

Assessing Safety Practices in Small Animal Veterinary Clinics

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Abstract

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Occupational hazards are an inherent risk present in all workplace settings. In the veterinary realm, these hazards are due in part to the human-animal interactions necessary to complete various job tasks. Previous work suggests that physical hazards, specifically animal-related injuries and needlestick and other sharps related injuries, are the most common injury types experienced by workers in the veterinary profession. Reducing the incidence of injury in this occupational group requires that one must first have a firm understanding of the worker, animal, and workplace environmental factors that precipitate injuries. One Health is an emerging framework that suggests the health of people, animals, and the environment are inextricably linked and thus must be assessed simultaneously in order to effectively address modern public health issues. In the animal care worker setting all three sectors of this paradigm are represented, in the workers, their animal patients, and the workplace environment, and thus application of a One Health approach is needed to understand fully the factors influencing injury incidence. Using this One Health approach, we have designed a mixed methods research study that assesses the factors that influence safety behaviors in the small animal clinical veterinary setting. A series of activities including a cross-sectional survey, focus group interviews and worker task observation were utilized to determine the human, animal, and environmental factors that influence physical injuries, more specifically animal-related injuries (ARIs) and needlestick/sharps injuries (NSIs) among members in the small animal veterinary workforce. Our study

results suggest that human factors including interpersonal communication, altruism and self-efficacy as well as animal health and behavior, workplace safety culture and the presence or absence of other personnel and/or pet owners in the workplace setting can influence veterinary worker safety behavior. Task observation results captured evidence of veterinary workers participating in a number of activities that may predispose them to physical injury including recapping needles and moving and lifting animal patients, while in awkward positions. Overall, ARIs and NSIs were common among veterinary personnel with nearly 83% of participants indicating at least one ARI in their career and 65% of participants experiencing at least one NSI. Workplace safety culture was identified as an underlying factor influencing injury occurrence in both focus group interviews and the cross-sectional survey. Overarching themes from all activities suggest that improvements in workplace safety culture along with additional training in effective communication and animal behavior are needed to improve safety outcomes in this workforce. Thus, educational interventions that address these factors are needed to effectively eliminate barriers and leverage facilitators to safety practices with the ultimate goal of reducing the incidence of injury in this occupational group.

1	<b>TABLE OF CONTENTS</b>	
2	Dedication.....	1
3	List of Tables .....	2
4	List of Figures .....	2
5	List of Appendices.....	3
6	List of Abbreviations .....	3
7	Introduction: Chapter 1: Applying the One Health approach to occupational safety and health.....	4
8	Abstract .....	5
9	Occupational health of animal Care workers .....	6
10	<i>One Health and occupational safety and health</i> .....	6
11	<i>Behavior change theories and worker safety and health</i> .....	7
12	<i>Dissertation objectives</i> .....	12
13	Chapter 2: Factors influencing workplace safety practice in the small animal clinical VETERINARY	
14	setting, Seattle, WA.....	14
15	Abstract .....	15
16	Introduction.....	17
17	Materials and methods .....	20
18	Subject recruitment and eligibility criteria.....	20
19	Explanatory model .....	21
20	Data analysis.....	24
21	Results .....	25
22	Animal related injuries.....	26
23	Needle handling .....	32
24	Improving behavior .....	35
25	Discussion.....	35
26	Limitations .....	38
27	Conclusion.....	39
28	Chapter 3: Pet owners’ perceptions of veterinary safety behaviors .....	40
29	Abstract .....	41
30	Introduction.....	43
31	Materials and methods .....	45
32	Study design .....	45
33	Study recruitment.....	46

34	Explanatory model .....	47
35	Data analysis .....	48
36	Results .....	49
37	Client perceptions of veterinary safety practices .....	50
38	Preferable veterinary characteristics.....	56
39	Animal restraint, communication.....	57
40	Discussion.....	58
41	Limitations .....	61
42	Conclusion.....	62
43	Chapter 4: An assessment of occupational injury exposures in small animal veterinary work, Seattle, WA	
44	.....	63
45	Abstract.....	64
46	Introduction.....	66
47	Materials and methods .....	67
48	Task observation .....	67
49	Data analysis.....	69
50	Results .....	70
51	Risk-related activities .....	72
52	Discussion.....	74
53	Animal behavior and restraint .....	75
54	Needle handling .....	75
55	Ergonomic issues .....	76
56	Limitations .....	77
57	Conclusion .....	78
58	Chapter 5: Prevalence of exposures to occupational hazards in small animal veterinary setting,	
59	Washington State.....	79
60	Abstract.....	80
61	Introduction.....	82
62	Materials and methods .....	84
63	Study design and subject recruitment.....	84
64	Online survey tool.....	85
65	Data analysis.....	85
66	Results .....	86
67	Work history and occupational health training.....	88

68	Occupational injuries.....	88
69	Infectious disease risk.....	89
70	Safety culture and climate .....	91
71	Discussion.....	93
72	Physical hazards.....	94
73	Musculoskeletal disorders.....	94
74	Infectious disease risks .....	95
75	Safety culture.....	95
76	Limitations .....	96
77	Conclusion .....	97
78	Conclusions and recommendations .....	99
79	Improving safety behaviors: intervention directions .....	100
80	Communication.....	100
81	Animal behavior.....	100
82	Safety culture.....	101
83	The Prevention of Injuries in Veterinary Occupational Tasks (PIVOT) Study.....	102
84	Implementation Strategies.....	103
85	References .....	105
86		
87		

## 88 Dedication

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103

104 **LIST OF TABLES**

- 105 Table 2-1: Focus group participant background and work history by Job Title
- 106 Table 2-2: Study Identified themes as related to ARIs
- 107 Table 2-3: Study Identified themes in relations to NSIs
- 108 Table 3-1: Small Animal Pet Owner Characteristics
- 109 Table 3-2: Pet Owner Focus Group Study Themes
- 110 Table 3-3: Pet Owner Focus Group Overarching Themes
- 111 Table 4-1: Task Observation Participant Job and Injury History Characteristics
- 112 Table 4-2: Frequency of Risk-related activities observed (# observed activities per observed 2-hour work  
113 session)
- 114 Table 5-1: Characteristics of study population
- 115 Table 5-2: Veterinary work history and pet ownership status
- 116 Table 5-3: Injury Prevalence
- 117 Table 5-4: Infectious Disease Risks
- 118 Table 5-5: Workplace Safety Climate

119 **LIST OF FIGURES**

- 120 Figure 1: One Health Occupational Safety and Health Model
- 121 Figure 2: Veterinary Worker Animal Related Injury Exposure Pathway
- 122 Figure 3: Veterinary Worker Needlestick/Sharps Related Injury Exposure Pathway
- 123 Figure 4A: Veterinary Worker Safety Sign, Animal Restraint
- 124 Figure 4B: Veterinary Worker Safety Sign, Treatment Area
- 125 Figure 5: Rapid Upper Limb Assessment Tool
- 126 Figure 6: The Prevention of Injuries In Veterinary Occupational Tasks (PIVOT) Study Intervention  
127 Outline

