Causal Inference "Target Trial Emulation" in Veterinary Epidemiology

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INTRODUCTION

Target trial emulation applies design principles from randomised controlled trials to the analysis of observational data for causal inference and is increasingly used within human epidemiology[1]. Veterinary electronic clinical records represent a potentially valuable source of information to estimate real-world causal effects for companion animal species using similar or adapted causal inference approaches[2].

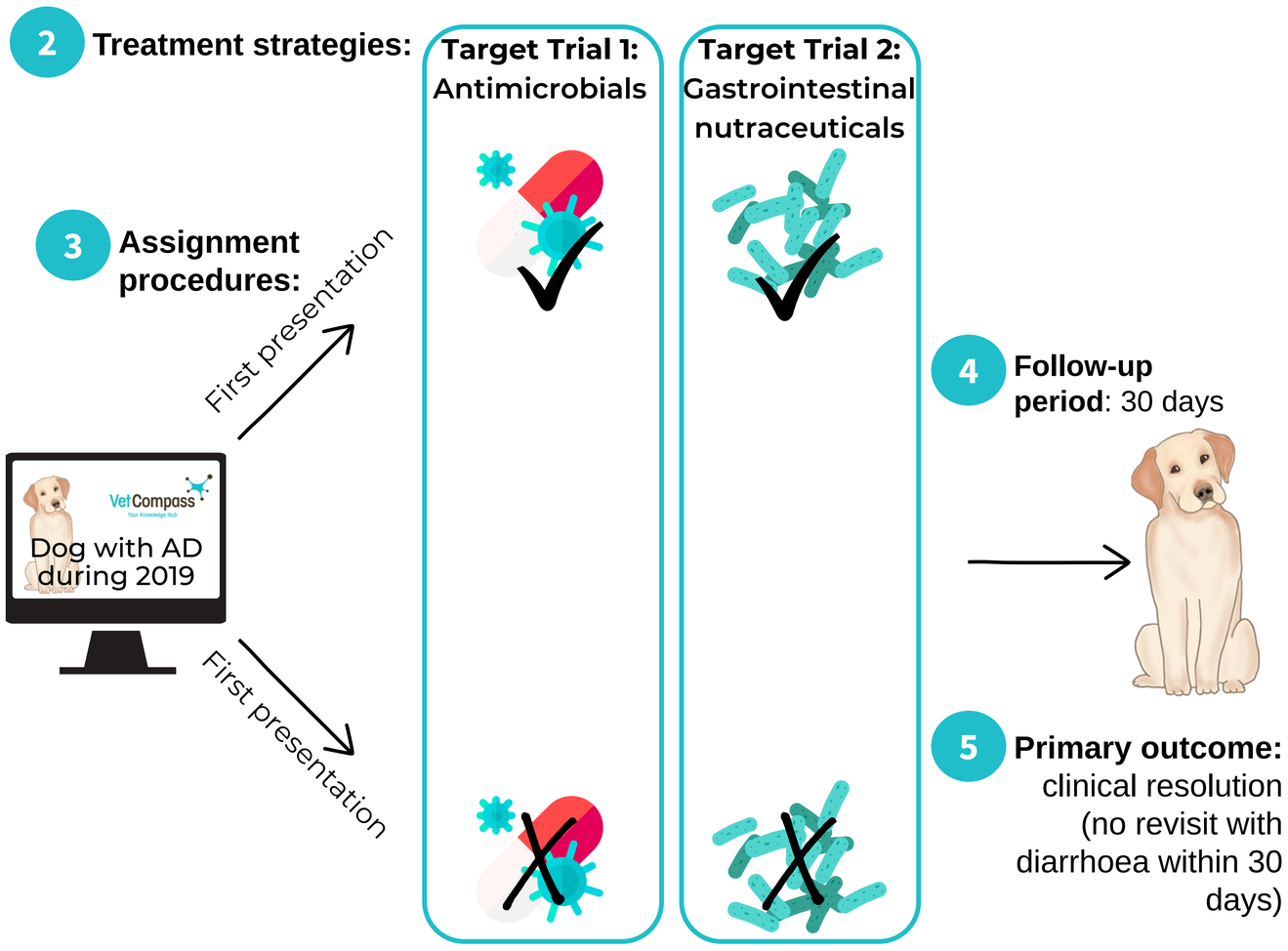
METHOD

Acute diarrhoea (AD) in dogs was used as a clinical exemplar[3]. The **target trial protocol** consists of 7 key steps[1]:

