

Brachycephalic Anesthesia

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Who Am I?



Who Am I?



Why This Topic?



Prevalence

Since 2007 UK Kennel Club

- 3104% increase in Frenchies
- 193% increase in Pugs
- 96% increase in Bulldogs

1987-2017 Australian Kennel Club

- 11.3% increase in Frenchies
- 320% increase in Pugs
- 324% increase in Bulldogs

In 2009: 1521 frenchies registered in UK

In 2019: 33,661 frenchies registered in UK

Prevalence

Breed	2020	2019	2018	2014	2011
Labrador Retriever	1	1	1	1	1
French Bulldog	2	4	4	9	18
German Shepherd	3	2	2	2	2
Golden Retriever	4	3	3	3	4
Bulldog	5	5	5	4	6



AMERICAN
KENNEL CLUB®



Today's Schedule

2/20/2020

Hospital for Small Animals

Delay	D	#	Patient	Breed	Procedure	Comments
			1	Labrador Retriever	right TPLO	AM D/O
			3	English Bulldog	removal tooth from nose	AM D/O through palate
			4	English Bulldog	cryptorchid neuter	AM D/O, needs AUS pre-op. brachy wakey. on metoclopramide and famotidine
			5	French Bulldog	Airway scope + airway surgery	Thoracic rads under premed and airway exam
			6	Boston Terrier	Brachy airway	AM D/O Had 1-2 regurg episodes prior to a week ago - on Reglan/omeprazole, met check under pre med
			7	English Bulldog	neuter	AM D/O. brachy wakey. on metoclopramide and famotidine
			9		Neck CT +/- sx to follow. Ventral neck swelling	AM D/O
			10		Bilateral elbow arthroscopy	AM D/O
			11	Domestic Shorthair	partial cystectomy (simple tumor removal) & bone marrow aspirates	AM D/O coming in on chill protocol (extreme caution when not drugged, will bite!)
			12		MCT removal right front paw, mass removal left lateral thigh	AM D/O, CBC/Chem done, owner is a tech - will be here all day to assist with restraint (caution)
			15	Domestic Medium	OD keratectomy	AM D/O, cysto under premed
			16	Yorkshire Terrier	cherry eye OD, deciduous teeth extractions	AM D/O can be done in NS, cysto under premed for USG
			17	Hound Cross	oral exam at induction (Carvalho).	AM D/O see sheet on ophtho door, chest rads under

Okay, there are a lot of them..

Do we really need to discuss them specifically in regards to anesthesia?



Norway Bans Breeding English Bulldogs and Cavalier King Charles Spaniels in Court Ruling

The Oslo District Court delivered its ruling Monday, saying selectively breeding the dogs violates Norway's Animal Welfare Act.

By [Austin Cannon](#) | February 03, 2022

www.dailypaws.com

EXCLUSIVE: Call for BAN on French Bulldogs and Pugs in Australia as experts slam 'cruel' selective breeding that has resulted in 'man-made health problems' for the animals

- The Australian Veterinary Association calls for partial ban on 'flat-faced' dogs
- It wants dogs with muzzles under a third of its skull length banned from breeding
- They often have huge breathing issues, need expensive surgery and medication
- Includes Pugs, French Bulldogs, Boston Terriers, Cavalier King Charles Spaniels

By [PETER VINCENT FOR DAILY MAIL AUSTRALIA](#)

PUBLISHED: 22:17 EST, 4 February 2022 | UPDATED: 01:41 EST, 7 February 2022

Recent News

Five Tips for the Veterinary Team to Reduce the Risks Involved with Brachycephalic Breeds

- 1 | Discuss increased risks of restraint, sedation, and anesthesia due to brachycephalic anatomy with the client.
- 2 | Consider developing or providing a client informational handout for owners of brachycephalic breeds. This can highlight the risks in these claims as well as heat stress, the components of brachycephalic syndrome, and more.
- 3 | Consider a consent form specific to brachycephalic breeds.
- 4 | Implement restraint, sedation, and anesthetic protocols for brachycephalic breeds. Include appropriate muzzles, low stress handling techniques, sedation when appropriate, anesthetic pre-treatment protocols, appropriate ET tube size, and close monitoring especially during recovery.
- 5 | Provide ongoing training for the entire veterinary team so they understand the increased risks with brachcephalics and how quickly problems can develop. Appropriate protocols and close monitoring is essential.

AVMA PLIT Vol 36(2) Summer 2017

Special Considerations: Brachycephalics



Q: What is special about them that impacts anesthesia?

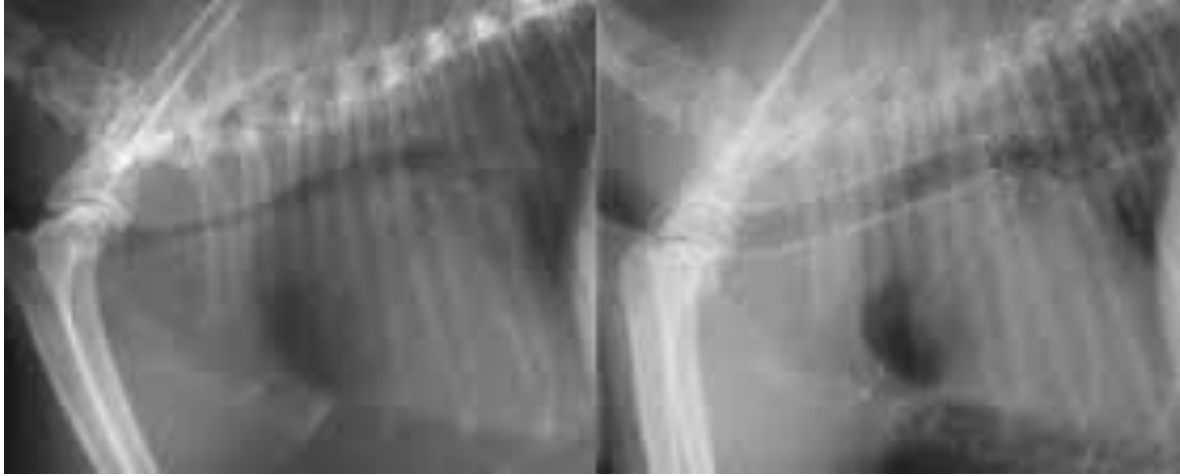
Statement: I like brachycephalics, the upcoming discussion is not meant to offend brachycephalics

Elongated Soft Palate



- Intubation may be difficult to visualize
- May obstruct airway when not intubated

Hypoplastic Trachea



- Intubation - anticipate small airway
- May obstruct when not intubated

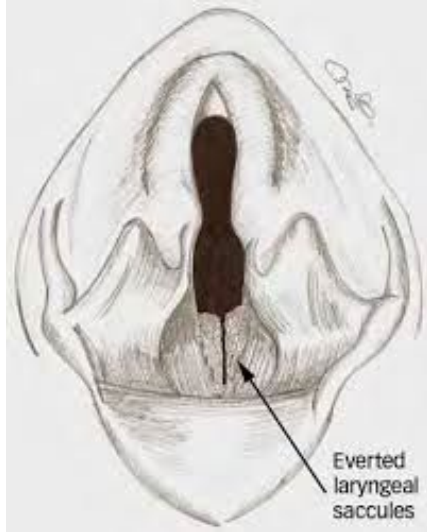
K9 Weight	Size ETT
3.5 kg	5.5 mm
4.5 kg	6 mm
6 kg	6.5 mm
10 kg	7.5 mm
14 kg	8.5 mm
18 kg	9.5 mm
25 kg	11 mm
30 kg	12 mm
40-60 kg	14+ mm

Stenotic Nares



- May obstruct airway when not intubated

Everted Laryngeal Sacculles



- Intubation may be difficult
- May obstruct airway when not intubated

Gastrointestinal Disease

> J Small Anim Pract. 2005 Jun;46(6):273-9. doi: 10.1111/j.1748-5827.2005.tb00320.x.

