoperatively. We have recently shown OAKS to be correlated with graft function, as well as the Kidney Donor Profile Index. We hypothesize that the quantification of this score is highly reproducible across surgeons with variable levels of experience, enabling implementation across institutions.
Methods: An anonymous survey was distributed to surgical attendings, fellows, and residents at teaching centers across Canada. These surveys contained images of six separate kidneys (two images each) taken at the time of intraoperative back table dissection. Participant demographics were collected. Images were given scores for three factors: vascular (calcifications/location), anatomic (cysts/scars),

MP 4.6. Table 1. Scoring of the Ontario Anatomic Kidney Score (0–6 points)

Scoring factor	Scoring criteria
Vasculature *Aneurysm adds a score of 0.5	0 – No calcifications 0.5 – Few calcified plaques in the aorta 1.0 – Calcified/ulcerated plaque in aorta 1.5 – Calcified plaque on renal artery ostium 2.0 – Calcified plaque in the renal artery or branch
Sticky fat (adipose tissue cannot be removed without damage to renal capsule	0 – No sticky fat remains 0.5 – >95% sticky fat removed 1.0 – Majority of sticky fat removed, areas of intense fibrosis 1.5 – Minority of fat can be removed 2.0 – Intensely adherent, impossible to remove
Anatomy (scars/cysts) (<3 mm = small cyst)	0 – No scars/cysts 0.5 – Less than 3 small cysts, or presence of mild parenchymal retraction 1.0 – Between 3 and 6 small cysts, or cyst up to 2 cm, or 2 areas of mild parenchymal retraction 1.5 – More than 6 small cysts, or cyst >2 cm, or moderate parenchymal retraction 2.0 – Multiple cysts >2 cm, or significant area of parenchymal retraction

MP 4.6. Table 2. Intraclass Correlation Coefficient for survey respondents by OAKS factor

Factor (number of respondents analyzed/assessments)	ICC (95% CI)
OAKS overall (23/138)	0.991 (0.976, 0.999)
Sticky fat (33/198)	0.986 (0.962, 0.998)
Vasculature (25/150)	0.981 (0.895, 1.000)
Anatomy (28/168)	0.980 (0.946, 0.997)

Reliability is poor, moderate, good, excellent: <0.5, 0.5–0.75, 0.75–0.90, >0.90, respectively.

and perception of adherent fat on the kidney; with scores between 0 points (ideal) and 2 points (unfavorable) in each category (Table 1). Respondents were stratified by level of training and specialty. Participant scores were compared in subgroups of residents, fellows, and staff using a one-way ANOVA. After pairwise exclusion, Intraclass Correlation Coefficient (ICC) scoring was calculated overall and for each scoring factor.

Results: Of the 46 respondents, 31 were in urology, 12 in general surgery, and two in vascular surgery. Additionally, 61% of participants were attending physicians, 13% were fellows, and 26% were residents. Of the 18 questions in the survey, there was no significant difference between fellow, resident, and attending scoring except for 2/6 adherent fat image sets. ICC for OAKS overall was >0.99, with each component scoring >0.90 (Table 2), which indicates excellent correlation between assessments.

Conclusions: Overall, the OAKS is a scoring system that is reproducible across multiple levels of expertise in centers across Canada. This provides a quantitative score to incorporate anatomic assessment into graft selection of donor kidneys.

MP 4.7

A novel intraoperative score to predict delayed graft function in renal transplantation

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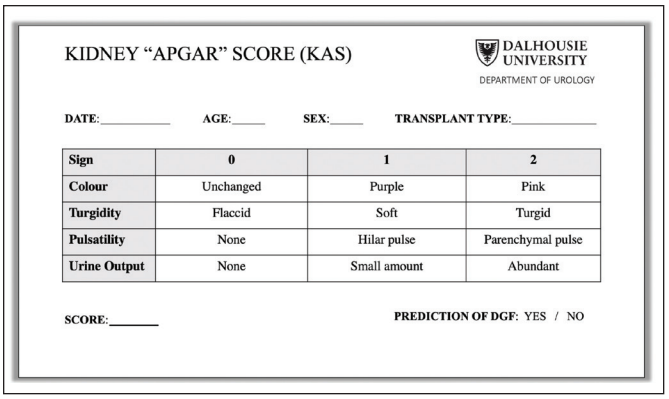
Introduction: Delayed graft function (DGF), defined as need for dialysis within seven days of transplantation, is related to worse graft outcomes and survival. A reliable and simple predictor of DGF would be invaluable in guiding postoperative care and enhancing communication between surgeons and internists. To our knowledge, no such prediction tool exists. Herein, we describe early findings of a novel and simple intraoperative score, playfully termed the kidney "APGAR" score, with promising preliminary results.

