ACVS

AMERICAN COLLEGE of VETERINARY SURGEONS

WEBINAR

ACVS

AMERICAN COLLEGE of VETERINARY SURGEONS

SMALL ANIMAL SURGICAL SAFETY, EFFICIENCY, TEACHING, AND MORE

NOVEMBER 12, 2020 | 6:00–8:00 P.M. ET

WILLIAM HAWKER

01

Surgical Safety Checklist (SSC) Implementation

William T. G. Hawker BVSc, MANZCVS (small animal surgery), Ameet Singh DVM, DVSc, DACVS, Thomas W.G. Gibson DVM, DVSc, DACVS, Michelle A. Giuffrida VMD, DACVS, J. Scott Weese DVM, DVSc, DACVIM (Large Animal)

- Dr. William Hawker BVSc, MANZCVS (small animal surgery)
  Resident in Small Animal Surgery
  The Ontario Veterinary College

ACVS
ABSTRACT
PRESENTATION

Image: https://theconversation.com/im-having-surgery-in-a-public hospital-will-a-junior-doctor-operate-on-me-106710

Conflict of Interest

I hereby certify that, to the best of my knowledge, no aspect of my current legal, personal or professional situation might reasonably be expected to affect my views on the subject on which I am presenting.

What are SSCs?

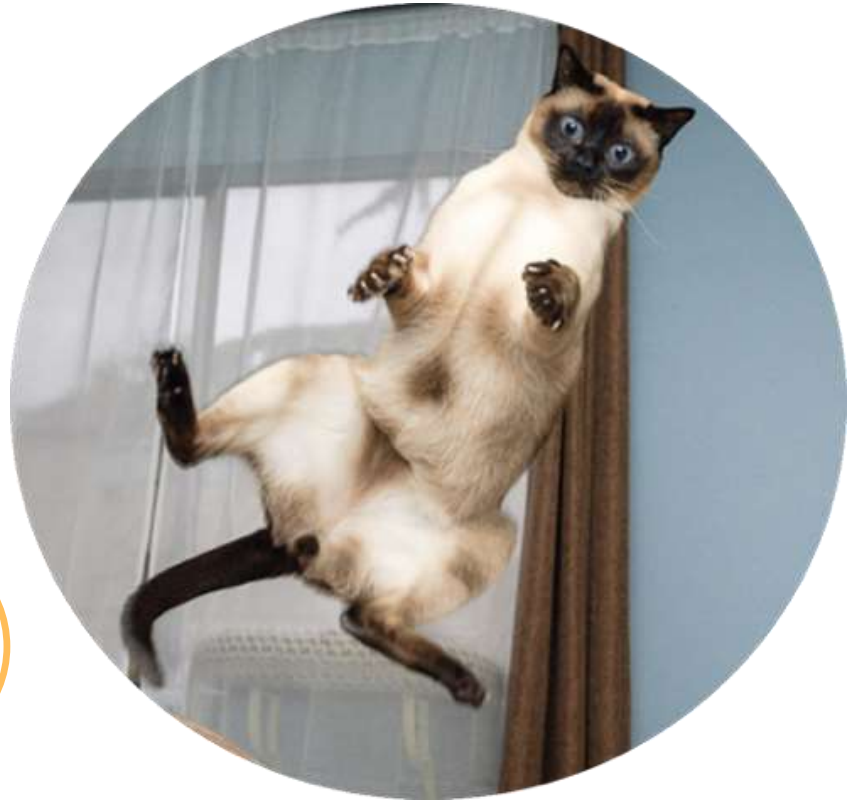
- Pioneered by aviation
- Adapted by the World Health Organization

Image: https://structurae.net/en/structures/world-health-organization-headquarters

Purported Benefits

- REDUCED MORTALITY

~48%



- REDUCED MORBIDITY

~36%

Image: https://www.businessinsider.com/9-reasons-to-own-a-dog-2014-12;
https://www.boredpanda.com/jumping-cats/?utm_source=google&utm_medium=organic&utm_campaign=organic

- MIMICS MEDICAL LITERATURE

- Decreased morbidity
- Reduced complications
- Mortality??

What about the veterinary literature?

- ARE THE FINDINGS CONSISTENT?

- Dose dependent effect between checklist use and outcomes

- VETERINARY IMPLEMENTATION RATES?

- Kilbane et al (2020)

8.4%

COMPLETELY FILLED

SSC IMPLEMENTATION PRESENTATION

STUDY OBJECTIVES/ DESIGN

OBJECTIVE

To determine the use and barriers to uptake of a SSC

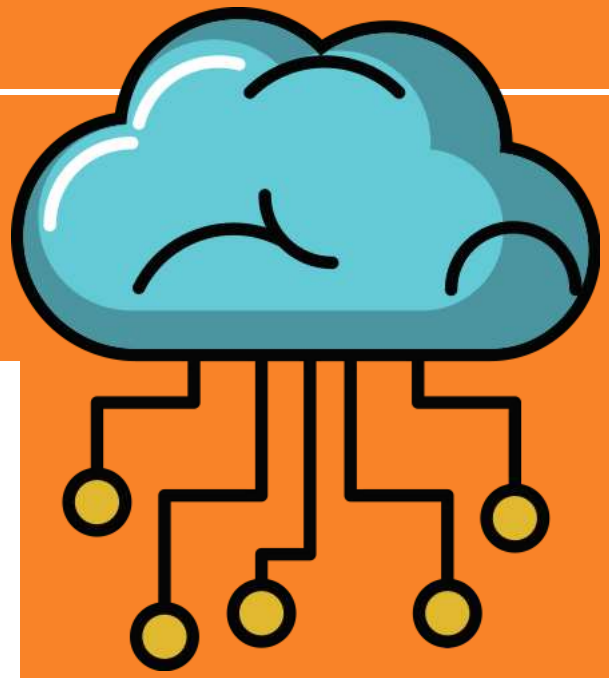
STUDY DESIGN

Retrospective study and online survey

SAMPLE POPULATION

All personnel active in surgery between Oct 2nd, 2018 - Jun 28th, 2019

Methods



D SSCS

Pre-Operative

To Be Completed Out Loud Before Skin Incision

- ☐ Introduction of the surgical team
- ☐ **Anesthesia:** Confirm the patient's name
- ☐ **Surgeon:** Confirm procedure and site(s).
- ☐ Radiographs in OR **Y / N**

To Surgeon

- ☐ What are the critical or non-routine steps?
- ☐ Expected duration of procedure? _____
- ☐ Anticipated blood loss

♦ Minimal < 5% ♦ Moderate 5-10% ♦ Severe > 10%

If Moderate or Severe, ask:

- ☐ Has the patient been blood typed?
- ☐ Are blood products available?
- ☐ Are biopsies or samples being collected? **Y / N**

Y – Is the sample being inked **Y / N**

To Anesthesia

- ☐ Has antibiotic prophylaxis been given within the last 45 minutes? **Y / N**
- ☐ Can this patient receive an NSAID? **Y / N**
- ☐ Do you have any patient specific concerns?

To OR Tech

- ☐ Is all the equipment present in the room?
- ☐ Are there any equipment concerns?
- ☐ **Pre- Operative Sponge Count**

Lap Sponges:_____

Gauze Squares:_____

Post-Operative

To Be Completed Out Loud Before Patient Leaves the OR

- ☐ Planned procedures have been completed
- ☐ Sharps have been placed in the green tray
- ☐ Is post-operative imaging needed? **Y / NA**

Y- Has Radiology been notified? **Y / N**

- ☐ Is bandaging required **Y / N**
- ☐ Equipment concerns have been reported
- ☐ Purse string has been removed? **Y / NA**
- ☐ Is a urinary catheter required? **Y / N**

Y- Have supplies been gathered? **Y / N**

To Surgeon

- ☐ Person to contact the owner has been identified

To Anesthesia

- ☐ Recovery location? **ICU / IMC / Wards**
- ☐ Any recovery concerns

To OR Tech

- ☐ **Post Op Sponge Count**

Lap Sponges:_____

Gauze Squares:_____

Statistics

- Univariable analysis: Fisher's exact, and χ2 tests

- Normality testing: Shapiro-Wilk

Results

ATTITUDES

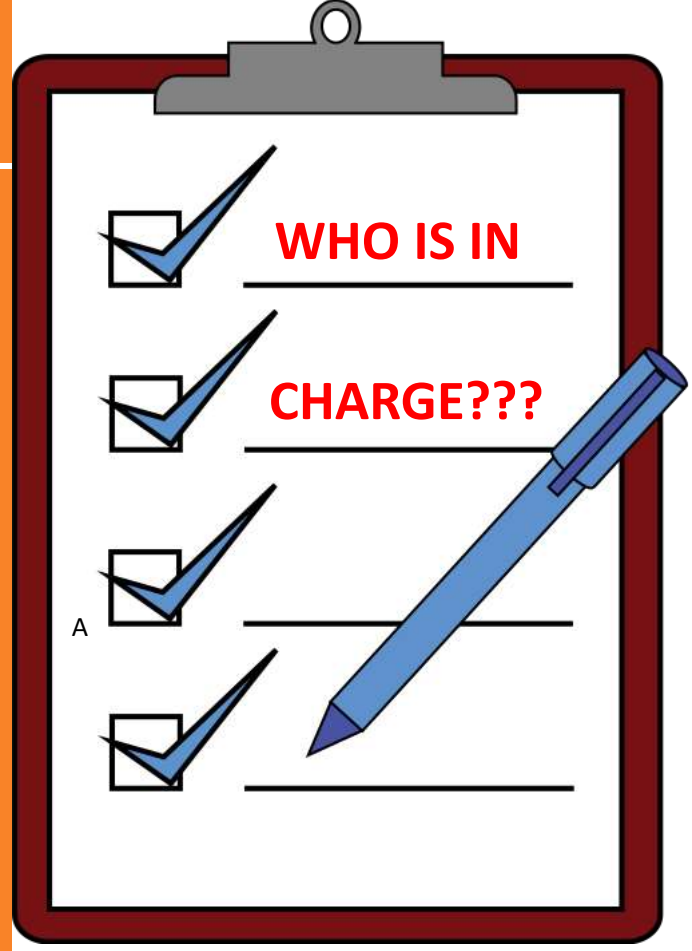
42%

Table 2: Survey demographics

Respondent position		Respondent roles	
Faculty	13 (21)	Anaesthesia	38 (61)
Resident	10 (16)	Surgery (scrubbed in)	39 (63)
Veterinary technician	18 (29)	Operating room staff	8 (13)
Rotating intern	3 (5)		
Final year veterinary student	18 (29)		

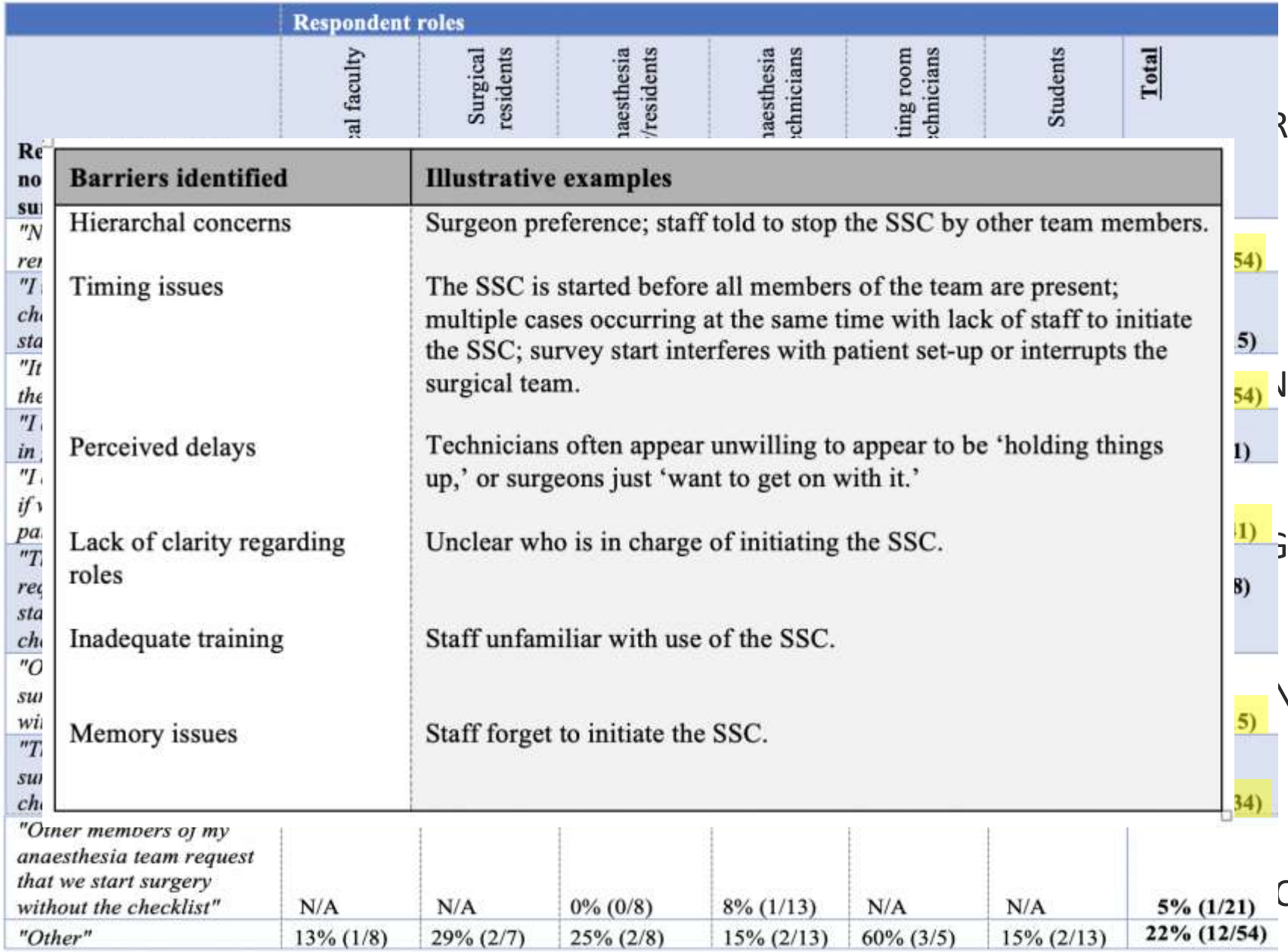
* N = 62. Data are n (%).

† Respondents were allowed to identify as undertaking more than one role, and thus the total number of responses (n = 85), does not equal the total number of respondents (N = 62).



Barr

Barriers identified	Illustrative examples
Hierarchal concerns	Surgeon preference; staff told to stop the SSC by other team members.
Timing issues	The SSC is started before all members of the team are present; multiple cases occurring at the same time with lack of staff to initiate the SSC; survey start interferes with patient set-up or interrupts the surgical team.
Perceived delays	Technicians often appear unwilling to appear to be 'holding things up,' or surgeons just 'want to get on with it.'
Lack of clarity regarding roles	Unclear who is in charge of initiating the SSC.
Inadequate training	Staff unfamiliar with use of the SSC.
Memory issues	Staff forget to initiate the SSC.



Ongoing iterative feedback

Showing 'why' and 'how'

Engage essential personnel

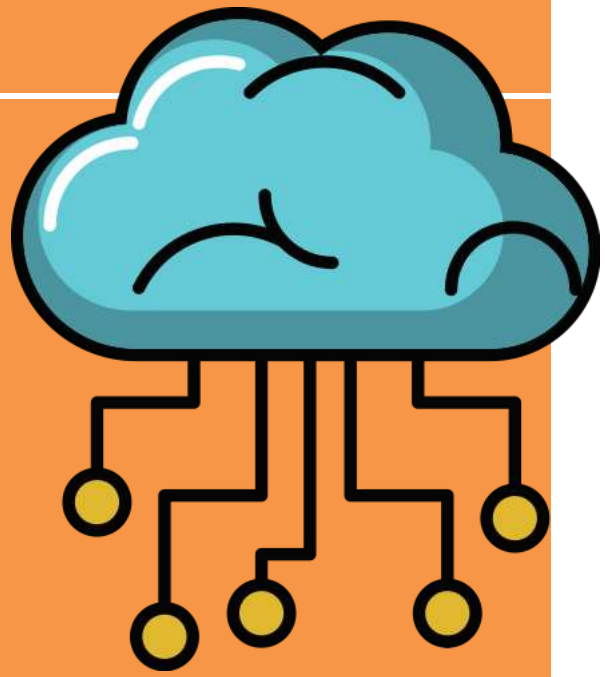
WHAT IS THE CLINICAL SIGNIFICANCE??

Designated roles

Active not passive exercise

Training, training, training!

Take home messages



- SSC benefits may be reliant on usage rates
  - Dose-dependent effect
  - There may be no benefit to having a poorly implemented SSC over having no SSC at all…
- It is not enough to just ‘introduce’ a SSC, it must be EFFECTIVELY implemented
- Training, training, training!!

1. Haynes AB, Weiser TG, Berry WR, et al. A Surgical Safety Checklist to Reduce Morbidity and Mortality in a Global Population. *New England Journal of Medicine*. 2009;360(5):491-499.

2. Launcelott ZA, Lustgarten J, Sung J, Samuels S, Davis S, Davis GJ. Effects of a surgical checklist on decreasing incisional infections following foreign body removal from the gastrointestinal tract in dogs. *Can Vet J*. 2019;60(1):67–72.

3. Bergström A, Dimopoulou M, Eldh M. Reduction of Surgical Complications in Dogs and Cats by the Use of a Surgical Safety Checklist. *Veterinary Surgery*. 2016;45(5):571-576.

4. Haugen AS, Søfteland E, Almeland SK, et al. Effect of the World Health Organization Checklist on Patient Outcomes. *Annals of Surgery*. 2015;261(5):821-828.

5. van Klei WA, Hoff RG, van Aarnhem EEHL, et al. Effects of the Introduction of the WHO "Surgical Safety Checklist" on In-Hospital Mortality. *Annals of Surgery*. 2012;255(1):44-49.

6. de Vries EN, Prins HA, Crolla RM, et al. Effect of a Comprehensive Surgical Safety System on Patient Outcomes. *New England Journal of Medicine*. 2010;363(20):1928-1937.

7. Conley DM, Singer SJ, Edmondson L, Berry WR, Gawande AA. Effective Surgical Safety Checklist Implementation. *American College of Surgeons*. 2011;212(5):873-879.

8. Putnam LR, Levy SM, Sajid M, et al. Multifaceted interventions improve adherence to the surgical checklist. *Surgery*. 2014;156(2):336-344.

9. Kilbane H, Oxtoby C, Tivers MS. Staff attitudes to and compliance with the use of a surgical safety checklist. *Journal of Small Animal Practice.* 2020; doi.org/10.1111/jsap.13131

References

IAN NICHOLSON

Adverse Event Grading in Veterinary Surgery

A New System for Grading Peri- and Post-Operative Adverse Events

Nicholson I, Swinbourne F, Jeffery N, Charlesworth T, Freeman A, Hall J, Hattersley R, de la Puerta B, Ryan T, Tivers M

ECVS
European College of Veterinary Surgeons

Declaration of interests

- Director Island VetCare Ltd, UK
- Director Petsmiths, UK
- Founder, and Committee member, of AVSTS Research Cooperative (ARC)

- I hereby certify that, to the best of my knowledge, no aspect of my current legal, personal or professional situation might reasonably be expected to affect my views on the subject on which I am presenting

Introduction

- Surgery
  - Aims to diagnose, improve, or cure
  - Can injure patient, or worse
  - “First do no harm”
- What makes a good surgical procedure?
  - Big, predictable, positive outcomes
  - Rare, mild, negative outcomes
  - Other (easy to learn/teach, low cost, no fancy kit etc)

Adverse events

How do we assess these outcomes?