Prevalence of gastrointestinal tract lesions in 73 brachycephalic dogs with upper respiratory syndrome

C M Poncet ¹, G P Dupre, V G Freiche, M M Estrada, Y A Poubanne, B M Bouvy

****71 of 73 dogs had gastrointestinal lesions on endoscopy**

- Increase risk of aspiration

Aspiration Risk

➤ J Small Anim Pract. 2017 Dec;58(12):703-708. doi: 10.1111/jsap.12734. Epub 2017 Sep 30.

Documenting the prevalence of hiatal hernia and oesophageal abnormalities in brachycephalic dogs using fluoroscopy

E J Reeve ¹, D Sutton ¹, E J Friend ¹, C M R Warren-Smith ¹

- 76% of Frenchies - hiatal hernias
- 86% of dogs had delayed esophageal transit
- 75% of dogs had GER

Blood Gas Differences

PaCO₂:

- 40.2 mmHg vs 33 mmHg

PaO₂:

- 76.8 mmHg vs 94 mmHg

English bulldogs have been shown to have SpO₂ < 90% during sleep

- Respiratory rate may be decreased when on 100% FiO₂

High Vagal Tone



- Bradyarrhythmias may be common

Short, Muscular Legs



- Equipment difficulty

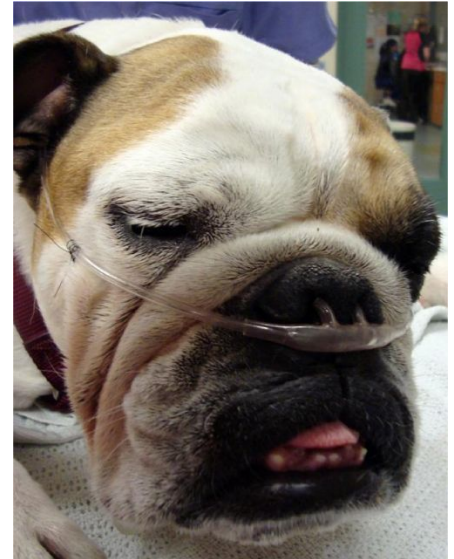
Timing of Complications

Pre-Anesthetic	Yes - UAO
Induction	Yes - difficult intubation
Maintenance	No
Post-Anesthetic	Yes - UAO, Aspiration

“Anesthetic” Brachycephalic

- **“English & French Bulldogs**
 - Pugs
 - Boston Terriers
 - Occasional Shih Tzus, Pekinese, Brussels

Do we have any evidence in the literature?



➤ J Am Vet Med Assoc. 2018 Aug 1;253(3):301-306. doi: 10.2460/javma.253.3.301.

Risk of anesthesia-related complications in brachycephalic dogs

Michaela Gruenheid, Turi K Aarnes, Mary A McLoughlin, Elaine M Simpson, Dimitria A Mathys, Dixie F Mollenkopf, Thomas E Wittum

- Retrospective study comparing peri-anesthetic complications in B vs nonB (*included ALL brachycephalics)
- Hypothesis - Bs would have higher complications than non-Bs
- Tried to identify complications and timing

Risk of anesthesia-related complications in brachycephalic dogs

- Compared ASA, medications, procedures, duration, IPPV
- Peri-anesthetic complications
 - Hypertension, vomiting, regurgitation, VPCs, dysphoria, death
- Intra-anesthetic complications
 - Hypotension, bradycardia, hypothermia

Intra-Anesthetic

Breed	% Complications
Brachycephalic	49.3% (n = 111)
Non-Brachycephalic	48.9% (n = 108)

Post-Anesthetic

Breed	% Complications
Brachycephalic	13.9% (n = 31)
Non-Brachycephalic	3.6% (n = 8)

Complications

Top Brachy Post-Anesthetic Complications

Aspiration Pneumonia 4% (9)

Regurgitation 3.1% (7)

Prolonged Recovery 1.3% (3)

Stertorous Breathing 1.3% (3)

Death 0.9% (2)

Conclusions

- Brachycephalic dogs were twice as likely to have a perianesthetic complication



Okay, there is increased risk

Can we predict who is at risk?

That study included
all brachycephalics



Predicting Risk

Multicenter Study > [Vet Surg.](#) 2019 Oct;48(7):1253-1261. doi: 10.1111/vsu.13291.

Epub 2019 Jul 27.

Development and validation of a brachycephalic risk (BRisk) score to predict the risk of complications in dogs presenting for surgical treatment of brachycephalic obstructive airway syndrome

Jason Tarricone ¹, Galina M Hayes ², Ameet Singh ³, Garrett Davis ¹

BRisk Score

Develop and validate a preoperative score that would accurately predict risk of major complication or death



Creating BRisk Score

Collected data on 233 dogs having corrective surgery for BOAS

Identified 5 independent risk factors associated with major complication

Prospectively validated the score

Category				
Breed	NOT BD or FBD 0 points	BD or FBD 0.5 points	BRisk Score	
Prior Airway Sx	No 0 points	Yes 1.5 points		
Other procedures	None 0 points	Yes 1.5 points		
BCS (0 - 5)	< 2.5 1 point	2.5 - 3.5 0 points	> 3.5 1 point	
Respiratory Status	Stertor - exercise 0 points	Stertor- rest 1.5 points	Oxygen 2 points	Intubation 4 points
Temperature	< 100 F 1.5 points	100-101 F 1 point	101-103 F 0.5 points	> 103 F 0 points

BRisk Score

BRisk Score	Negative Outcome
< or = 3	3.2% (n = 6/185)
> 3	29.6% (n = 29/98)

The relative risk of dogs > 3 was 9.1x greater than that of dogs < 3

Reminder: BD/FBD = 0.5, multiple surgery = 1.5, stertor @ rest = 1.5

Is there anything we can do to decrease the risk?



