



Detecting and pulling sick animals



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Mild mouth secretions

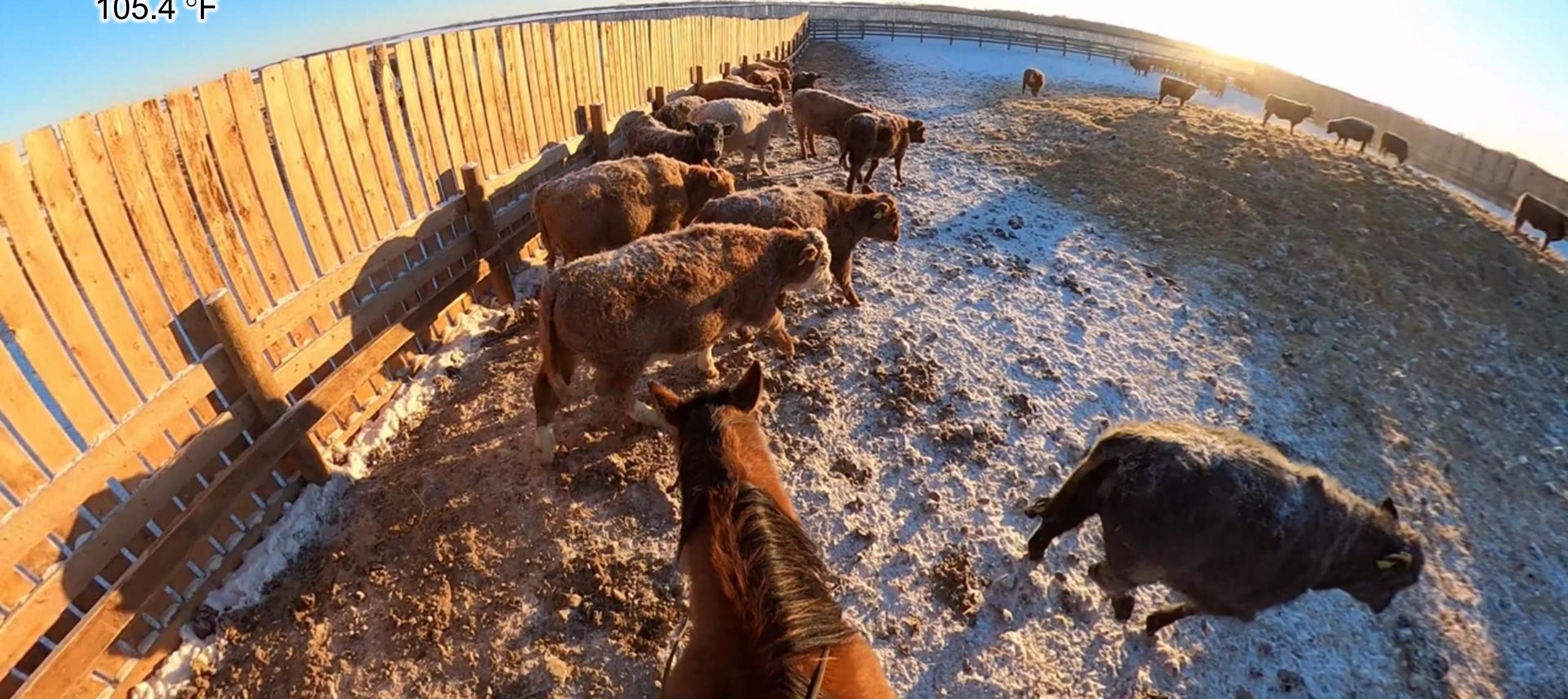
Dopey eyes

105.4 °F

Very
healthy

Survey (n=47): 89.3% would pull

Very
sick



Nose secretions
Dopey eyes
103.9 °F

Survey (n=53): 69.8% would pull

Very
healthy

Very
sick



Nose secretions
Dopey eyes
102.2 °F