128	<b>LIST OF APPENDICES</b>
129	A-1 Veterinary worker focus group/telephone interview guide
130	A-2 Veterinary worker focus group background survey
131	A-3 Pet owner focus group interview guide
132	A-4 Pet owner focus group background survey
133	A-5 Task observation card
134	A-6 Task observation study background survey
135	A-7 Veterinary worker occupational hazards survey

136	<b>LIST OF ABBREVIATIONS</b>
137	ARI Animal-Related Injuries
138	MSD Musculoskeletal Disorders
139	NSI Needlestick/Sharps Injuries
140	OHOSH One Health Occupational Safety and Health Model
141	PPE Personal Protective Equipment
142	RULA Rapid Upper Limb Assessment
143	

144 INTRODUCTION: CHAPTER 1: APPLYING THE ONE  
145 HEALTH APPROACH TO OCCUPATIONAL SAFETY AND  
146 HEALTH  
147

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164 **ABSTRACT**

165 The One Health approach promotes transdisciplinary collaboration across human, animal, and  
166 environmental health sectors to resolve emerging and complex issues. Historically, this  
167 movement has primarily focused on prevention and control of emerging zoonotic diseases, yet  
168 potential areas of application extend far beyond that of infectious disease. Utilization of this  
169 approach provides a holistic overview of a given issue which will ultimately lead to the  
170 identification of effective solutions to assist in resolving it. We describe a new area of focus for  
171 One Health research in the realm of occupational safety and health with an emphasis on animal  
172 care workers. We present a novel “One Health” Occupational Safety and Health Model that  
173 integrates all three aspects of health and that builds on Bandura’s Social Cognitive Theory to  
174 create a framework for guiding feasible interventions to improve health and safety behaviors  
175 among animal care workers. We conclude with a case study example from the small animal  
176 veterinary setting to demonstrate an application of this integrated One Health model for animal  
177 care worker health and safety.

178 **Keywords:** One Health, Animal Care Workers, Safety Model

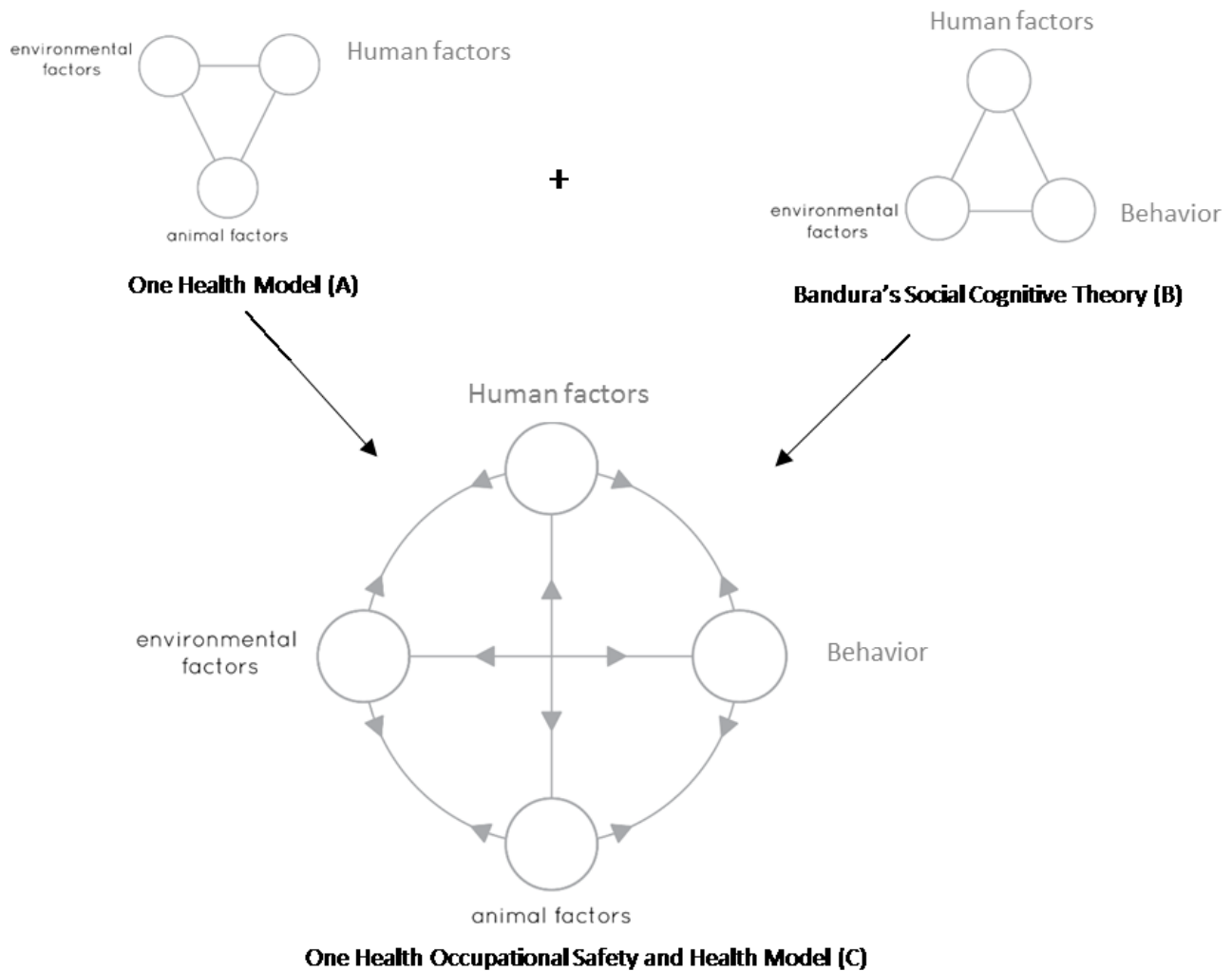
179

180 OCCUPATIONAL HEALTH OF ANIMAL CARE WORKERS

181 It is estimated that over 1.5 million people in the United States work with animals as their  
182 primary source of income (1). These animal care workers are employed on farms, in veterinary  
183 clinics, at zoos and aquariums, in abattoirs, at wildlife rehabilitation centers, etc. As a result of  
184 their work these individuals are at risk for a myriad of occupational injuries and illnesses (2-5).  
185 Case reports of rare and at times fatal infectious diseases among these workers are sprinkled  
186 throughout the animal sciences and public health literature (2, 4, 6). Yet, despite this increased  
187 zoonotic disease risk, animal care workers often work in settings where occupational health  
188 programming is limited to non-existent (7).