TUFTS 2012: Brachycephalic SOP

Decrease

- Regurgitation
- Aspiration Pneumonia
- Respiratory Distress

Increase awareness of perioperative complications in brachys

Specifically targeted

- English & French Bulldogs
- Pugs, Boston Terriers, occasional Shih Tzus

Development: Brachycephalic SOP

Regurgitation/Aspiration Pneumonia

- Reglan & Famotidine added to pre-anesthetic
- Pure opiates avoided if possible and alternative analgesics encouraged

Decrease post-anesthetic respiratory distress

- All patients recovered in ICU
- For airway surgery - DexSP added to protocol

Development: Brachycephalic SOP

Increase awareness

- Brachycephalic specific consent form
- Clinicians provided with questions regarding historical GI signs

Any patient with history of regurgitation and elective procedure:

- Rx reglan and a proton pump inhibitor for 7 days before surgery

I am aware that if my brachycephalic pet undergoes sedation or general anesthesia the potential complications include partial or complete airway obstruction during recovery and regurgitation/vomiting which could lead to aspiration pneumonia/respiratory distress.

I am aware that anesthetizing or sedating a brachycephalic animal for any reason can lead to the development of significant complications as described in this document.

My pet has demonstrated difficult breathing, exercise intolerance, and/or collapse episodes.

YES _____ NO _____

My pet has demonstrated difficult eating, such as gagging, vomiting, and regurgitation.

YES _____ NO _____

Did The Protocol Work?

➤ J Am Vet Med Assoc. 2020 Apr 15;256(8):899-905. doi: 10.2460/javma.256.8.899.

Postoperative regurgitation and respiratory complications in brachycephalic dogs undergoing airway surgery before and after implementation of a standardized perianesthetic protocol

Renata S Costa, Amanda L Abelson, Jane C Lindsey, Lois A Wetmore

Did The Protocol Work?

Retrospective study

Database searched for all dogs undergoing BOAS surgery

Divided cases into 2 groups

2011-2013: Before implementation

2014-2016: After implementation

Analyzed records for regurgitation, respiratory distress,
pneumonia

Did The Protocol Work?

Characteristic	Group		P value
	A (n = 40)	B (n = 44)	
ASA physical status			0.95
I	5 (13)	5 (12)	
II	24 (60)	28 (65)	
III	11 (28)	10 (23)	
Not recorded	0	1	
Breed			0.053
Boston Terrier	2 (5)	3 (7)	
English Bulldog	21 (53)	20 (45)	
French Bulldog	2 (5)	11 (25)	
Pug	15 (38)	10 (23)	
Age (y)	2.4 (0.8–5.4)	3.2 (1.0–7.5)	0.53
Sex and reproductive status			0.36
Sexually intact female	5 (13)	5 (11)	
Spayed female	15 (38)	11 (25)	
Sexually intact male	13 (33)	13 (30)	
Castrated male	7 (18)	15 (34)	

Did The Protocol Work?

	2011-2013 (n = 40)	2014-2016 (n = 44)	
Regurgitation	35% (n = 14)	9% (n = 4)	p = 0.007
Pneumonia	5% (n = 2)	2% (n = 1)	p = 0.6
Respiratory Distress	28% (n = 11)	18% (n = 8)	p = 0.43



Post-Anesthetic Regurgitation

13 of 18 dogs started regurgitating > 6 hours post-anesthesia

- Reglan wearing off?
- More stress at that time?

History of regurgitation was significantly associated with regurgitation peri-anesthetically

Peri-Anesthetic Regurgitation

> Vet Surg. 2020 Jan;49(1):53-60. doi: 10.1111/vsu.13297. Epub 2019 Jul 22.

Postoperative regurgitation in dogs after upper airway surgery to treat brachycephalic obstructive airway syndrome: 258 cases (2013–2017)

Joy V H Fenner¹, Robert J Quinn¹, Jackie L Demetriou¹

- Regurgitation - 34.5% (our pre-protocol was 35%)
- History of regurgitation - 2.5x more likely to regurgitate
- French BD - 7.6x higher chance of regurgitating

What Other Literature Do We Have?

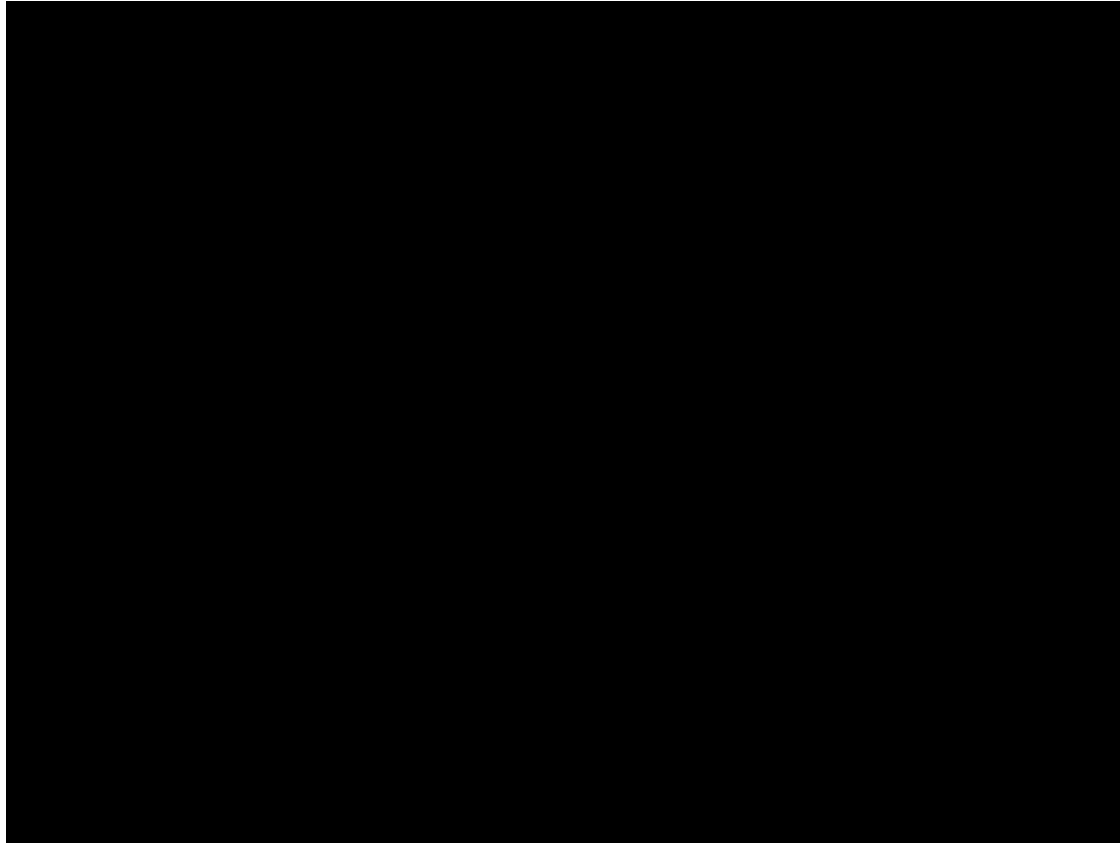
➤ [J Am Vet Med Assoc. 2020 Oct 1;257\(7\):744-749. doi: 10.2460/javma.257.7.744.](#)

Anesthetic risk during subsequent anesthetic events in brachycephalic dogs that have undergone corrective airway surgery: 45 cases (2007–2019)

Crystal R Doyle, Turi K Aarnes, Gregory A Ballash, Erin L Wendt-Hornickle, Caroline F Baldo, Rebecca A Johnson, Thomas E Wittum, Mary A McLoughlin

Previous corrective upper airway surgery decreased odds of postanesthetic complications

Previous Airway Surgery



Recurrent Findings About Risk

Anesthetic Duration!!

