



ANESTHESIA FOR PEDIATRIC PATIENTS “THE WEE ONES”

Sheilah Robertson - Senior Medical Director - Lap of Love Veterinary Hospice

1



2

3 months



15 years



3

3

**Robust yet a
vulnerable
population**



Physical
Psychological
Pain
Stress

Socialization
Isolation
Bad experience
Disease

4

Anesthesia mortality

Brodbelt et al 2007, 2008

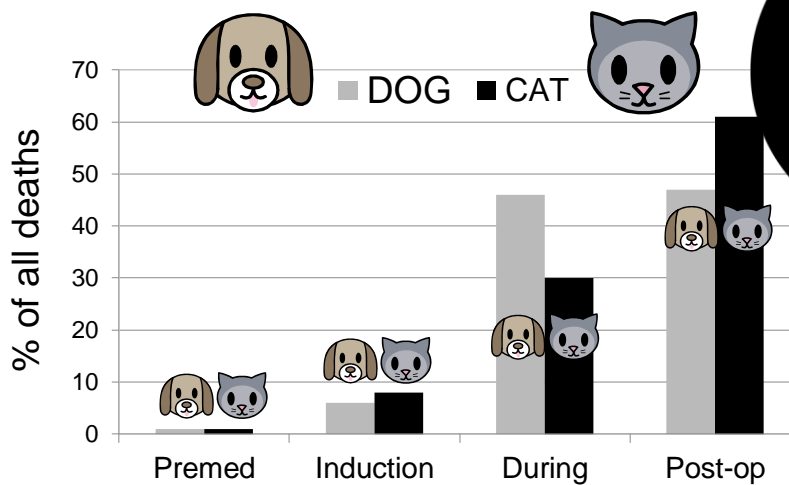
	% 	% 
Overall	0.17	0.24
Healthy ASA I-II	0.054	0.112
Sick ASA III-V	1.3	1.4

ASA status:

American Society of Anesthesiologists

5

Time of death



6

Risk Factors - age or weight?

< 5 kg



< 2 kg



7



The Veterinary Journal 2017

Perioperative mortality in cats and dogs undergoing spay or castration at a high-volume clinic

J.K. Levy^{a,*}, K.M. Bard^b, S.J. Tucker^a, P.D. Diskant^a, P.A. Dingman^a

0.03%







8

The Veterinary Journal 2017

Perioperative mortality in cats and dogs undergoing spay or castration at a high-volume clinic

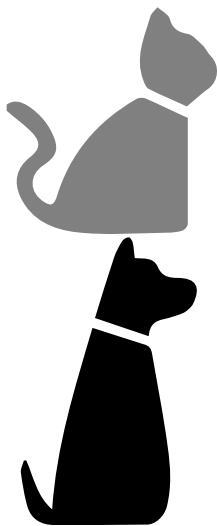
J.K. Levy^{a,*}, K.M. Bard^b, S.J. Tucker^a, P.D. Diskant^a, P.A. Dingman^a

NUMBERS	SPECIES & SEX	MORTALITY %
4 of 42,349		0.009
34 of 71,557		0.048 0.030  0.063 

9

The Veterinary Journal

Levy *et al* 2017



44% < 6 months

27% < 6 months

10



Neonatal pain experiences

11



International Association for the Study of Pain

IASP

Working together for pain relief

PAIN

2011

Johnston *et al*

Pain in neonates is different

12

Neonatal Hind Paw Injury Alters Processing of Visceral and Somatic Nociceptive Stimuli in the Adult Rat