189 *ONE HEALTH AND OCCUPATIONAL SAFETY AND HEALTH*

190 Protecting this workforce requires competencies that extend beyond that of traditional  
191 occupational health. One Health is an emerging research approach that stresses the linkages  
192 between human, animal, and environmental health (8-12). This model as displayed in Figure 1A  
193 stresses the relative independence of the aforementioned sectors of health while simultaneously  
194 emphasizing their interdependence, the major underlying principle of One Health, as illustrated by  
195 the lines connecting these three sectors in the triad. In the animal care worker setting, this approach  
196 builds upon the traditional occupational health approach of assessing a given exposure and  
197 outcome by compartmentalizing the exposure into manageable sections. By doing so, this  
198 expanded One Health approach ensures review of all potential factors that may lead to injury in  
199 combination with consideration of existing behavior models used to improve safety behaviors and  
200 consequently safety outcomes.



202 *FIGURE 1: COMPONENTS OF THE ONE HEALTH OCCUPATIONAL SAFETY AND HEALTH MODEL.*  
 203 When the (A) One Health Model and (B) Bandura’s Social Cognitive Theory are combined for the  
 204 purposes of addressing occupational safety and health issues of animal care workers, the One  
 205 Health Occupational Safety and Health Model (C) is created.

206

207 *BEHAVIOR CHANGE THEORIES AND WORKER SAFETY AND HEALTH*

208 Bandura’s social cognitive theory (SCT) model suggests that human behavior results from  
 209 the reciprocal relationship between the individuals themselves, given behaviors, and their  
 210 environment (see Figure 1B) (13, 14). It implies that an individual is influenced not only by their  
 211 social and physical environment, but also their perception of this environment (i.e. outcome  
 212 expectations) and their learned history surrounding a given behavior. Thus, adoption of new

213 behaviors is influenced by the individual's level of confidence in their ability to perform a given  
214 behavior (i.e. self-efficacy) and the presence or absence of social support within the surrounding  
215 environment. Since its inception this theory has been adapted to explain a number of safety  
216 behaviors as well as to improve a variety of health behaviors, including the use of hearing  
217 protection in loud environments, injury prevention in human health care settings, and cancer  
218 prevention in the general public (15-21). Its application to occupational health of animal care  
219 workers, utilizing the One Health paradigm, has not been previously described.

220 In order to quantify the burden of injury and disease among animal care workers and begin  
221 to improve safety behaviors, the University of Washington's Center for One Health Research  
222 (COHR) set out to assess worker safety risks with the goal of reducing injury incidence among  
223 those employed in the fields of veterinary medicine and animal care services. The Center aims to  
224 achieve such goals through the creation and implementation of a holistic occupational safety and  
225 health model. This model is borne out of the One Health concept, includes input from Bandura's  
226 Social Cognitive Theory, and is described below. We postulate that an occupational health and  
227 safety model that blends concepts from this behavioral model with that of the One Health model  
228 can be used to improve safety behaviors among animal care workers by ensuring a holistic  
229 approach to injury assessment and prevention.

230 The proposed One Health Occupational Safety and Health (OHOSH) model (Figure 1 C)  
231 merges concepts from Bandura's model of Social Cognitive Theory (Figure 1 B) with the One  
232 Health model (Figure 1 A) via the addition of animal factors. The key components of this model  
233 are human, animal, behavioral, and environmental factors. The environmental factors, though  
234 shared by both animal care workers and animals alike, are often experienced differently depending  
235 on their role in, perception of, and control over the situation. For the animal care worker, the

236 workplace environment includes other people who can influence work outcomes, the physical  
237 environment or layout of the workspace, and other administrative factors including workplace  
238 safety culture and policies and supplies needed to perform the work safely and/or effectively. For  
239 the animal patient, on the other hand, the perception of this (workplace) environment deals  
240 primarily with the senses, i.e. sight, sound, smell, taste and touch (22, 23). The activation of these  
241 senses convey feelings of fear, anxiety, and/or stress of animals handled in this setting in the past  
242 and allows these animals to contribute additional olfactory signals to be picked up by others that  
243 enter that same environment in the future (23-27). Most importantly, these sensory characteristics  
244 of the workplace environment can positively or negatively impact animal behavior leading to  
245 reactive animals that can potentially cause harm to animal care workers in this setting.

246 Human factors describe the worker-related factors that precipitate injury such as skill set,  
247 level of focus at the time of work years of experience, and communication (28-30). Behavioral  
248 factors relate specifically to a behavior conducted by an individual including negative behavior  
249 patterns, and finally, animal factors directly describe the health of an animal as well as its behavior  
250 as displayed in the workplace setting.

251 Finally, Bandura's construct of reciprocal determinism which describes the relationships  
252 between factors in the SCT is maintained in this new model where one of the factors in the model  
253 can directly impact another leading to a domino effect and ultimately a behavior change(13). In  
254 the case of the veterinary setting, the impact of the environment on behavior can impact both  
255 worker and animal alike thus influencing human worker-related factors leading to either the  
256 adoption or rejection of a safety practice.

257 We present the following illustrative case of animal-related injury in a small animal clinical  
258 veterinary setting as an example of interactions in this setting as well as application of the proposed  
259 OHOSH model.

260 *CASE EXAMPLE AND MODEL APPLICATION*

261 *Cookie, a 14-year-old female, spayed indoor domestic shorthair cat with unknown*  
262 *vaccination history, presents to the veterinary clinic to update her vaccines and address*  
263 *other existing health issues. Cookie's owner had recently seen small, rice-like "inch*  
264 *worms" crawling around near the base of her tail and around her rectum, suggesting she*  
265 *was infected with Dipylidium caninum, (cat and dog tapeworm). The veterinarian asked*  
266 *the veterinary technician to give the cat a pill to treat the infection, but as the technician*  
267 *held Cookie by the scruff of her neck and while the other technician tried to give her a pill,*  
268 *the cat became extremely agitated and attempted to free herself using her teeth and claws.*  
269 *The technician held on to the cat despite incurring multiple puncture wounds, erroneously*  
270 *thinking this action would protect the veterinarian and others in the room from harm.*  
271 *Witnessing the struggle, the cat's owner attempted to comfort the animal, only to be bitten*  
272 *and scratched in the process. To add to this already stressful situation, a student working*  
273 *at the clinic also placed her hands on the cat and was bitten and scratched. After more*  
274 *struggle, the cat vacated her bowels out of fear, contaminating the hands of several of the*  
275 *personnel. The three bitten and scratched individuals were referred for medical evaluation.*

276 In this case, example, Cookie the cat brings with her to the veterinary appointment her  
277 personal animal factors, including her negative learned history of veterinary clinical interactions,  
278 potential pain and/or discomfort from her intestinal worm infestation, and possible feelings of fear,  
279 stress, and/or anxiety placed upon her by her owner when crating and transporting her to the clinic

280 (*animal factors*). These factors combined lead to an animal patient that is high risk for potentially  
281 causing injury to the veterinary workforce, which as a result requires extra care when handling to  
282 effectively prevent harm to the workers (*animal factors*). A number of factors influenced the  
283 behavior of the animal care workers in this scenario as outlined by the OHOSH model. Their  
284 outcome expectations were likely related to learned history and perceptions of the social  
285 environment (i.e. what they believe their co-workers think) and may have affected their  
286 mishandling of the stressed cat (*human and behavioral factors*).