Introduction – Adverse Event Reporting

- **Adverse event definition in this study: “deviation from the ideal, planned, treatment course for this specific patient, according to expectations at the time”.**

- There is no consistent recording or reporting of surgical harm in veterinary practice

- Swinbourne and others, JSAP (2017) 58(9):495-503
- Follette and others, Vet Surg (2020) 49:61–69

Introduction – Adverse Event Reporting

- This means it is currently difficult to understand fully, or communicate reliably, the expected outcome of any veterinary surgical procedure
- Without consistent and systematic adverse event recording or reporting, it is not possible to compare or combine published studies effectively, or to audit individual surgeons, hospitals, or new techniques, consistently

AVSTS

Introduction – Adverse Event Reporting

- Human surgery:
  - Clavien-Dindo classification system widely used
  - 0-5 scale, ranking complications according to the degree of intervention needed to address the complication

Introduction – Clavien-Dindo system

- Grade 0 – no complication
- Grade 1 – no additional treatment, or extra “peri-op” drugs only
- Grade 2 – additional medical treatment
- Grade 3 – additional interventional treatment
- Grade 4 – life-threatening complication
- Grade 5 – patient death
  - Add “D” if complication results in disability
  - Does not include all adverse events
    - Failure to cure
    - Sequelae

Human vs Veterinary surgery

Euthanasia = adverse event

Introduction – Objectives and Hypothesis

- Stage 1
  - To test the Clavien-Dindo system ("original grading system" or OldGS), including euthanasia category, on veterinary surgical adverse event cases, measuring inter-rater reliability
- Stage 2
  - To create a "new grading system" (NewGS) suitable for veterinary patients, by refining the grade descriptions and the guidelines for their use
  - To test the NewGS on the same adverse event cases, and compare inter-rater reliability with the OldGS

Null hypothesis: there would be no difference in inter-rater reliability between OldGS and NewGS

Methods

- Case data used from previous study into GI biopsy dehiscence
  Swinbourne and others, JSAP (2017) 58(9):495-503
- 368 case summary paragraphs prepared, with case data and adverse event data (“cases”)
- AVSTS members recruited to grade cases (“graders”), and each provide 5-10 adverse event case summary paragraphs using their own cases
- Each grader used OldGS to record: a single complication grade for each case summary paragraph; and a free-text comment if they wished
  - highest grade used if multiple Cx occurred

Methods

- Problems implementing OldGS assessed by analysis of comments
  - Emerging themes of common difficulties discussed amongst graders
  - New grade descriptions agreed by consensus
  - New guidelines for implementing the grading system agreed by consensus

- Graders used NewGS to re-grade all cases
  - Recorded all adverse events; highest grade; free-text comment

Methods – Data analysis

- Mode grade determined for all OldGS and New GS cases
  - Where equal numbers of graders had used different grades, highest grade used
- Agreement between graders was estimated for OldGS and NewGS
  - Using mode grade allocated for each case
  - Unweighted Cohen's kappa coefficient and confidence intervals (Stata 14, StataCorp, College Station, TX) calculated
- Null hypothesis: confidence intervals of kappa values for OldGS and NewGS would overlap

Null hypothesis: there would be no difference in inter-rater reliability between OldGS and NewGS

Results

- 9 graders (all ECVS-boarded surgeons)
- 83 grader-origin cases added to 368 GI biopsy cases = 451 cases overall

Results – NewGS grades and guidelines

- **Key differences from OldGS:**
  - Clarified grade descriptions, relevant to veterinary (not human) patients
  - Guidelines designed to clarify common controversies
    - Initially, all vets will be novice users of any new adverse event grading system
  - ALL adverse events graded, not just complications
  - Disability (“D”) and Euthanasia (“E”) suffices added, as for OldGS
  - SOURCE of adverse event now recorded once adverse event grade allocated
    - Complication (no prefix)
    - Failure to Cure (“FTC” prefix)
    - Sequela (“S” prefix)

Results – NewGS grades and guidelines

- **Grade 0** - No adverse event
- **Grade 1** - Adverse event occurred
  - BUT patient received NO additional treatment/diagnostics to address the adverse event
  - OR received additional commonly-used peri-operative supportive medical or nursing treatments
  - OR additional non-invasive diagnostics

Results – NewGS grades and guidelines

- **Grade 2** - Adverse event occurred and patient received additional, more advanced, medical or nursing treatments (or diagnostics) not included in grade 1, to diagnose and/or treat the adverse event
- **Grade 3** - Adverse event occurred, and patient received additional surgical treatment to address this
- **Grade 4** - Life-threatening adverse event occurred
- **Grade 5** - Patient death occurred

Results - Euthanasia

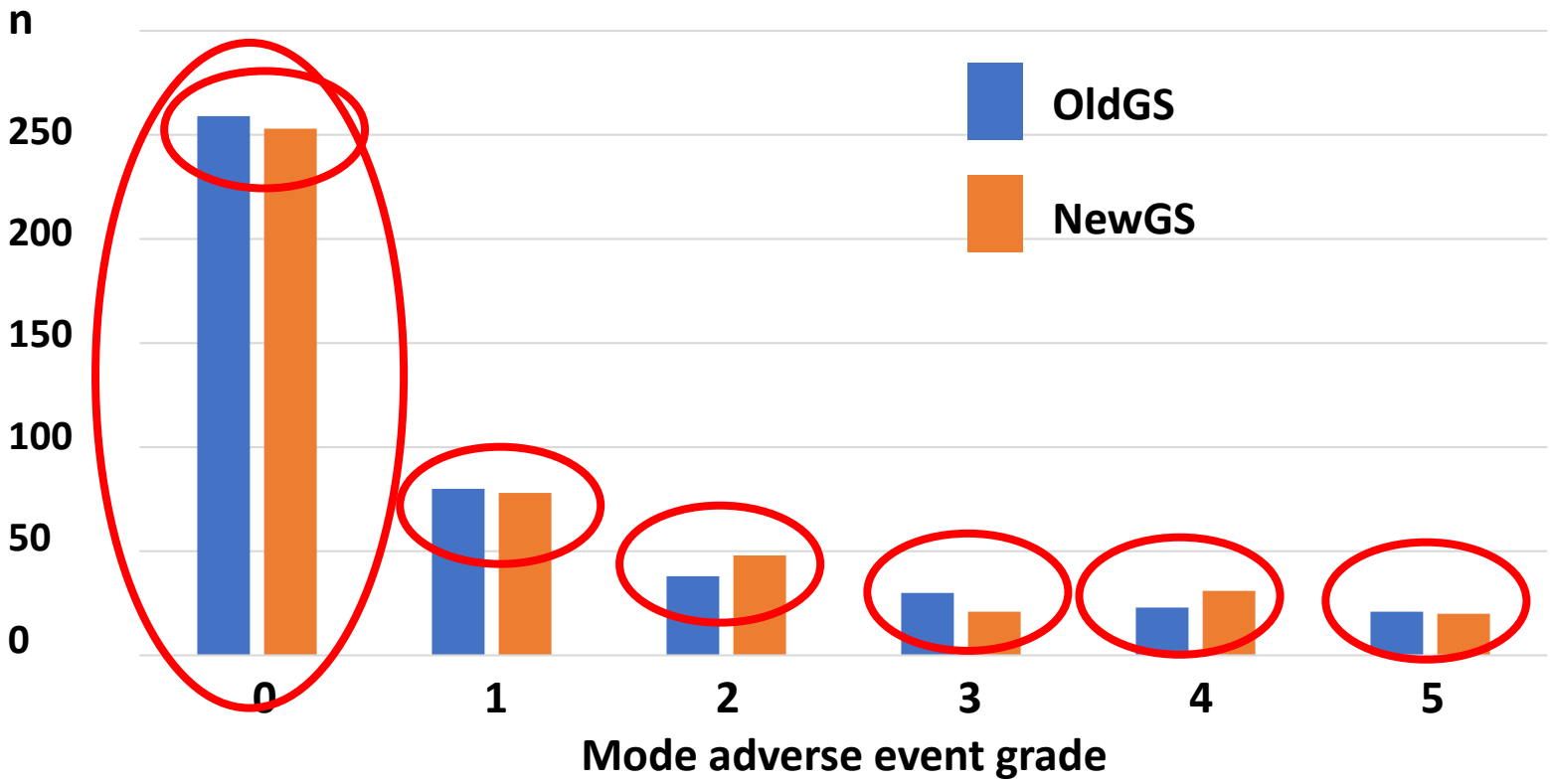
- 28 of 451 cases underwent euthanasia, 423 did not
- All graders allocated “E” correctly for every case, with the exception of six assessor-case mistakes (out of 8118 assessor-cases)
  - error rate of 0.07%

Results – Disability, and Source of Adverse Event

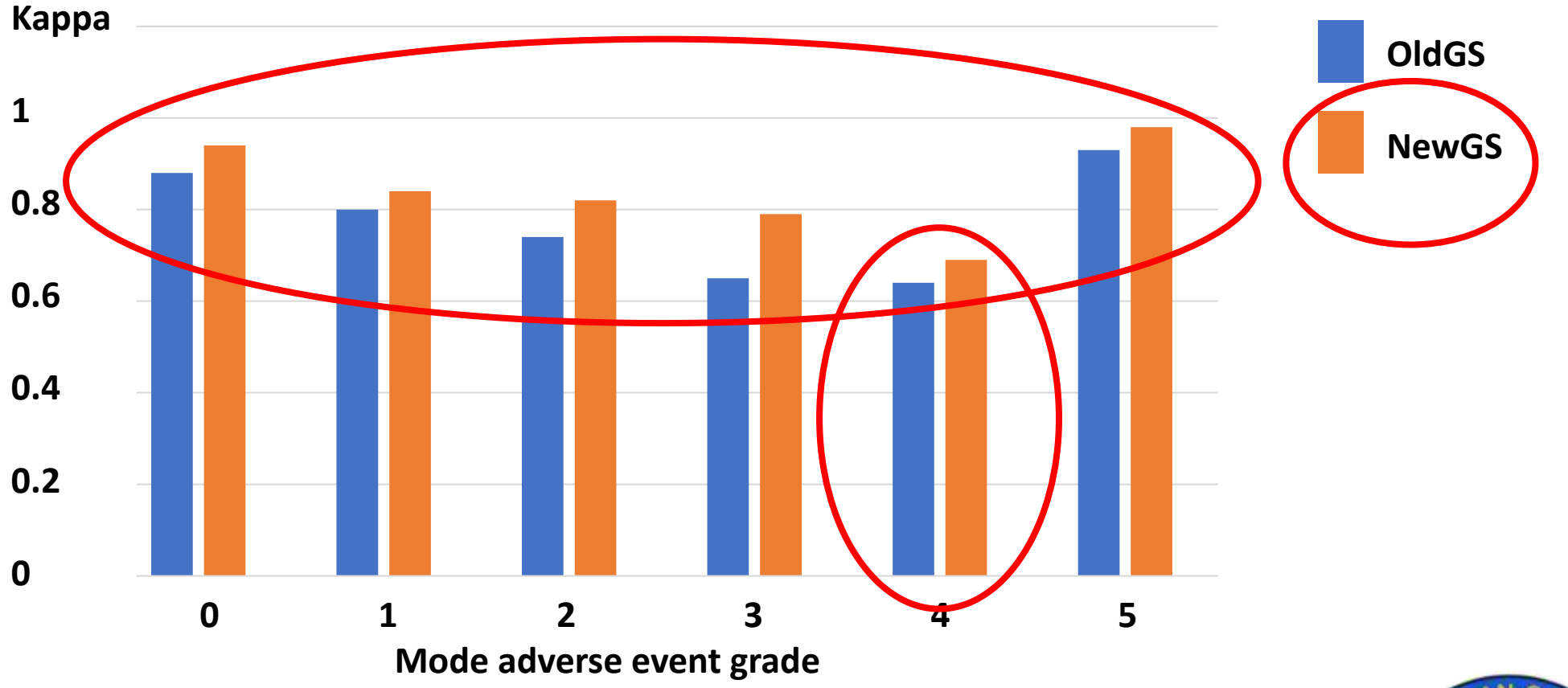
- Disability
  - 2/451 cases (OldGS) or 4/451 (NewGS) had the majority of graders use suffix D

- Source of Adverse Event. Majority of graders allocated:
  - Failure to Cure – 9/451 cases
  - Sequelae – 0/451
  - Complications – 442/451

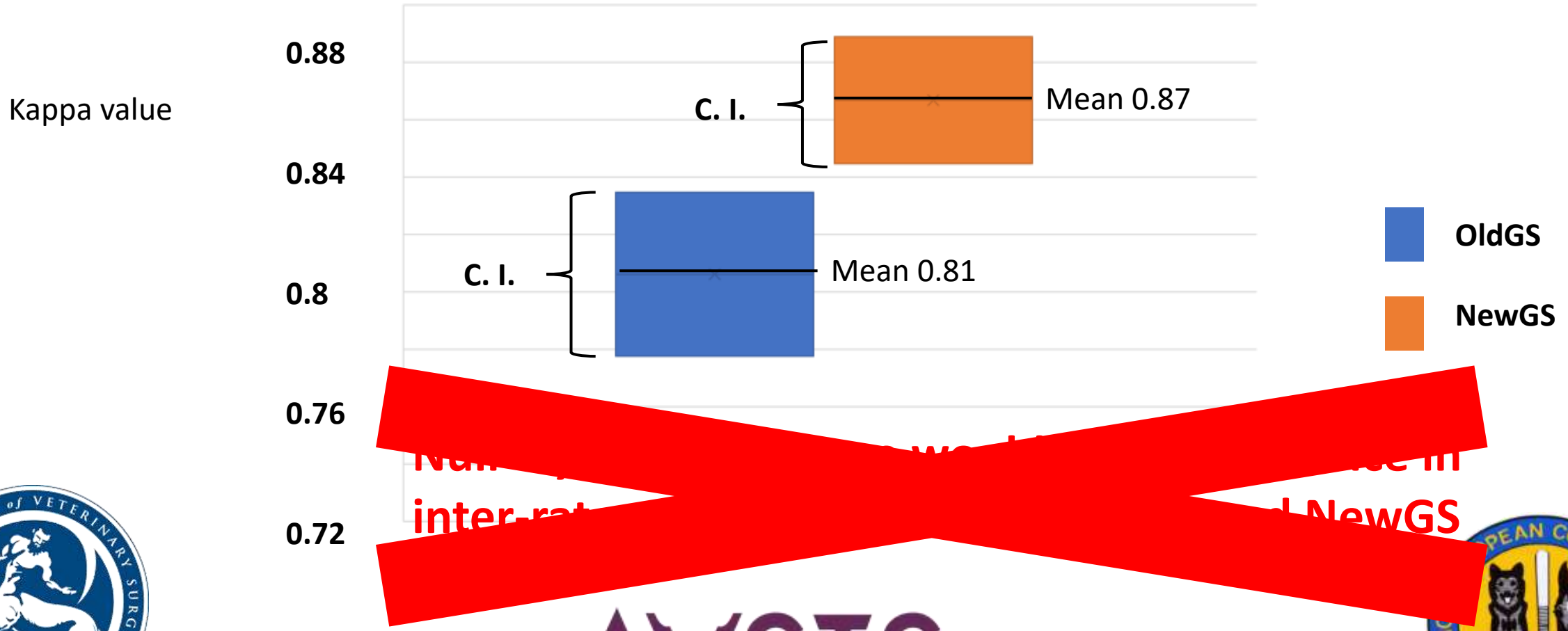
Results – Adverse event grades



Results – Agreement for each grade



Results – Overall Agreement OldGS vs NewGS



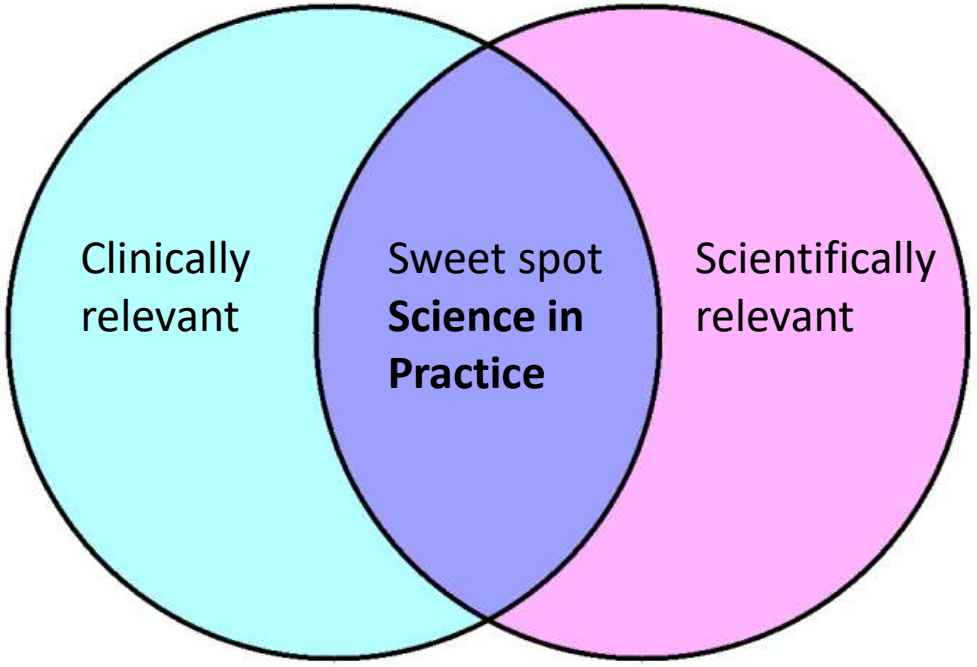
[redacted]

Discussion – Scientific and Clinical Relevance

- First study to look in detail at systematic Adverse Event grading in veterinary surgery
- Important area to study and develop
- Building a common language for surgical harm recording and reporting
  - Help Clinicians be more scientific with self-audit and with publications
  - Published studies should become comparable/combinable, to allow meta-analysis

Discussion – Scientific and Clinical Relevance

- Help Quality Improvement for individual vets, practices, and surgical procedures



AVSTS

Discussion - Limitations

- Improvements in agreement may have related to experience of graders, gained during this study
  - Perhaps – however four years between gradings
  - Guidelines allow sharing of this experience for others to build upon

Discussion - Limitations

- Study design meant graders were more distant to cases than would normally be expected to be the case when NewGS used in practice or in publications
  - Agreement likely underestimated

Discussion - Limitations

- Not enough data to assess “D”, and Adverse Event Source
  - Study design – GI biopsy dataset
  - Unfamiliarity of these terms by graders, and vets in general
  - Ability to determine “D” is critical for checking holistic impact of procedure on patient
  - Ability to distinguish between Complications and Failure to Cure is also critical in helping use surgical outcomes to assess surgeons/centres
    - “how well are they doing the job?”
    - “how well does this procedure actually work when it is performed technically well?”
  - **Authors recommend recording “D” and Adverse Event Source in future work in this area, which is needed**

Discussion - Limitations

- Least agreement for Grade 4 (Life-threatening) adverse events, even with NewGS
  - Accordion system drops Grade 4 altogether, due to it being subjective
  - Could re-run this study dropping Grade 4
  - Authors feel “Life-threatening” is an important term the allows stratification of risk in communications around surgical procedures
    - **Better to keep this term and work to improve definitions**

Discussion - Limitations

- Is this system useful for GI biopsy cases, or is it broader?
  - 83 cases were “mixed bag” of ortho, neuro, and soft tissue surgeries
  - More work needed testing system on more cases, in different scenarios, with more numbers and types of graders
  - Likely further refinement of grade descriptors/guidelines will need to be considered

Discussion - Limitations

- How should the NewGS be used by individuals, practices, hospitals, and journals?
  - This study was not designed to answer this – big area for future collaborative work

Discussion – Scientific and Clinical Relevance

- Euthanasia can be recorded alongside any adverse events, adding key detail to allow more accurate conclusions to be drawn about a particular outcome, surgeon, or procedure
- **NewGS has significantly better agreement than OldGS, and is therefore recommended for Adverse Event Recording and Reporting in Veterinary Surgical Patients**

Future work

- **Systematic Recording of Surgical Outcomes**
- ACVS and ECVS to provide leadership in this area?
  - Currently required to log cases, not track outcomes
- Opportunities to use technology to help – generate Big Data?
- **Strive collectively towards Quality Improvement**

- inicholsonvet@gmail.com

JENNIFER PETERSON

Environmental Influences on Suturing Efficiency

Jennifer Peterson, DVM
Marije Risselada, DVM, PhD, DECVS, DACVS-SA
George E. Moore, DVM, PhD, DACVIM, DACVPM

PURDUE UNIVERSITY
College of Veterinary Medicine

Conflicts of Interest

- No conflicts of interest to declare

Background Information

- Distractions common in OR setting
  - 63% of medical professionals regularly listen to music in the OR[1]
- OR noise levels exceed WHO recommendations[2]
- Effect on veterinary surgeons unknown

[1]Ullmann Y, *Injury*. 2008
[2]Dornbusch JD, *Vet Surg*. 2018

Objective & Hypotheses

Objective: To determine the effect of music and surgeon-directed questions on the suturing efficiency of veterinary professionals in simulated trials

Hypotheses:

1) Unfavorable music and asking questions would decrease suturing efficiency
2) Gender would not influence suturing efficiency
3) A direct relationship would be seen between participant experience level and suturing efficiency

Materials & Methods

- Study Design: randomized clinical study

- Participants:
  - Specialists: boarded surgeons, boarded neurologists
  - Residents: surgery, neurology
  - Rotating interns
  - Students

Materials & Methods

- IRB approval: exempt after initial review (IRB-2019-105)

- Enrollment Data Collection:
  - Gender
  - Experience level
  - Specialty
  - Favorable and unfavorable music preferences

Study ID #.....
Gender: identifies as female / identifies as male / identifies as other / identifies as neither / does not wish to identify
Experience level:
Student (3rd year / 4 th year), rotating intern, specialty intern (.....years after graduation)
Resident: specialty..... Yr 1 / Yr 2 / Yr 3/ other
Faculty: specialty..... Years post graduation: 0-5; 6-10; 11-15 ; 16-20; 21-25; 26-30; >30

Materials & Methods

- Suturing:
  - 10 cm, simple continuous
  - Practice trial first
  - All trials with new suture (3-0 nylon)

- Influences assessed (randomized):
  - Favorable music
  - Unfavorable music
  - Questions (at 2 and 7 cm)
    - Q1: What are the days of the week?
    - Q2: What is 5x7?

Materials & Methods

- Trial duration recorded:
  - First bite to last throw
  - No audience

- Response to questions:
  a) Continued at same pace
  b) Slowed down
  c) Stopped
  d) Asked for question to be repeated

Materials & Methods

- Statistical Analyses:
  - Mean duration of interventions compared via paired t-Tests
  - Pearson Chi-Squared test used for groups $\geq$ 5 participants
  - Fisher's Exact test used for groups < 5 participants

  - All analyses performed using STATA SE, v 16.0 (StataCorp, College Station, Texas, United States)

Results

- *Data collection delayed due to COVID-19 pandemic*

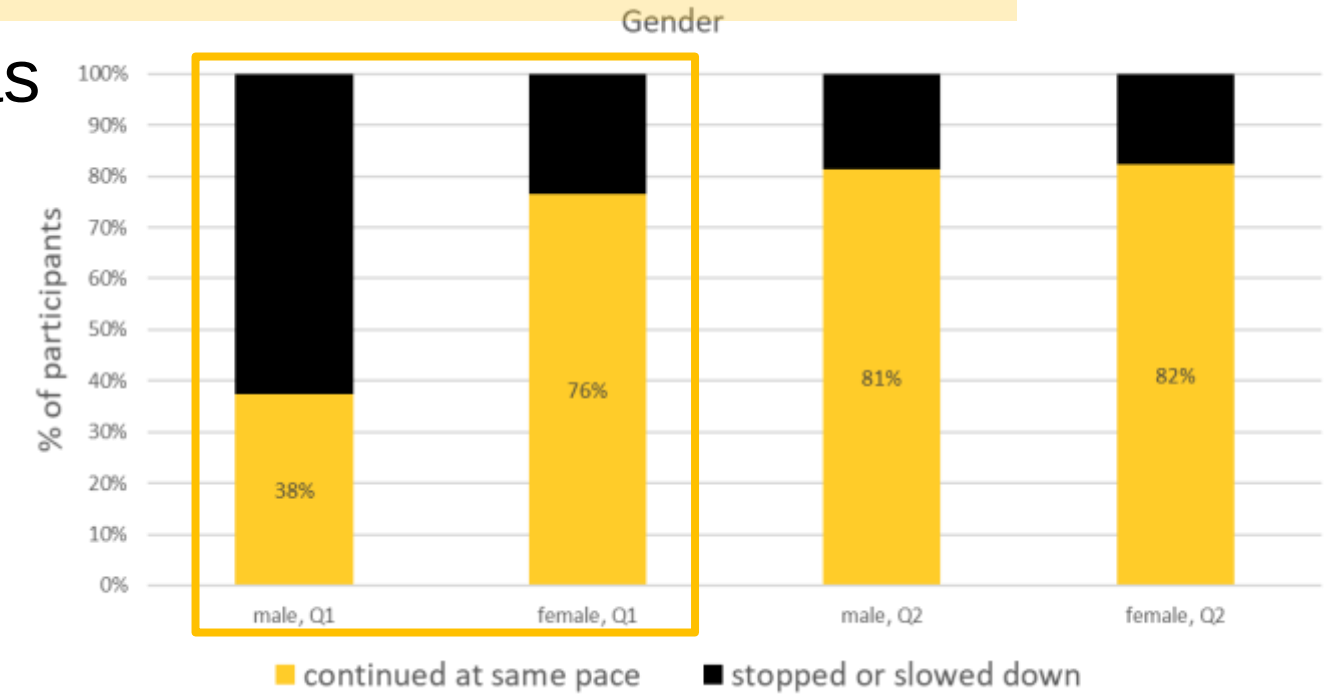
- 50 participants enrolled:
  - Gender:
    - 16 males
    - 34 females
  - Experience:
    - 9 boarded specialists
    - 4 residents
    - 7 interns
    - 30 students

Results: Environment

- **Significant differences were seen between trial durations based on environment:**
  - Mean Trial Duration:
    - Favorable Music: 153.6 ± 46.739 sec
    - Unfavorable Music: 154.9 ± 42.435 sec
    - Questions: 160.4 ± 48.530 sec
  - **Favorable music vs. questions (P=0.030)**
  - Favorable music vs. unfavorable music (P=0.639)
  - Unfavorable music vs. questions (P=0.827)