Survey (n=62): 12.9% would pull

Very
healthy

Very
sick



Mouth secretions
Dopey eyes
105.1 °F

Survey (n=48): 29.2% would pull

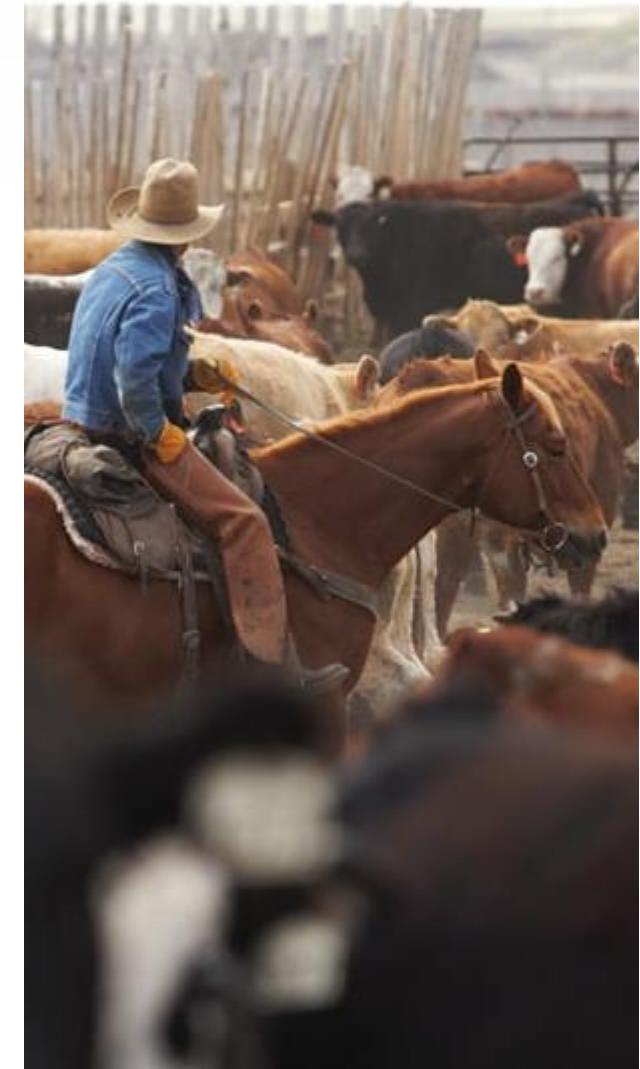
Very
healthy

Very
sick

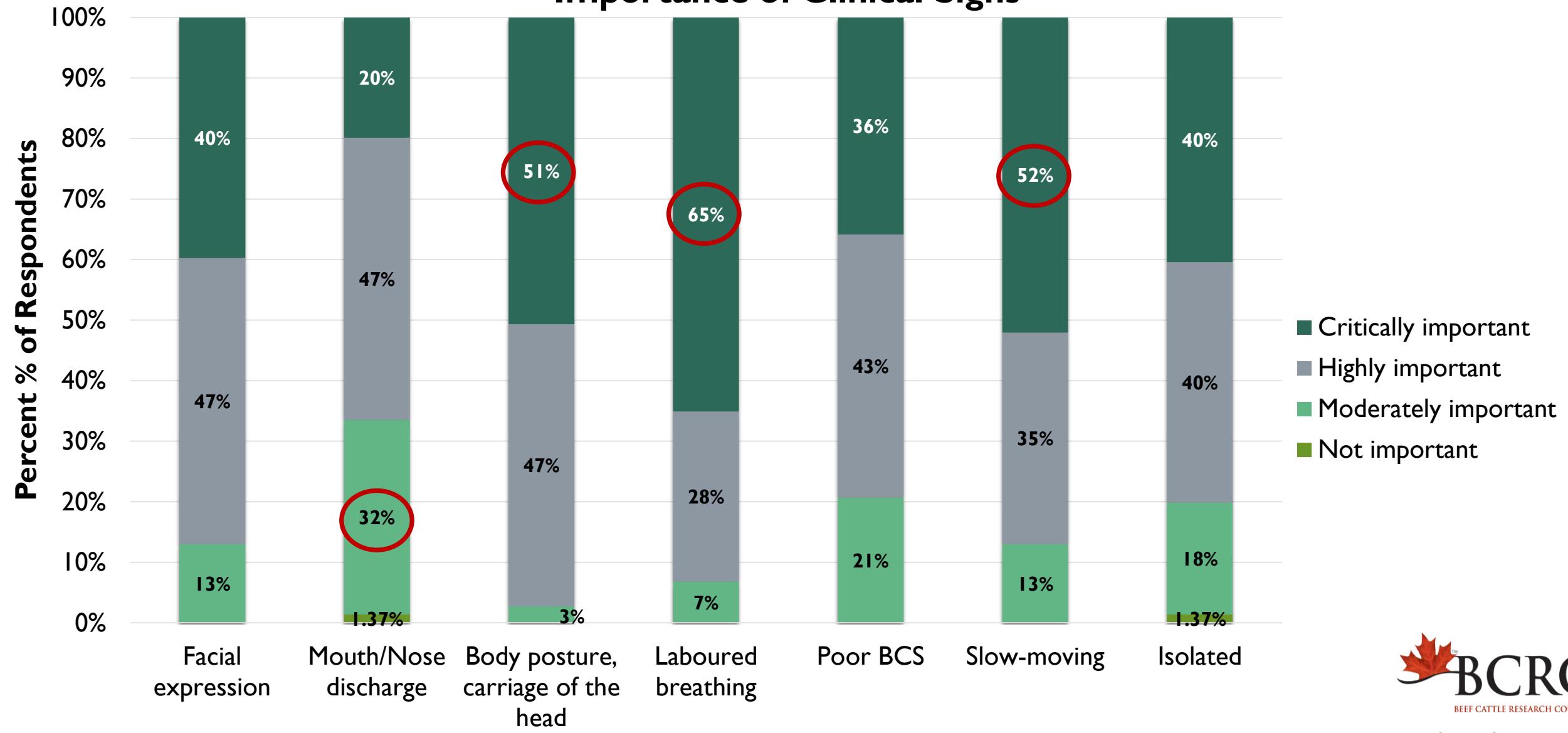


BRD Diagnosis

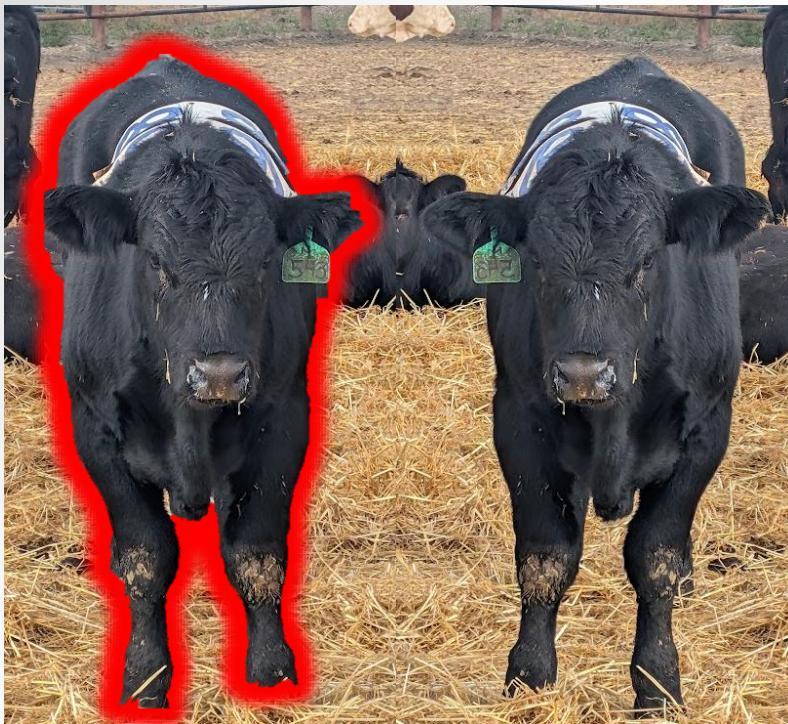
- D** Depression: Isolated, lethargic, low head carriage, low ears, sad/sunken eyes, flat tail, dragging toes, no stretching,