287         The physical environment in this example, though not described, consisted of an open floor  
288 plan. This structural layout allowed the cat to interact with other animals prior to and during its  
289 examination likely contributing to its stress. In addition, veterinary workers were forced to  
290 navigate the workplace environment in such a way that would prevent the cat from getting loose  
291 and possibly lost (*environmental and animal factors*).

292         The veterinary technician's competency or skills in animal restraint and refusal to let go,  
293 stop, or request a change to the approach of pilling the cat only exacerbated negative behaviors in  
294 the cat, leading to its aggressive reaction and resulting injuries to the veterinary workers and its  
295 owner (*human factors*).

296         Other factors at play in this scenario included the veterinary team's working history and  
297 the lack of communication strategies and approaches to protect one another from harm  
298 (*environmental and human factors*). Given the role of the one technician of restraining the cat  
299 while the other administered the medication, it is important for communication to flow freely  
300 between the two personnel involved in the activity to prevent injury(31-34). Ultimately, the  
301 outcome in this case, which likely occurs often in clinical veterinary settings worldwide, was that  
302 a fear aggressive cat injured multiple personnel and even the owner during a routine procedure

303 (22, 23, 25-27, 35). As a result, the workers involved in this scenario each leave this experience  
304 with a learned lesson on animal restraint, which will influence their behaviors and actions in the  
305 future (*behavioral factors*). The cat in this example is also considered a victim as the evacuating  
306 of its bowels was an obvious sign of extreme stress and fear, which will likely leave a lasting  
307 impression that will influence its behavior at veterinary offices in the future (*animal factors*).

308 In this situation, animal factors as outlined above, in combination with the perceptions of  
309 the physical and social environment, and about the worker's interpretation of the animal's behavior  
310 and resulting response, are the primary factors that led to this unsafe situation. In addition, the need  
311 for the animal to receive care to address an underlying medical condition may also have  
312 contributed to the animal's temperament at the time of the appointment. Violence directed toward  
313 workers by their patients or Type II violence, is well documented in the human health literature;  
314 however, violence by animal patients as described in our illustrative case is thought to be due in  
315 part to animal behavior, thus highlighting the need for an understanding of these unique human,  
316 animal, behavioral, and environmental factors when discussing injury risk (36). The proposed One  
317 Health Occupational Safety and Health Model considers these factors when assessing injury risk  
318 in the workplace as the cause of injury to animal care workers is often multifactorial.

### 319 *DISSERTATION OBJECTIVES*

320 Of the variety of hazards present in the animal care worker setting, animal related injuries (ARIs)  
321 and needlestick/sharps injuries (NSIs) are by far the most common(3, 37-43). In addition to acute  
322 trauma these injury types place veterinary personnel at increased risk of a number of adverse health  
323 outcomes including broken limbs, musculoskeletal disorders, infectious disease, tissue necrosis,  
324 abortion, and death (2, 44-52). Yet despite their popularity in the literature, little is known about  
325 the primary sources that lead to such injuries with an emphasis on injury reduction (28-30, 43, 45,

326 47, 53). This dissertation seeks to fill existing gaps in the literature around animal care worker  
327 injury by identifying modifiable factors related to ARIs and NSIs in small animal veterinary care  
328 work. This work will utilize the proposed One Health Occupational Safety and Health Model to  
329 these injuries to gain a deeper understanding of their primary causes and eventually develop source  
330 material for educational interventions that will reduce the incidence of injury among these  
331 workers.

332 This study, the Prevention of Injuries in Veterinary Occupational Tasks (PIVOT) study, will utilize  
333 a mixed methods approach to address the following objectives:

- 334 (1) Assess the human factors that influence safety practices in the small animal clinical  
335 veterinary setting via focus group and one-on-one interviews with veterinary workers and  
336 their clients (Chapters 2 and 3)
- 337 (2) Characterize the frequency and duration of common, potentially high risk tasks conducted  
338 in small animal veterinary care work via task observation (Chapter 4)
- 339 (3) Determine the prevalence of ARIs and NSIs as well as potential risk factors that predispose  
340 workers to injury in this occupational setting via a statewide cross-sectional survey  
341 (Chapter 5)

342 Findings from this work are summarized within.

343

344 CHAPTER 2: FACTORS INFLUENCING WORKPLACE  
345 SAFETY PRACTICE IN THE SMALL ANIMAL CLINICAL  
346 VETERINARY SETTING, SEATTLE, WA

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364 **ABSTRACT**

365 **Objectives** – To identify barriers and facilitators to the implementation of safety practices for  
366 injury prevention in the small animal clinical veterinary setting

367 **Design**– Semi-structured focus group and one-on-one telephone interviews

368 **Sample** – Small animal clinical veterinary personnel in Washington State

369 **Materials and Methods**- Semi-structured focus group interviews of veterinary personnel were  
370 carried out among Washington State veterinary medical workers (practicing small animal  
371 medicine?) on October 9, 2016. Focus group participants were separated by job title with  
372 veterinarian and veterinary technician focus group interviews occurring at different times and  
373 locations. In addition, one on one semi-structured telephone interviews were conducted with 13  
374 veterinary assistants in the state between January 5 and March 1, 2017. Focus group and one-on-  
375 one telephone interview questions were identical between groups and covered topics related to  
376 common sources of Animal related injuries (ARIs), needle handling practices, animal restraint  
377 practices, as well as personnel identified solutions for reducing injuries in the small animal clinical  
378 veterinary setting (Appendix A-1). Two coders conducted a dual coding thematic content analysis  
379 independently and reached agreement on discordant codes. Study codes were derived from the  
380 One Health Occupational Safety and Health (OHOSH) model that describes primary factors that  
381 lead to injury in animal care worker settings. Primary and overarching themes were identified and  
382 summarized.

383 **Results** –Forty-two veterinary personnel participated in the study. All 42 veterinary personnel  
384 reported experiencing at least one ARI in their career. Cats were the most common source of injury  
385 that participants found somewhat unavoidable. Major domains drawn from the One Health

386 Occupational Safety and Health (OHOSH) model included animal factors including animal  
387 behavior and animals recovering from anesthesia, as well human behavior, interpersonal  
388 communication practices and workplace safety. ARIs were experienced by all members of the  
389 study population and attributed to animal species, workplace safety culture and the presence or  
390 absence of the pet owner in the clinical setting. Needlestick/sharps injuries (NSIs) were also  
391 common with 95% of participants (n=40) experiencing at least one NSI in their career. Study  
392 themes surrounding needle handling included negative behavior patterns, absence of safety devices  
393 such as sharps containers in the local environment and animals responding to needle use.  
394 Administering therapeutics led to self-inoculation and/or accidentally injuring another member of  
395 the veterinary team and/or the pet owner. Identified solutions for needle handling included  
396 increasing the number of sharps containers present in the workplace as well as reducing the cost  
397 of medical waste associated with disposing of the needle and syringe versus just the needle tip.  
398 Having severe health consequences resulting from ARIs and NSIs were voiced on multiple  
399 occasions as a factor that would be effective in improving safety behaviors around injury in the  
400 veterinary profession.