- 15-minute increase in anesthesia time increased the odds of a postanesthetic complication by 12%
- 30-minute increase in anesthesia time increased complications by 18%
- Multiple procedures increased risk

Dogs with history of regurgitation more likely to regurgitate

What I try to do



Goals Of My Anesthetic Protocols

Prevent Upper Airway Obstruction

- Minimize stress
- Minimize panting
- Alert and calm recovery

Reduce/Limit GI Distress

- Minimize stress
- Minimize Ileus, Nausea and Vomiting

Provide appropriate analgesia



Minimize Upper Airway Obstruction

- Provide sedation for handling (not too much sedation)
 - Low dose acepromazine +/- dexmedetomidine in cardiovascularly stable patient
- If needed consider a “chill protocol” prior to admission
 - Original Chill - Melatonin, Gabapentin + Acepromazine
 - Modified Chill - Trazadone +/- Gabapentin

Minimize Upper Airway Obstruction

- Minimize panting
 - Limit stress
 - If premed is IM consider pre-medicating with butorphanol and then giving a “stronger” opiate after induction
- Decrease nasal edema
 - Phenylephrine
- Extubate when fully alert
 - Be prepared to re-intubate

Minimize GI Distress

- Reglan
- Pepcid or omeprazole
- Minimize stress
- Minimize upper airway obstruction
- Minimize amount of pure opiate used

- Cerenia if nausea is a concern

Provide Appropriate Analgesia

- Alternative analgesics in combination with buprenorphine for mild to moderate pain
- If moderate to severe pain is anticipated
 - Choose methadone if possible
 - If morphine/hydromorphone used, administer antiemetic at least 1 hour before premedication

Provide Appropriate Analgesia

- Multimodal analgesia to limit the amount of opiate used and therefore side effects
 - Dexmedetomidine
 - Ketamine bolus & CRI
 - Lidocaine CRI
 - Local blocks
 - NSAIDs
 - Long acting bupivacaine



Alternative Analgesia

Add to 250 ml bag of LRS and run at 5 mls/kg/hr

Drug	Mgs	Volume	Dose
Ketamine 100 mg/mL	30 mg	0.3 mLs	0.6 mg/kg/hr
Lidocaine 20 mg/mL	150 mg	7.5 mLs	50 ug/kg/min

Recovery

Be prepared for dysphoria or airway obstruction

Be prepared to provide oxygen

- Flow by
- Nasotracheal
- Reintubation



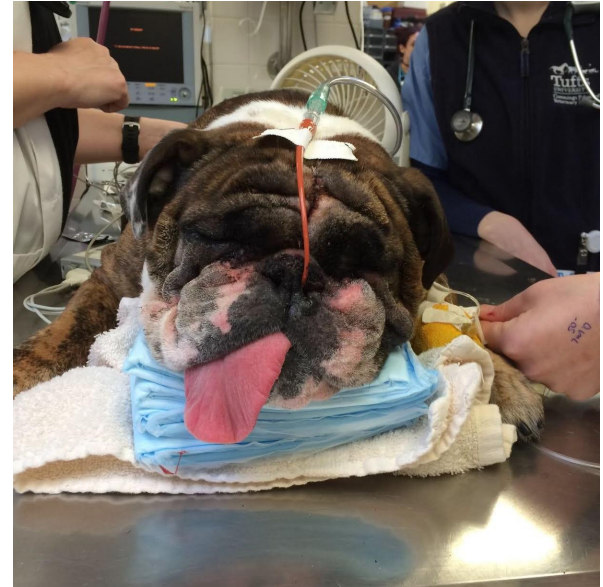
Nasotracheal Oxygen

> J Vet Emerg Crit Care (San Antonio). 2011 Jun;21(3):261-7. doi: 10.1111/j.1476-4431.2011.00612.x. Epub 2011 Feb 11.

Retrospective evaluation of postoperative nasotracheal tubes for oxygen supplementation in dogs following surgery for brachycephalic syndrome: 36 cases (2003–2007)

David Senn ¹, Nadja Sigrist, Franck Forterre, Judith Howard, David Spreng

Affiliations: 1. Howard



Let's talk anesthetic protocols!

THIS SHEET NEEDS TO BE FILLED OUT TO COMPLETION

Form updated 9/13/18

Procedure Induction/Recovery Record

Circle Choices: Cone 0/31/21 Date: 12/21/21

CBC ☐ SMAC ☐ SMACIII ☐ E3 ☐

Blood work checked by Dr: Yes

Radiographs:

Body Part: _____ Views: _____

Body Part: _____ Views: _____

Weight: 10.6 kg

Temp: 100.74x

HR: 120

RR: 40

MM: _____

Deckel, Test

Chl. ID: 114835

Procedure: BAS Surgeon: _____

Drugs (mg/ml)	Dose (mg/kg)	Quantity	Route	Time	Logged	Hx of		
Pre Med: <u>Propofol 10mg/ml</u>	<u>0.3</u>	<u>0.3</u>	<u>IV</u>					
<u>Propofol 500ug/ml</u>	<u>2.0</u>	<u>0.04</u>						
<u>Propofol 2mg/ml</u>								
Induction Agent:								
<u>Ketamine 100mg/ml</u>								
<u>Propofol 10mg/ml</u>								
Antibiotics:								
<u>Cefazolin 100mg/ml</u>	<u>2.2</u>	<u>2.3</u>	<u>IV</u>					
Additional Medications/CRIs								
<u>Prop. Dex SP 4mg/ml</u>								
<u>Prop. 5mg/ml</u>	<u>0.5</u>	<u>1</u>	<u>SC</u>					
<u>Propofol 10mg/ml</u>								
IV Fluids: Type _____ B=bolus								
<u>LRS + LK</u>								
Add <u>0.3mls Ketamine</u>								
and <u>7.5mls lidocaine</u>								
Induction ET Tube Size: _____ cm								
Time	Induction	5min	10min	15min	20min	25min	30min	35min
HR								
RR								
BP								

The “Kelley Ann”

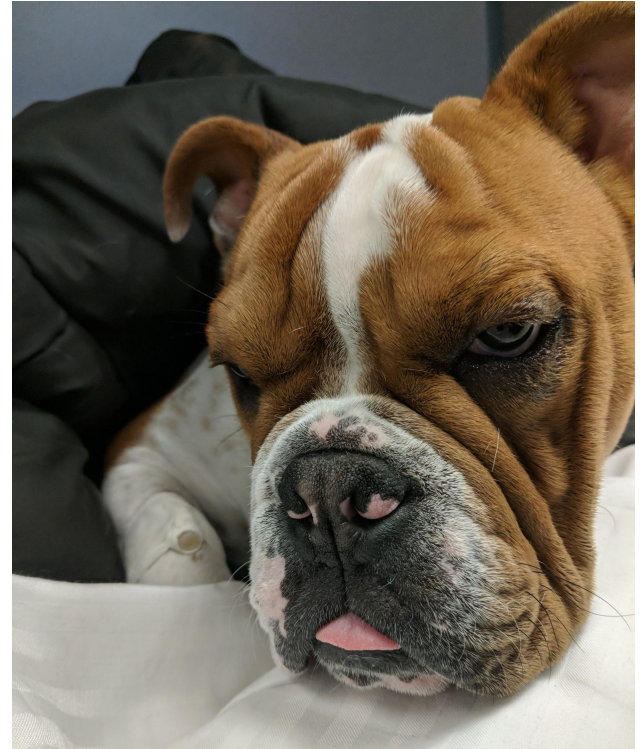
(for “healthy” bulldogs & french bulldogs)