- A** Anorexia: Appetite loss, away from bunk, empty flank, poor BCS
- R** Respiratory signs: Heavy, rapid, open-mouth, thoracic, abdominal, nasal/oral discharge
- T** Temperature (>104 or 105 °F; >40 or 40.5 °C)



Importance of Clinical Signs



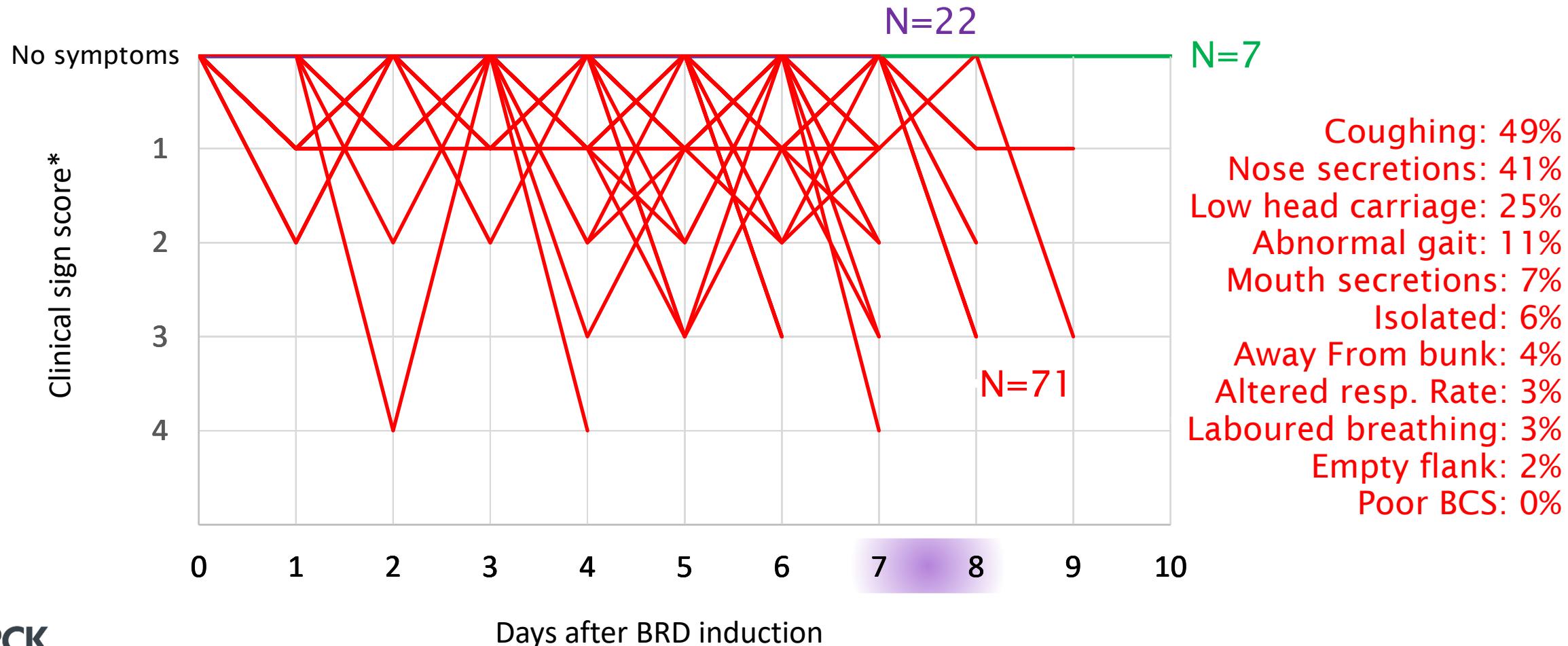
Association between diagnosis and clinical signs