Wang *et al* 2004 J Pain

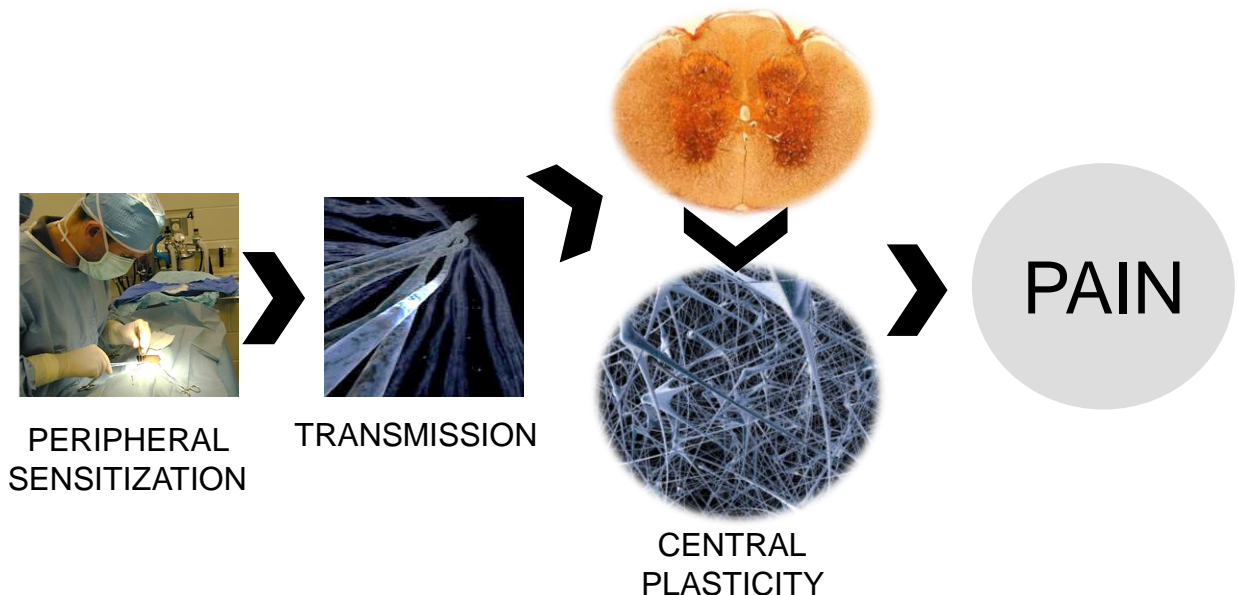


Effect of neonatal circumcision on pain response during subsequent routine vaccination

Taddio *et al* 1997 The Lancet



13



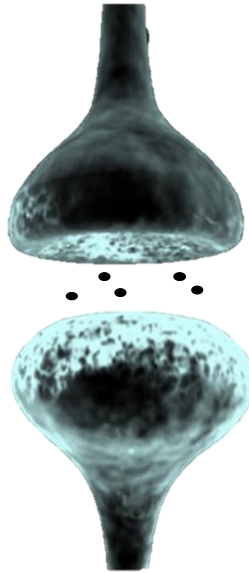
14

Central Plasticity [sensitization]

Activation of NMDA*
receptors

Glutamate

*N-methyl-D-aspartate



15

Effect of age on post-operative pain following routine OHE Polson *et al* 2013 JFMS