Pre-premedication

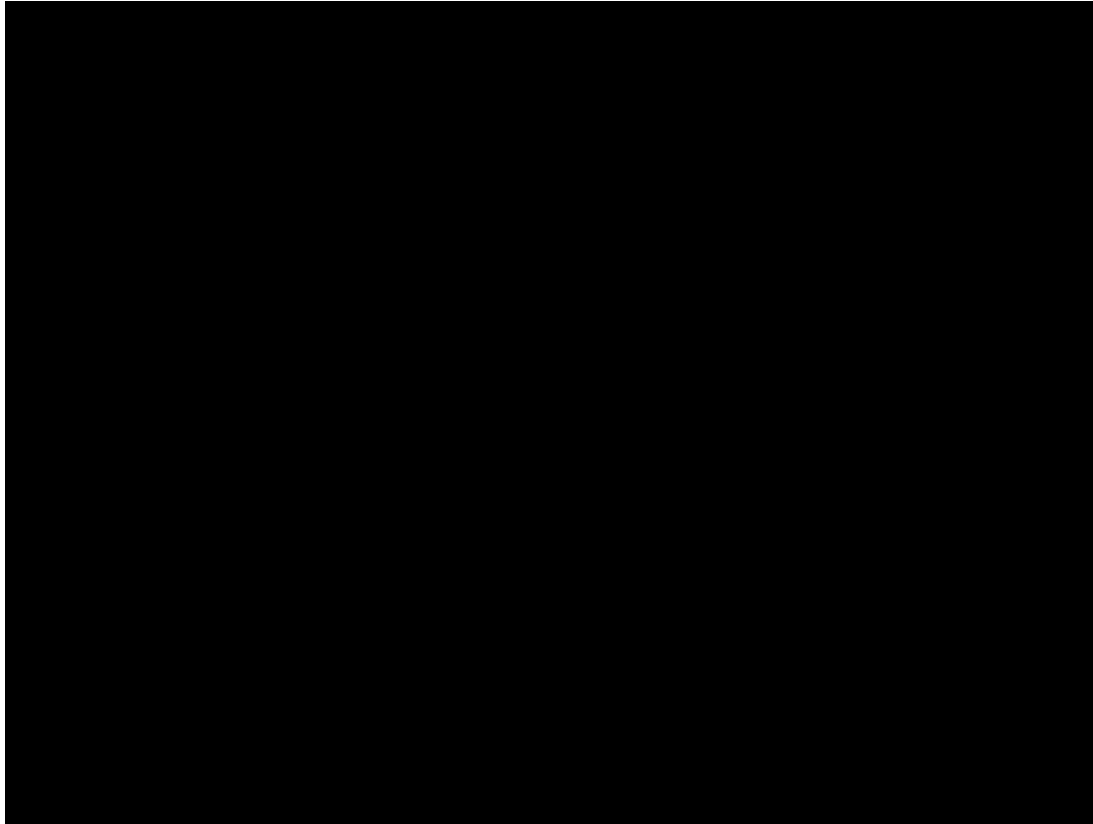
- Reglan 0.5 mg/kg SQ
- Pepcid 1 mg/kg SQ

Premedication

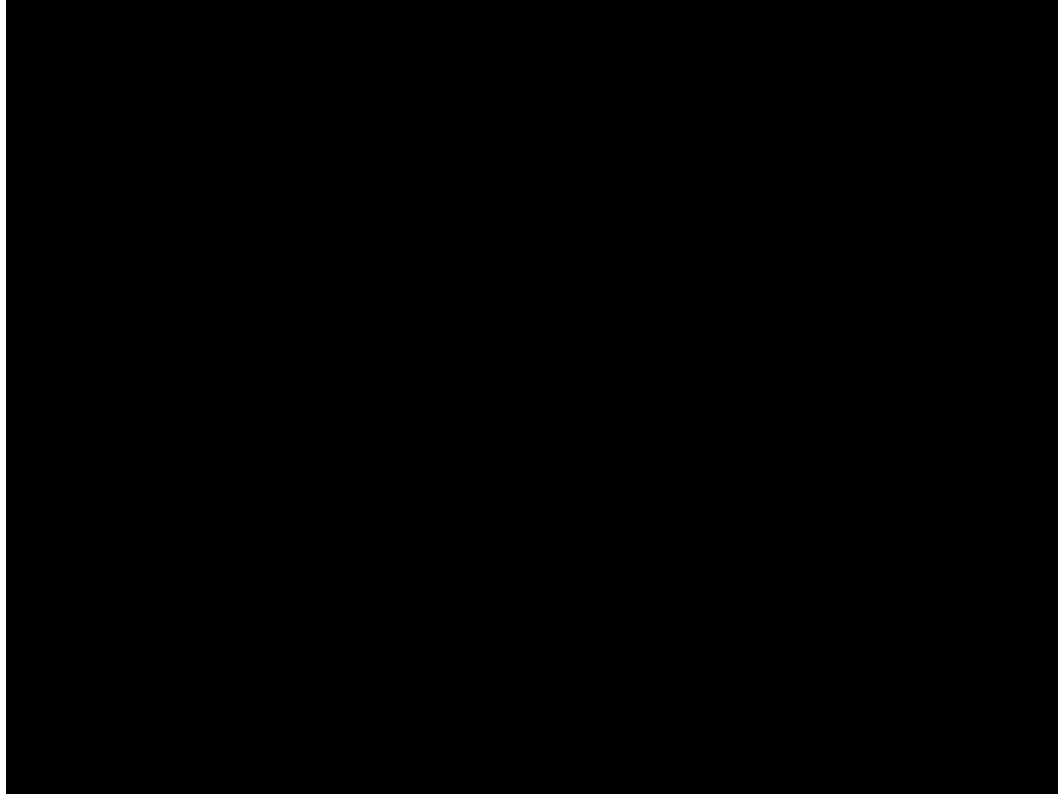
- Butorphanol 0.3 mg/kg
- Acepromazine 0.015 mg/kg
- Dexmedetomidine 0.002 mg/kg