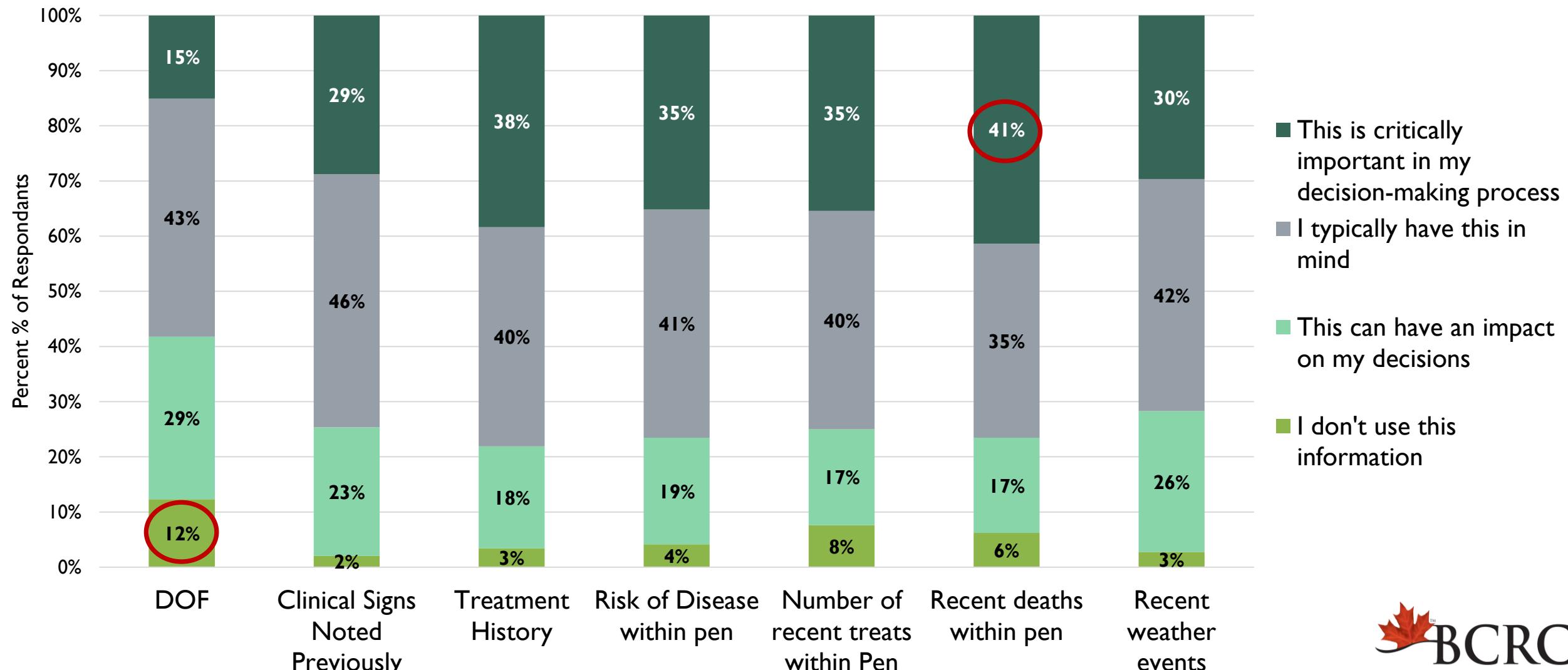
	With fever	Without fever	Odds Ratio
Mouth secretions	25.4%	20.4%	1.33
Nose secretions	51.7%	30.6%	2.43*
Eye expression	28.1%	44.9%	0.48
Coughing	21.1%	30.6%	0.6
Flat tail	21.1%	16.3%	1.37
Abnormal Respiration	10.5%	8.2%	1.32
Lack of rumen fill	30.7%	30.6%	1
Isolation in Pen	9.7%	12.2%	0.77
Lethargy	30.7%	40.8%	0.64
Abnormal Head Carriage	47.4%	42.9%	1.2

* Means P -value <0.05

Symptomatology of 100 BRD-induced calves



Factors Affecting Decision to Pull



BRD Diagnosis based on visual observation

- White and Renter (2009)
Sensitivity: 61.8% (55.7–68.4)
Specificity: 62.8% (60.0–65.7)
- Timsit et al. (2016)
Sensitivity: 27% (12–65)
Specificity: 92% (72–98)

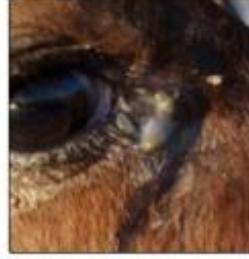
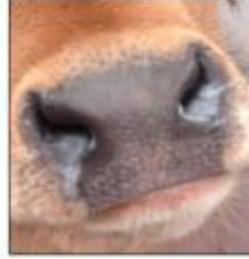
		True diagnosis (based on lung lesions at harvest)	
		Positive	Negative
Visual diagnosis (pen riders)	Positive	TP	FP
	Negative	FN	TN

- Use of lung lesions as gold standard.
- Lack of consistency across evaluators.
- Failure to assign a consistent weight to various clinical signs to reflect its importance.