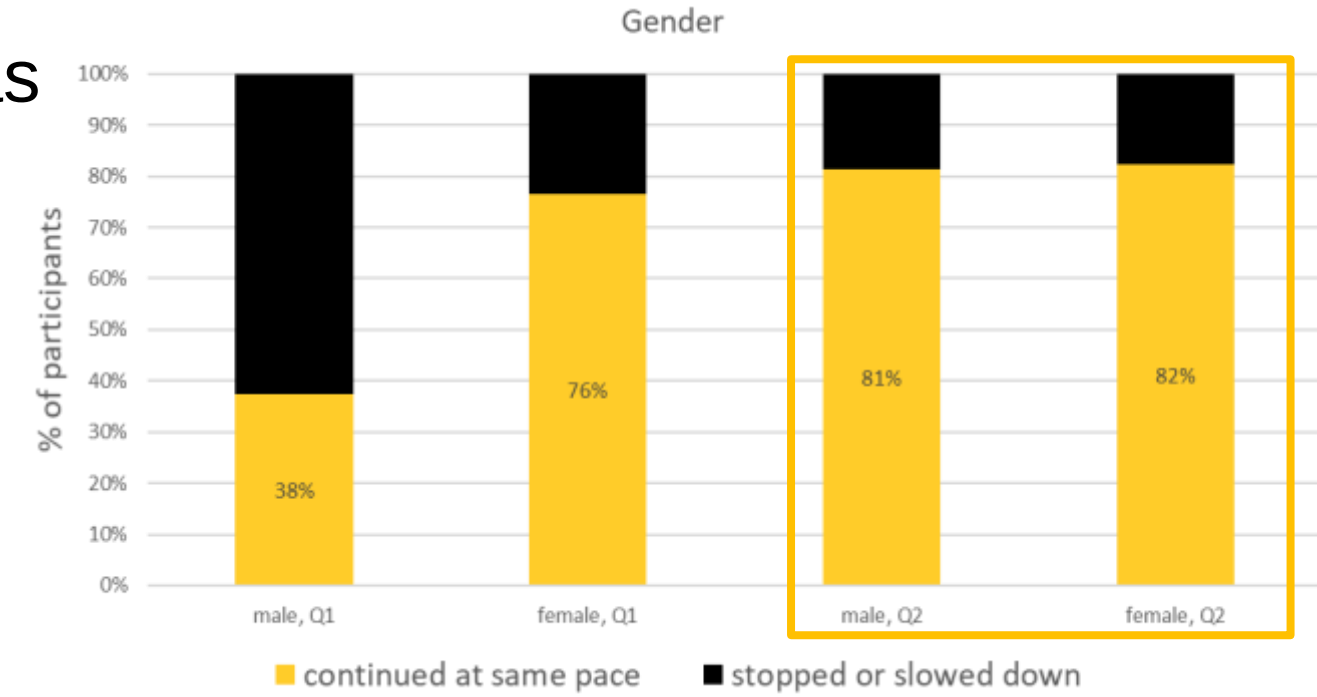
Results: Gender

- **A significant association was seen between gender and response to Q1 (P=0.007):**
  - 6/16 (38%) males and 26/34 (76%) females continued at the same pace in response to Q1
- No significant association was seen between gender and response to Q2 (P=0.925):
  - 13/16 (81%) males
  - 28/34 (82%) females



Results: Gender

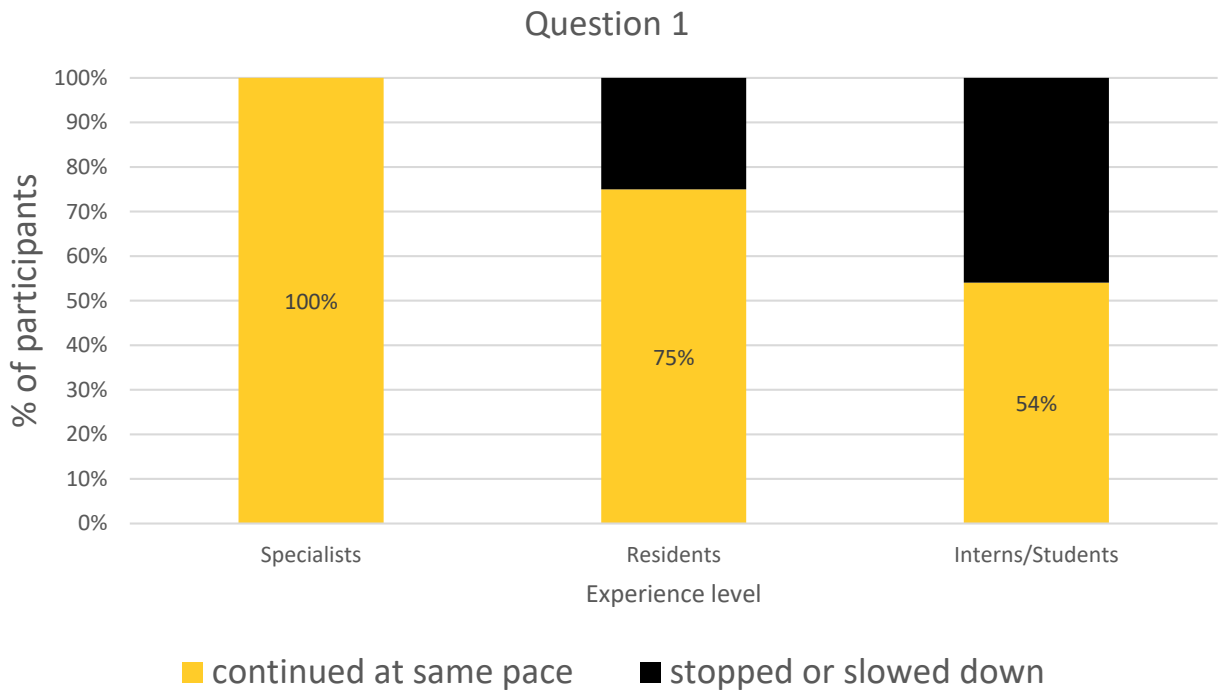
- **A significant association was seen between gender and response to Q1 (P=0.007):**
  - 6/16 (38%) males and 26/34 (76%) females continued at the same pace in response to Q1
- No significant association was seen between gender and response to Q2 (P=0.925):
  - 13/16 (81%) males
  - 28/34 (82%) females



Results: Experience

- **Experience level had a significant effect on participants' response to Q1 while suturing (P=0.021)**

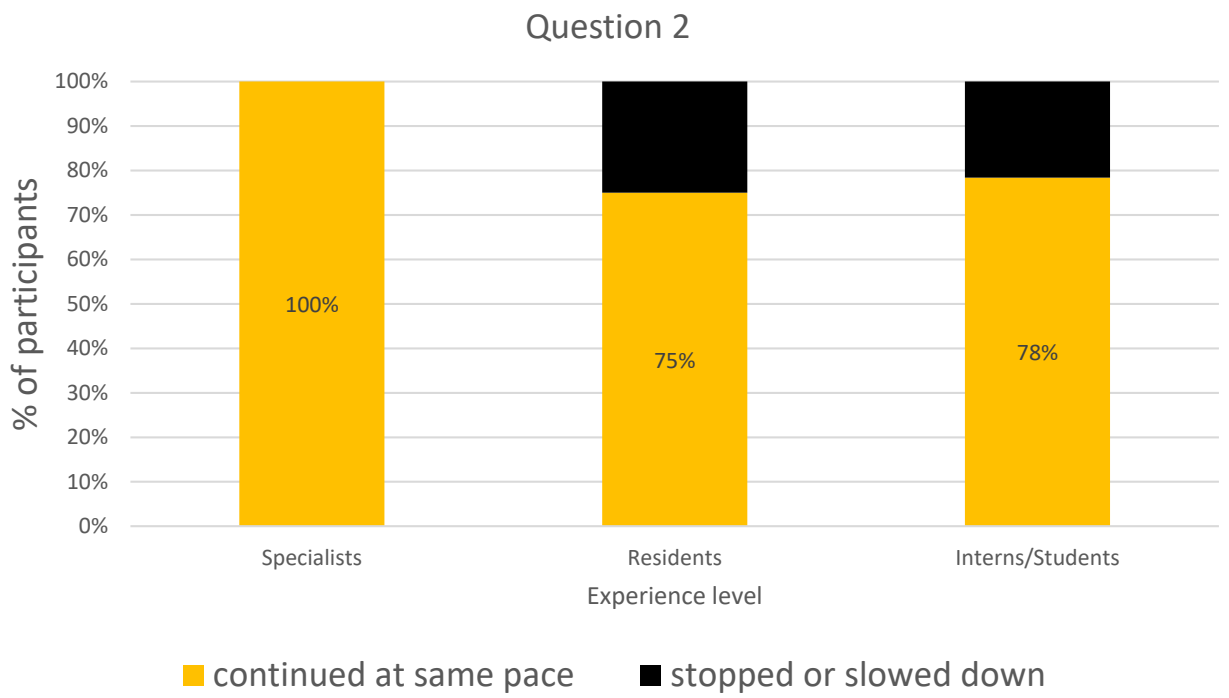
- Continued at same pace:
  - Specialists: 9/9 (100%)
  - Residents: 3/4 (75%)
  - Students/interns: 20/37 (54%)



Results: Experience

- Experience level did not have a significant effect on participants' response to Q2 while suturing (P=0.354)

- Continued at same pace:
  - Specialists: 9/9 (100%)
  - Residents: 3/4 (75%)
  - Students/interns: 29/37 (78%)



Discussion: Environment

- 1st Hypothesis: *Unfavorable music and asking questions would decrease suturing efficiency*
  - Asking questions significantly decreased suturing efficiency.
  - Unfavorable music did not significantly decrease suturing efficiency.

Discussion: Gender

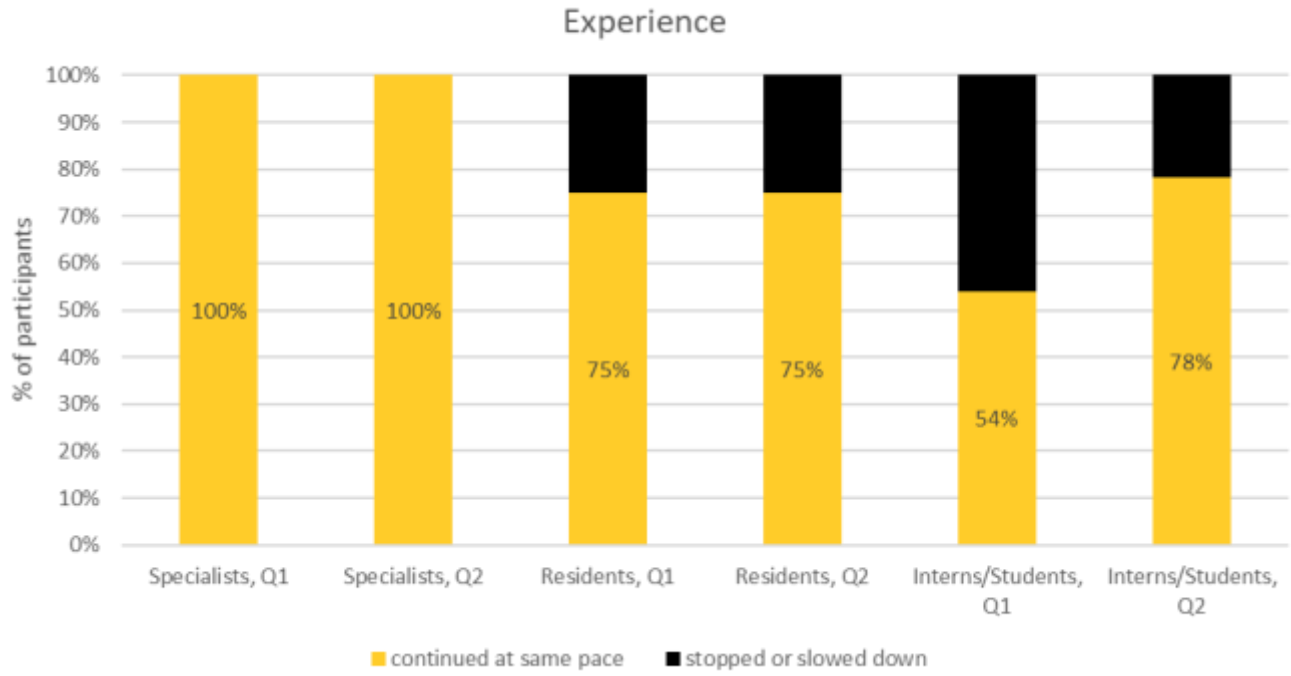
- 2nd Hypothesis: *Gender would not influence suturing efficiency*

- Males were more likely than females to slow down or stop suturing.
  - Significant for Q1 (What are the days of the week?)
  - Not significant for Q2 (What is 5x7?)
    - Type I error?
    - Observer bias?
    - Environmental influence?
    - Length of response?

Discussion: Experience

- 3rd Hypothesis: *Direct relationship seen between experience level and efficiency*

  - Significant for Q1
  - Not significant for Q2
    - Type II error?
    - Adaptation at time of second question?



Limitations

- Small data set
- Single non-blinded observer
- Use of a suture model
- Limited number of questions

Conclusions

- Answering questions decreases the suturing efficiency of students and minimally experienced surgeons.
- Males may be more likely than females to decrease suturing speed or to pause when answering a question.
- The effect of environment on suturing efficiency decreases with increasing experience.

Data collection ongoing

Acknowledgements

- Dr. Marije Risselada, DVM, PhD, DECVS, DACVS-SA
- Dr. George E. Moore, DVM, PhD, DACVIM, DACVPM
- Study participants
- Medline Industries, Inc.

References

1. Ullmann Y, Fodor L, Schwarzberg I, et al. The sounds of music in the operating room. *Injury*. 2008;39:592-597.
2. Dornbusch JD, Boston S, Colee J. Noise levels in veterinary operating rooms and factor that contribute to their variations. *Vet Surg*. 2018;47:678-682.

FARID HABIB

Université de Montréal

Surgical simulator improves student performance

F HABIB[1], M MAGALDI[2] AND B LUSSIER[1]

[1]Department of Clinical Sciences, Faculty of Veterinary Medicine, Université de Montréal, Canada
[2]Associate Professor, Faculty of Medicine, Federal University of Mina Gerais, Brazil,

Presentation

1. Introduction
2. Material and Methods
3. Results
4. Statistical Analysis
5. Discussion
6. Conclusion

Challenges in teaching veterinary surgery

- Logistical challenges of practical teaching of surgery in large groups
- Costs related to the use of live animals
- Growing pressure from a society seeking to adhere to the principles of the 3Rs, reducing, refining and replacing the use of animals (Russell and Birch 1959)

Different pedagogical approaches to surgical training

- Terminal surgeries→ ethically complicated (procurement, 3Rs, public perception)
- Survival surgeries→ Gold standard, but requires a lot of resources!
- The Use of simulators→ An interesting option!

Veterinary Surgical Simulators

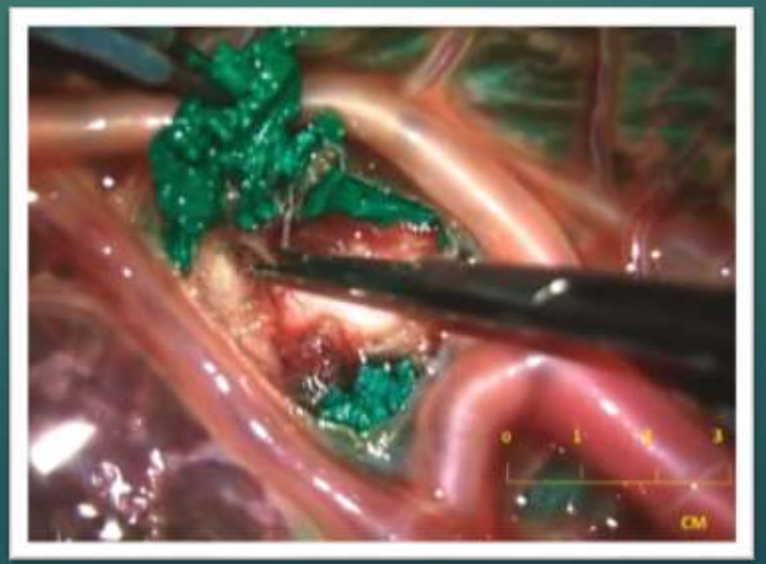
- Help bridge the gap between theory and actual practice (Smeak 2007)
- Do not require the use of live animals
- In veterinary medicine, some studies have shown that models can have some added value (Greenfield, Johnson et al. 1993) (Greenfield, Johnson et al. 1995)
- We have found a few examples in the literature, including one hemostatic model for ovariohysterectomy simulation. (Griffon, Cronin et al. 2000)

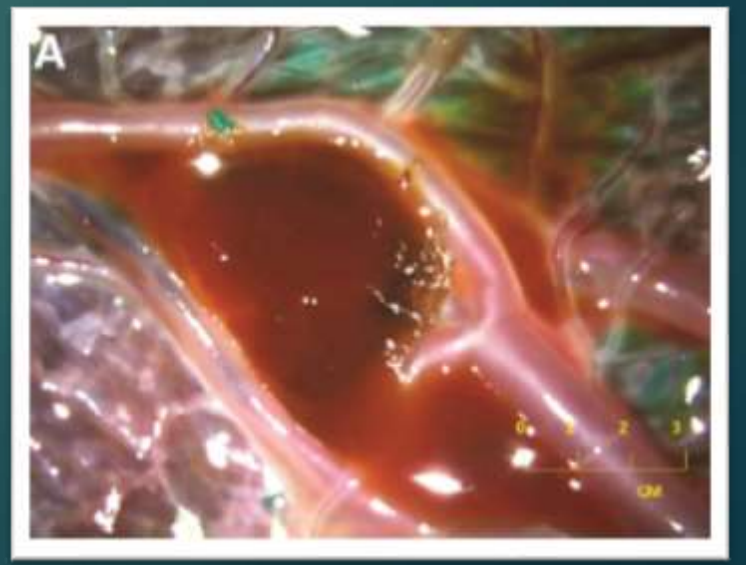
Surgical Simulators

- Different types:
  - Non-hemostatic
    - Cadavers
    - DASIE
    - Skin simulator
  - Hemostatic
    - Synthetic
    - **Placenta based*****

Validated hemostatic simulators using placentas

- In human neurosurgery and microvascular surgery (Oliveira, Araujo et al. 2015) (Oliveira Magaldi, Nicolato et al. 2014)
- Highly Realistic





Validation

What is simulator validation ?

Validation

The objective assessment of a simulator's ability to adequately prepare for the performance of a task

Validation of surgical simulators

- **Face validity**
- **Content validity**
- **Construct validity**
- **Predictive validity**
- **Concurrent validity**

Validation of a simulator - Terminology

- **Face validation:** A global subjective evaluation of the simulator to see if it is faithful to the construct it is trying to simulate
- **Content validation:** An evaluation of the simulator is done by individually evaluating each component / stage of the construct that it is trying to simulate.
- **Predictive validation:** Evaluates the ability of a simulator to predict an actual outcome

Validation of a simulator - Terminology

- **Face validation:** A global subjective evaluation of the simulator to see if it is faithful to the construct it is trying to simulate
- **Content validation:** An evaluation of the simulator is done by individually evaluating each component / stage of the construct that it is trying to simulate.
- **Predictive validation:** Evaluates the ability of a simulator to predict an actual outcome

Validation of a simulator - Terminology

- **Face validation:** A global subjective evaluation of the simulator to see if it is faithful to the construct it is trying to simulate
- **Content validation:** An evaluation of the simulator is done by individually evaluating each component / stage of the construct that it is trying to simulate.
- **Predictive validation:** Evaluates the ability of a simulator to predict an actual outcome

Problematic

No hemostatic simulator using placentas for canine orchiectomy in veterinary medicine

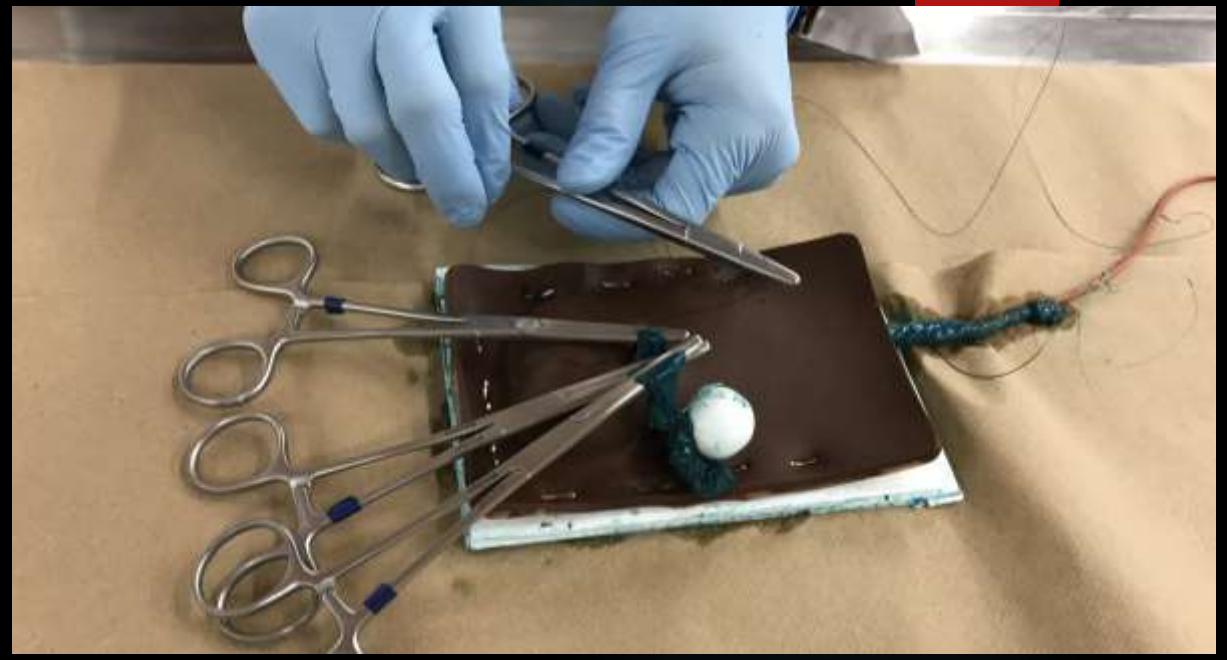
Objectives and Hypotheses

- **Objective:** To develop and validate a hemostatic orchiectomy simulator based on placental tissue.

Objectives and Hypotheses

- **Hypotheses:**
  - For predictive validation:
  - Students in the simulator group would perform better than Control Group students during their first live animal surgeries.


10
20
30
40
50
60
cc




180.100.16

Methodology - Predictive Validity

- 55 third-year students were enrolled in our study
- Authorization of the Ethics committee (CPÉR 17-036-D)
- Consent forms where obtained from all participating students
- Randomly distributed in 2 groups
  - Control Group (n=27)
  - Simulator Group (n=26)

Methodology - Predictive Validity

- Control Group did not have access to our simulator
- Simulator Group had access to a single simulator to perform surgery once, 2 days before performing survival surgery.