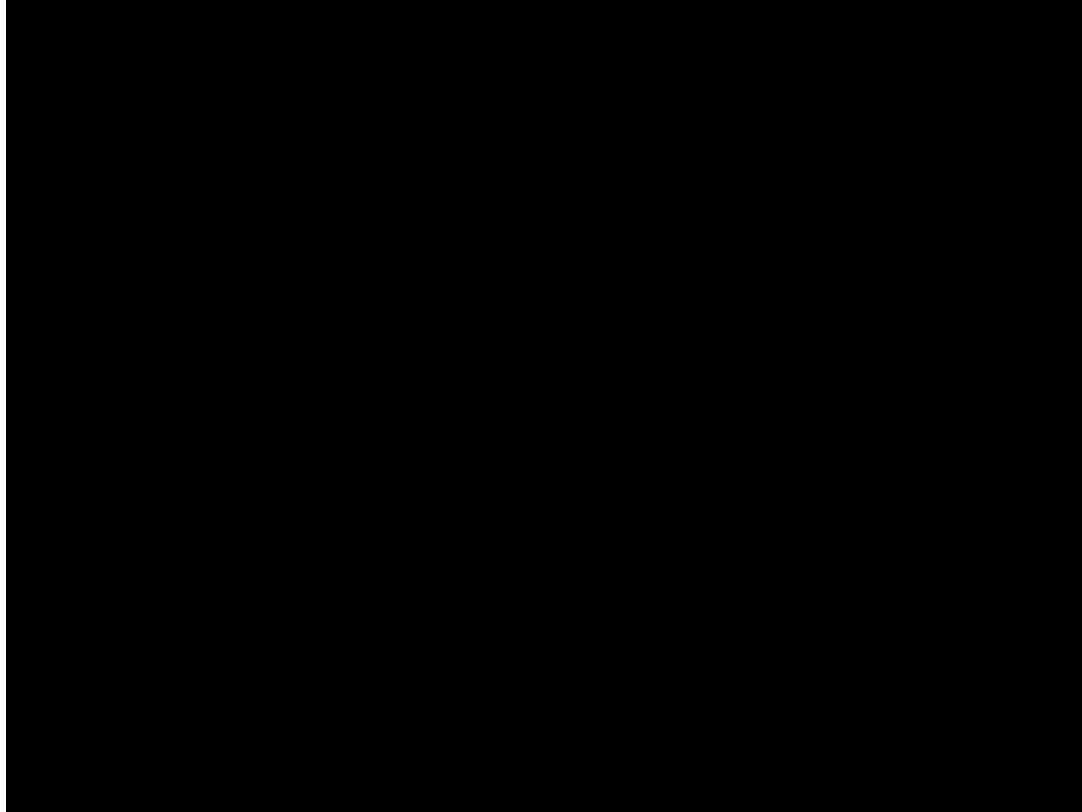
Before Premedication



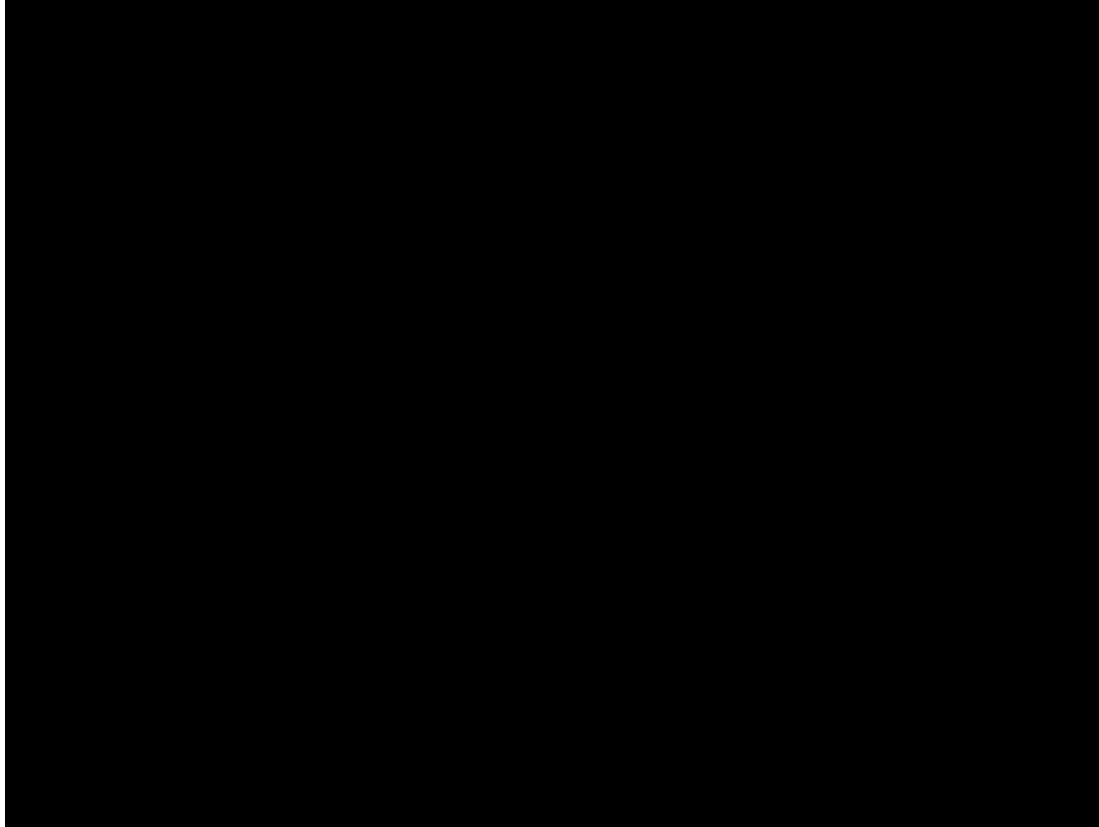
10 minutes After Pre-Med



30 Minutes After Pre-Med



30 Minutes After Pre-Med



Induction

“Ketofol”

- Ketamine 2 mg/kg IV
- Followed by propofol 3 mg/kg titrated IV to effect

The ketamine provides additional analgesia

Do not use ketamine in patient with moderate to severe cardiac disease, increased IOP, etc.

Maintenance

Inhalant

After induction give additional opiate if required

Mild to moderate pain

- Buprenorphine 0.01-0.02 mg/kg IV

Moderate to severe pain

- Methadone 0.2-0.3 mg/kg IV
- Hydromorphone 0.05 - 0.1 mg/kg IV
- Morphine 0.5 mg/kg IM