1 Eligibility criteria:
Dogs aged ≥ 3 months and < 10 years presenting with AD in the VetCompass database during 2019.

2 Treatment strategies:

3 Assignment procedures:

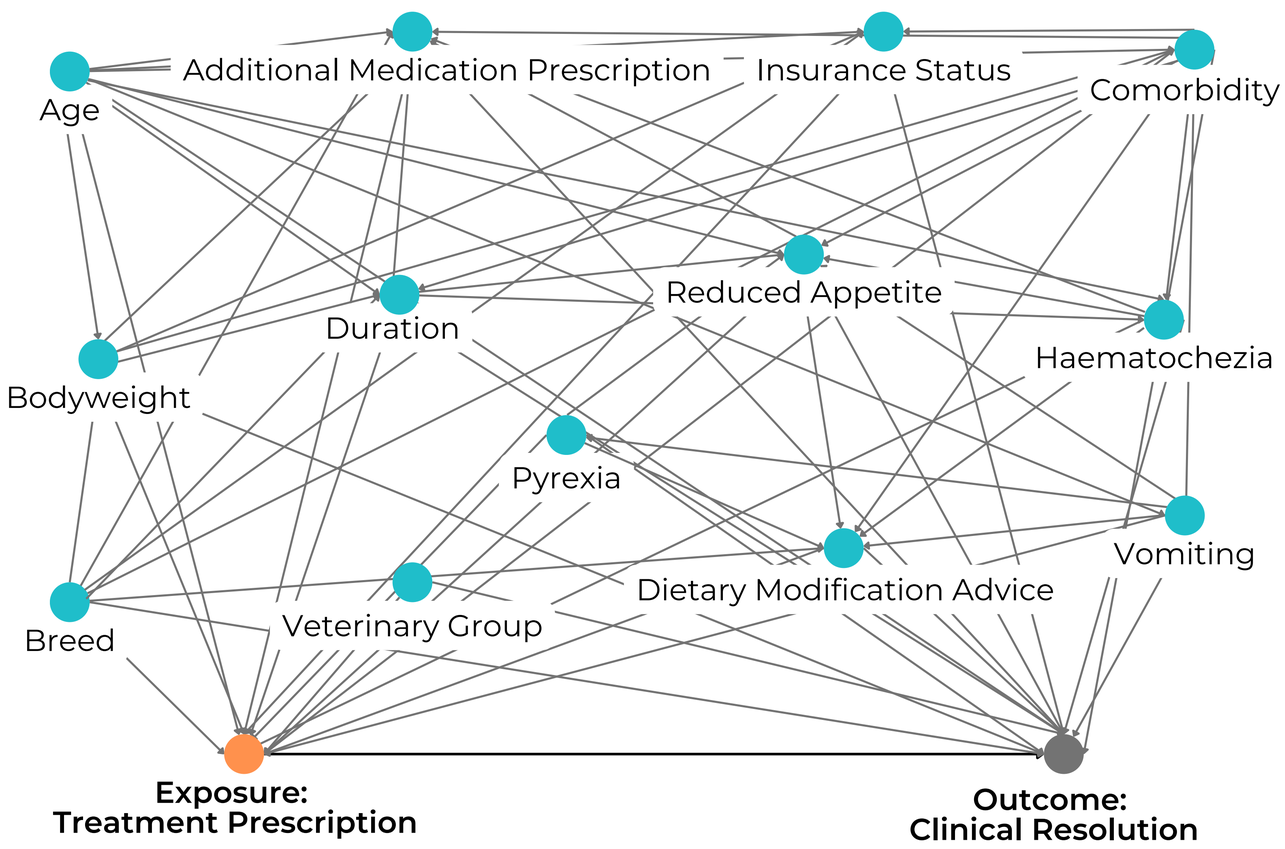


4 Follow-up period: 30 days

5 Primary outcome: clinical resolution (no revisit with diarrhoea within 30 days)

6 Causal contrasts of interest: Per protocol effect

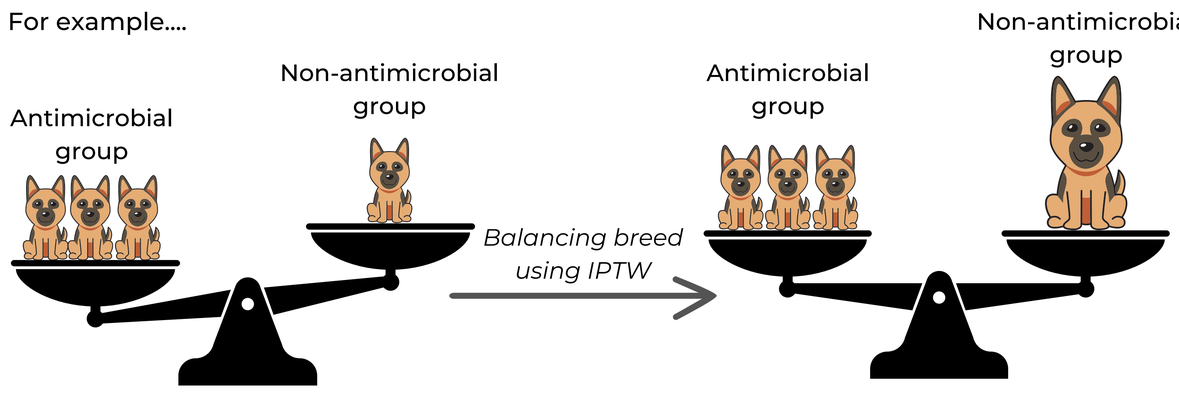
7 Analysis plan:
Covariate data derived from a **directed acyclic graph** (DAG):