Methods: We prospectively included 30 kidney transplant patients (53% living donors) in Halifax, Nova Scotia, between January 2021 and 2022 (Table 1). After allograft implantation, surgeons scored the kidney based on 1) color; 2) turgor; 3) pulsatility; and 4) urine output (Figure 1). Each kidney received 0–8 points. Thereafter, kidney scores were binned into risk categories: poor (0–3 points), intermediate (4–6 points), and good (7–8 points). Other data included serial serum creatinine, length of stay, and need for post-transplant dialysis. Data were analyzed using Pearson correlation and cross tabulation with 95% confidence intervals Our primary endpoints included perioperative creatinine decline and need for dialysis.

Results: The distribution of kidney scores was bell-shaped, ranging from 3–8 points (Figure 2, Table 2). As risk category improved (Figure 3), creatinine decline increased, while need for dialysis fell sharply. Creatinine drop was negatively correlated with both need for dialysis (r=-0.42, p=0.027) and length of stay (r=-0.60, p<0.001). Kidney score negatively correlated with need for dialysis (r=-0.44, p=0.019). The relative risk for dialysis in kidneys scored <7 was RR 1.83, 95% CI 1.25, 2.69.


KIDNEY "APGAR" SCORE (KAS)

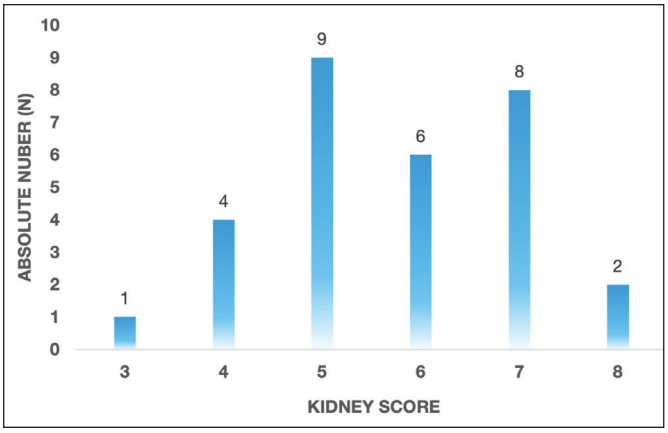
DALHOUSIE UNIVERSITY
DEPARTMENT OF UROLOGY

DATE:_____ AGE:____ SEX:____ TRANSPLANT TYPE:_____

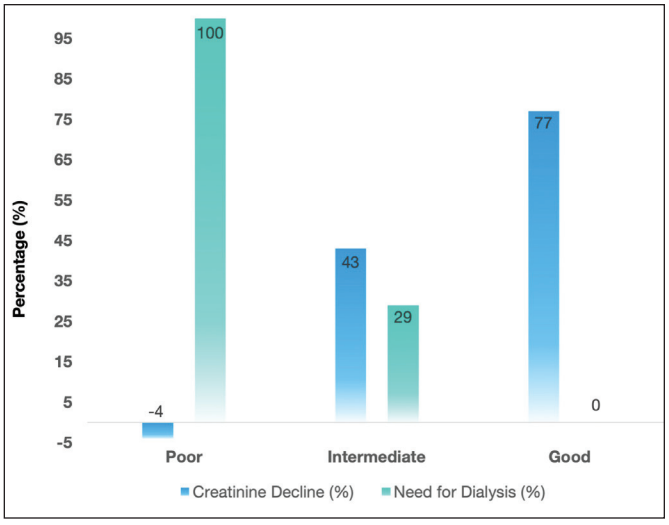
Sign	0	1	2
Colour	Unchanged	Purple	Pink
Turgidity	Flaccid	Soft	Turgid
Pulsatility	None	Hilar pulse	Parenchymal pulse
Urine Output	None	Small amount	Abundant

SCORE:_____ PREDICTION OF DGF: YES / NO

MP 4.7. Figure 1. The kidney APGAR scoresheet used intraoperatively by the transplant surgeons to score our kidneys.