Methodology - Predictive Validity

- Both groups were filmed during their surgeries on live patients
- Their surgeries were evaluated blindly by an ACVS surgeon
- Two main parameters were evaluated:
  - **Surgical times in minutes**
  - **OSATS score (7 to 35)**

Methodology - Predictive Validation

TABLE 1 Objective Structured Assessment of Technical Skills (OSATS)

RATING SCALE	1	2	3	4	5
RESPECT FOR TISSUE	Frequently used unnecessary force on tissue or caused damage by inappropriate use of instruments		Careful handling of tissue but occasionally caused inadvertent damage		Consistently handled tissues appropriately with minimal damage
TIME AND MOTION	Many unnecessary moves		Efficient time/motion but some unnecessary moves		Economy of motion and maximum efficiency
INSTRUMENT HANDLING	Repeatedly makes tentative or awkward moves with instruments		Competent use of instruments although occasionally appeared stiff or awkward		Fluid moves with instruments and no awkwardness
KNOWLEDGE OF INSTRUMENTS	Frequently asked for the wrong instrument or used inappropriate instrument		Knew the names of most instruments and used the appropriate instrument for the task		Obviously familiar with the instruments required and their name
USE OF ASSISTANTS	Consistently placed assistants poorly or failed to use assistants		Good use of assistants most of the time		Strategically used assistant for the best advantage at all times
FLOW OF THE OPERATION AND FORWARD PLANNING	Frequently stopped operating or needed to discuss next move		Demonstrated ability for forward planning with steady progression of operative procedure		Obviously planned course of operation with effortless flow from one move to the next
KNOWLEDGE OF SPECIFIC PROCEDURE	Deficient knowledge, needed specific instruction at most operative steps		Knew all important aspects of the operation		Demonstrated familiarity with all aspects of the operation

Results—
Predictive Validity

- Comparison of surgical times between the two groups
-

Group	Mean (min)	Median (min)	Min (min)	Max (min)
Control (n=27)	97.5 +/- 3.6	90	63	138
Experimental (n=24)	100.5 +/- 4.5	97	75	173

T-Student test showed no significant difference between the two groups (p - 0.42)

Results—
Predictive Validity

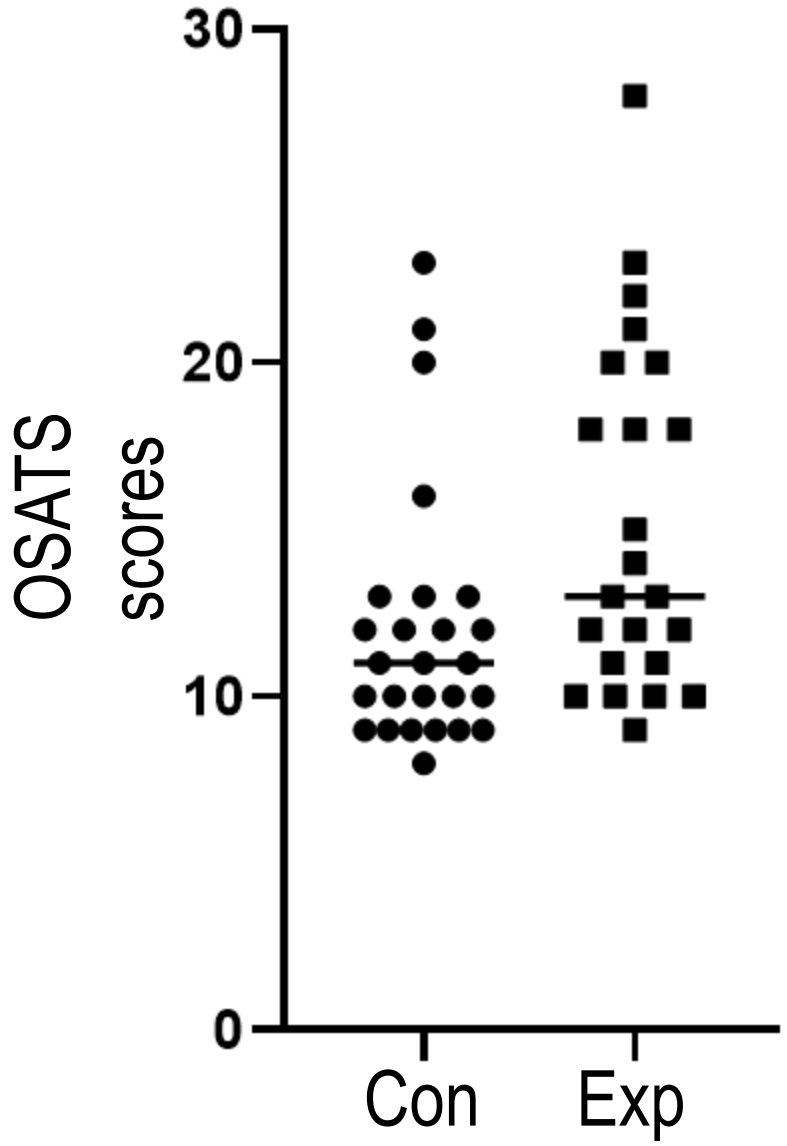
- Comparison of OSATS scores between the two groups
-

Group	Mean	Median	Min	Max
Control (n=27)	12.0 +/- 0.76	11	8	23
Experimental (n=24)	15.3 +/- 1.09	13	9	28

Mann-Whitney test shows a significant difference between the two groups (p-0.012)

Students in the experimental group had a 12% increase in their OSATS scores compared to students in the control group

OSATS scores for both groups



Reviewing OSATS scores

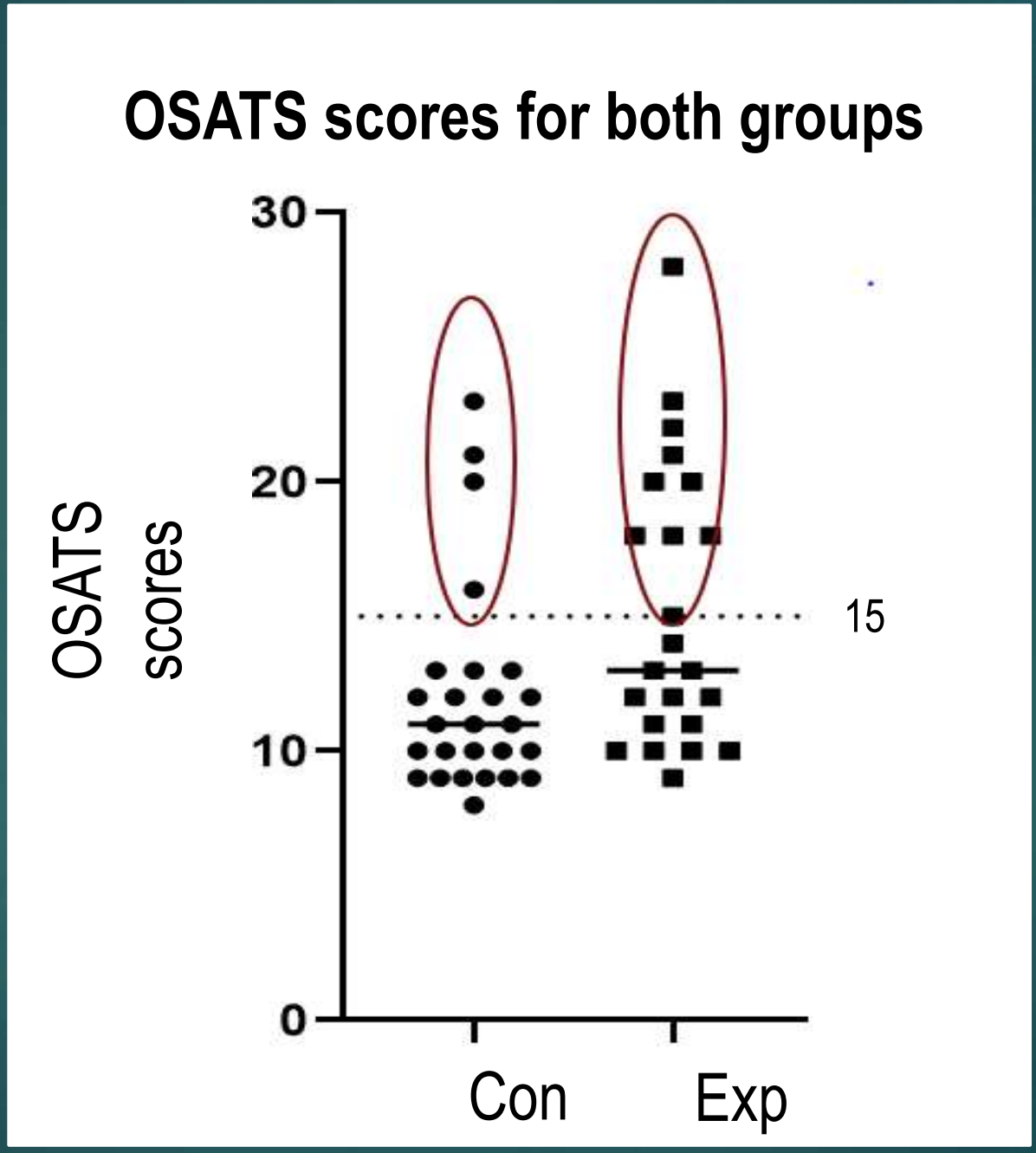
- We determined from the OSATS description that a student who achieved a score of 15 for his first surgery performed adequately

TABLE 1 Objective Structured Assessment of Technical Skills (OSATS)

RATING SCALE	1	2	3	4	5
RESPECT FOR TISSUE	Frequently used unnecessary force on tissue or caused damage by inappropriate use of instruments		Careful handling of tissue but occasionally caused inadvertent damage		Consistently handled tissues appropriately with minimal damage
TIME AND MOTION	Many unnecessary moves		Efficient time/motion but some unnecessary moves		Economy of motion and maximum efficiency
INSTRUMENT HANDLING	Repeatedly makes tentative or awkward moves with instruments		Competent use of instruments although occasionally appeared stiff or awkward		Fluid moves with instruments and no awkwardness
KNOWLEDGE OF INSTRUMENTS	Frequently asked for the wrong instrument or used inappropriate instrument		Knew the names of most instruments and used the appropriate instrument for the task		Obviously familiar with the instruments required and their name
USE OF ASSISTANTS	Consistently placed assistants poorly or failed to use assistants		Good use of assistants most of the time		Strategically used assistant for the best advantage at all times
FLOW OF THE OPERATION AND FORWARD PLANNING	Frequently stopped operating or needed to discuss next move		Demonstrated ability for forward planning with steady progression of operative procedure		Obviously planned course of operation with effortless flow from one move to the next
KNOWLEDGE OF SPECIFIC PROCEDURE	Deficient knowledge, needed specific instruction at most operative steps		Knew all important aspects of the operation		Demonstrated familiarity with all aspects of the operation

Control group: 4 students with a score equal to or greater than 15

Experimental group: 10 students with a score of 15 or more

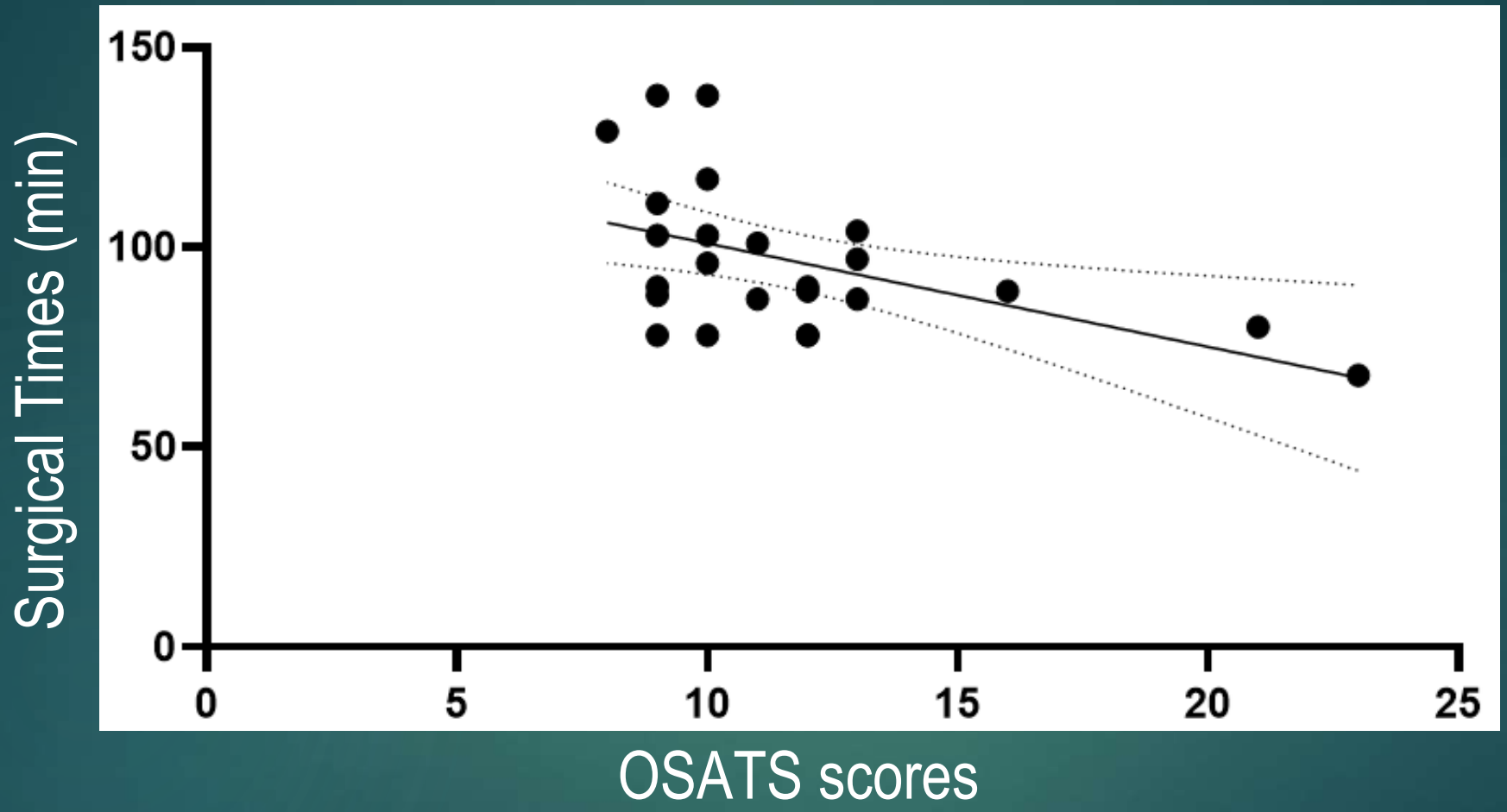


Other Results

Negative correlation between surgical times and OSATS scores

- Spearman's R-test demonstrates a negative correlation with a value of R= -0.43 (p-0.012)

Surgical times as a function of OSATS scores .



Spearman's R-test demonstrates a negative correlation with a value of R= -0.43 (p-0.012)

Discussion

- The absence of a significant difference between the two groups in surgical times could be explained by:
  - Sample size was too small
    - Post-hoc Power analysis : Power above 80%
- How surgical exercices are structured…
- Negative correlation between OSATS scores and surgical time
- The significant increase in the number of students with an OSATS score above 15 demonstrates that the use of our simulator seems to have had a measurable impact

Discussion

- Study Limitations
  - Pre-surgical experience of students
  - The lack of a competitive simulator for the control group
  - An unvalidated OSATS score threshold (15 points)

Conclusion

The use of our surgical simulator can have a **measurable positive impact** on student performance

Acknowledgements

- Dr. Geoffroy Noel
- Surgireal® for their contribution in the development and design of the silicone models
- Funding from
  - “Fonds en Santé des animaux de compagnies”
  - “Fonds du Centenaire ”

References

- Russell, W. M. S. a. B., R.L. (1959). The Principles of Humane Experimental Technique. London, Methuen.
- Smeak, D. D. (2007). "Teaching Surgery to the Veterinary Novice: The Ohio State University Experience." JVME **34**(5).
- Greenfield, C. L., et al. (1995). "Comparison of surgical skills of veterinary students trained using models or live animals." J Am Vet Med Assoc **206**(12): 1840-1845.
- Greenfield, C. L., et al. (1993). "Development of parenchymal abdominal organ models for use in teaching veterinary soft tissue surgery." Vet Surg **22**(5): 357-362.
- Griffon, D. J., et al. (2000). "Evaluation of a hemostasis model for teaching ovariohysterectomy in veterinary surgery." Vet Surg **29**(4): 309-316.
- Oliveira, M. M., et al. (2015). "Face, Content, and Construct Validity of Brain Tumor Microsurgery Simulation Using a Human Placenta Model." Neurosurgery.
- Oliveira Magaldi, M., et al. (2014). "Human placenta aneurysm model for training neurosurgeons in vascular microsurgery." Neurosurgery **10 Suppl 4**: 592-600; discussion 600-591.

Thank you!

For any questions please email me at: farid-habib@hotmail.com

ANN RAM

UNIVERSITY of GUELPH

ONTARIO VETERINARY COLLEGE
HEALTH SCIENCES CENTRE

Evaluating the Effect of Solution Type, Reconstitution Time and Storage Methods on Indocyanine Green Fluorescence in a Cadaveric Model

AS Ram[1,2] & ML Oblak[1]

[1]Department of Clinical Studies
Ontario Veterinary College, University of Guelph, Guelph, ON, CA

[2]Department of Biomedical Sciences
Ontario Veterinary College, University of Guelph, Guelph, ON, CA

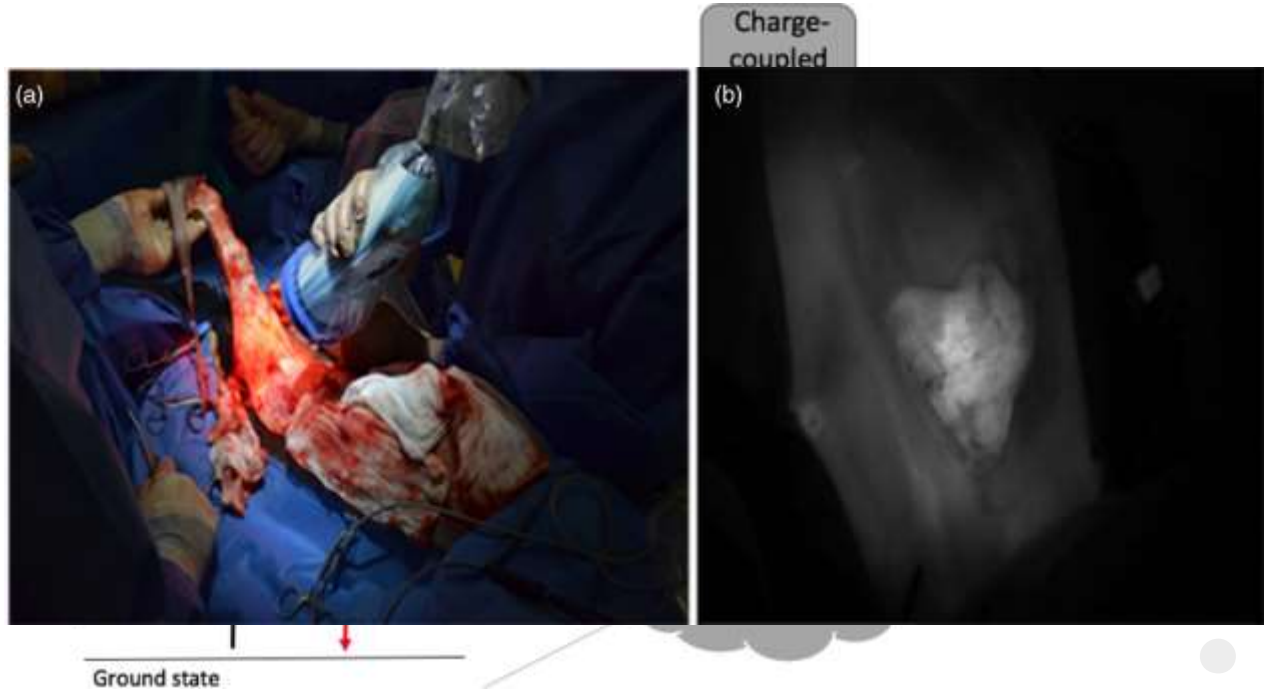
DISCLOSURES

- I hereby certify that, to the best of my knowledge, no aspect of my current legal, personal or professional situation might reasonably be expected to affect my views on the subject on which I am presenting.
- This study was funded by the OVC Pet Trust

Ontario Veterinary College
OVC PET TRUST

NEAR-INFRARED IMAGE-GUIDED SURGERY

- Operates in 700-900nm range of the spectrum
- No autofluorescence and maximized signal-to-background ratio (SBR)
- Safe = no ionization radiation
- No staining of surgical field
- Minimally invasive



Favril et al., 2018

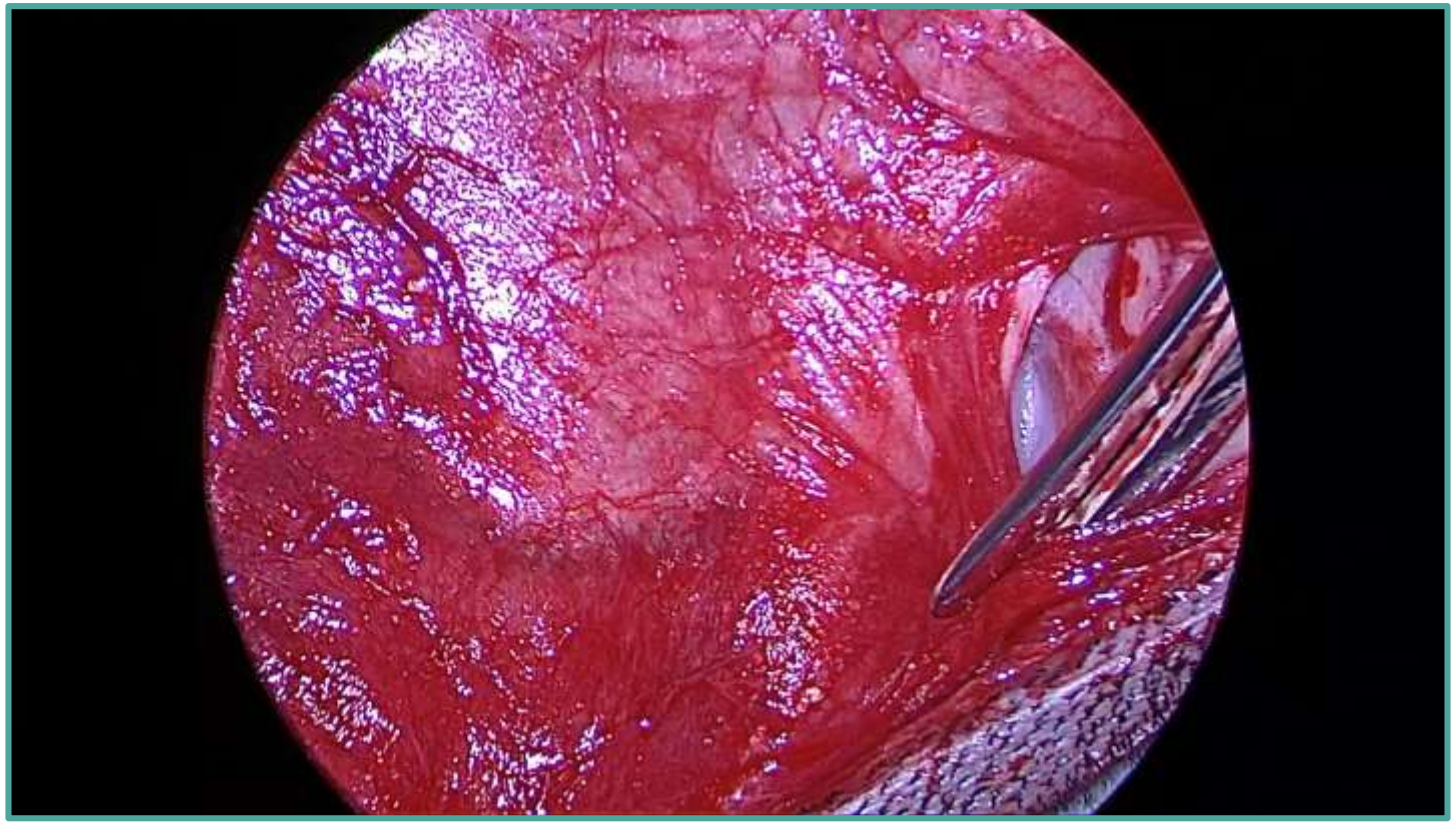
INDOCYANINE GREEN (ICG)