401 **Conclusions and Clinical Relevance** – ARIs and NSIs are common in veterinary medicine.  
402 Animal species and behavior, workplace safety culture and the presence of other personnel and/or  
403 veterinary clients in the workplace environment all influence veterinary personnel's safety  
404 behavior. A comprehensive occupational health program that addresses these potential concerns  
405 by providing feasible solutions are needed to improve health outcomes in this occupational setting.

406 Abbreviation list:

407 ARI Animal-related Injury

408 NSI Needlestick/Sharps Injury

409 INTRODUCTION

410 Occupational injury is prevalent in the veterinary field (3, 7, 38, 40, 43, 54-66). More  
411 specifically, animal-related injuries (ARIs), including being bitten, scratched, kicked, or stepped  
412 on, as well as needlestick/sharps injuries (NSIs), are the most common injuries suffered by  
413 veterinary personnel working in the clinical setting(3, 43, 46). In Washington State, a study of  
414 workers' compensation claim rates confirmed this finding by noting that the highest rates of  
415 injuries among veterinary personnel are associated with trauma inflicted by animals. This study  
416 also implicated cats as the most common source of injury in the veterinary profession in the state  
417 (37). Despite this high prevalence of injury, little to no data exists on the prevalence and  
418 implementation of formal occupational health programs designed to reduce and prevent injury and  
419 illness on the job (7, 38, 58, 67). Furthermore, few studies have been conducted that explain the  
420 internal and external factors at play that influence safety behavior and/or precipitate injury (1, 3,  
421 7, 28-30, 47, 53, 65, 66). These existing studies; however, suggest that personal and demographic  
422 factors such as age, years in practice and level of physical activity are associated with injury  
423 prevalence in the profession.(28-30)

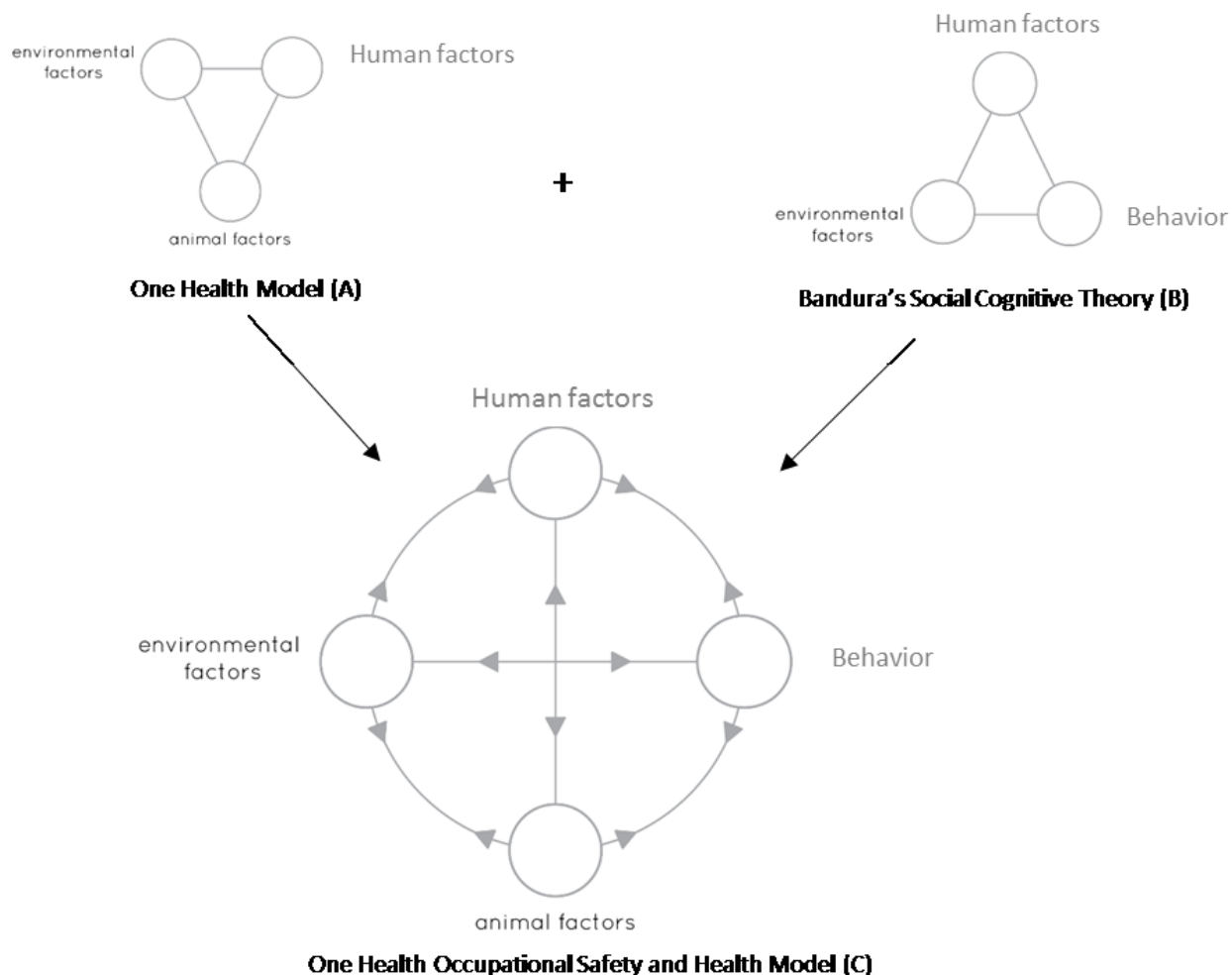
424 Qualitative research methods provide an innovative means of addressing worker safety and  
425 health (15, 36, 68-71). These studies provide insight on the internal and external factors that  
426 influence human behaviors and often outline means for improving a given behavior (13, 15, 72).  
427 To date these studies have focused on a number of occupational settings, including but not limited,  
428 to construction, agriculture, healthcare and the services industry, and have explored a variety of  
429 topics related to workplace violence, safety culture, and interpersonal team communication (36,  
430 71, 73-77). Few qualitative studies however, have been conducted in the veterinary profession as  
431 a whole, let alone those aimed at assessing individual factors regarding safety and health  
432 practices.(69, 70, 78, 79) Instead, assessments in the realm of occupational safety and health of

433 animal care workers have been primarily cross-sectional and thus failed to identify individual  
434 human factors that predispose one to injury (3, 28, 37).