Recovery

Extubate when no longer tolerating the ETT

Be prepared to re-intubate

Be prepared to lightly sedate

Low dose Ace - 0.01 mg/kg

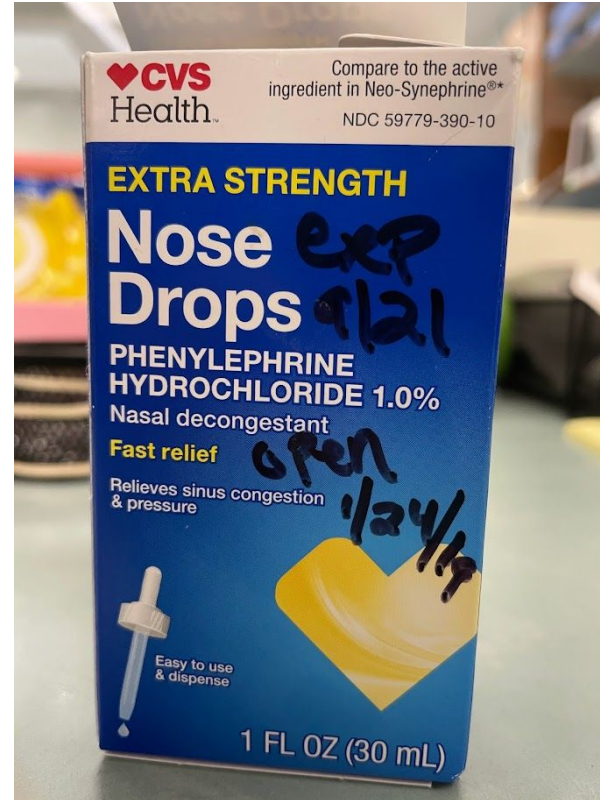
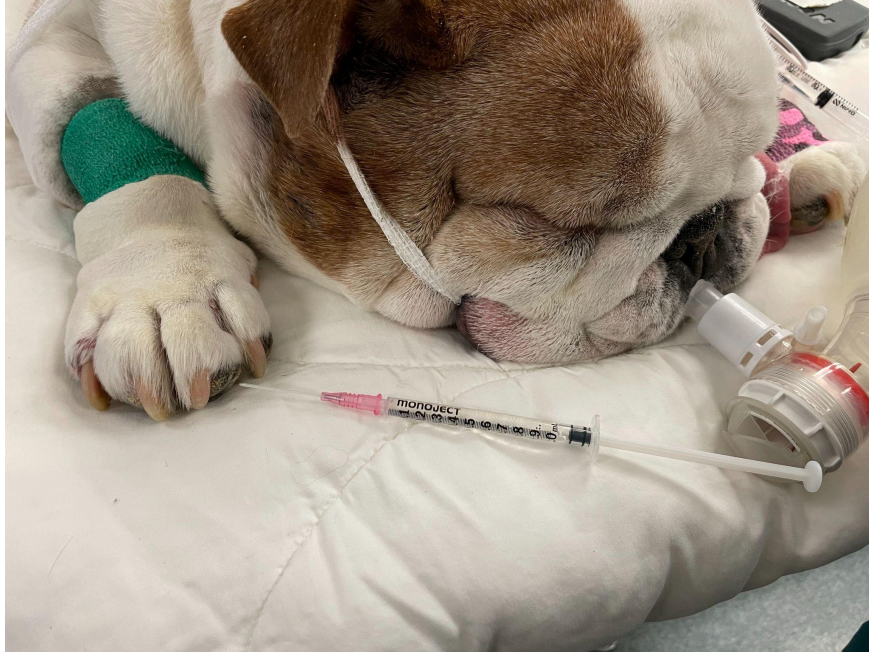
Low dose Dex - 0.001 ug/kg



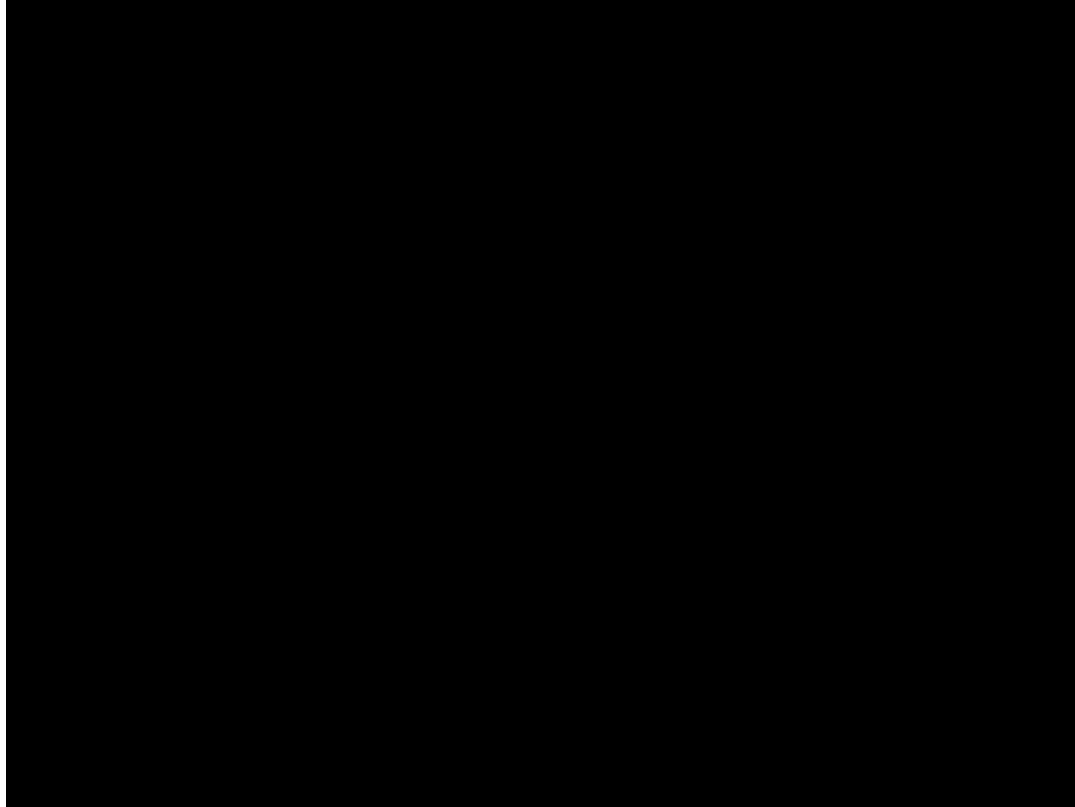
Try to decrease nasal congestion, tongue swelling