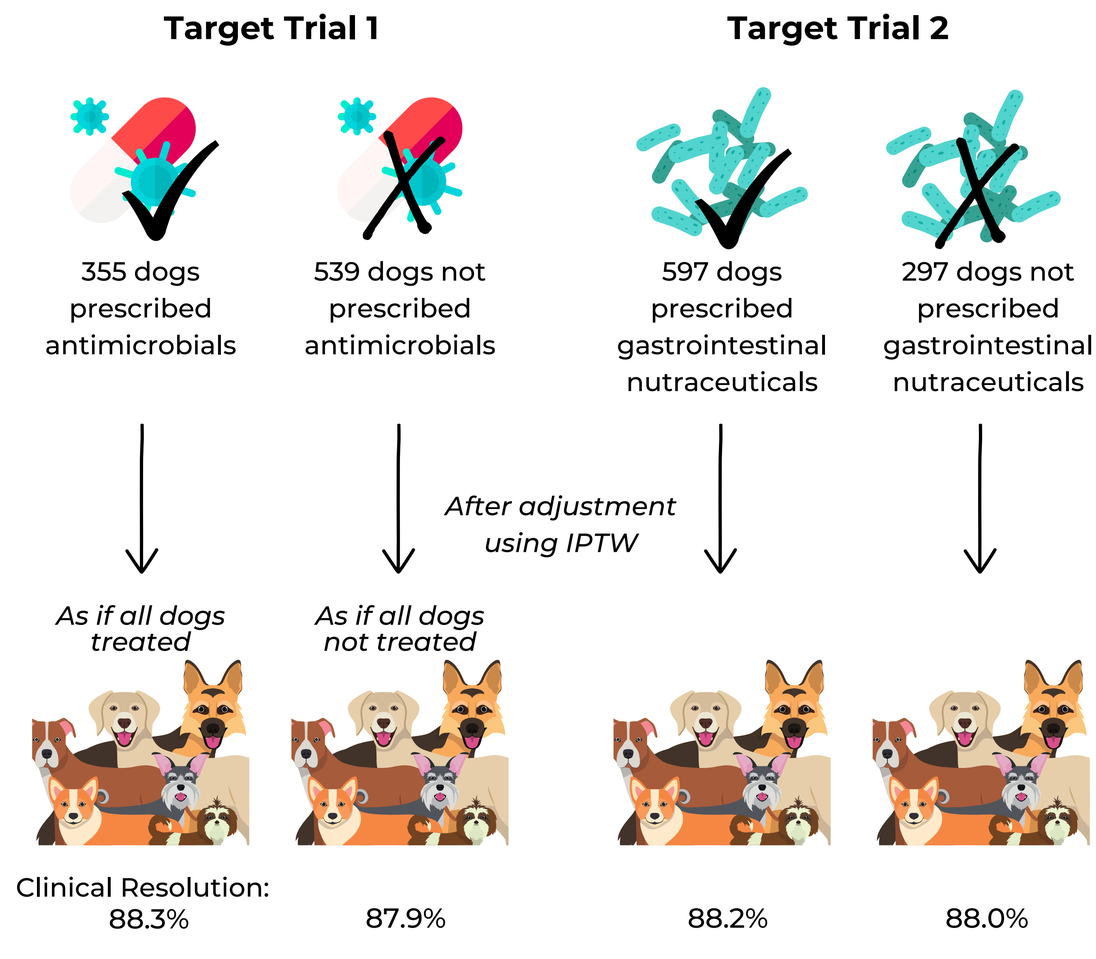
Inverse probability of treatment weighting (IPTW) used to balance covariates between the treatment groups as follows[4]

1. Separate logistic regression models fitted with treatment as the outcome conditional on adjustment variables.
2. Predicted probabilities of receiving treatments generated, used to calculate IPTWs.
3. IPTW used to weight each dog's contribution to binary logistic regression outcome models.

For example....



RESULTS



Risk Difference = +0.4%
(95% CI -4.5% to +5.3%)

Risk Difference = +0.2%
(95% CI -4.5% to +5.0%)

CONCLUSIONS

This study successfully applied the target trial framework to veterinary observational data. The findings show that antimicrobial or gastrointestinal prescription at first presentation of acute diarrhoea in dogs ***causes*** no difference in clinical resolution. The findings support the recommendation for veterinary professionals to limit antimicrobial use for acute diarrhoea in dogs.

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