MP 4.7. Figure 2. Distribution of kidney scores among our transplant recipients. As can be seen, the distribution is bell-shaped in nature.



MP 4.7. Figure 3. Postoperative renal function. "Creatinine decline" is percentage change between preoperative and postoperative day 7 serum creatinine. "Need for dialysis" is the proportion of patients within a group that required dialysis.

Conclusions: Our novel intraoperative scoring system shows promise in predicting delayed graft function and creatinine decline following renal transplantation. This is an early exploratory study with positive results that will continue to accrue patients.

MP 4.7. Table 1. Baseline demographic, biochemical, and allograft information on the patient cohort

Total number, N	30
Age at transplant (years), mean (SD)	57.0 (10.7)
Female, n (%)	11 (36.7%)
Baseline serum creatinine (mg/dL), mean (SD)	823.2 (254.3)
Type of donor kidney	
Living donor, n (%)	16 (53.3%)
Donation after circulatory death (DCD), n (%)	8 (26.7%)
Neurological determination of death (NDD), n (%)	6 (20.0%)

MP 4.7. Table 2. Postoperative outcomes among renal transplant recipients

Total number, N	30
Length of hospital stay (days), mean (SD)	14.9 (8.5)
Creatinine decline on POD#1 (%), mean (SD)	18.7 (24.6)
Creatinine decline on POD#7 or day of discharge (%), mean (SD)	52.9 (44.0)
Kidney composite scores, n (%)	
0	0 (0%)
1	0 (0%)
2	0 (0%)
3	1 (3.3%)
4	4 (13.3%)
5	9 (30%)
6	6 (20%)
7	8 (26.7%)
8	2 (6.7%)
Complications	
Patients requiring... n (%)	
Dialysis	6 (20.0%)
Transfusion	8 (26.7%)
Fluid resuscitation	16 (53.3%)
Vasopressors	0 (0%)
Core allograft biopsy	1 (3.3%)
Renal scan	12 (40%)
Renal ultrasound	22 (73.3%)

MP 4.8

Management of mycotic pseudoaneurysms in renal transplant patient: A literature review and proposal of a novel management pathway

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Introduction: Vascular complications represent the main cause of early graft loss in renal transplantations, with less than 1% of these cases developing mycotic pseudoaneurysms. There is a significant mortality rate with this complication, at rates of 15–20%. There have been three renal transplant patients at the University of Alberta Hospital who developed mycotic pseudoaneurysms with different surgical repairs and outcomes. We performed a quality assurance review and a literature review of the surgical management of mycotic pseudoaneurysms and we have proposed a novel management pathway that may help reduce postoperative complications.

Methods: The databases MEDLINE and SCOPUS were searched for all case reports describing management of mycotic pseudoaneurysms in renal transplant patients between years 1990–2022.

Results: Forty-one case reports were identified of mycotic pseudoaneurysms in renal transplant recipients; 61% of cases were repaired with an aortic patch (25/41), 22% with endovascular stenting (9/41), and 12% with an extra-anatomical bypass (5/41). Five percent of patients (2/41) had a post-mortem diagnosis. The failure rate of patch repair resulting in death or repeat surgery was 44% (11/25), the failure rate for stents was 22% (2/9), and the failure rate for extra-anatomical bypass was 0%. Every patient who required a takeback operative procedure was managed with an extra-anatomical bypass.

Conclusions: Considering the high failure rates of aortic patch repairs and endovascular stents, we suggest the first-line strategy for repair should be an extra-anatomical bypass with the assistance of vascular surgery when possible. If this cannot be performed, we suggest a wide surgical debridement with autologous in-line reconstruction. These surgical approaches may help decrease the incidence of surgical failure rates and mortalities. Having a standardized management pathway may allow for improved patient surgical outcomes and graft survival outcomes in the future.