- Added score:
 $\geq 5 \rightarrow \text{BRD} +$
 $\leq 4 \rightarrow \text{BRD} -$

- Decaris et al., 2022
Sensitivity: 67.1% (53.6-80.1)
Specificity: 79.1% (73.9-84.6)

Bovine respiratory disease scoring system for pre-weaned dairy calves^{1,2,3}

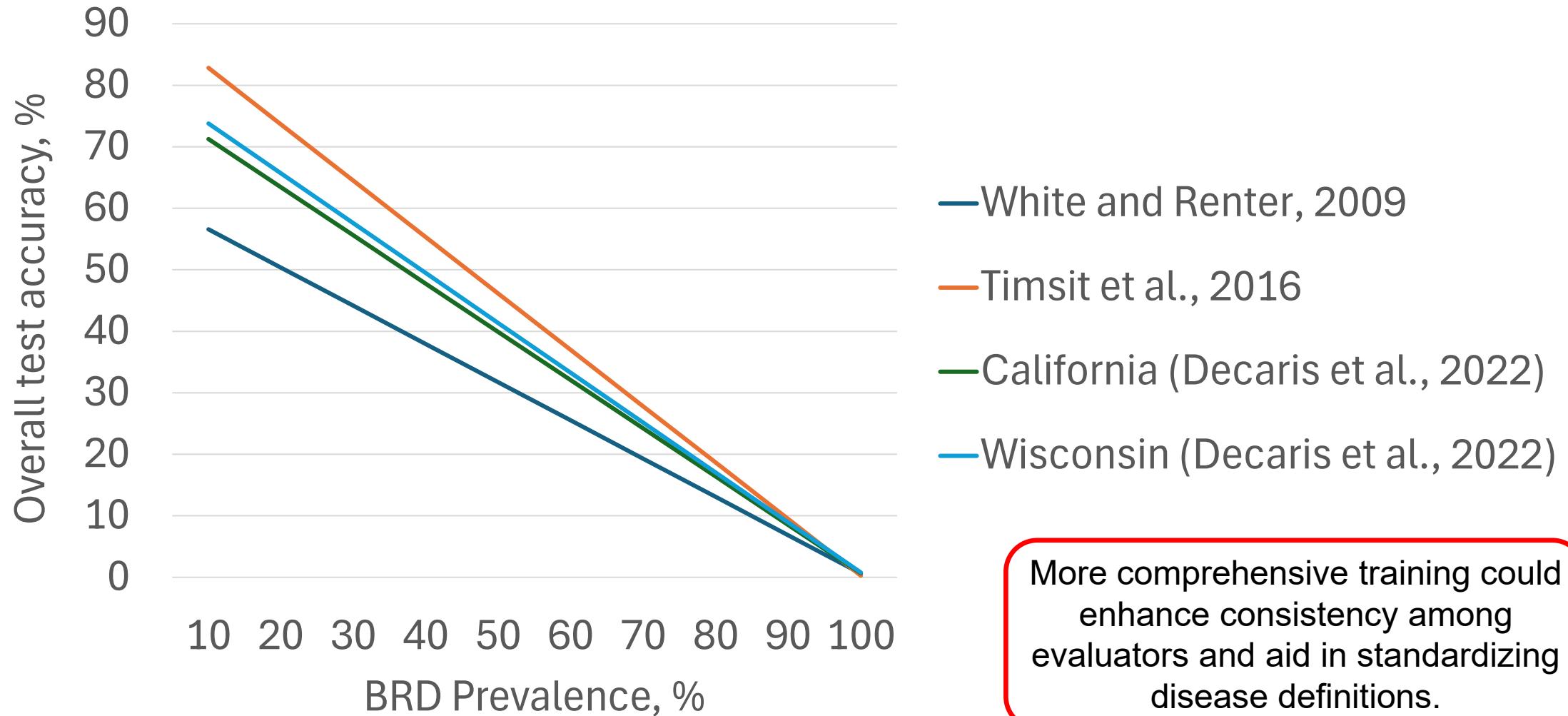
Clinical sign	Score if normal	Score if abnormal (any severity) ⁴				
Eye discharge	0 	2 		Or		
Nasal discharge	0 	4 		Or		
Ear droop or Head tilt	0 	5 		Or		
Cough	0 No cough	2	Spontaneous cough			
Breathing	0 Normal	2	Rapid or difficult breathing			
Temperature	0 $< 102.5^{\circ} \text{ F}$	2	$\geq 102.5^{\circ} \text{ F}$			

- Added score:
 $\leq 4 \rightarrow$ watch
 $\geq 5 \rightarrow$ treat

- Decaris et al., 2022
 Sensitivity: 77.9% (64.8-90.2)
 Specificity: 81.9% (76.3-88.2)