< 4 months



Adults ± pregnant



16

Effect of age on post-operative pain

Mechanical Threshold

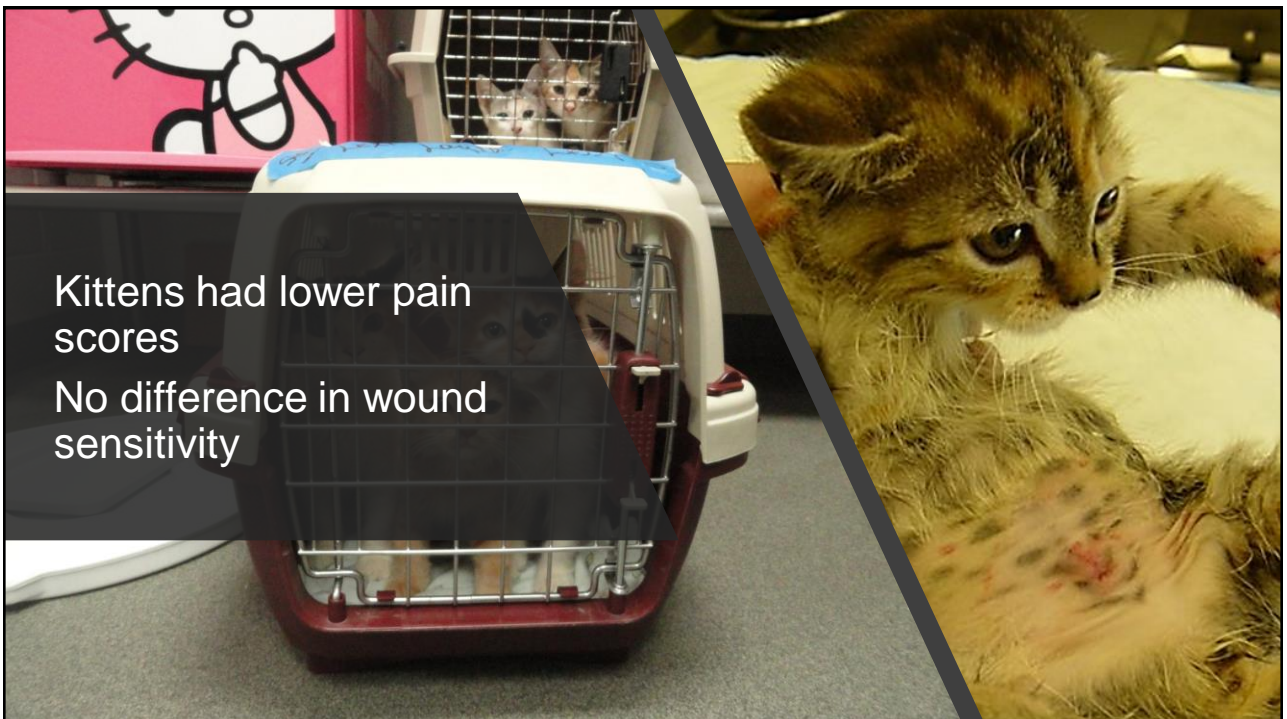


Simple Descriptive Scale

Score	Behavior
0	No pain – posture, can palpate wound
1	Mild pain – responds to wound pressure
2	Moderate pain – hunched, responds to wound pressure
3	Severe pain – miserable, hunched, growls, can't palpate wound

VAS

17



18

Research Paper

Clark et al 2011 VAA

Do psychological and physiological Stressors alter the acute pain Response to castration and tail docking in lambs



19



**Don't separate
litter mates**

20

Adverse event surveillance in small animal anesthesia

McMillan and Darcy 2016

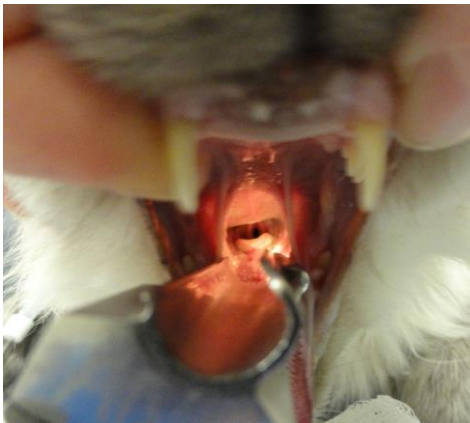


ADVERSE EVENT	RELATIVE FREQUENCY %
Arousal / breakthrough pain	10.7
Hypoventilation	9.7
Airway complications	9.4
Hypothermia	7.0
Arrhythmias	4.7
Recovery excitement / delirium	3.0
Desaturation	3.0
Potential aspiration	2.3

21

Intubation

Increased risks for ***minor, routine and short*** procedures



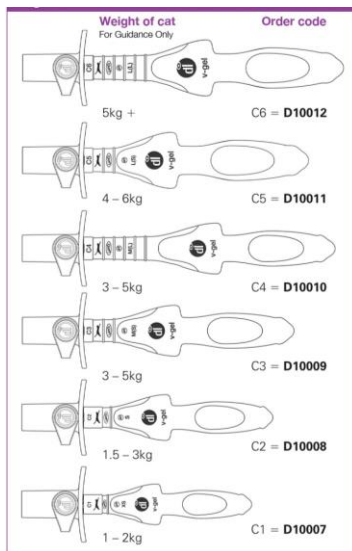
Small size
Laryngospasm
Swelling
Trauma
Lidocaine?