MP 4.9

Baseline frailty and physical functioning status of kidney transplant recipients: A need for prehabilitation

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Introduction: Frailty has been characterized as a clinically recognizable state of physiological decline across many domains, including health, mobility, function, and cognition. Multiple studies have associated frailty with a higher risk of adverse outcomes following kidney transplantation. These adverse outcomes have included an increased risk of delirium, length of stay, delayed graft function, early hospital readmission, and mortality; however, no current guidelines objectively assess the frailty and physical functioning status of kidney transplant candidates. We sought to quantify frailty status and its relationship to physical functioning prior to kidney transplantation.

Methods: We conducted a prospective cohort study at Vancouver General Hospital (VGH) of all eligible transplant recipients between September 2019 and September 2021. Frailty was determined using the Fried Frailty Phenotype (FFP). Physical functioning was assessed using the six-minute walk, 30-second sit-to-stand, and timed-up and go (TUG) tests. Patient characteristics, length of dialysis, and level of physical functioning were compared between frail and non-frail transplant recipients.

Results: Of the 273 participants enrolled, 255 completed the baseline frailty and physical functioning assessment with a mean age of 57.6±13.3 years. Participants were predominately male (57.1%) and on hemodialysis (50.2%). Using the FFP, the prevalence of frailty was 19.6%; this increased to 21.3% for those receiving hemodialysis. Factors associated with frailty included the distance covered during the six-minute walk test (313.0 m vs. 468.9 m, p=0.000), 30-second sit-to-stand (9.1 vs. 13.3, p=0.000), and TUG (12.4 sec vs. 9.0 sec, p=0.000). There were

no significant differences between the frail and non-frail groups with respect to age, BMI, duration of dialysis, location from transplant center, or fatigue levels.
Conclusions: Frailty is highly prevalent in BC patients who are being assessed for kidney transplantation. Our study found a significant difference in levels of physical functioning between the frail and non-frail groups. There was no significant difference in frailty status when compared to length of dialysis. These results highlight the potential utility of prehabilitation to improve physical functioning and slow the progression of frailty preoperatively. Further study is required to determine the impact that prehabilitation and frailty status may have on postoperative recovery.

MP 4.10

Reconsidering draping in cystoscopy: A sustainability audit in urology

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Introduction: Cystoscopy is a mainstay of urological practice, critical to the diagnostic investigation and treatment of numerous pathologies. It is performed in a variety of settings, from bedside to the operating room, with variable incidence of urinary tract infections (UTIs) depending on setting and infection control protocol. At the McGill University Health Centre (MUHC), cystoscopy is performed with patients fully draped in a sterile room. Given the present climate crisis, reducing healthcare waste is of critical importance. Despite the central role of cystoscopy in urology, there is scant data on its environmental impact from a waste perspective.
Methods: A cross-sectional waste audit was conducted at the MUHC cystoscopy suite, with a particular focus on disposable equipment and drapes. Waste from each case performed over a single half-day was segregated and weighed according to the categories outlined in Table 1. Average daily waste per category was calculated based off the number of cases for the afternoon (n=8) and scaled to the average number of booked cases per day in August and September 2022 (n=16). Calculated daily averages were then extrapolated for 46 workweeks per year, i.e., 230 days, to account for holidays and weekends.
Results: On average, patient drapes generated in 295 g of plastic waste (range 294–305 g), representing 22–30% (mean 26%) of case waste by weight. Drapes were the second most important contributor to overall waste, behind nursing waste. Waste per category is presented in Table 1. The estimated annual waste generated by cystoscopy at our institution was 4140.0 kg (range 3742.6–4692.0 kg). Of this, roughly 1085.6 kg (range 1081.9–1122.4 kg) corresponded to waste generated by patient drapes alone.
Conclusions: Reducing drape usage for simple cystoscopy has the possibility of significantly decreasing the environmental footprint of urological practice, with potentially minimal impact on the incidence of post-cystoscopy UTIs.