435 For animal care workers like clinical veterinary personnel, the factors that influence injury  
436 prevalence span the realms of human, animal, and environmental health, making it an appropriate  
437 application of the One Health Occupational Safety and Health (OHOSH) model to understand and  
438 improve safety behavior among these workers (Chapter 1; See Figure 1). In the case of ARIs and  
439 NSIs specifically, these factors include the following components:

- 440 • Human and behavioral factors, which include worker behavior, culture, and  
441 practice as well as the behavior and practices of the pet owners that have the  
442 potential to influence the behaviors and actions of the pets and personnel present.
- 443 • Animal factors, which include animal behavior, health, and influence of previous  
444 experiences in the clinical setting.
- 445 • Environmental factors, which include the physical and sensory characteristics of  
446 the workplace environment including the presence or absence of safety devices that  
447 can precipitate ARIs or NSIs.

448



449 *FIGURE 1: COMPONENTS OF THE ONE HEALTH OCCUPATIONAL SAFETY AND HEALTH MODEL.*  
 450 When the (A) One Health Model and (B) Bandura's Social Cognitive Theory are combined for the  
 451 purposes of addressing occupational safety and health issues of animal care workers, the One  
 452 Health Occupational Safety and Health Model (C) is created. The four key domains of this model  
 453 are human, behavioral, animal, and environmental factors. Specific exposure pathways illustrate  
 454 how this model applies to a given animal care worker setting.

455 In an attempt to improve worker safety and health outcomes among veterinary small animal  
 456 care workers, we set out to conduct a series of qualitative interviews to identify root causes of  
 457 occupational injury in the veterinary profession with the goal of identifying modifiable factors that  
 458 can be leveraged to improve worker safety and health. The objective of this study is to identify  
 459 through qualitative interviews, barriers and facilitators to implementing behavioral practices that  
 460 reduce the likelihood of ARIs and NSIs in the small animal clinical veterinary setting. This study

461 is part of a larger study aimed at preventing injuries in veterinary workers called the Prevention of  
462 Injuries in Veterinary Occupational Tasks (PIVOT) study. Other study methods included pet  
463 owner-client focus groups, worker task observation, and a population-based cross-sectional survey  
464 of worker injury and illness.

## 465 MATERIALS AND METHODS

466       Semi-structured focus group interviews of veterinary personnel were carried out among  
467 Washington State veterinary medical workers attending a statewide veterinary conference on  
468 October 8, 2016. Two focus groups of veterinarians and two of veterinary technicians were carried  
469 out for a total of four focus groups. Additionally, one on one semi-structured telephone interviews  
470 were conducted with 13 veterinary assistants in the state with an emphasis on the Seattle area  
471 between January 4 and March 1, 2017. Focus group and one-on-one interview questions covered  
472 topics regarding common sources of ARIs and NSIs, needle handling practices, animal restraint  
473 practices, and personnel-identified solutions for injury reduction in veterinary medicine (See  
474 Appendix A-1). All interviews were tape-recorded and the audio transcribed in preparation for  
475 qualitative analysis. Prior to the start of each interview, participants were asked to complete a short  
476 survey describing their clinical experience, injury history, and demographic information (See  
477 Appendix A-2).

## 478 SUBJECT RECRUITMENT AND ELIGIBILITY CRITERIA

479       The study was open to veterinarians, veterinary technicians, and veterinary assistants  
480 licensed in and attending the annual state veterinary conference in Washington State. A  
481 recruitment email was sent out to all registered attendees two weeks prior to the conference. Follow  
482 up invitations were sent weekly and then up to twice a week as the meeting date approached to  
483 facilitate recruitment. Interested participants contacted the study team directly and were assigned  
484 to a specific focus group to be held during the conference depending on their job title and

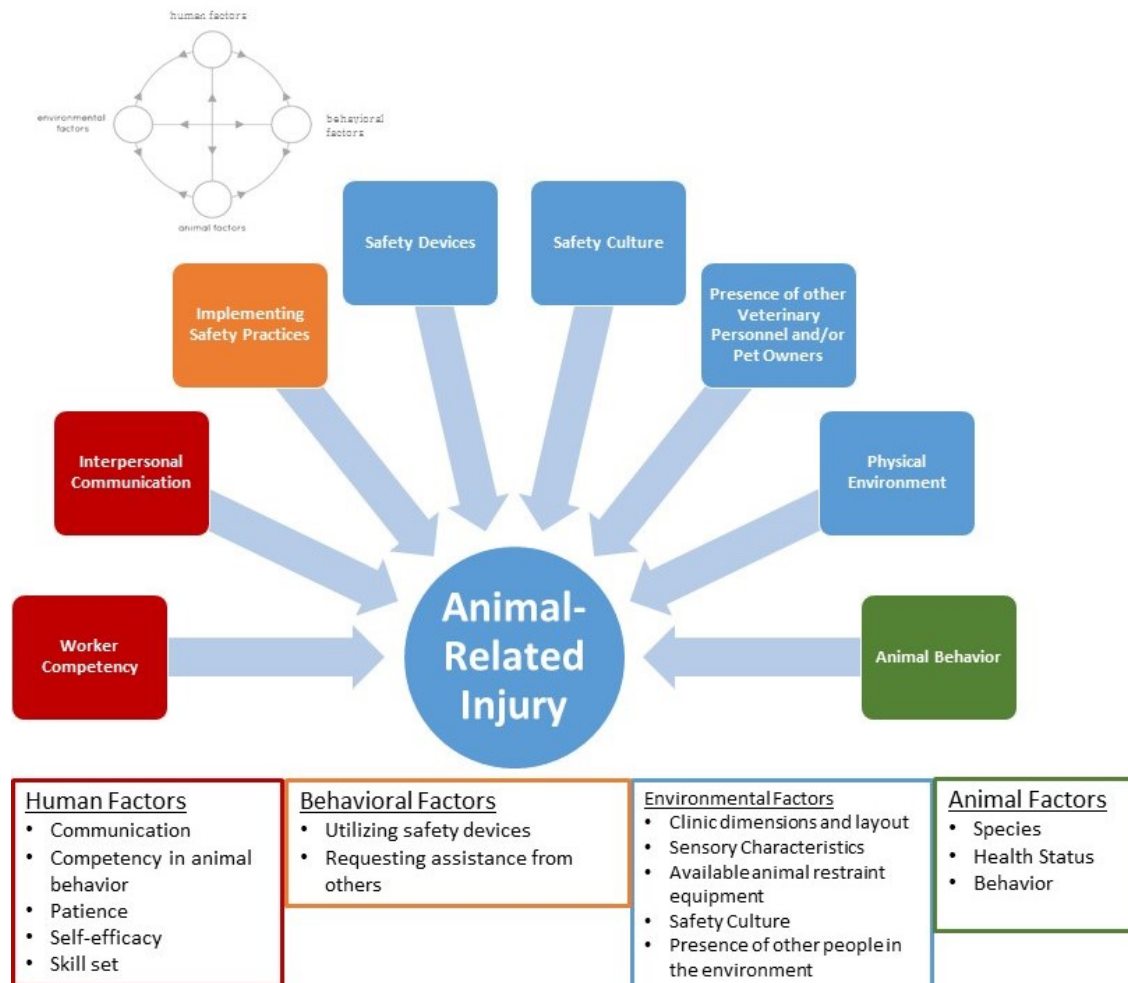
485 availability. Each focus group was scheduled to include five to ten participants. Focus groups not  
486 meeting this minimum enrollment requirement of five participants were cancelled and participants  
487 rescheduled if possible.