22



23

Supraglottic airway devices



<http://docsinnovent.com/>



24

Paper Veterinary Record 2015

Assessment of v-gel supraglottic airway device placement in cats performed by inexperienced veterinary students

M. Barletta, S. A. Kleine, J. E. Quandt



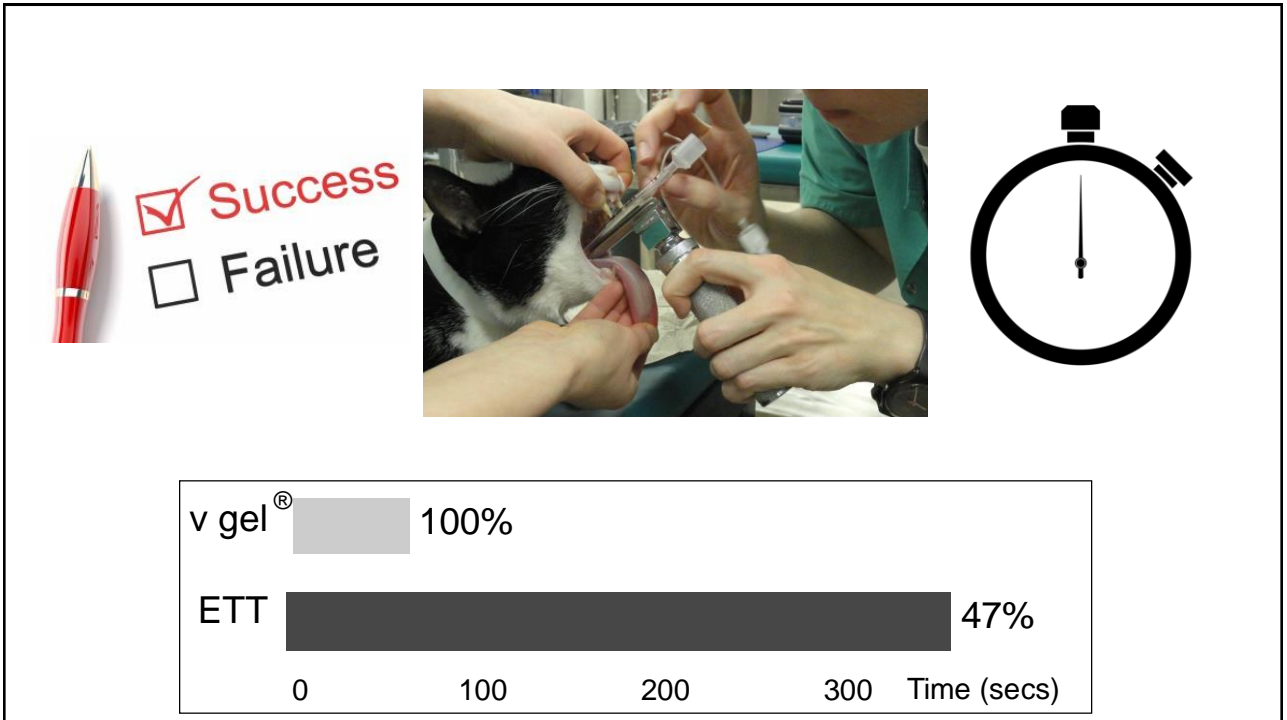
25

Dose of propofol (mg/kg)