- Regulatory body approved
- Tricarbocyanine dye (-)
- Dry form **must** be reconstituted in water
- Aggregation = ↓ fluorescence intensity (FI)
- Non-specific binding to plasma proteins → increases FI and stability

Fig 1. 17CM98 melanoma cells incubated with 800uM (high concentration) of ICG diluted with NaCl

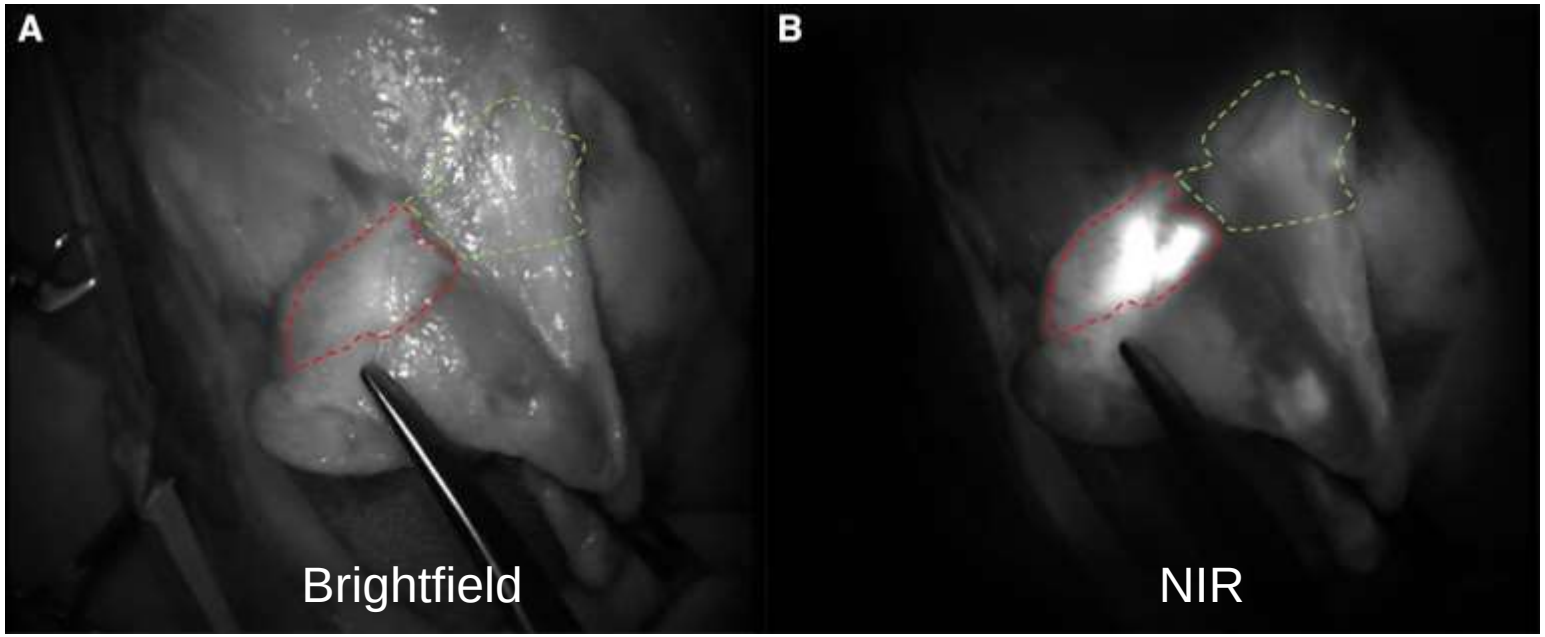
APPLICATIONS OF ICG

- Sentinel lymph node mapping:
    - Local peritumoural injection → binding to plasma proteins → ICG carried to lymph node → enterohepatic circulation



APPLICATIONS OF ICG

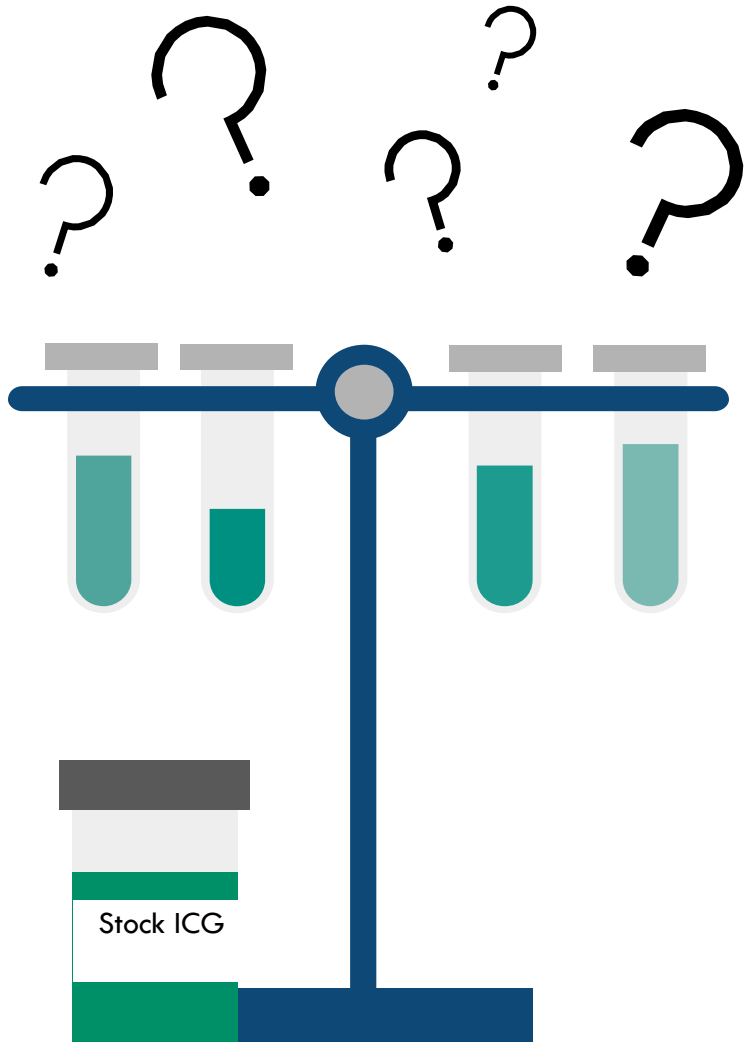
- Tumour bed imaging:
  - Local or IV injection → ICG accumulates around/in tumour → detect metastases and tumour deposits
  - Enhanced permeability and retention effect



Favril et al., 2020

STUDY RATIONALE

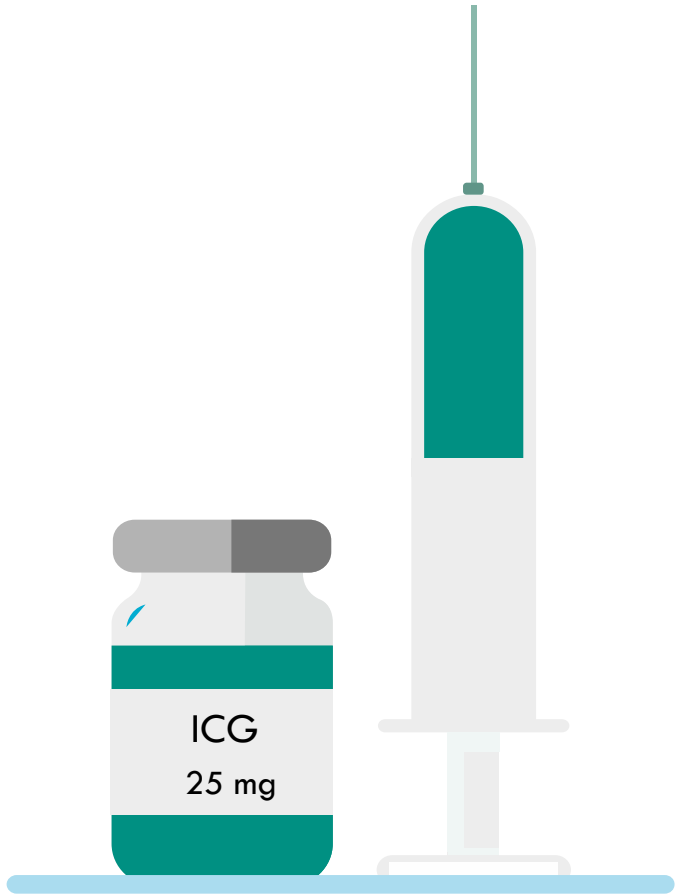
- Fluorescence dependent on concentration, time, and storage
- Variances in handling of ICG across surgical applications
- Optimized usage for veterinary practice
- Cost efficacy for veterinary practice



OBJECTIVES

Pilot study to evaluate:

1. The effect of concentration and diluents on ICG fluorescence
2. The effect of reconstitution time and storage environment on ICG fluorescence

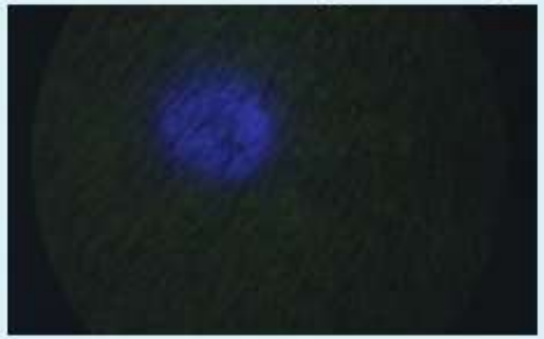


HYPOTHESIS

1. Isotonic ICG solutions = optimal fluorescence intensity
2. ICG fluorescence will persist over a period of days.
3. Storage will not impact the fluorescence intensity.

METHODS

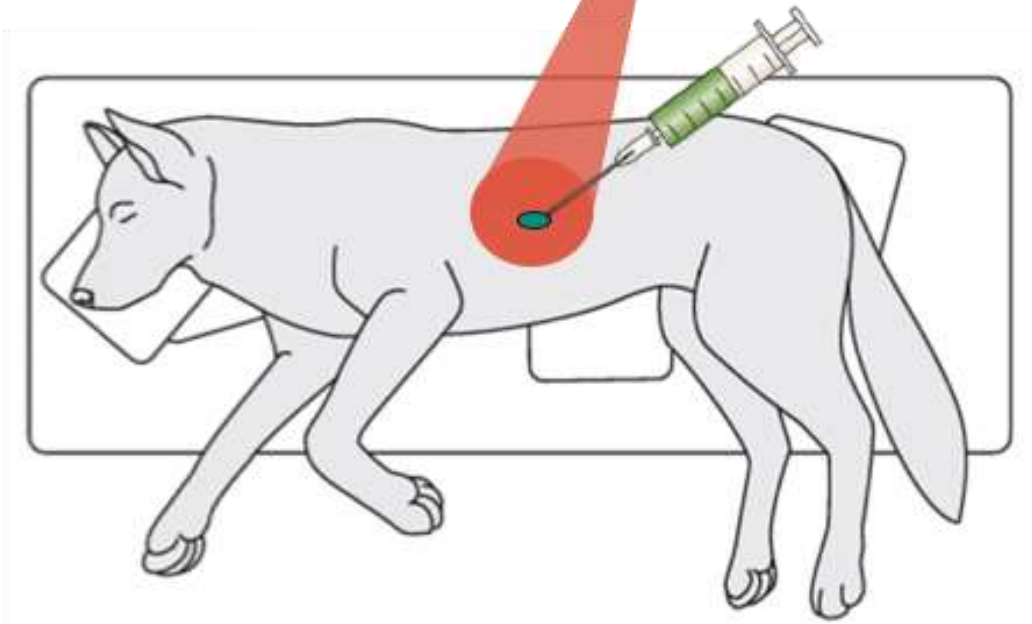
Display
Color-NIR image merge



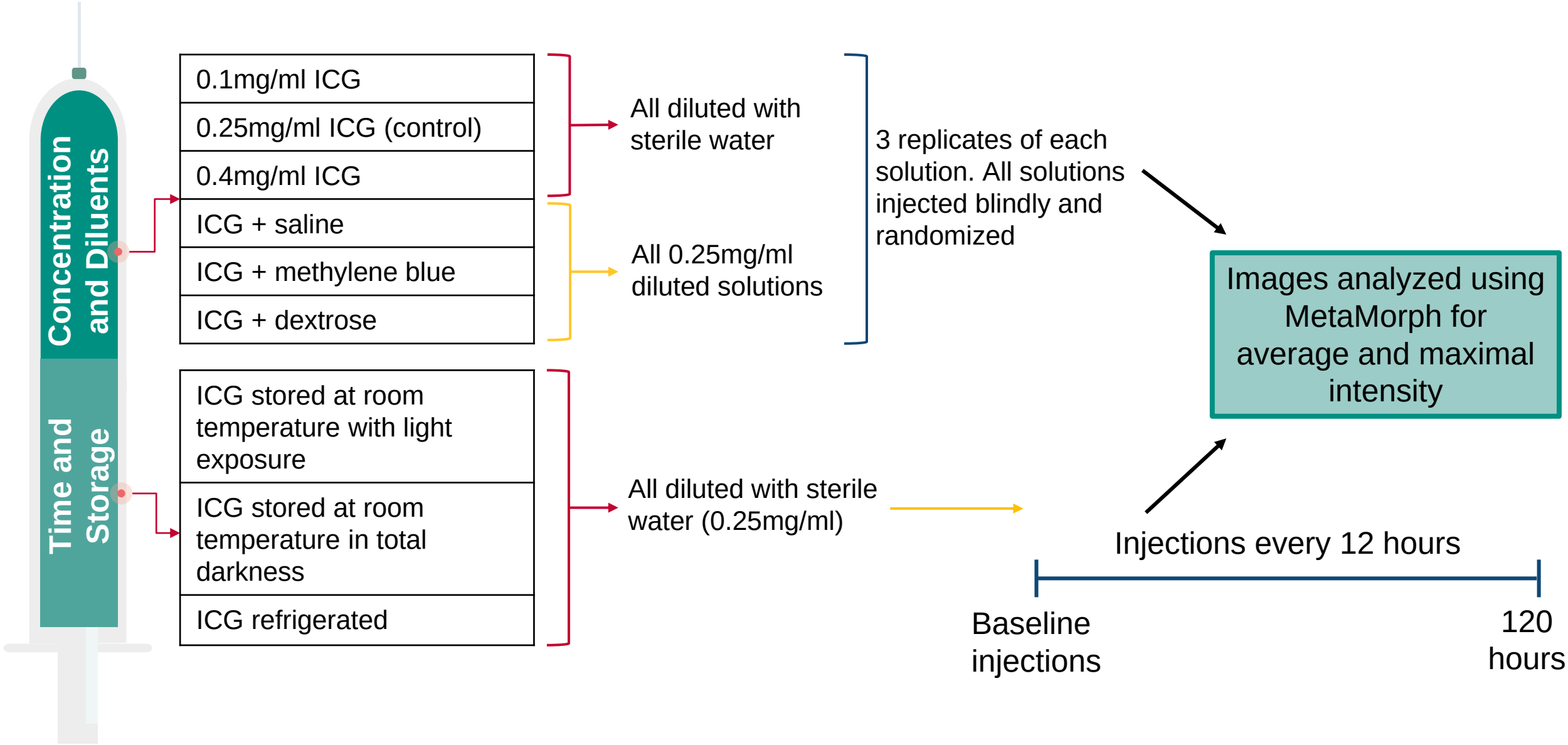
VITOM II NIR
imaging system

ICG solutions
administered intradermally

20 cm working
distance

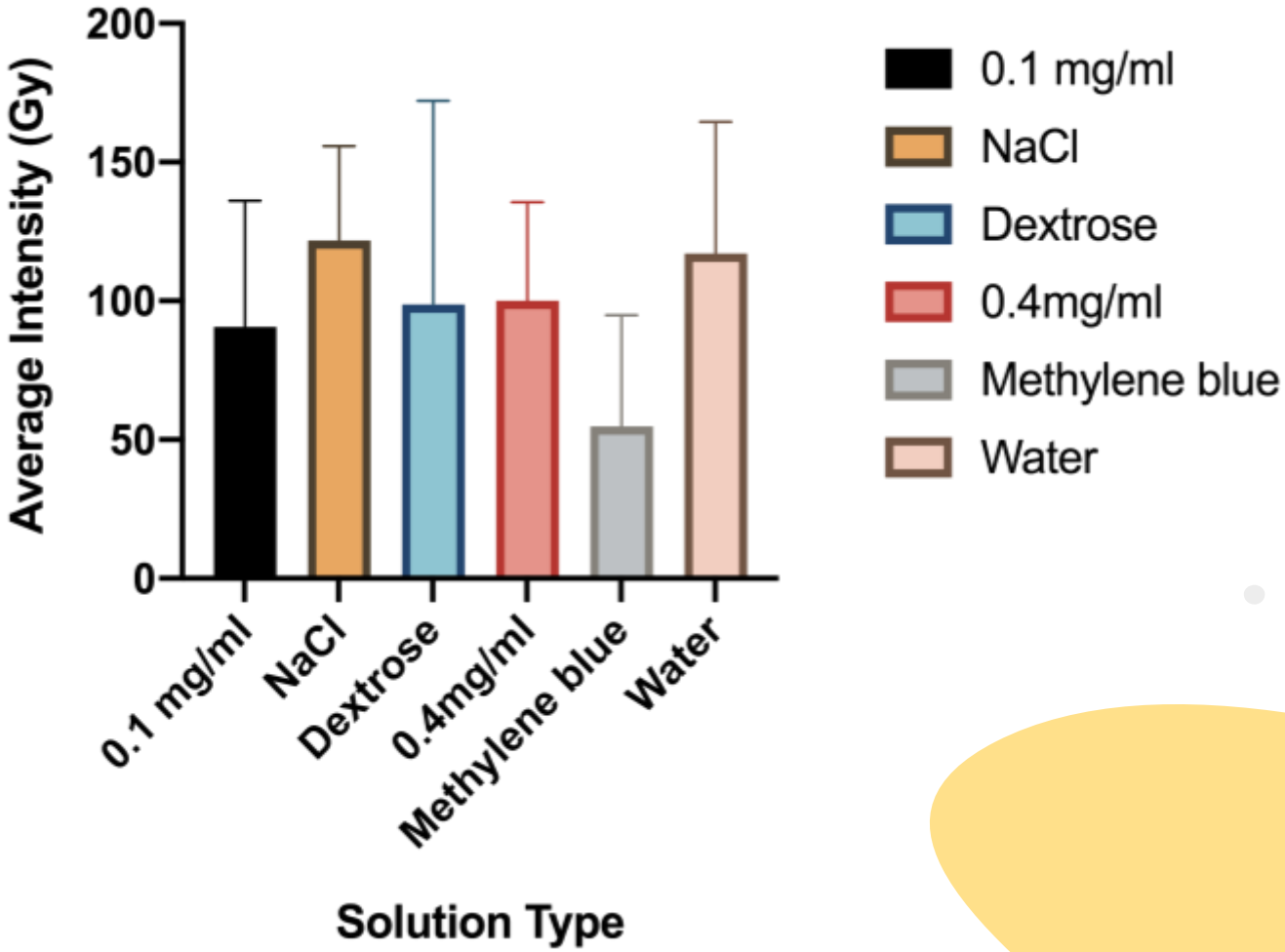


METHODS

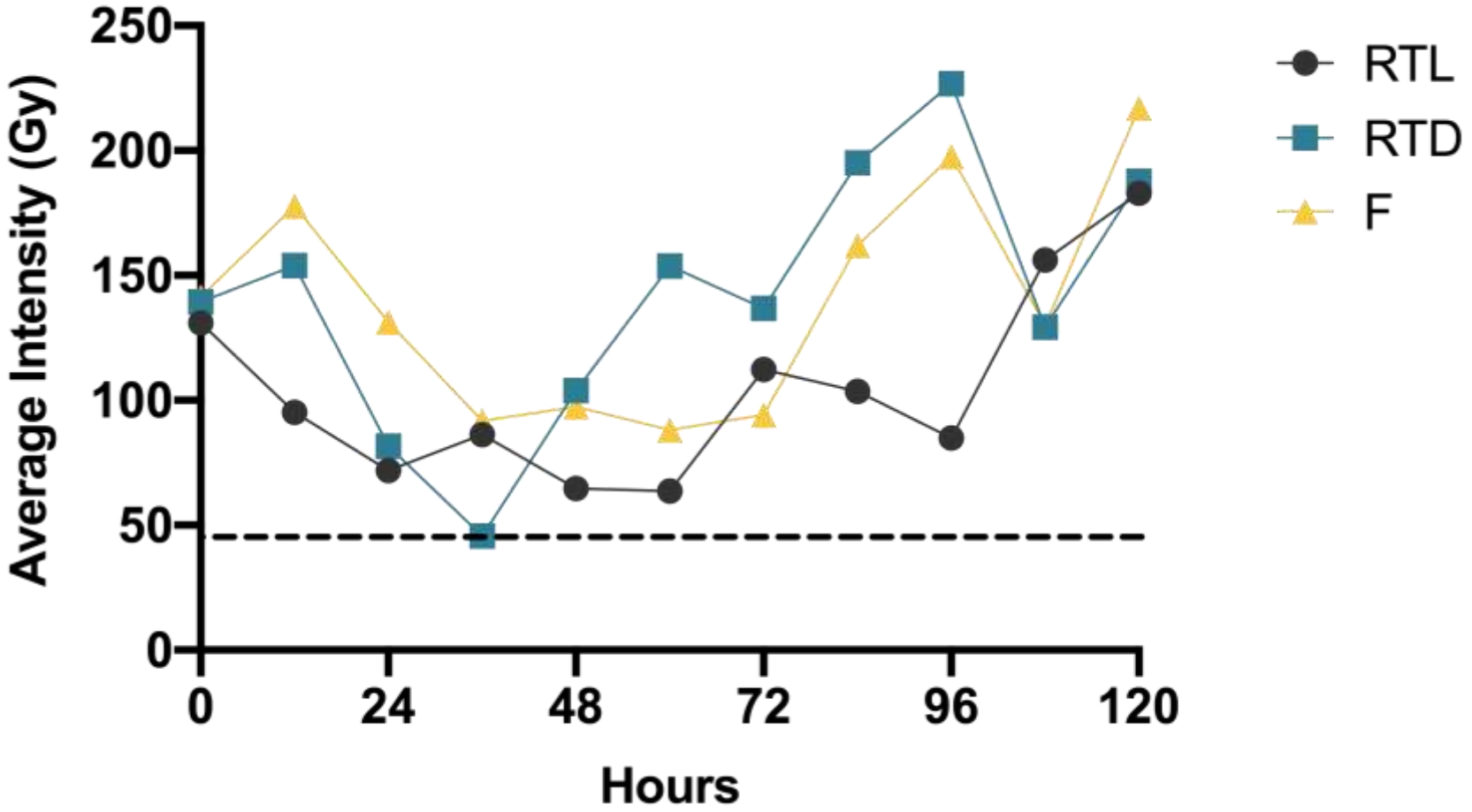

Concentration and Diluents
Time and Storage
0.1mg/ml ICG
0.25mg/ml ICG (control)
0.4mg/ml ICG
ICG + saline
ICG + methylene blue
ICG + dextrose
ICG stored at room temperature with light exposure
ICG stored at room temperature in total darkness
ICG refrigerated
All diluted with sterile water
All 0.25mg/ml diluted solutions
All diluted with sterile water (0.25mg/ml)
3 replicates of each solution. All solutions injected blindly and randomized
Images analyzed using MetaMorph for average and maximal intensity
Injections every 12 hours
Baseline injections
120 hours