MP 4.11

Environmental performance of kidney replacement therapy: Comparative lifecycle assessment of dialysis and kidney transplantation

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Introduction: Healthcare delivery is energy and resource-intensive and is associated with a considerable amount of greenhouse gas (GHG) and other pollutant emissions. These environmental impacts adversely affect human health, which is at odds with the sector's core mandate. Emissions from continuous building operations and resource-intensive supply chains, including pharmaceuticals and medical devices, are mainly responsible for these high impacts. End-stage renal disease (ESRD) is often treated with resource-intensive kidney replacement therapies (KRT), including dialysis and kidney transplantation. Although the relative health and economic impacts of various KRTs have been examined, their environmental impacts have received little attention. This study aimed to assess

MP 4.10. Table 1. Summary of audited weights from eight cases

	Patient drapes	SG	SG packaging	NG	NG packaging	Saline bag	Tubing	Clamp	Lidogel™	Nursing table	Miscellaneous	What other?	Calculated total	Weighed total
Case #1	279 (22.2)	46 (3.7)	11 (0.9)	21 (1.7)	N/A	37 (2.9)	79 (6.3)	18 (1.4)	N/A	407 (32.4)	195 (15.5)	2 x 5 Fr, Guidewire + case, 2 x 20 cc + 10 cc syringe	1093	1257
Case #2	288 (22.6)	23 (1.8)	16 (1.3)	14 (1.1)	N/A	50 (3.9)	118 (9.3)	18 (1.4)	11 (0.9)	469 (36.8)	N/A	Unused povidone-iodine	1007	1275
Case #3	305 (30.0)	23 (2.3)	8 (0.8)	15 (1.5)	6 (0.6)	37 (3.6)	114 (11.2)	18 (1.8)	17 (1.7)	365 (35.9)	N/A		908	1017
Case #4	297 (26.6)	23 (2.1)	8 (0.7)	15 (1.3)	6 (0.5)	36 (3.2)	83 (7.4)	18 (1.6)	N/A	421 (37.7)	N/A		907	1118
Case #5	297 (28.0)	23 (2.2)	8 (0.8)	30 (2.8)	5 (0.5)	37 (3.5)	80 (7.5)	18 (1.7)	16 (1.5)	359 (33.9)	N/A		873	1060
Case #6	294 (28.6)	23 (2.2)	8 (0.8)	21 (2.0)	N/A	39 (3.8)	82 (8.0)	18 (1.8)	16 (1.6)	476 (46.3)	N/A		977	1027
Case #7	295 (25.1)	23 (2.0)	8 (0.7)	21 (1.8)	5 (0.4)	39 (3.3)	80 (6.8)	18 (1.5)	16 (1.4)	557 (47.3)	N/A	16 Fr Foley	1062	1177
Case #8	302 (27.4)	23 (2.1)	5 (0.5)	13 (1.2)	6 (0.5)	38 (3.5)	81 (7.4)	18 (1.6)	18 (1.6)	472 (42.9)	46 (4.2)	20 cc + 50 cc syringe	1022	1101
Average	294.5 (26.2)	25.1 (2.2)	8.6 (0.8)	18.1 (1.6)	5.6 (0.5)	38.9 (3.5)	88.5 (7.9)	18 (1.6)	15.5 (1.4)	436.5 (38.8)	94.7 (8.4)		978.3	1125.3

Data presented in grams (and percent of total). Nursing table waste (standard cystoscopy kit containing: irrigation set packaging, gauze, sterile lubricant, povidone-iodine preparation sponges and packaging, irrigation stopcock packaging, two small measuring/sample containers, one circular and one kidney basin, one clear tray, miscellaneous plugs, disinfecting wipes, table drape, cystoscopy kit blue wrap).