ETT	V gel
5.6	4.1

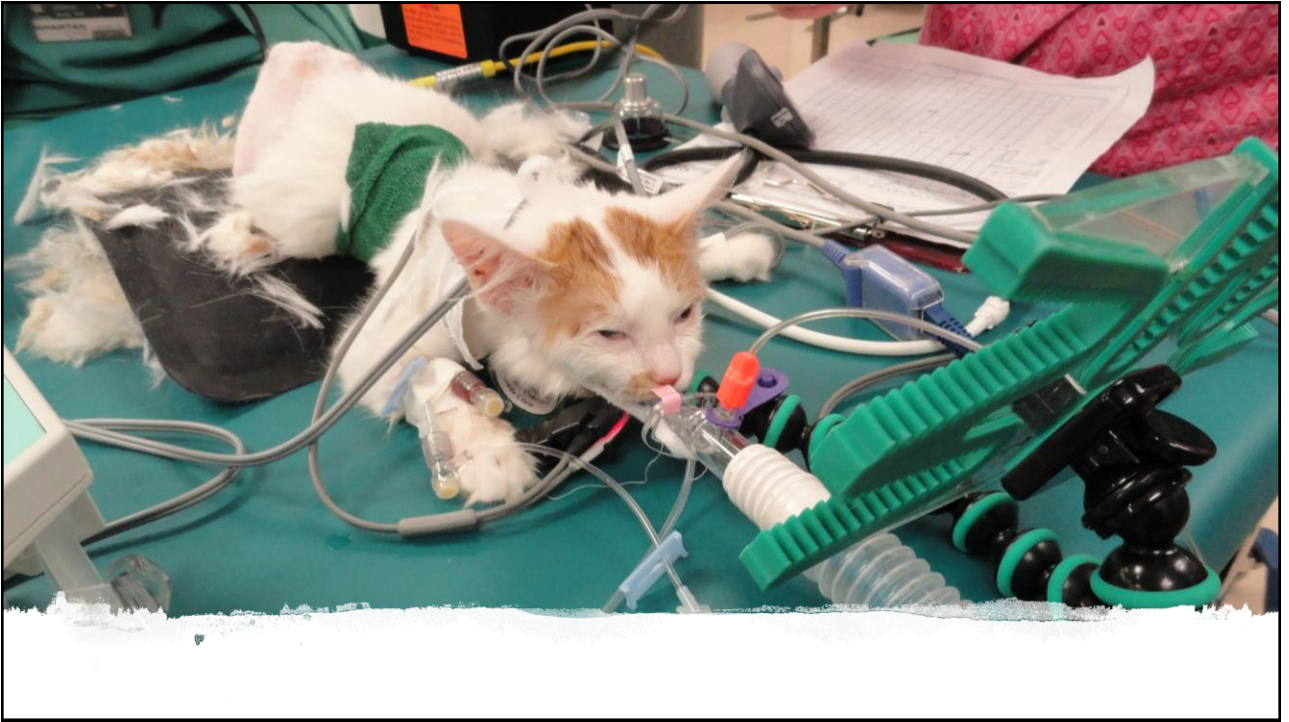
26



27



28



29

Fasting

NPO

30

Hypoglycemia?



31

Research Study

Cornell et al 2018 JFMS

Effect of transmucosal corn syrup application on post-operative blood glucose concentrations in kittens



32

Total Injectable protocols

DKB = Add 1 ml of dexmedetomidine, 1 ml of ketamine and 1 ml of butorphanol in a sterile vial creating 3 mls of the mixture.