RESULTS

- 6 replicates, outliers omitted
- Adjusted Tukey-Kramer test (SAS)
- No significant difference in average intensity between mixture groups (all $p > 0.5017$)
- No significant difference between maximal intensity of mixture groups (all $p > 0.2117$)



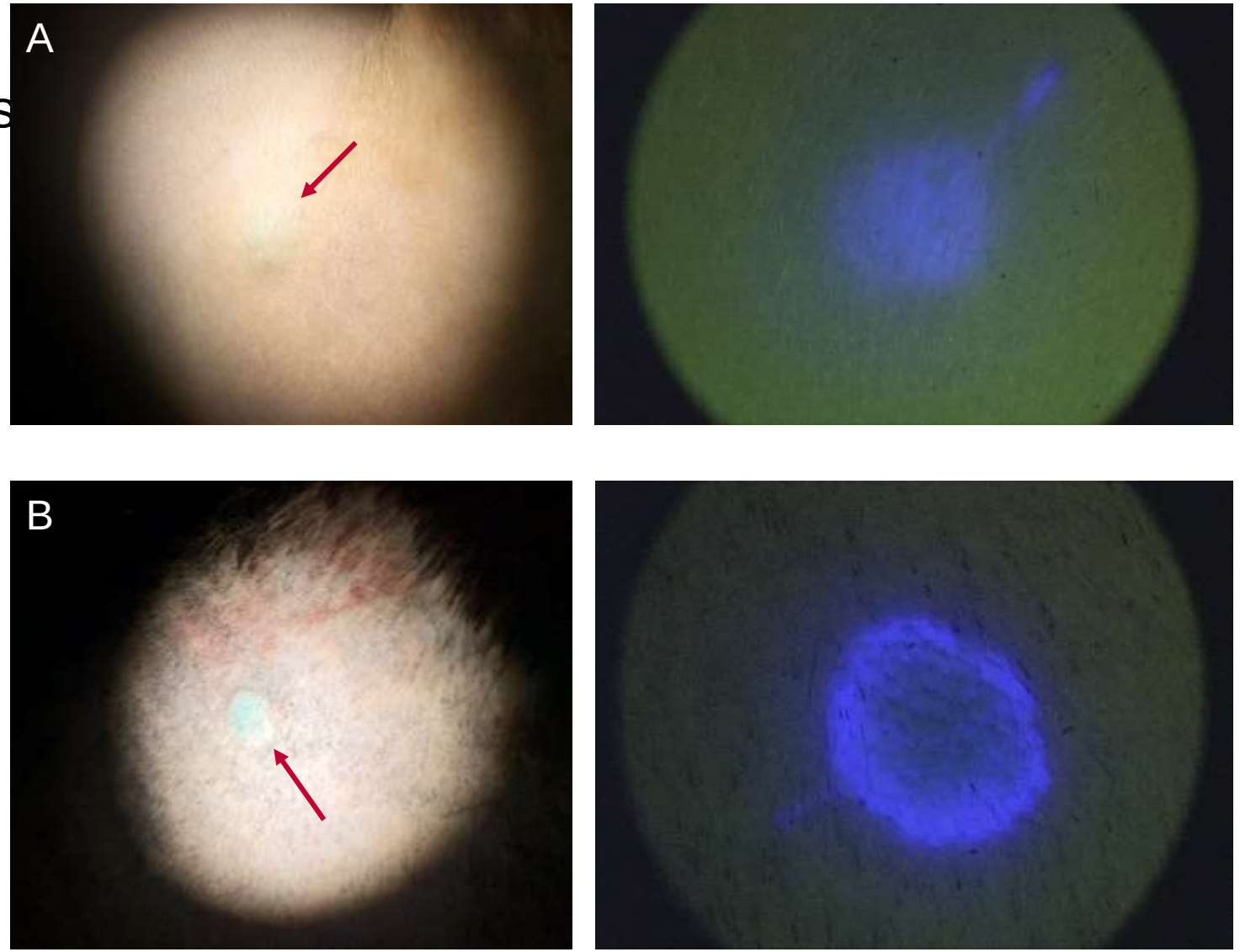
RESULTS



Fluorescence intensity over time with ICG solutions stored in room temperature with light (RTL), room temperature in darkness (RTD), and refrigerated (F).

LIMITATIONS

- Low number of replicates → need more to make conclusions about effect of time and storage
- Inability to standardize injection depth



CLINICAL RELEVANCE

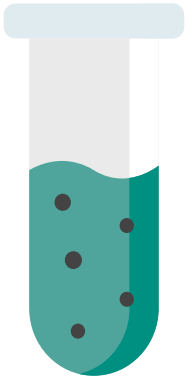
- Potential that any aqueous diluent or low concentration can be used for ICG preparation without affecting fluorescence intensity

- Usage of ICG beyond 6 hrs post-reconstitution → maximize clinical cost efficacy

NEXT STEPS...

Future Research

Determine differences in an *in vitro* and clinical setting



Further evaluate conditions that aid fluorescence stability

To use clinically, sterility must be considered for multi-use ICG vials over a period

THANK YOU

Dr. Michelle Oblak & Charly McKenna

Address correspondence to aram01@uoguelph.ca

XIAO NIU

LSU School of Veterinary Medicine

LECOR

Cryopreservation and Cell Sorting Affect Feline Adipose-Derived Multipotent Stromal Cell in Vitro Behavior

Xiao Niu, BVM; Wei Duan, MS, PhD; Mandi J. Lopez, DVM, MS, PhD;

Wendy Wolfson, DVM; Marilyn A Dietrich, MS

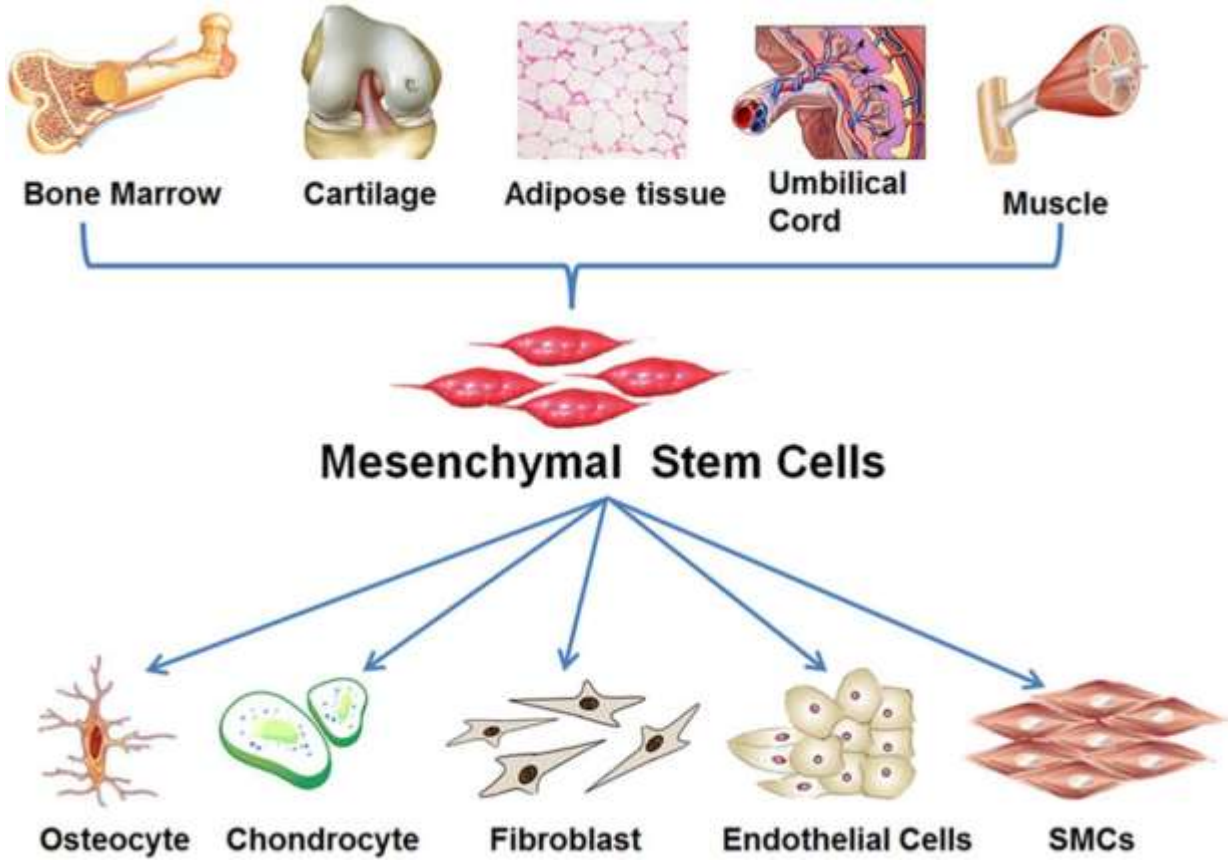
American College of Veterinary Surgeons
November 12, 2020

Conflict of Interest

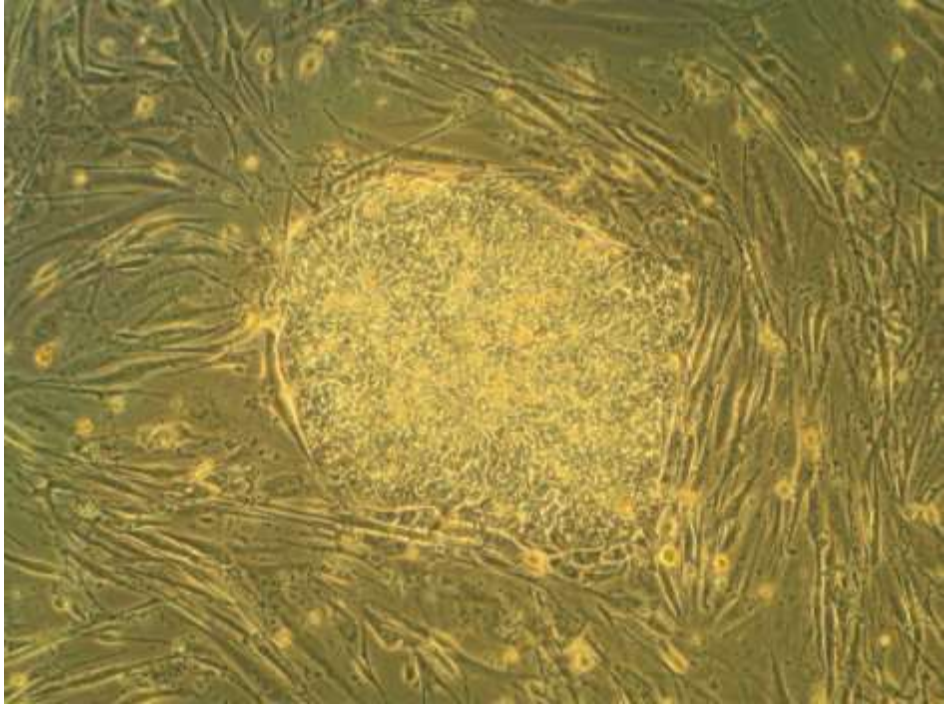
- *The authors declare no conflicts of interest with respect to this research.*

Multipotent Stromal Cells (MSCs)

- Derived from the many tissues
- Differentiation capacity
- Immunomodulatory properties
- Trophic effects



(Differencebetween.info)



Cell-based therapy in Feline

Attractive tools for cellular therapy to treat chronic, degenerative diseases in cats

- Gingivostomatitis
- Asthma
- Kidney disease
- Type II diabetes

Cryopreservation

- Storage and delivery
- Allogeneic cell transplantation
- Harvest at young age for later use
- Potential impacts on cell behaviors

(Medium)

Cryopreservation

Effect on equine MSCs

Effects of enzyme and cryoprotectant concentrations on yield of equine adipose-derived multipotent stromal cells

Wei Duan PhD; Mandi J. Lopez DVM, PhD

Laboratory for Equine and Comparative Orthopedic Research, Department of Veterinary Clinical Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA 70803. (Duan, Lopez)

- **Proliferation** Cell doubling↓, doubling time↑
- **Immunophenotype**

  Major histocompatibility complex (MHC) class II positive cell percentage ↑
- **Multipotentiality** Osteogenic potential↓

Immunophenotype of Feline MSCs

Sources	Positive	Negative
Feline Adipose-derived MSCs	CD9, CD29,**CD44**, CD90, **CD105**	CD4, **MHC II**
Feline Bone marrow-derived MSCs	CD44, CD9, CD90, CD105, MHC I	CD4, CD8, CD13, CD14, CD18, CD45, MHC II

- Cluster of differentiation (CD) 29, **CD44**, CD90 and **CD105**
  Commonly used to identify and isolate multipotent stromal cells (MSCs)

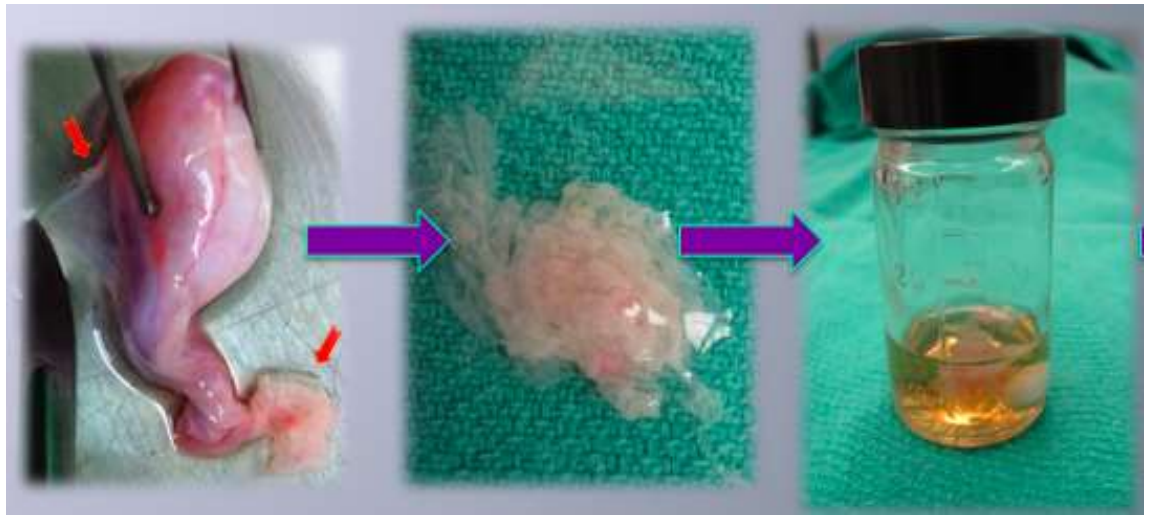
- Major histocompatibility complex **(MHC) class II**
  A protein for presenting processed antigens derived primarily from exogenous sources, to T-lymphocytes.

Tissue Source

Adipose tissue removed during routine sterilization, and digested in type I collagenase to obtain feline adipose-derived MSCs (fASCs)

Therapeutic Doses of Multipotent Stromal Cells from Minimal Adipose Tissue

Nan Zhang · Marilyn A. Dietrich · Mandi J. Lopez



- Possible effect of hormonal conditions on ASC capabilities from the adipose tissues located at reproductive organs

Overall Goals

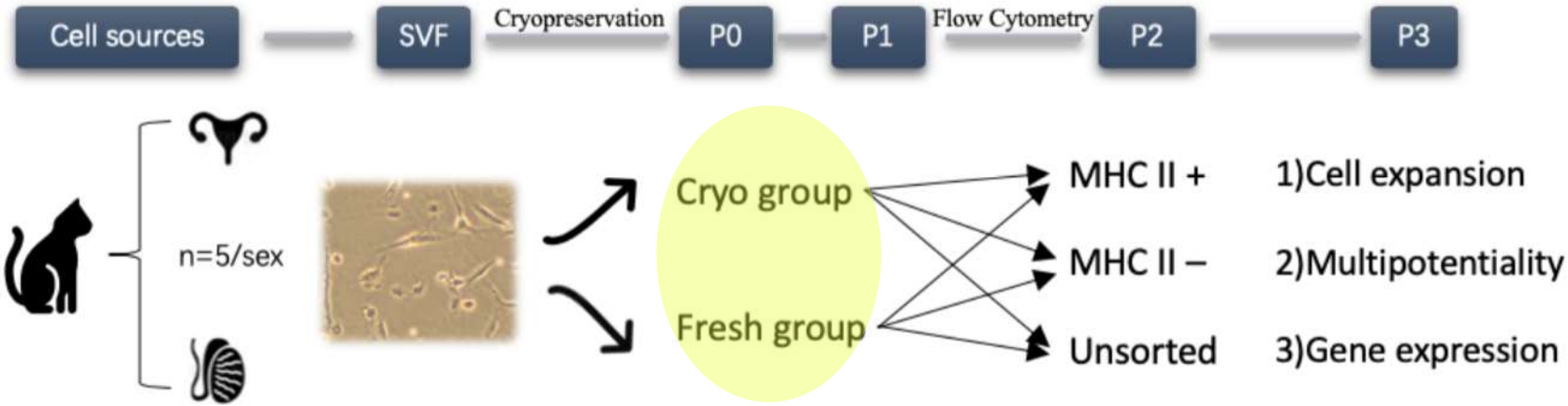
The present study was designed to evaluate the independent effects of cryopreservation and immunophenotype on in vitro proliferative capacity and multipotentiality of fASCs.

- **Hypotheses**

1) Cryopreservation increases MHCII expression and reduces plasticity and expansion potential of fASCs.

2) MHCII- fASCs have greater plasticity and higher expansion potential than MHCII+.