Decrease Nasal Congestion

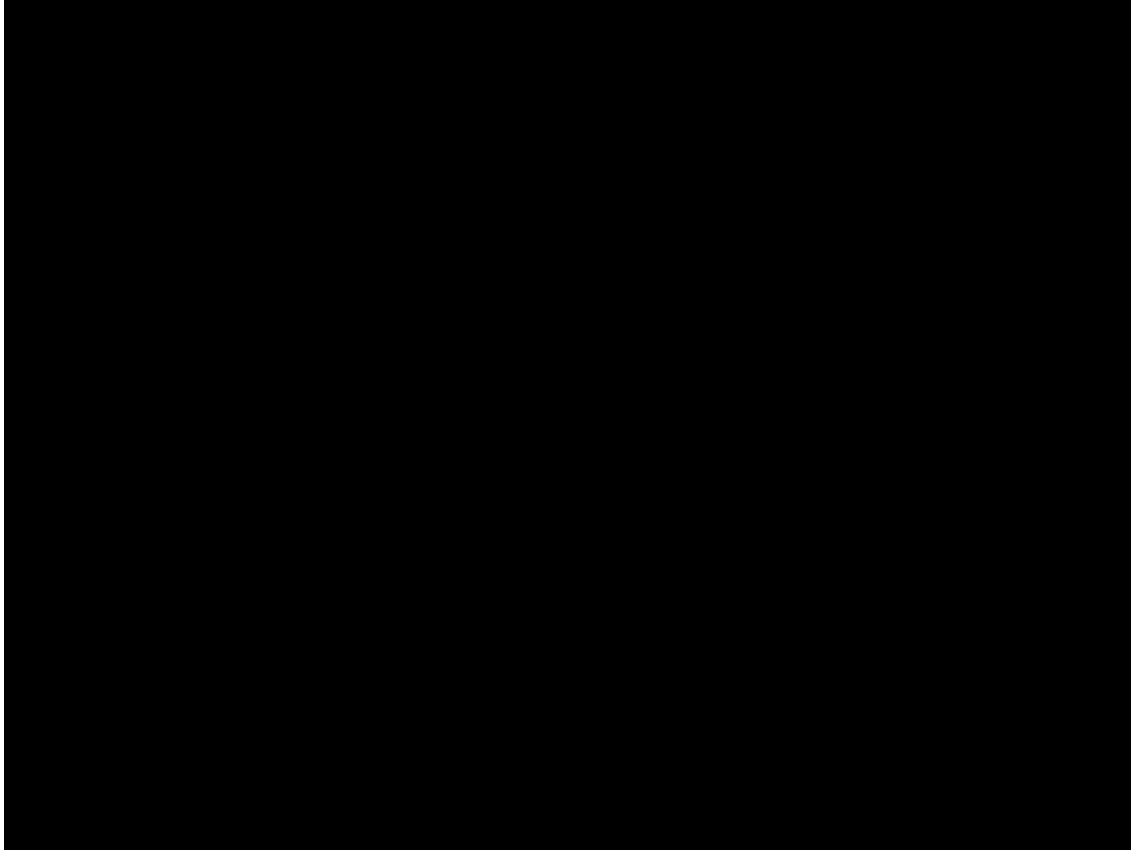
Phenylephrine nasal drops



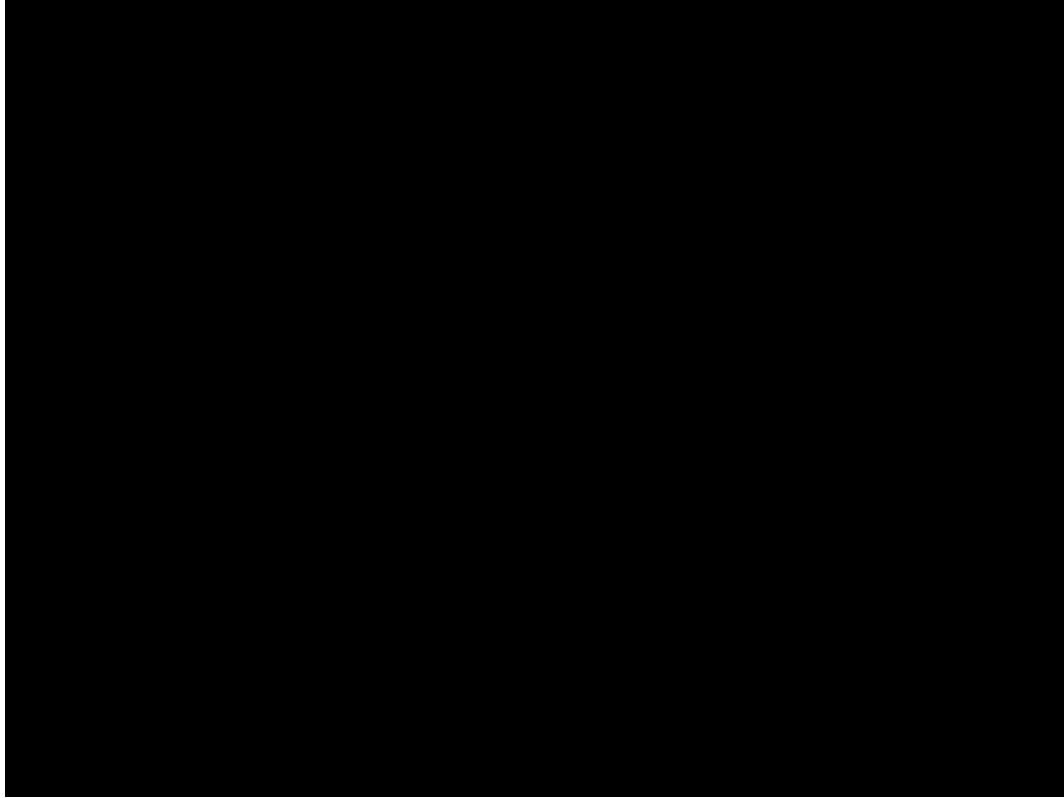
Decrease Nasal Congestion



Recovery



Post Extubation



The “Low Dose”

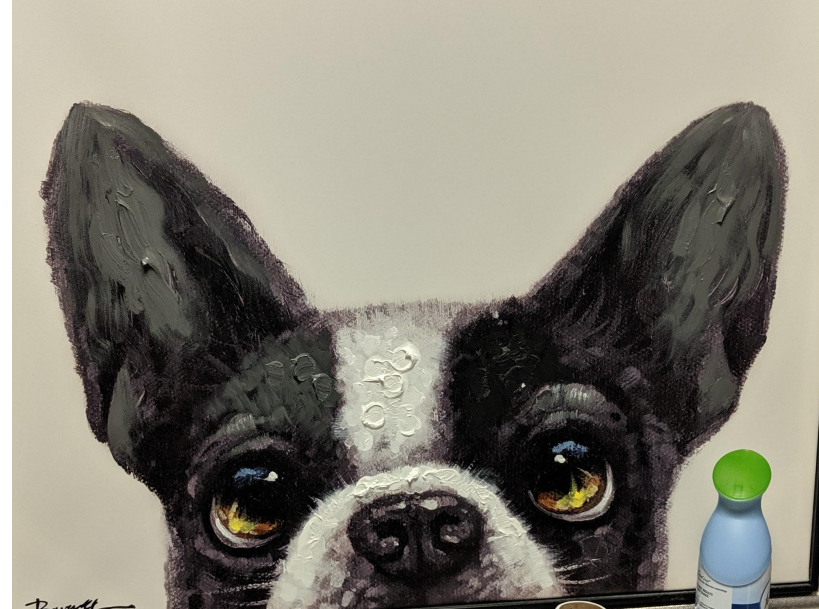
(for “healthy, friendly” young pugs, boston terriers, etc)

+/-Pre-premedication

- Reglan 0.5 mg/kg SQ
- Pepcid 1 mg/kg SQ

Premedication IM

- Butorphanol 0.3 mg/kg
- Acepromazine 0.03 mg/kg



The “OG - Old Grump”

(for “elderly - healthy brachys”)

+/- Pre-premedication

- Reglan 0.5 mg/kg SQ
- Pepcid 1 mg/kg SQ

Premedication IM

- Butorphanol 0.2 mg/kg
- Acepromazine 0.005-0.01 mg/kg



Take Homes

Educate owners about risk!!

Thorough GI history

Decrease anesthesia time

Prepare for regurgitation

Decrease nasal swelling

Decrease GI distress



ANY QUESTIONS?



NOTICE

CE credit certificates & presentation slides will be emailed to you. If you do not receive an email with this information within a week, contact Nichole - *nicholemanfredi@capecodvetspecialists.com*