DVM 360 February 2011

Dr Bushby - Mississippi State University

33

Review article

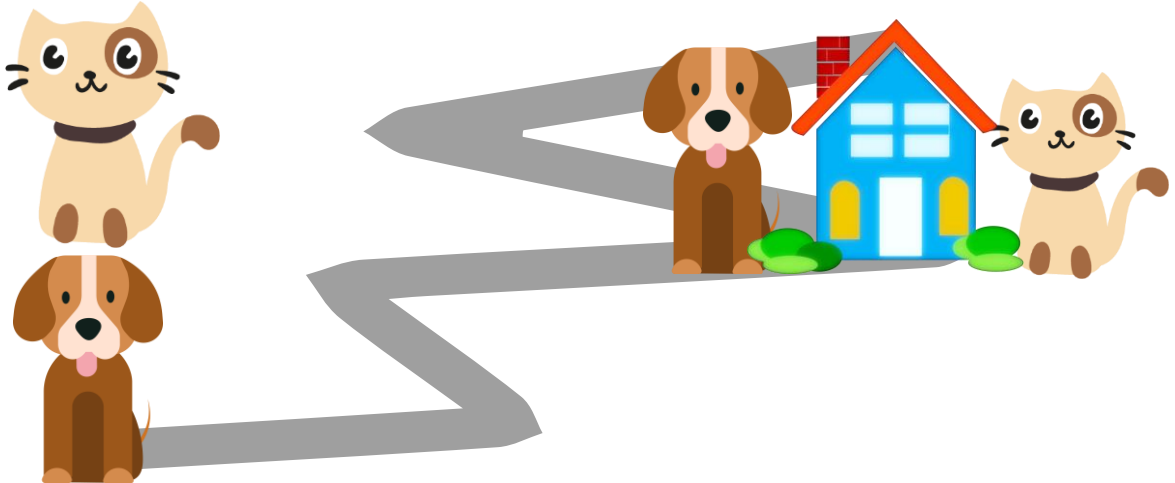
Warne *et al* 2014 JAVMA

Evaluation of the perioperative analgesic efficacy of buprenorphine, compared with butorphanol, in cats



34

Fast track anesthesia and surgery



35

Research Study

Hasiuk *et al* 2015

Application of fast-track surgery principles to evaluate effects of atipamezole on recovery and analgesia in cats anesthetized with dexmedetomidine-ketamine-hydromorphone



36

Dexmedetomidine

Sedation

Dose related from 2 and 40 $\mu\text{g/kg}$ IM

Analgesia

Only at 40 $\mu\text{g/kg}$ IM



Slingsby and Taylor 2008 J Vet Pharmacol Ther

37

Alfaxalone

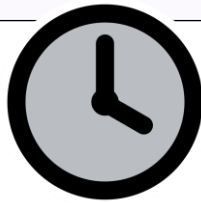
Approved for IV induction
IM, SC - off label



38

IM combinations for sedation / anesthesia

ALFAXALONE mg/kg (10mg/ml)	WITH [DRUG] mg/kg
1-2	Methadone 0.4
2	Butorphanol 0.2
2	Buprenorphine 0.02
2	Midazolam 0.25



Peak effect at 10 minutes
Duration 20-35 minutes

39

Ketamine or Alfaxalone
Dexmedetomidine
Hydromorphone
Meloxicam + IT block

Ketamine or Alfaxalone
Dexmedetomidine
Butorphanol
Meloxicam + Scrotal block



40

Alfaxalone cats ate sooner



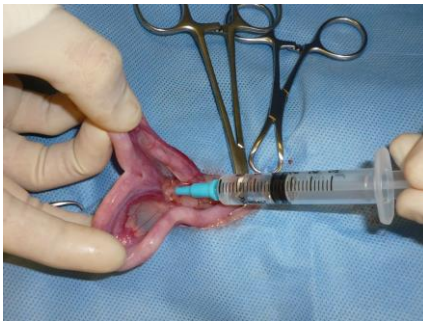
41

Original Article



jfms
Journal of Feline
Medicine and Surgery

Analgesic efficacy of intraperitoneal administration of bupivacaine in cats

Benito *et al* 2016

Bupivacaine (0.25%) 2 mg/kg

42

Intratesticular block



1-2 mg/kg LIDOCAINE



2 mg/kg LIDOCAINE

43

Value of IT blocks



Blunted nociceptive response to surgery – HR, MAP, HRV

Reduced isoflurane requirements
Blunted HR and BP response to surgery

44

Post-operative Complaints

1. Feeling cold
2. Nausea
3. Pain



45



Warmth is analgesic in
healthy newborns
Gray *et al* 2012 Pain

46

Predictors of temperature at the end of anesthesia

1. Duration of anesthesia
2. Reason for anesthesia
3. ASA Status
4. Baseline temperature

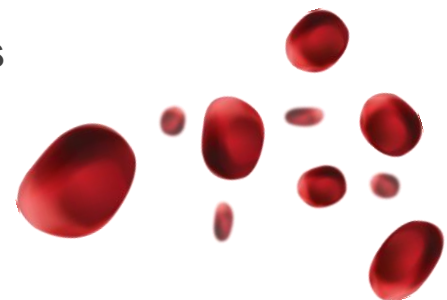
47

JVECCS

Original Study

In vitro evaluation of the effect of hypothermia on coagulation in dogs via thromboelastography