Study Design



- Cryo(cryopreserved); Fresh(continuously cultured)
- MHC II+(MHC II+, CD44+, CD105+); MHC II-(MHC II-, CD44+, CD105+)

Cell Sorting

The fASCs were labeled with antibodies at Passage(P)2:

- Stem cell marker: CD44 (delight 488), CD105 (PE)
- Target cell marker: MHC II (delight 633)

After cell sorting:

- CD44+ CD105+ MHCII+ cell group (MHC II+)
- CD44+ CD105+ MHCII- cell group (MHC II-)
- Unsorted cell group (Unsorted)

Continuously cultured in stromal (basal) medium [10% FBS, 1% antibiotic/antimycotic] **up to P3**

Cell Proliferation Rate

Measured the percent reduction of alamarBlue® after 2, 4, and 6 days of culture

- Reduction of alamarBlue: absorbance was measured at 560 nm and 590 nm.
- Fold change: the percent reduction among time points was calculated as Nf/Ni (Nf = final reduction and Ni = initial reduction) with day 4 and 6 as Nf, and day 2 as Ni for each isolate

(gbiosciences)

Multipotentiality
Colony-Forming Unit (CFU) Frequency

- Eight replicates of 5000, 2500, 1250, 625, 312, or 156 cells/well in 96-well plates

Differentiation	Culture medium	Staining
Fibroblastic	Stromal (10d)	0.1% toluidine blue
Osteoblastic	Stromal (10d)→osteogenic (10d)→supplemented (10d)	2% alizarin red
Adipocytic	Stromal (10d)→adipogenic (10d)	0.3% oil red O

- P3 cell plasticity quantification via limiting dilution assays to determine fibroblastic (CFU-F), osteoblastic (CFU-Ob) and adipocytic (CFU-Ad) colony-forming unit frequency percentages

  - ***Positive identification*** *Wells with ≥10 toluidine blue-stained colonies (CFU-F), ≥10 oil red O-stained colonies (CFU-Ad), or ≥1 alizarin red-stained colony (CFU-Ob)*
  - ***CFU frequency*** *The ratio of negative to total wells per row, according to Poisson's ratio (F=e-x; F: ratio of negative to total wells; e=2.71; x: CFU/well)*
  - ***CFU frequency percentage*** *1/CFU frequency ×100*

Multipotentiality Target Gene Expression

Processed real-time RT-PCR respectively for

- Progenitor genes (SOX2, Nanog)
- Adipocytic genes (PPAR-γ, leptin)
- Osteoblastic genes (ALP, OPG)

Lineage	Gene	Sequence
Stromal	SOX2	F: GGAGGTACATGCTGATCATG
		R: CAGTACAACTCCATGACC
	Nanog	F: TTTGCTGTAACTGTATCTGGG
		R: CCAGGCTTCTATTCCTATCACCAG
Osteoblastic	ALP	F: GAAGGAGGCAGGATTGAC
		R: ACAGGATGGAGGTGAAGG
	OPG	F: GTCTCATTCGAGAAGAACCC
		R: CACAACCGCGTGTGCGAGTGC
Adipocytic	PPAR-γ	F: GGGAGTTTCTAAAGAGCCTGAG
		R: GTCCTCAATGGGCTTCACATTCAGC
	Leptin	F: CCATCTTGGACAAACTCAGGAC
		R: GTTGAAGCTGTGCCAATCCG
Reference	β-actin	F: AGCCTTCCTTCCTGGGTATG
		R: ACAGCACCGTGTTAGCGTAG

Statistics

- Assays performed in duplicate
- Statistical method: Mixed **ANOVA models**
- Significance: $p < 0.05$

The majority of the cells were MHCII-; the percentage of MHCII+ cells was higher in cryopreserved cells than continuously cultured cells

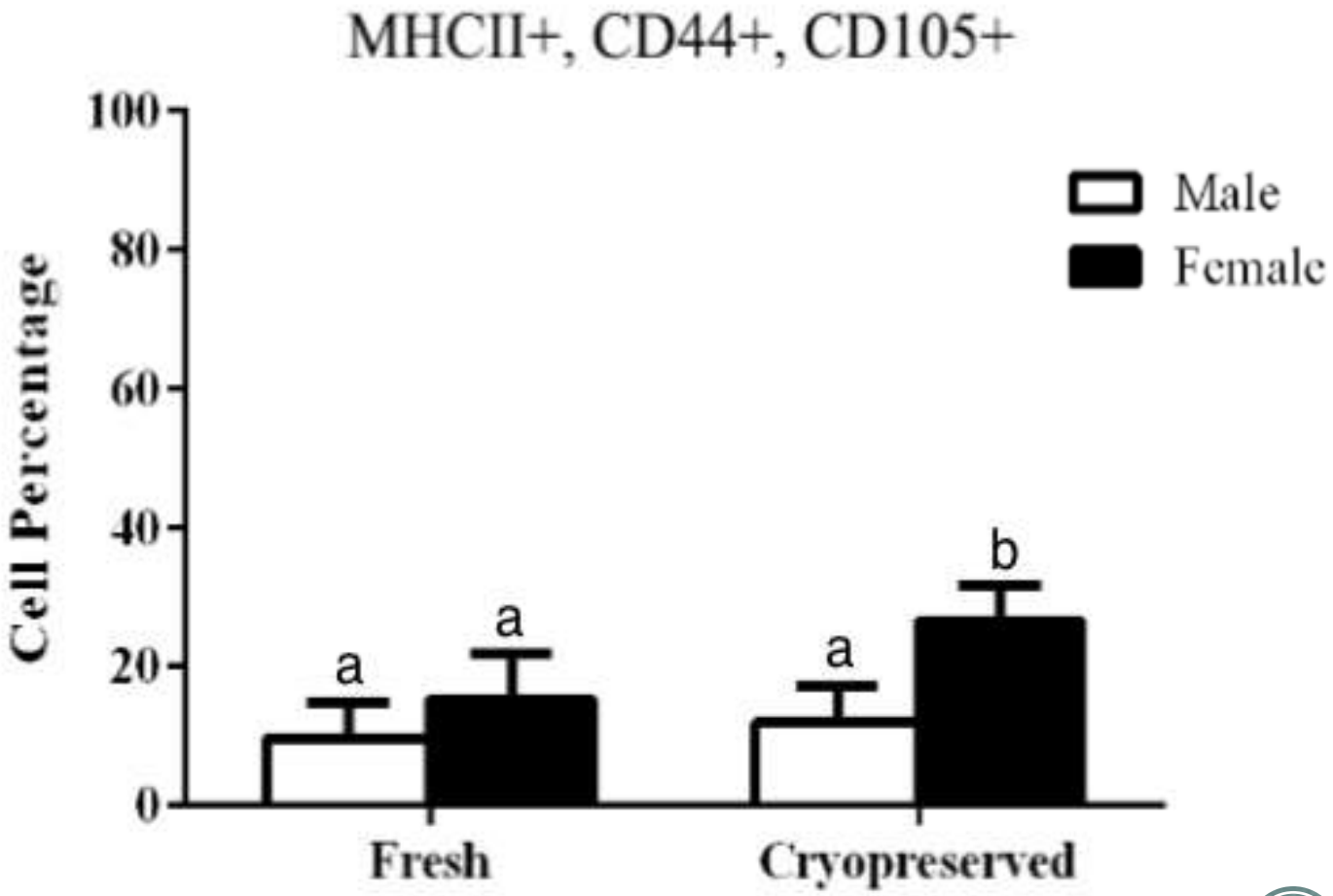
Cryopreserved cells：15.7±4.2%

- Male 12.3±3.6%
- female 23.45±3.67%

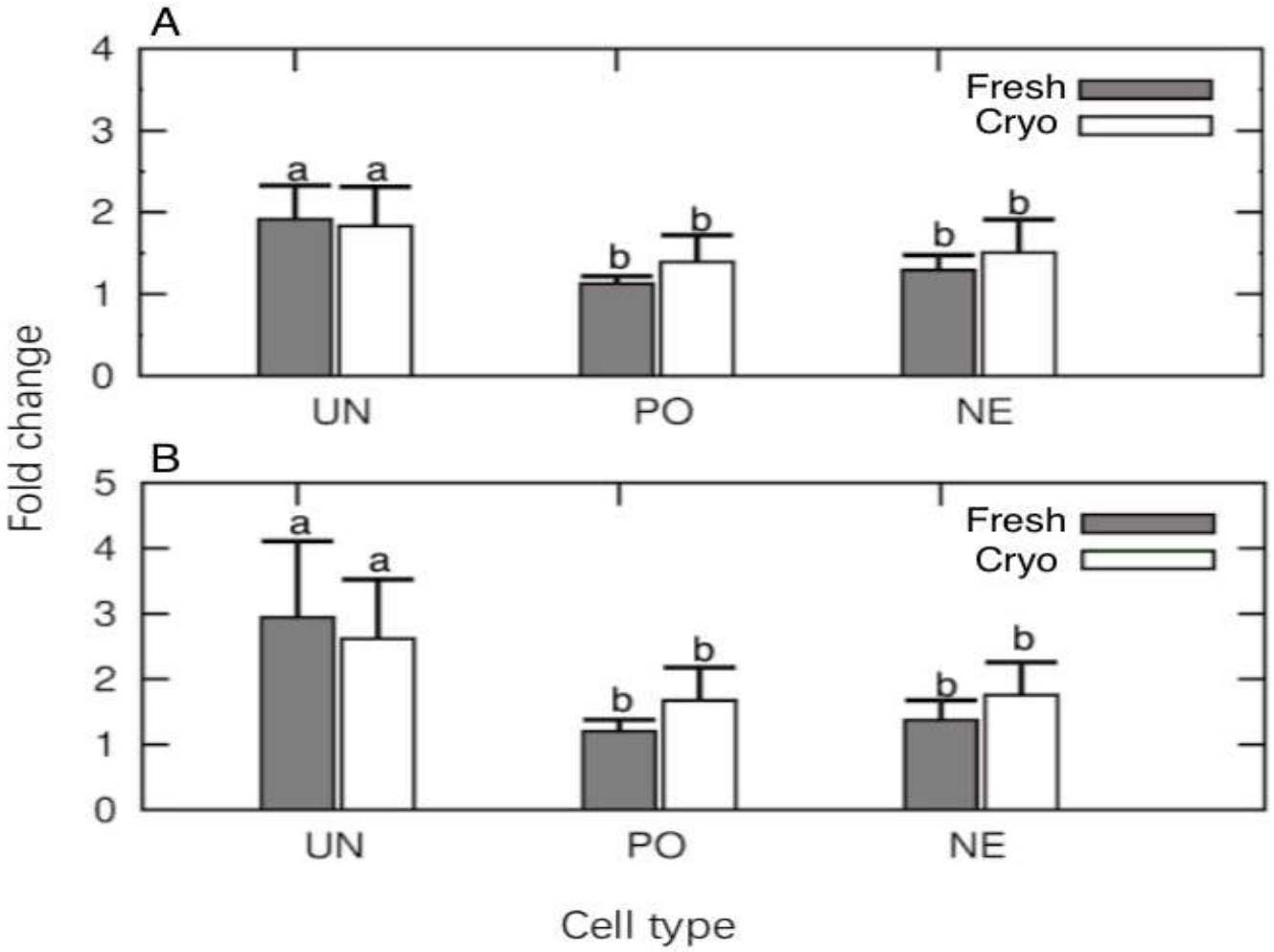
Continuously cultured cells: 9.4±3.1%

- Male 8.9±4.0%
- female 13.6±3.1%

**Continuously cultured in stromal medium (Fresh) Cultured in stromal medium following cryopreservation (Cryopreserved).*

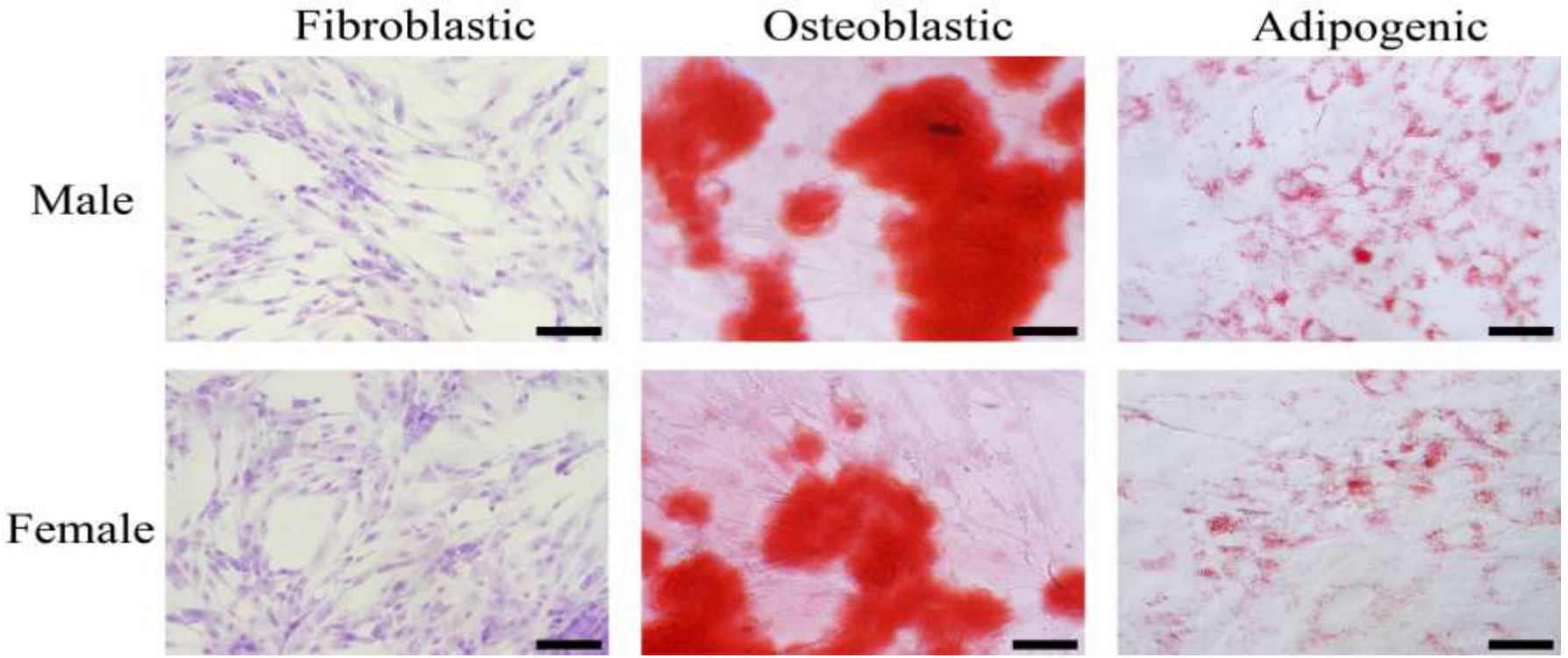


Both fresh and cryopreserved immunophenotyped (MHCII+ and MHCII-) cells had lower proliferation capability than unsorted cells



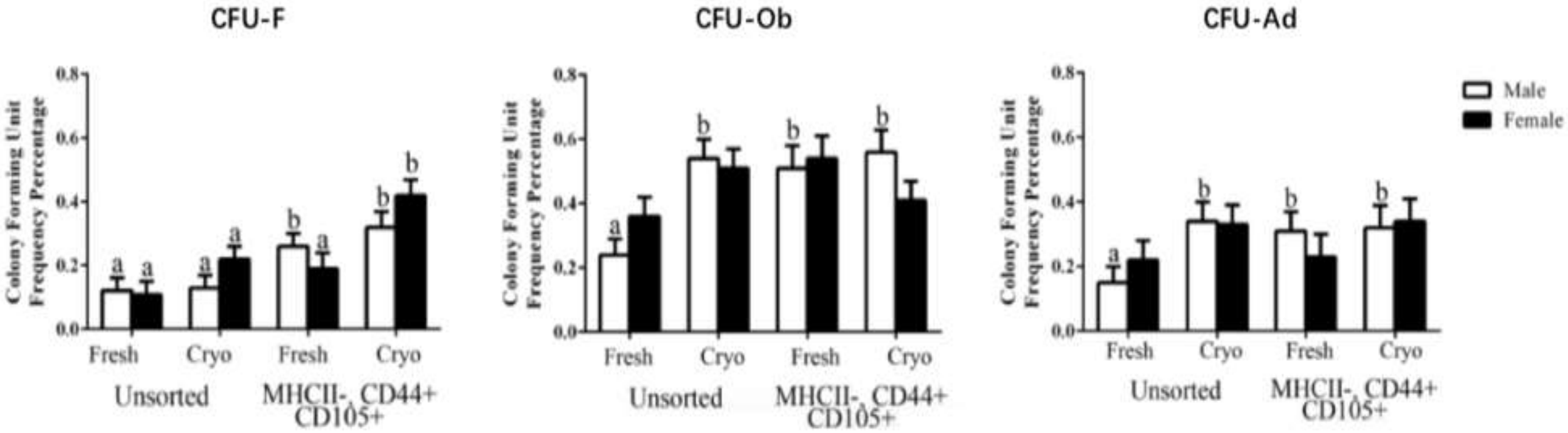
**Fold change after 4 days (A) and 6 days (B) relative to 2 days of culture in stromal medium. Unsorted (UN), MHCII+(PO) and MHCII-(NE) cryopreserved (Cryo) or continuously cultured (fresh)*

All cell populations showed osteoblastic and adipocytic differentiation capabilities



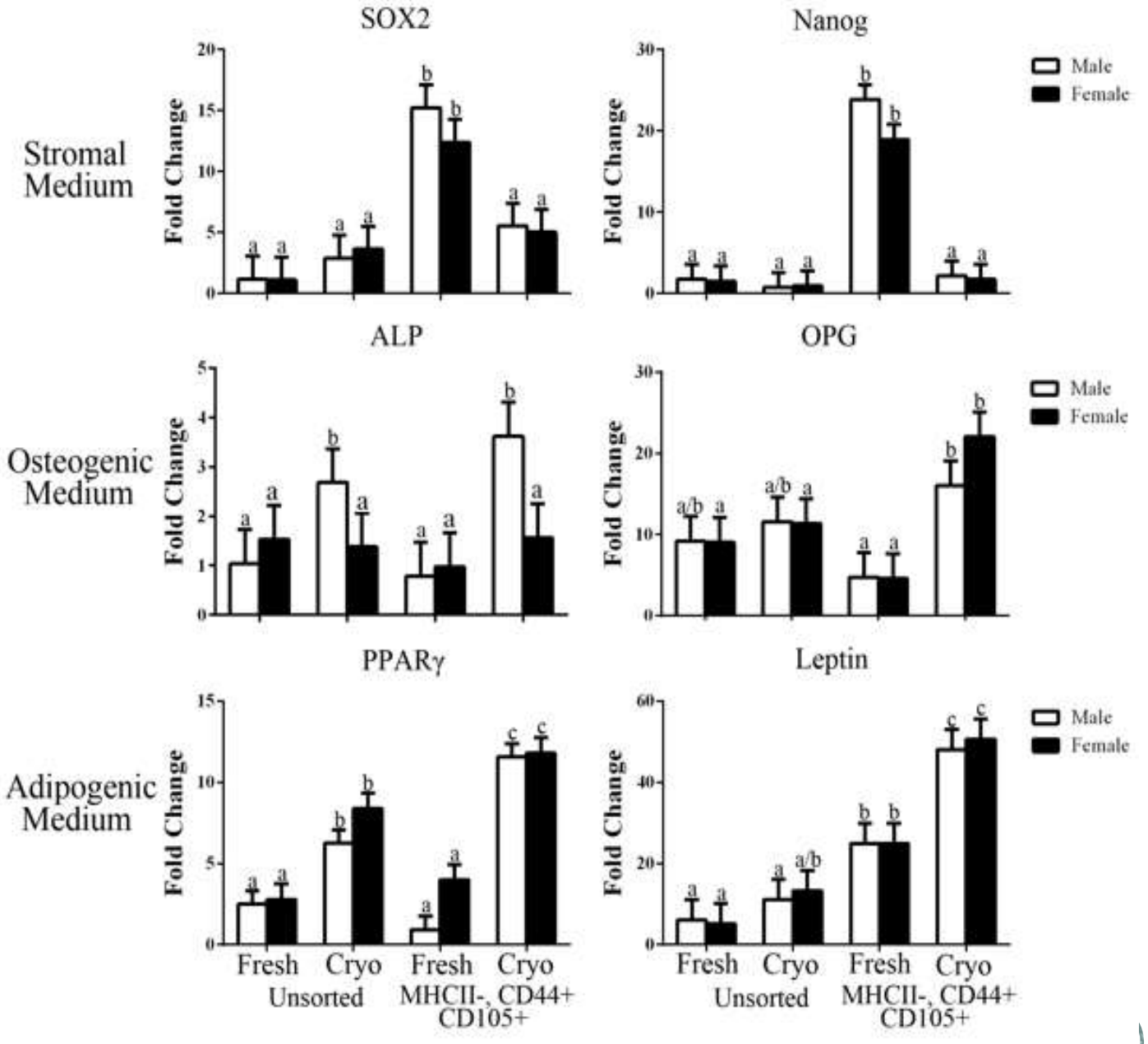
**Photomicrographs of male and female fresh feline ASCs after culture in stromal medium and toluidine blue staining, osteogenic medium and alizarin red staining and adipogenic medium and oil red O staining at P3. Magnification: 20×; scale bar: 100μm.*

MHCII- ASCs had a higher CFU-F percentage versus unsorted cells; cryopreserved, unsorted ACSs from male donors had greater CFU-Ob and -Ad percentages compared to continuously cultured, unsorted cells



**Fibroblastic (CFU-F), osteoblastic (CFU-Ob), and adipocytic (CFU-Ad) colony forming unit (CFU) frequency percentages for continuously cultured (fresh) and cryopreserved (cryo)*

Progenitor gene expression was highest in continuously cultured male and female MHCII- ASCs; osteogenic and adipogenic gene expression was higher in cryopreserved ASCs than fresh ASCs



** Fold change in progenitor, osteoblastic and adipocytic target gene expression for continuously cultured (fresh) and cryopreserved (cryo), unsorted and MHCII-ASCs from male and female donors.*

Conclusion

- Variable cell immunophenotypes may be necessary for sustained cell proliferation.
- Cryopreservation could enhance osteogenicity and adipogenicity at the expense of proliferative capacity in MHCII- cells.
- The effects of sex differences on immunophenotyped ASCs may indicate that the natural cell niche involves complex interactions among diverse cell populations.

(Waisman Biomanufacturing)

Overall, these results confirm the effects of cryopreservation, sorting, and sex on progenitor cell behavior, and each should be considered when comparing studies and cell therapies.

Scientific Relevance

- The cells used in the present study are isolated from reproductive organs, suggesting hormonal conditions may affect ASC capabilities from the adipose tissues located at reproductive organs.
- The results highlight the potential advantages of cell sorting for isolation and characterization of specific cell immunophenotypes for tissue generation.
- Further investigation of feline ASCs characterizes and cryopreservation will contribute to reproducible results of targeted cell therapies and tissue generation.

Acknowledgement

Funding

Funding for MSC studies performed by the authors was provided by the Winn Feline Foundation

Contribution

- Supervisor: Dr. Mandi J. Lopez, DVM, MS, PhD
- Sample collecting support: Dr. Wendy Wolfson, DVM
- Flow cytometry technique support: Marilyn A Dietrich, MS
- LECOR (Laboratory for Equine & Comparative Orthopedic Research) member:

  Catherine Takawira, Qingqiu Yang, Takashi Taguchi, Pengju Wang

Citations

- Duan, W. & Lopez, M. J. Effects of enzyme and cryoprotectant concentrations on yield of equine adipose-derived multipotent stromal cells. Am J Vet Res 79, 1100-1112, doi:DOI 10.2460/ajvr.79.10.1100 (2018).
- Zhang, N., Dietrich, M. A. & Lopez, M. J. Therapeutic doses of multipotent stromal cells from minimal adipose tissue. Stem Cell Rev 10, 600-611, doi:10.1007/s12015-014-9508-1 (2014).
- Behrend, E. N. & Greco, D. S. Treatment of feline diabetes mellitus: Overview and therapy. Comp Cont Educ Pract 22, 423-+ (2000).


Thanks for Your Time!

ABBIE TIPLER

ACVS

AMERICAN COLLEGE of VETERINARY SURGEONS

Urinary Catheterisation of female dogs – a comparison between three techniques for catheter placement

Dr AE Tipler, Eleanor A Moses , Hon A/Professor Ristan Greer, Dr Peter Delisser, Dr Blaine D McCracken, Adjunct Professor PA Moses

Veterinary Specialist Services

Conflict of Interest

I hereby certify that, to the best of my knowledge, no aspect of my current legal, personal or professional situation might reasonably be expected to affect my views on the subject on which I am presenting.