the environmental performance of primary modes of KRT in British Columbia, Canada.
Methods: A process-based life cycle assessment study was performed on three KRT modalities: 1) deceased donor kidney transplantation (DDKT); 2) chronic incentre hemodialysis (ICHD); and 3) automated peritoneal dialysis (APD). Environmental impact related to energy and material consumption per therapy/ patient/ the year was quantitatively evaluated. A lifecycle assessment tool, SimaPro (version 8.3.0.0), was used to analyze the inventory data. The ReCiPe (World) endpoint H and midpoint H methods were used to compare and evaluate the environmental impact of all modalities.
Results: The ReCiPe midpoint assessment results declared that out of 18 environmental impact categories, 14 are highly impacted by the ICHD, followed by APD and DDKT. ICHD and APD had considerably higher climate impact (621 kgCO2eq/person/year and 408 kgCO2eq/person/year, respectively) than DDKT (75.1 kgCO2eq/person/year). The ReCiPe endpoint assessment also showed that ICHD has the highest impact on human health and ecosystem, while for resources, APD showed the highest impact. Patient travel in ICHD, waste management in APD, and procedure energy consumption in DDKT were the highest contributors to these environmental impacts.
Conclusions: The study demonstrates a considerable disparity in environmental impacts across different modes of KRT, with DDKT associated with the least environmental harm. When comparing dialysis modalities, APD is more environmentally preferable than ICHD and could be considered for more prevalent use. In combination with existing clinical and economic data, these results could enlighten policy and decision-makers to optimize the delivery of chronic kidney care.
Acknowledgements: The authors would like to acknowledge the staff and nurses of the OR and dialysis unit, biomedical engineers at Vancouver General Hospital (VGH), and industrial partners, including Daniels Waste Management Company and K-bro Linen, for providing us with the primary information for this study.

MP 4.12

A prospective analysis of patient-reported tolerability and surgical success of scrotal and penile urological procedures under conscious sedation

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Introduction: The standard of care for most urological procedures is the administration of general or spinal anesthesia (GA), requiring the operating room (OR). This poses significant challenges with OR costs, resources, accessibility in rural areas, and patient wait times. This is especially true for penile and scrotal procedures in Canada, often treated non-urgently with wait times exceeding six months. Our study aims to examine surgical and patient-reported outcomes for penile and scrotal urological procedures under conscious sedation (CS) as a viable alternative.
Methods: Adult patients undergoing penile or scrotal surgery under CS with or without local anesthesia have been enrolled since August 2022, and is ongoing. Demographics, surgeon-reported and patient-reported visual analogue scales, and surgical variables are collected. Using a standardized questionnaire, patient tolerability and future anesthetic choice are assessed at the 4–6-week followup appointment. Statistical tests will include analyses to determine associations between demographic or surgical variables and patient-reported outcomes. This prospective study is registered as a clinical trial NCT05617261.
Results: Thus far, 113 patients are enrolled with complete followup data on 44 patients. The mean age ± SD is 42.2±16.4 years and there has been a 100% success rate with no perioperative complications. At followup, 89% of patients indicated they would recommend CS to others, with 75% opting for CS for a future procedure. Of the 25% opting for GA, only 2/11 patients did so due to excess pain, highlighting that patient tolerability is not a limiting factor; instead, a desire to have no memory of the procedure is prevalent.
Conclusions: CS is a promising technique for various scrotal and penile urological procedures, with high levels of patient tolerability. As we continue our analysis, we anticipate data highlighting cost savings to our public healthcare system, and a substantial reduction in patient wait times and surgical and recovery times.

UP 4.1

Immediate rewarming of the kidney with cooling techniques during transplant anastomosis is associated with delayed graft function