Temperature changes
clot kinetics and speed
of fibrin build-up



Clots form more slowly
but strength is unaffected

48

Delayed Recovery

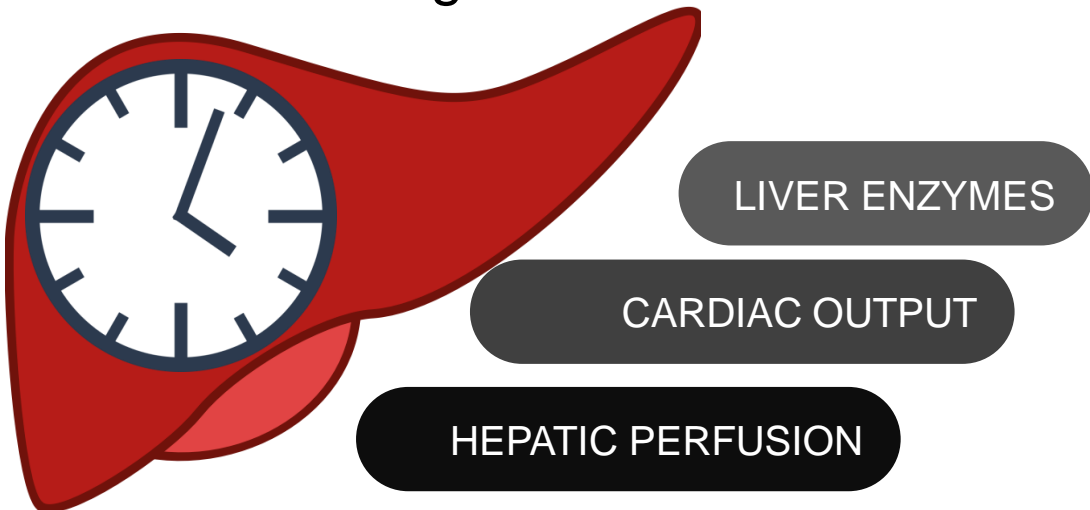
- Increased solubility of inhalant agents
- Decreased MAC*
5% per 1°C fall



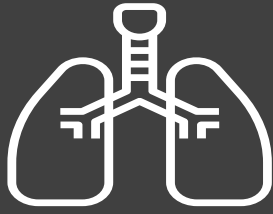
*Minimum Alveolar Concentration

49

Drug Metabolism



50



Respiration



Depressed
respiratory drive

Delayed return of
spontaneous respiration

51

Wound Infection – Risk Factors

Duration of surgery



Hypothermia



Beal *et al* Vet Surg 2000

52

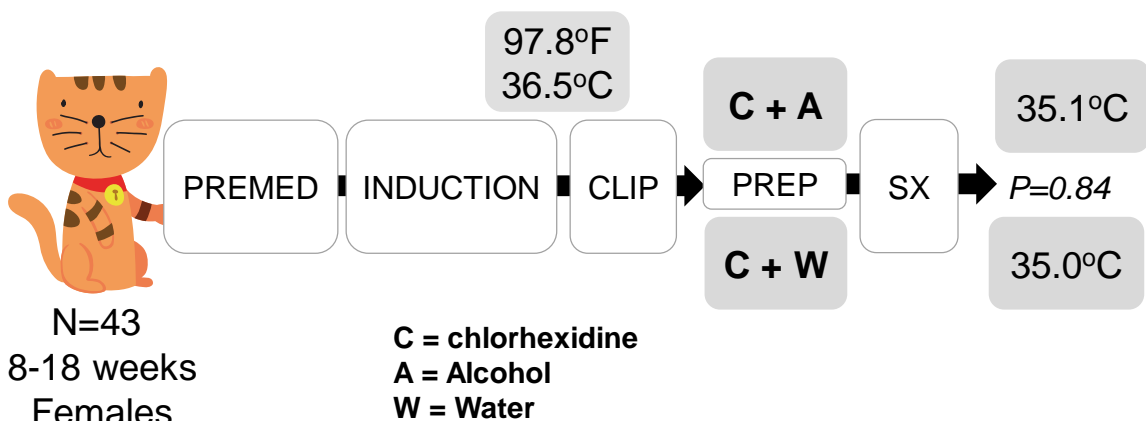
“Prep” Solutions?