Calf Health Scoring Criteria			
0	1	2	3
Rectal temperature			
100-100.9	101-101.9	102-102.9	≥ 103
Cough			
None	Induce single cough	Induced repeated coughs or occasional spontaneous cough	Repeated spontaneous coughs
Nasal discharge			
Normal serous discharge	Small amount of unilateral cloudy discharge	Bilateral, cloudy or excessive mucus discharge	Copious bilateral mucopurulent discharge
			
Eye scores			
Normal	Small amount of ocular discharge	Moderate amount of bilateral discharge	Heavy ocular discharge
			
Ear scores			
Normal	Ear flick or head shake	Slight unilateral droop	Head tilt or bilateral droop
			

Overall accuracy of visual diagnostic



Other devices

- Rumen pH, drinking, temperature, activity

SmaXtec



Moonsyst



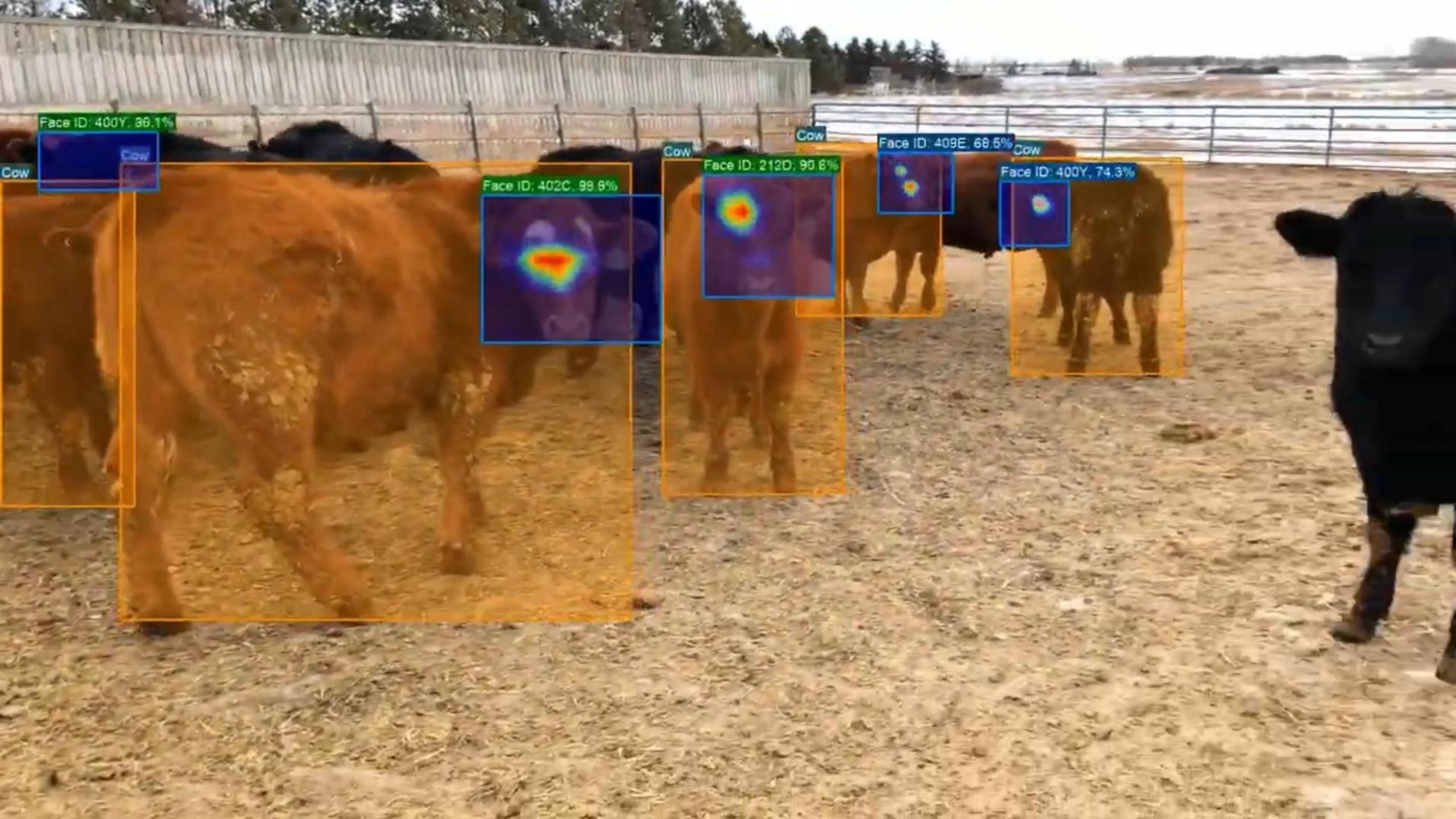
CowManager



SenseHub (Merck Animal Health)