Introduction

- Urinary catheterisation has frequent indications
- Urinary catheterisation complications include urethritis, urethral mucosal damage, urinary tract perforation and **urinary tract infection**.
- Urinary tract infections

20% of one-time catheterisations

27% increase in risk for each additional day

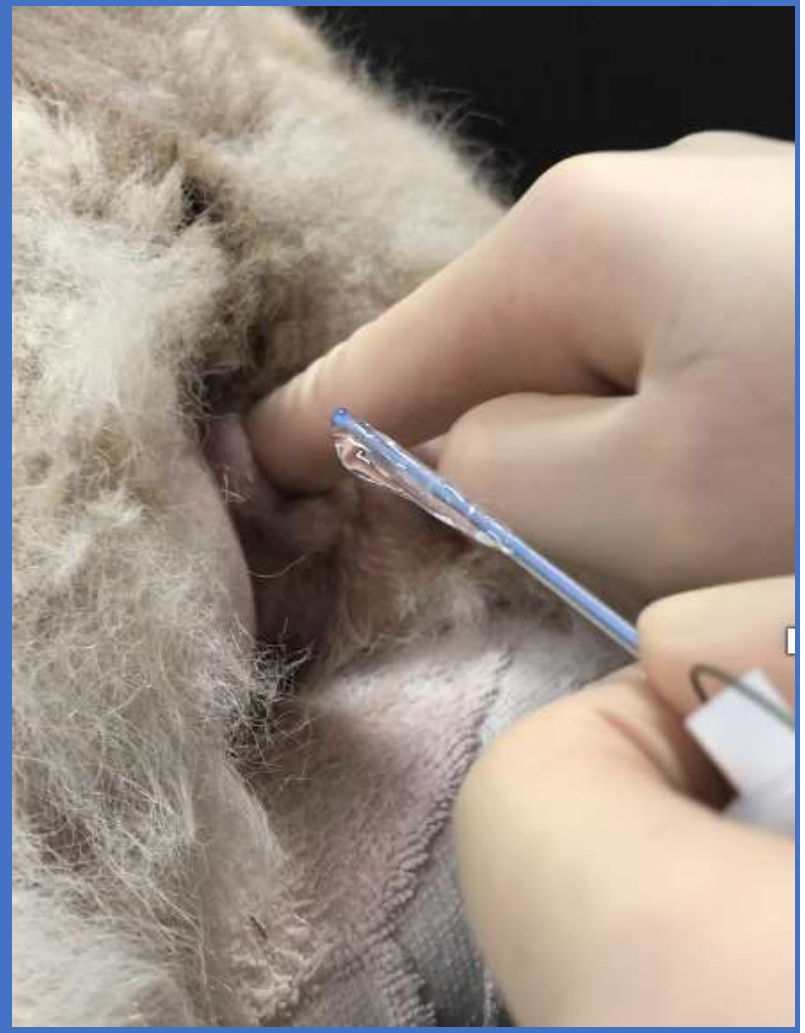
10-50% overall risk UTI

Veterinary Specialist Services

Introduction

- Predisposing factors – mucosal damage, proximity to anus, catheter as conduit for bacterial movement
- Antimicrobials not successful at reducing UTIs
- Focus on strict asepsis, careful maintenance, atraumatic and fast insertion

Veterinary Specialist Services



- Techniques for placement of urinary catheter – blind palpation, visualisation with speculum.
- Comparisons between techniques not investigated

Introduction

- Objectives;

Primary:

Describe novel technique, compare techniques in terms of speed when first learning

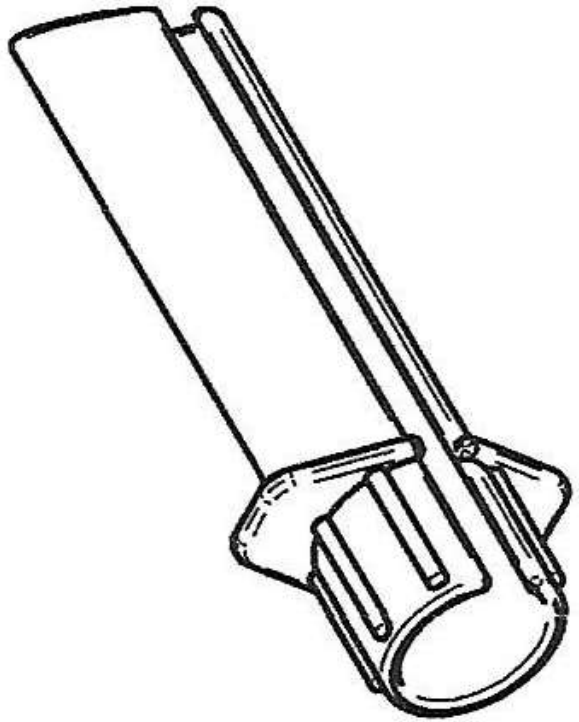
Secondary: To survey participants on which technique they preferred

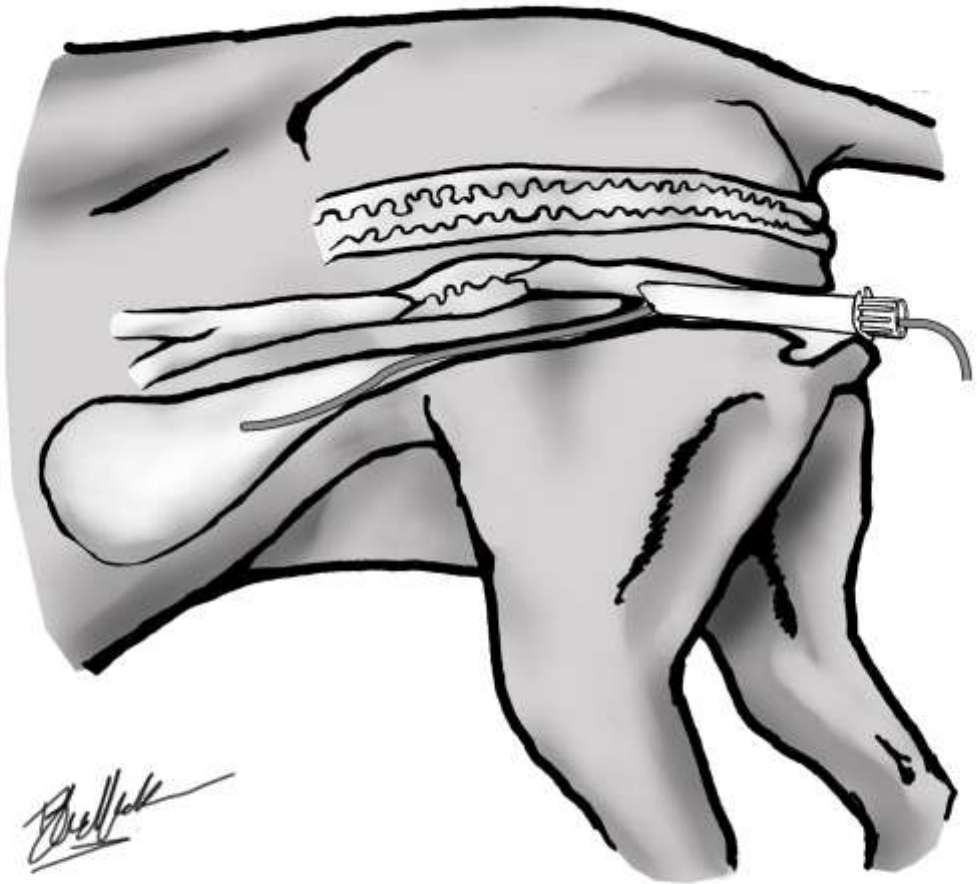
Veterinary Specialist Services

Materials and Methods

- ❑ 9 cadavers – cooled not frozen
- ❑ 9 volunteer veterinary students
- ❑ 30 minute tutorial on urinary catheterisation techniques prior to workshop
- ❑ Post workshop questionnaire

Veterinary Specialist Services





Materials and methods

Veterinary Specialist Services

Materials and methods

- 3 Veterinary technicians
- 3 dogs to each row of benches - Small (<10kg), medium (15-25kg) and large (>30kg).
- Three rounds, 3 participants started with blind palpation (BP), 3 with visual with speculum (SPEC) and 3 with novel catheterisation device (NCD)
- STOP signs held while waiting for a tutor so that wait time not recorded

Veterinary Specialist Services


FOR SINGLE USE

Which technique did you find the easiest to learn?

Which technique did you find the easiest to perform?

What is your overall preferred technique for urinary catheterisation post this workshop?

Which technique did you find the most difficult to learn?

Which technique did you find the most difficult to perform?

What is your overall least preferred technique for urinary catheterisation post this workshop?

Statistical analysis

- Time required using each technique was compared using Kaplan-Meier plots with log-rank test
- Mixed model Cox Proportional Hazards regression was used to compare the effect of technique accounting for repeated measures of student and to assess any effect of dog size

Veterinary Specialist Services

Results

- Median times to catheterisation (95% CIs) were

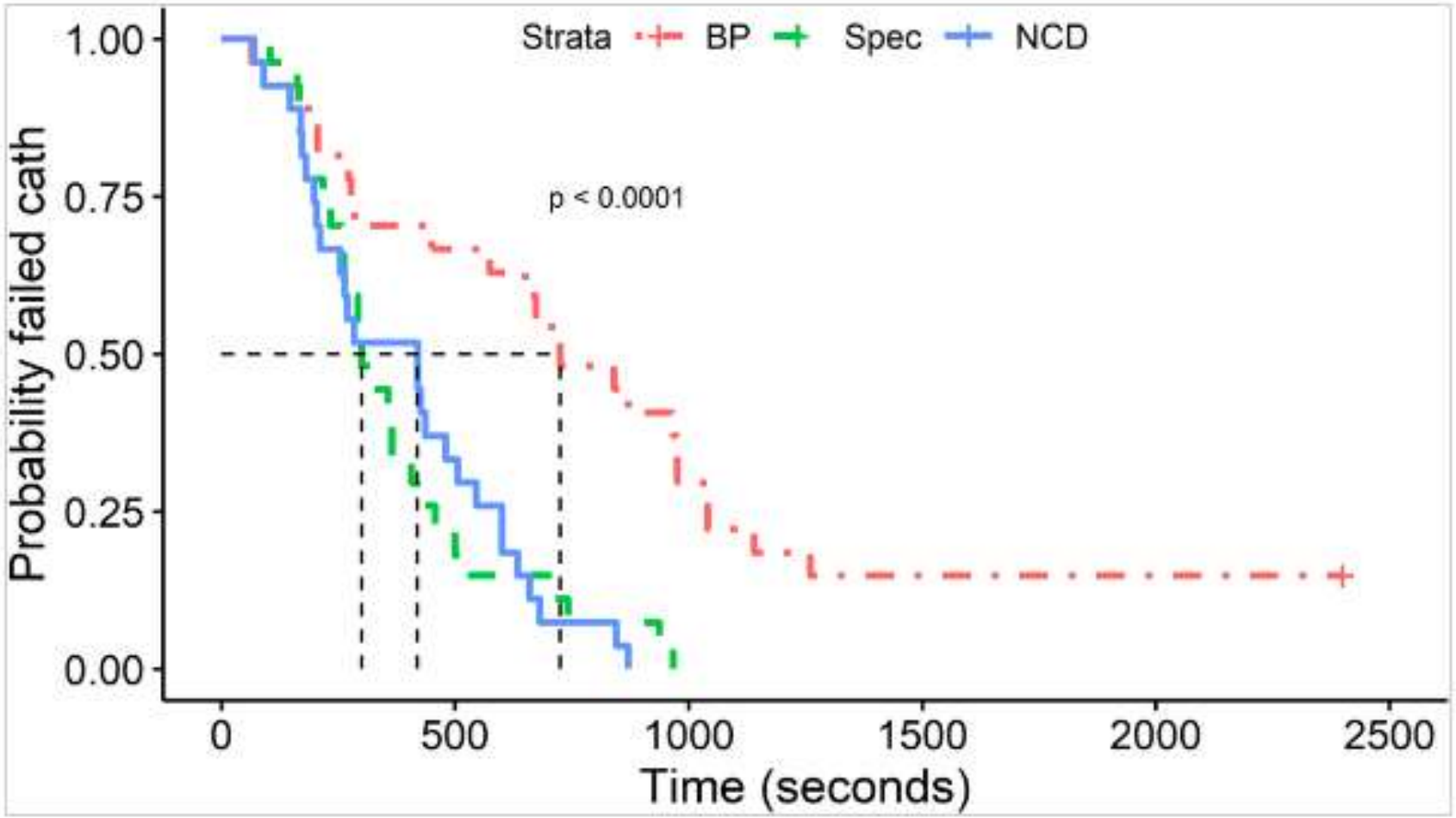
300 (261-417) seconds, n=27, p<0.001 for visual with speculum (SPEC)

420 (253-545) seconds, n=27, p<0.001 for Novel catheterisation device (NCD)

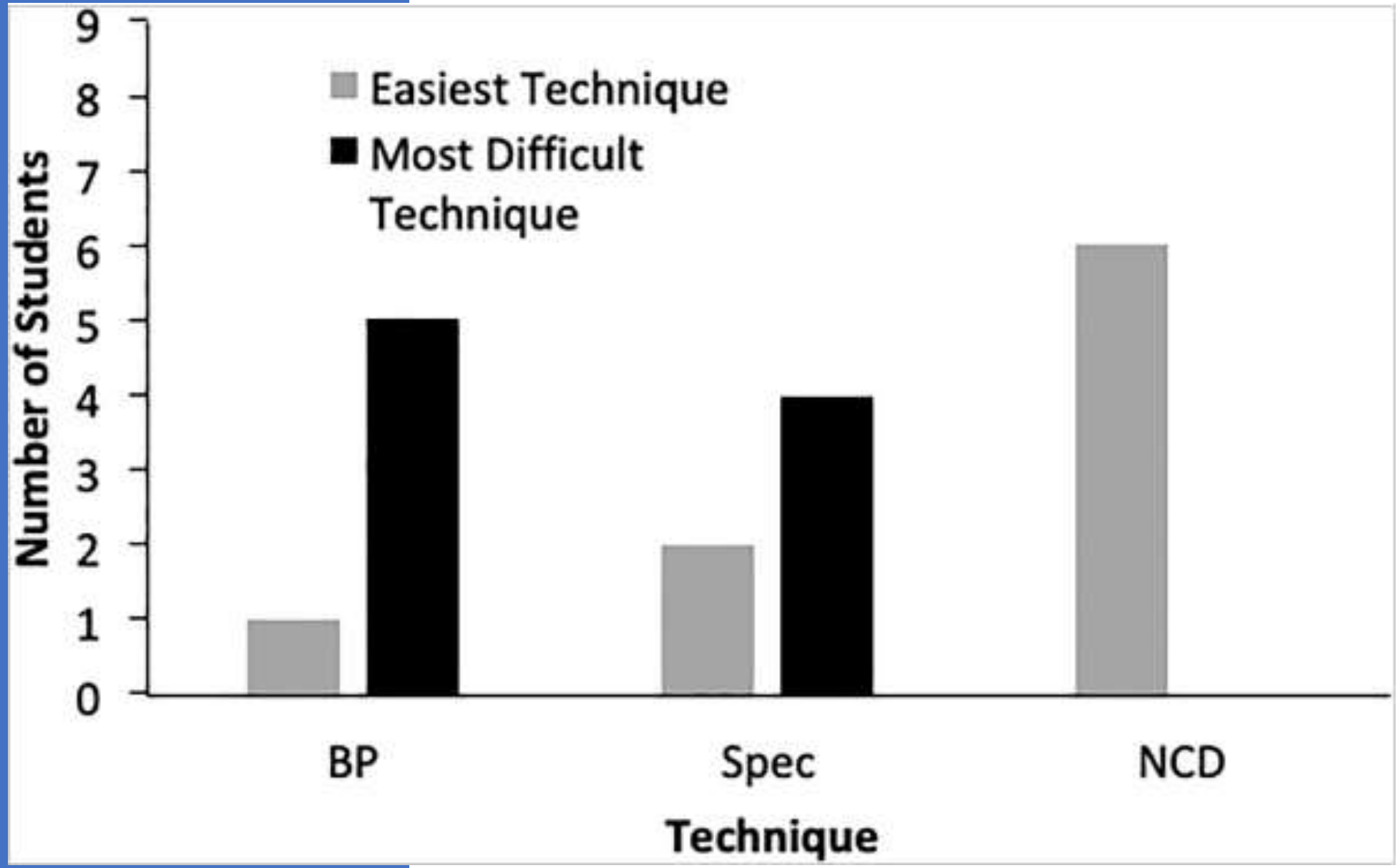
725 (574-1032) seconds, n=27, p<0.001 for Blind Palpation (BP)

Hazard ratio of 3.66 (95% CI 1.94-6.91 p<0.001) for SPEC compared to BP

Hazard ratio of 3.57 (95% CI 1.87-6.81 p<0.001) for NCD compared to BP



(Figure 4. Kaplan-Meier survival plot for time to catheterisation using three methods, BP (blind palpation) – median (95% CI) 725 (574-1032) seconds, n=23, SPEC (visual with speculum) – median (95% CI) 300 (261-417) seconds, n=27 and NCD (Novel Catheterisation Device) – median (95% CI) 420 (253-545) seconds, n=27. The dashed lines indicate the median times to catheterisation for each method.)


Easiest Technique
Most Difficult Technique
Number of Students
0
1
2
3
4
5
6
7
8
9
BP
Spec
NCD
Technique

Discussion

- Ideal technique should be quick, easy to learn and perform whilst maintaining aseptic technique
- Urinary catheterisation by blind palpation slower
- Difficulty palpating landmarks, multiple failed attempts to pass the catheter or visual techniques allowing visualisation of the papilla

Veterinary Specialist Services

Discussion

- Reasonable time – 5 minutes
- Sterility of various techniques an idea for future research

Veterinary Specialist Services

Discussion

- 6/9 Participants found the NCD the easiest technique. Possible reasons include the ease of holding in one hand, the longer cranio-dorsal edge blocking off the vestibulovaginal junction and cup the urethral papilla
- 5/9 participants found blind palpation the hardest and 4/9 found speculum the hardest. Possible reasons include difficulty palpating landmarks or the difficulty manipulating and adjusting the vaginal speculum in one hand.

Limitations

- Cadavers - no bleeding or patient movement
- Cadaver tissue texture may be different
- Small sample size
- Veterinary students may not be a good model for qualified veterinarians or veterinary technicians

Summary

- Visual technique with speculum or novel catheterisation device may be less difficult and require less time when teaching veterinary staff to place urinary catheters
- Palpation least preference, increased time and highest rate of failure
- Novel device may provide a simpler method of visualisation, provide a more sterile way of placing.


MILA
INTERNATIONAL, INC.
Medical Instrumentation for Animals
7984 Tanners Gate Lane
Florence, Kentucky 41042 USA
859-957-1722/888-645-2468/www.milaint.com
PROTOTYPE
Light Guided Foley Introducer for
Female Dogs: Large
Veterinary Use Only
Sterile
Single Use Only

Fun Fact


NATIONAL, INC.
Medical Instrumentation for Animals
/984 Tanners Gate Lane
Florence, Kentucky 41042 USA
859-957-1722/888-645-2468/www.milaint.com
PROTOTYPE
Light Guided Foley Introducer for
Female Dogs: Large
Veterinary Use Only
Sterile
Single Use Only

Fun Fact

References

- 1. Aldrich J. Advanced Monitoring and Procedures for Small Animal Emergency and Critical Care. 2012:395-406.
- 2. Smarick SD, Haskins SC, Aldrich J et al. Incidence of catheter-associated urinary tract infection among dogs in a small animal intensive care unit. *J Am Vet Med Assoc* 2004;224:1936-1940.
- 3. Biertuempfel PH, Ling GV, Ling GA. Urinary tract infection resulting from catheterization in healthy adult dogs. *Journal American Veterinary Medical Association* 1981;178:989-991.
- 4. Nacey JN, Delahunt B, Tulloch AG. The assessment of catheter-induced urethritis using an experimental dog model. *Journal urology* 1985;134:623-625.
- 5. Stickler DJ. Bacterial biofilms in patients with indwelling urinary catheters. *Nature Clinical Practice Urology* 2008;5:598-608.
- 6. Barsanti JA, Blue J, Edmunds AA. Urinary tract infection due to indwelling bladder catheters in dogs and cats. *Journal American Veterinary Medical Association* 1985;187:384-388.
- 7. Ogeer-Gyles J, Mathews K, Weese JS, Prescott JF, Boerlin P. Evaluation of catheter-associated urinary tract infections and multi-drug-resistant Escherichia coli isolates from the urine of dogs with indwelling urinary catheters. *Journal of the American Veterinary Medical Association* 2006;229:1584-1590.
- 8. Bubenik LJ, Hosgood GL, Waldron DR, Snow LA. Frequency of urinary tract infection in catheterized dogs and comparison of bacterial culture and susceptibility testing results for catheterized and noncatheterized dogs with urinary tract infections. *J Am Vet Med Assoc* 2007;231:893-899.
- 9. Bubenik L, Hosgood G. Urinary Tract Infection in Dogs with Thoracolumbar Intervertebral Disc Herniation and Urinary Bladder Dysfunction Managed by Manual Expression, Indwelling Catheterization or Intermittent Catheterization. *Veterinary Surgery* 2008;37:791-800.
- 10. Freshman JL, Reif JS, Allen TA, Jones RL. Risk factors associated with urinary tract infection in female dogs. *Preventive Veterinary Medicine* 1989;7:59-67.
- 11. Sullivan LA, Campbell VL, Onuma SC. Evaluation of open versus closed urine collection systems and development of nosocomial bacteriuria in dogs. *J Am Vet Med Assoc* 2010;237:187-190.
- 12. Segev G, Bankirer T, Steinberg D et al. Evaluation of urinary catheters coated with sustained-release varnish of chlorhexidine in mitigating biofilm formation on urinary catheters in dogs. *J Vet Intern Med* 2013;27:39-46.
- 13. Olby NJ, MacKillop E, Cerda-Gonzalez S et al. Prevalence of urinary tract infection in dogs after surgery for thoracolumbar intervertebral disc extrusion. *J Vet Intern Med* 2010;24:1106-1111.
- 14. Seguin MA, Vaden SL, Altier C, Stone E, Levine JF. Persistent urinary tract infections and reinfections in 100 dogs (1989-1999). *J Vet Intern Med* 2003;17:622-631.
- 15. Stiffler KS, Stevenson MA, Sanchez S et al. Prevalence and characterization of urinary tract infections in dogs with surgically treated type 1 thoracolumbar intervertebral disc extrusion. *Vet Surg* 2006;35:330-336.
- 16. Beal MW, Brown DC, Shofer FS. The Effects of Perioperative Hypothermia and the Duration of Anesthesia on Postoperative Wound Infection Rate in Clean Wounds: A Retrospective Study. *Veterinary Surgery* 2000;29:123-127.
- 17. Bexfield N. BSAVA Guide to Procedures in Small Animal Practice. 2 edn, 2014:249, 251.
- 18. Silverstein Dombrowski DC. Small Animal Critical Care Medicine. 2009:603-606.
- 19. Carothers M. Small Animal Internal Medicine for Veterinary Technicians and Nurses. 2012:480-484.
- 20. Evans HE, de Lahunta A. Female Genital Organs. *Miller's Anatomy of the Dog*. 4 edn. Elsevier, Missouri, 2013:392-396.
- 21. Team RC. R: A language and environment for statistical computing. R Foundation for Statistical Computing., Vienna, Austria., 2017.
- 22. Kassambara A, Kosinski M, Biecek P. Survminer: Drawing Survival Curves using 'ggplot2'. R package version 0.4.6. . 2019.
- 23. Therneau TM, Grambsch PM. *Modeling Survival Data: Extending the Cox Model.* . Springer, New York., 2000.
- 24. Therneau TM. A Package for Survival Analysis in S. version 2.38., 2015.
- 25. Therneau TM. coxme: Mixed Effects Cox Models. R package version 2.2-16., 2020.

Questions

Thank you for listening.

Dr Abbie Tipler ATCL BVSc MANZCVS (Surgery)

Veterinary Specialist Services Surgery Resident

Veterinary Specialist Services

WEBINAR

ACVS

AMERICAN COLLEGE of VETERINARY SURGEONS

SMALL ANIMAL SURGICAL SAFETY, EFFICIENCY, TEACHING, AND MORE

NOVEMBER 12, 2020 | 6:00–8:00 P.M. ET

ACVS

AMERICAN COLLEGE of VETERINARY SURGEONS