Does it matter?



53

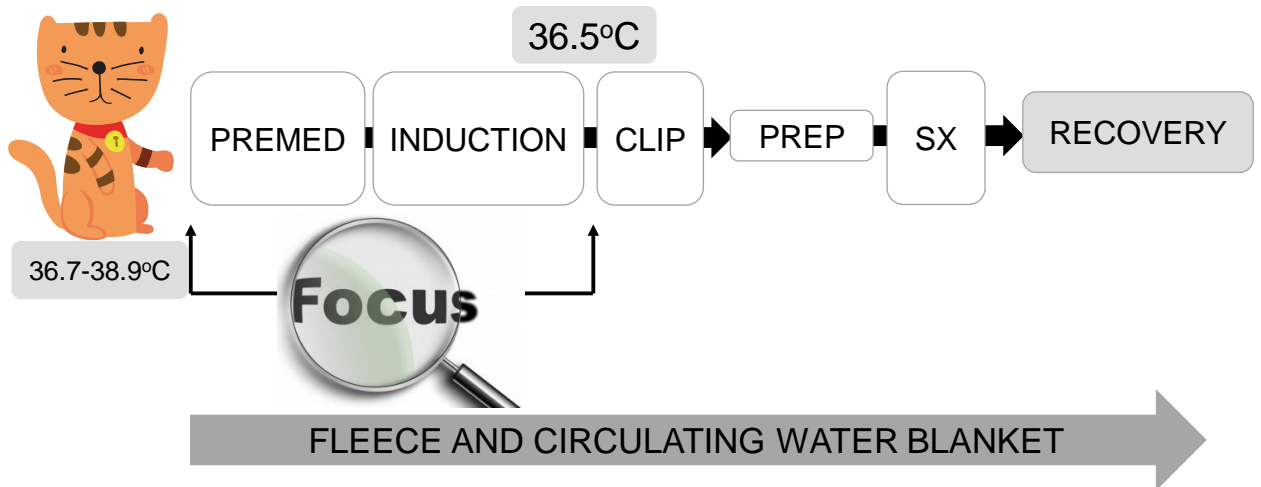
Clinical study: Isaza *et al* 2017



FLEECE AND CIRCULATING WATER BLANKET

54

Clinical study: Isaza *et al* 2017



55

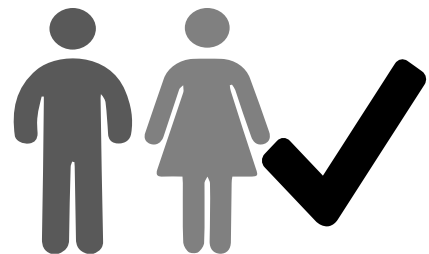
Original Article

The effect of short time periods of pre-operative hypothermia

The effect of short time periods of pre-operative warming in the prevention of per-operative

Horn *et al* 2012 Anesthesiology

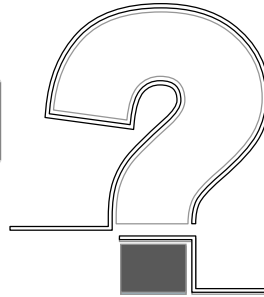
Warm air body blanket



Works well in people

56

Veterinary studies



Rigotti *et al* 2015 JAVMA
Aarnes *et al* 2017 Can J Vet

Dog studies showed no benefit
Cats – not yet studies

57



Monitoring

58



59