- Ear temperature, eating, ruminating, activity

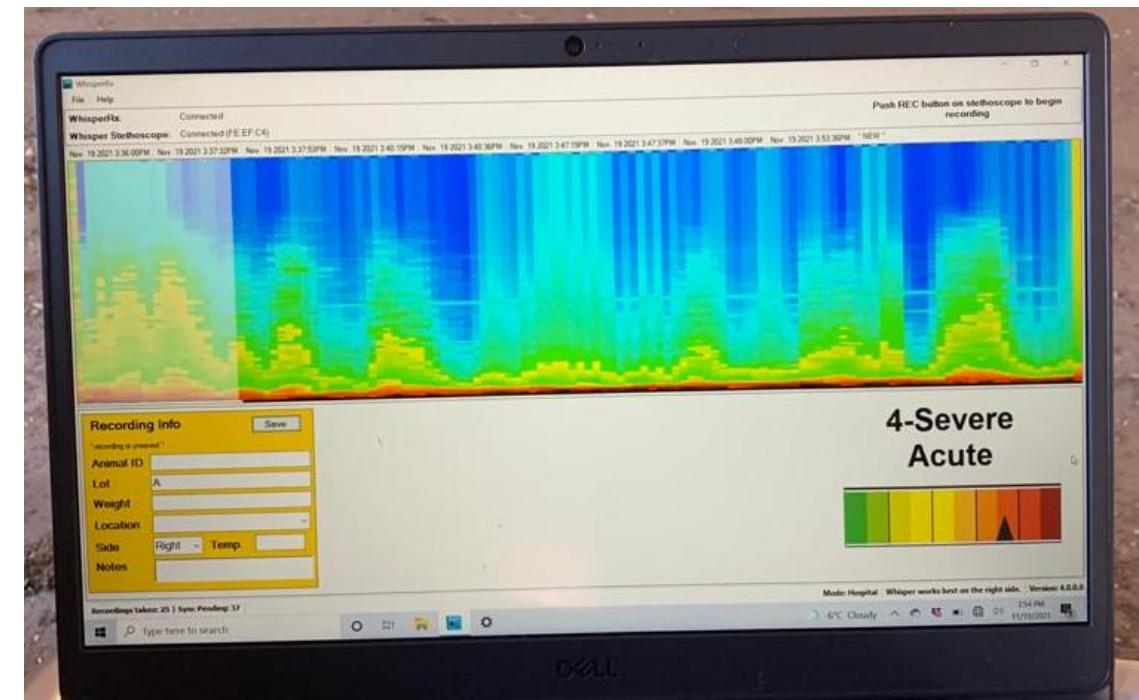


Computer-assisted lung auscultation

Whisper OnArrival (Merck Animal Health)