488 One-on-one interviews were limited to veterinary assistants currently in practice in  
489 Washington State, with an emphasis on the Seattle area. Participants were recruited from those  
490 individuals that expressed interest in the focus groups during the statewide veterinary conference  
491 though were unable to participate in focus group interviews due to low recruitment. Additional  
492 participants were recruited using the Nextdoor app, which targets app users in the Seattle  
493 metropolitan area. Interviews were conducted by phone and utilized the same interview and survey  
494 tools as the focus groups (See Appendices A-1 and A-2). All participants received a \$25 gift card  
495 for their participation.

#### 496 EXPLANATORY MODEL

497 Explanatory models explaining the issues that precipitate ARIs and NSIs were used to develop key  
498 deductive domains to be used in the content analysis (Figure 2 and 3). These models highlight the  
499 key human, behavioral, animal, and environmental factors that precipitate injury in the clinical  
500 veterinary setting described by the OHOSH Model (See Chapter One, Figure 1). The OHOSH  
501 model suggests that understanding behavior change in an animal care worker setting requires  
502 evaluation of the human, behavioral, animal, and environmental factors that influence it. Human  
503 factors relate specifically to the individual as outlined in Bandura's Social Cognitive Theory.  
504 These factors include communication with other people present in the workplace environment,  
505 skill set or competency in a specific area, and feelings of self-efficacy or ability to affect change  
506 or enact a given behavior in a specific scenario (13, 14). Environmental factors relate to the  
507 physical characteristics of the workplace setting including the worksite dimensions and sensory

508 characteristics that can be interpreted by animal patients. These factors also include the presence  
509 and/or absence of restraint equipment as well as other workers or clients that may influence worker  
510 behavior. Workplace safety culture, i.e. the combination of the knowledge, beliefs, and practices  
511 possessed by workers in a specific workplace setting or profession also falls in the realm of  
512 environmental factors as it is often specific to a given workplace environment, in this case the  
513 veterinary clinic. Animal factors describe factors related to the animal itself including species and  
514 behavior, and temperament as well as the age, breed and reproductive status or signalment of the  
515 pet. Finally, behavioral factors describes a safety behavior that either protects or predisposes a  
516 worker to injury either recapping needles, working alone with potentially dangerous animals,  
517 and/or failing to use the appropriate animal restraint equipment.



518

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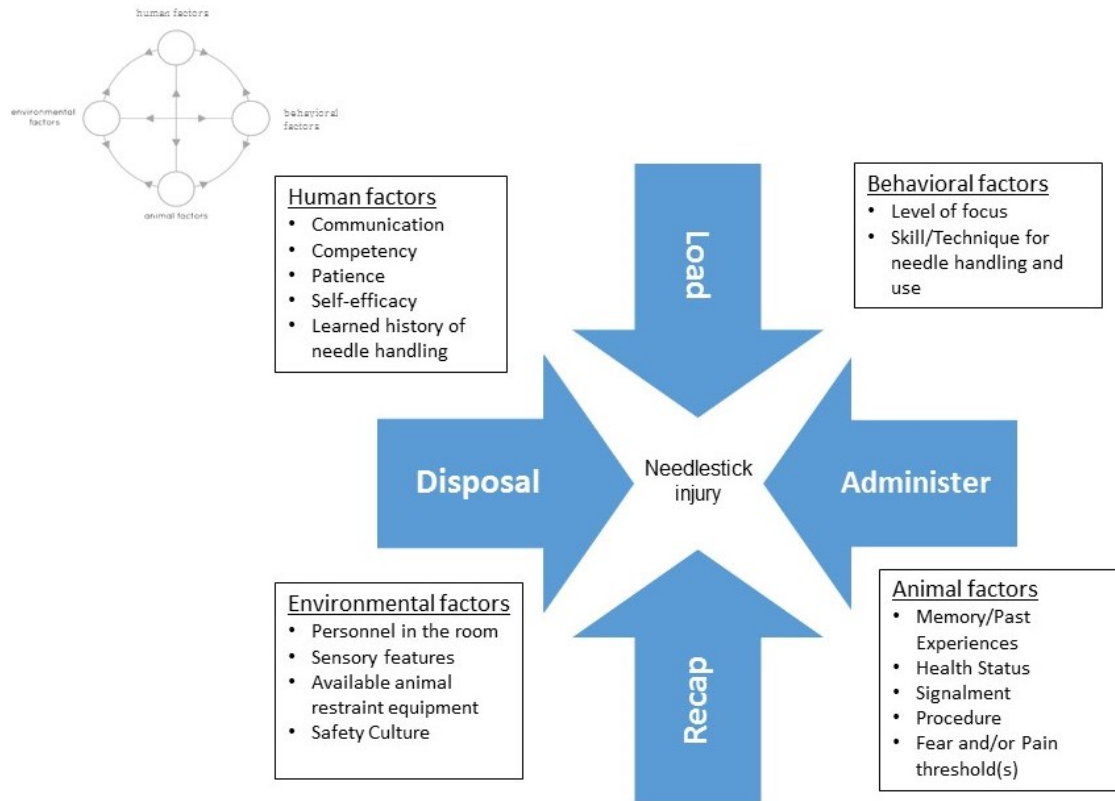
520

521 *FIGURE 2: VETERINARY WORKER ANIMAL-RELATED INJURY (ARI) EXPOSURE PATHWAY*

522 In the clinical veterinary setting, a number of influencers are none to precipitate injury. These  
 523 influencers are denoted in the figure above and are color coded according to the OHOSH factor it  
 524 represents. .

525

526



527

528 *FIGURE 3: VETERINARY WORKER NEEDLESTICK/SHARPS RELATED INJURY EXPOSURE PATHWAY*

529 Needle handling including loading, recapping and disposing of syringes as well as administering  
 530 injections are all thought to lead to NSIs. Human, behavioral, animal, and environmental factors  
 531 all are thought to influence needle handling.