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Introduction: Cooling techniques have been used to minimize warm ischemia during the anastomosis of blood vessels in renal transplant training centers. In our center, our cooling technique uses a layer of crushed ice wrapped around the kidney in a RAY-TEC sponge during vascular anastomosis. This ice jacket is then immediately removed during reperfusion. We hypothesized that the ice jacket would reduce delayed graft function (DGF), as well as improve three-month and 12-month renal function in donation after cardiac death (DCD) renal transplants.
Methods: We analyzed a single-center database of DCD renal transplant recipients from 2006–2020. Pediatric donors and donations after euthanasia were excluded. We analyzed recipient and donor demographics, surgery information, and outcomes up to one-year post-transplant. SPSS was used for statistical analysis.
Results: Of the 197 DCD kidney transplants identified, the ice jacket technique was used in 21 (11%) transplants. The mean anastomotic times were similar between ice jacket cases and controls (46 minutes vs. 48 minutes, p=0.14). Surprisingly, we found that recipients with the ice jacket had significantly higher rates of DGF than the control patients. Of the 21 ice jacket patients, 17 experienced DGF (81%), which was significantly higher than the 52% DGF rate in the control group (p=0.04); however, we found no statistically significant difference in three-month creatinine or 12-month creatinine levels (p=NS). As a part of a subgroup analysis, we also found no statistically significant difference in DGF, three-month, or 12-month creatinine levels between those with anastomotic times of <30 minutes, 30–40 minutes, and >40 minutes.
Conclusions: Rapid rewarming with our cooling technique was associated with high rates of DGF vs. controls; however, there was no difference seen in intermediate-term renal function. While the cooling technique may minimize warm ischemia, immediate rewarming may cause worse reperfusion injury. Strategies that allow controlled rewarming when using cooling devices for training purposes should be investigated.

UP 4.2

Non-invasive measurement of intrarenal temperatures of porcine kidneys during simulated kidney donation

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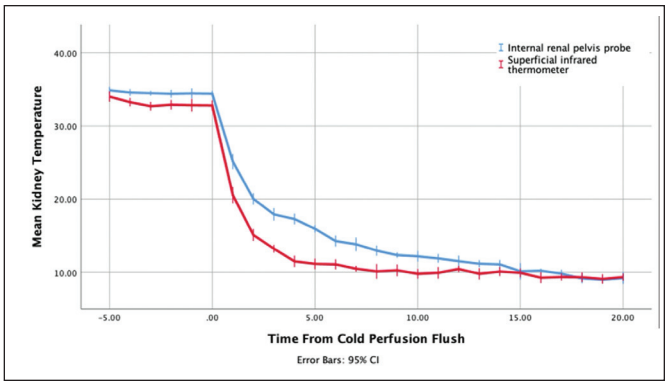
Introduction: Rapid cooling of kidney grafts after procurement surgery is essential to reducing organ storage injury. The technique to assess kidney temperatures has not been standardized. Invasive parenchymal probes have been used to measure internal temperature, while non-invasive methods, such as surface probes or infrared thermometers, only measure superficial temperatures. A ureteric probe inserted into the renal pelvis offers a non-invasive method of measuring the kidney's internal temperature. We aimed to assess intrarenal kidney temperatures during simulated porcine kidney procurements.
Methods: Six porcine kidneys underwent a simulated open donor nephrectomy. The kidneys were flushed with 4°C HTK solution, in a basin of cold saline with ice. Before flushing the kidney, a thermocouple was inserted retrograde through the ureter into the renal pelvis and connected to a portable vital signs monitor. The superficial temperature was taken using an infrared thermometer aimed at the lateral interpolar region of the kidney. Measurements were taken every minute, from five minutes prior to flush until 20 minutes after flush. SPSS was used for statistical analysis.
Results: We saw a significant difference in temperature measurements between the intrarenal temperature probe and the superficial infrared thermometer. Inter-experimental differences were minimal. For the first five minutes after the flush, the intrarenal temperature had a mean of 19.2° C, while the superficial temperature was 14.3° C (p=0.001). Between five and 10 minutes, the intrarenal temperature had a mean of 13.1° C, while the superficial temperature was 10.3° C (p=0.002). Between 10 and 15 minutes, the intrapelvic temperature

was 11.1°, while the superficial temperature was 10.0° C (p=0.012); however, temperature differences were not seen beyond 15 minutes post-flush (Figure 1). **Conclusions:** The ureteric probe measuring intrarenal temperature dropped slower than the superficial temperature measured with an infrared thermometer in our clinically relevant model. Beyond 15 minutes, superficial and internal temperatures were identical. These data provide a basis for temperature assessment in ongoing laboratory and clinical research with regard to optimizing temperatures for kidney preservation and protection prior to transplantation.



UP 4.2. Figure 1. Internal and superficial temperature of kidney during cold flush.