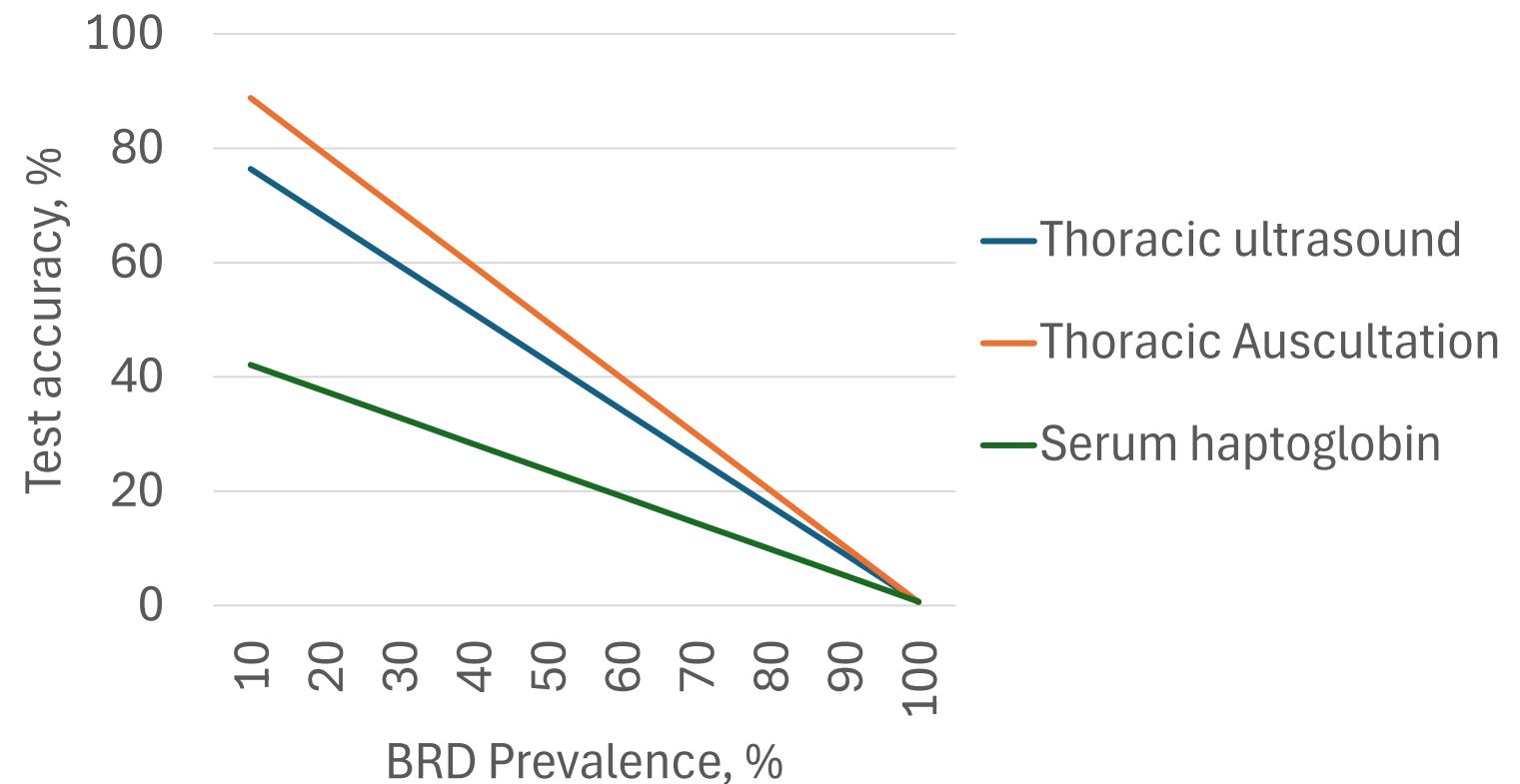


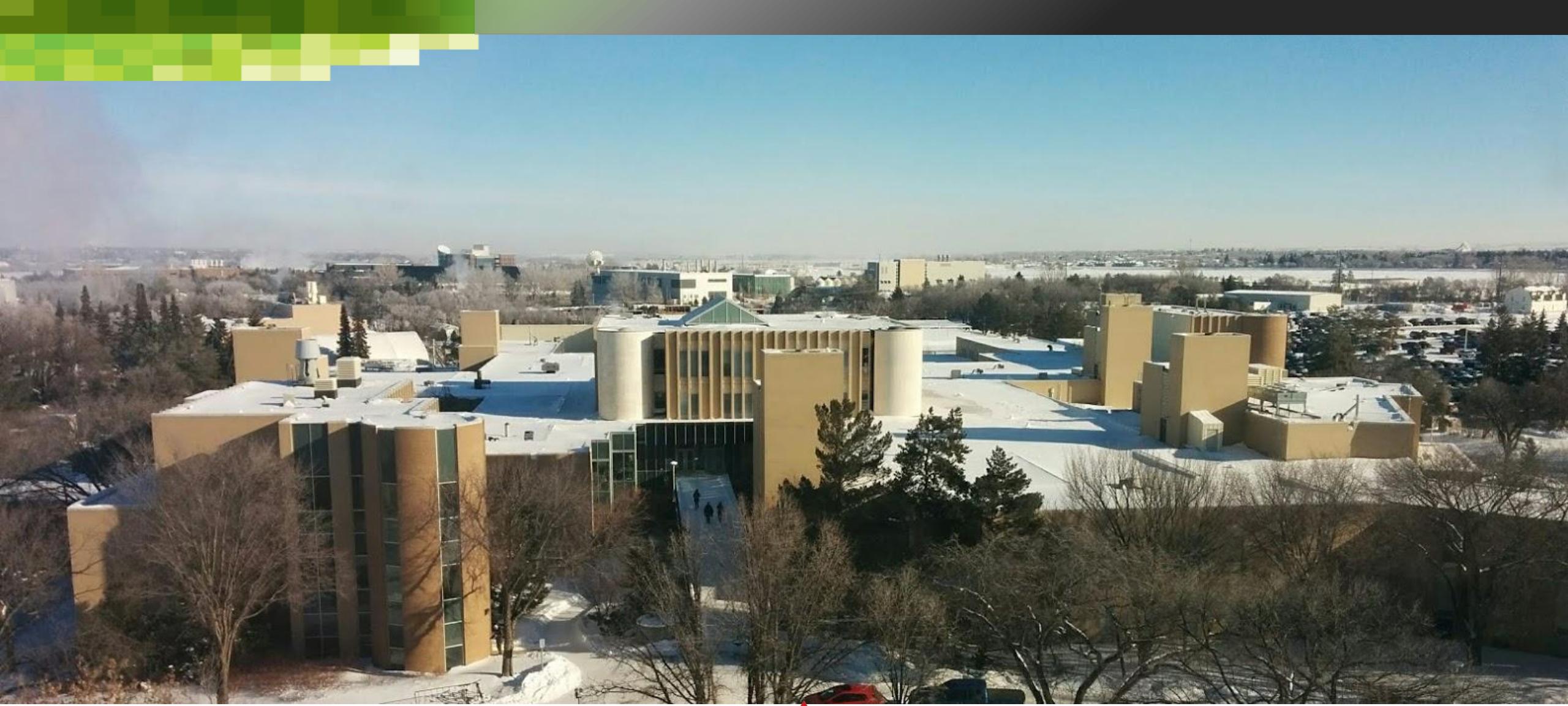
- Algorithm associates lung noises to health status
- Score from 1 to 5



Other chute-side diagnostic tools

- Thoracic ultrasound
Sensitivity: 59.8% (46.5–73.1)
Specificity: 84.8% (80.0–89.5)
- Thoracic auscultation
Sensitivity: 58.8% (41.3–79.8)
Specificity: 98.6% (95.7–99.9)
- Serum haptoglobin
Sensitivity: 67.6% (55.3–78.8)
Specificity: 46.7% (41.4–52.2)





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