532 **DATA ANALYSIS**

533 Participant demographics, work and injury history were summarized by job title. A dual  
 534 coding, i.e. inductive and deductive, thematic content analysis was conducted by the first author.  
 535 Study transcripts were analyzed using codes derived from the OHOSH model that describes  
 536 primary human, animal, behavioral, and environmental factors. Main themes as they related to  
 537 ARIs in the small animal clinical veterinary setting were identified and summarized. All qualitative  
 538 analyses were conducted using a qualitative data software program<sup>a</sup>. Quantitative data was cleaned  
 539 in data management software<sup>b</sup> and analyzed using an analysis software program<sup>c</sup>. This study was  
 540 approved by the University of Washington Institutional Review Board.

541 **RESULTS**

542 Twenty-nine veterinary personnel including 11 veterinarians and 18 veterinary technicians  
 543 participated in one of four focus groups held in conjunction with the state’s veterinary medical  
 544 conference. In addition, 13 veterinary assistants completed one-on-one telephone interviews with  
 545 a member of the study team. Participants were primarily white, middle-aged women with nearly  
 546 two decades of experience in veterinary medicine (Table 1). These workers indicated coming into  
 547 contact with approximately 18 patients per day during an averaged 4-day, 34.2 hour workweek.

548 *TABLE 2-1: FOCUS GROUP PARTICIPANT BACKGROUND AND WORK HISTORY BY JOB TITLE†*

	Veterinarian (n=11)	Veterinary Technician (n=18)	Veterinary Assistant (n=13)	All (n=42)
Race, N (%)				
White	11 (100%)	15 (83%)	10 (77%)	36 (86%)
Gender, N (%)				
Female	10 (91%)	18 (100%)	12 (92%)	40 (95%)
Age (yrs.), mean (range)	44 (26-61)	43 (21-65)	27 (22-35)	38 (21-35)
Years in practice (yrs.), mean (range)	19 (1-38)	18 (1-36)	5 (1-13)	14 (1-38)
Average weekly work hours (nearest hr.) , mean (range)	26 (8-50)	36 (8-50)	38 (25-45)	34 (8-50)
Average days worked /wk., mean (range)	3.0 (1-5)	4 (2-5.5)	4 (3-5)	4 (1-5.5)
Average patient interactions/day, mean (range)	20 (12-30)	17 (6-35)	18 (4-40)	18 (4-40)
Any NSI, N (%)	11 (100%)	18 (100%)	18 (100%)	42 (100%)
Average NSIs/yr. , mean (range)	6 (0-24)	5 (0-25)	6 (0-24)	5 (0-100)
Any ARI, N (%)	11 (100%)	17 (94%)	18 (100%)	41 (98%)
Average ARIs/yr. , mean (range)	9 (1-40)	6 (0-20)	17 (1.5-100)	10 (0-100)
Occupational safety and health program at work*, N (%)	3 (27%)	10 (56%)	7 (54%)	20 (48%)

549 **\*An occupational safety and health program was defined as formal training provided either**  
 550 **by the employer or as part of the work agreement. No other restrictions were placed on this**  
 551 **definition.**

552 † No statistically significant differences were found between worker groups

553

554

555 ANIMAL RELATED INJURIES

556 ANIMAL FACTORS

557 When discussing ARIs, several major themes emerged. These themes directly map back to the  
558 explanatory conceptual model (Figure 1) and cover all four realms of the OHOSH model (Table  
559 2). In the animal health sector, animal species, behavior, and mental status, such as when under  
560 the influence of chemical sedatives and/or anesthetics, appeared to explain when animals were  
561 prone to causing injury. Cats and dogs were equally implicated in focus group discussions  
562 concerning ARIs in small animal veterinary clinics; however, factors that precipitated injury were  
563 primarily related to the physical size and anatomy of dogs and the behavior of cats. For instance,  
564 the physical size and strength of a dog precipitated the injury of a senior veterinarian with over 30  
565 years of experience in clinical veterinary clinics as explained in the following quote:

566 “I’ve had a couple of times with large aggressive dogs that are muzzled, and we’re trying  
567 to restrain them for something, and they are so violent that I end up with back or shoulder  
568 injuries, not real significant ones, but if I didn’t back off and give up, I would have been  
569 pretty badly hurt. And sometimes the staff get hurt that way, too. If you get your head  
570 smashed by a mastiff, it still hurts, whether or not it leaves a mark.”

571 This same veterinarian later explained that despite the size and strength of certain canine patients  
572 seeking care at her clinic, she still feels more comfortable working with dogs over cats due to the  
573 availability of effective animal restraint devices.

574 “I think dogs are less scary because you have things like rabies poles and that sort of thing  
575 that you can approach them more easily. And they have less weapons. Their toenails  
576 usually aren’t going to take your eye out.”

577 Another veterinarian echoed this sentiment suggesting that the behavior of dogs was far more  
 578 predictable than cats implying a reduced risk of injury from this species as a result: “I think dogs  
 579 are a little more predictable and they give you a little more warning sometimes than cats do.”  
 580 Among these study participants, risk perception was dependent on animal species and animal  
 581 behavior.

582 The mental and physical state of the animal was repeatedly mentioned throughout focus group and  
 583 telephone interviews as potential factors related to ARIs. Animals recovering from anesthesia or  
 584 under sedation were noted as causing severe injuries in veterinary personnel due to an impaired  
 585 mental state and/or possible fear. One focus group participant described the severity of her ARI  
 586 from an animal recovering from anesthesia, stating “...one of my worst cat bite injuries was a cat who  
 587 was waking up from anesthesia.” This statement was echoed by another participant with a similar  
 588 story, but whose injury was caused by a dog bite: “One of my worst bites was an anesthesia dog.  
 589 It was a—fear aggressive dog.” Overall, an animal’s behavior, health and physical size were the  
 590 primary animal related factors that were identified during discussions surrounding predisposing  
 591 factors of ARIs in small animal veterinary settings.

592 TABLE 2-2: STUDY IDENTIFIED THEMES AS RELATED TO ARIS

OHOSH Dimension	Theme	Supporting Quote ( <i>Author Job Title</i> )
Animal Factors	Dogs are less threatening than cats	“I think dogs are less scary because you have things like rabies poles and that sort of thing that you can approach them more easily. And they have less weapons. Their toenails usually aren’t going to take your eye out.” ( <i>Veterinarian</i> )
	Animals under anesthesia pose increased risk or injury	“...one of my worst cat bite injuries was a cat who was waking up from anesthesia.” ( <i>Veterinarian</i> )

Environmental Factors	Workplace Safety Culture encourages risky behavior	"... when I first started out as a technician, we weren't taught to read the pets, and the thing we were taught is, "Don't let your veterinarian get hurt," and so you did everything you could, even sacrifice yourself, so that they wouldn't get hurt." <i>(Veterinary Technician)</i>
	Workplace safety culture negatively impacts worker moral	"I kind of feel like we're expendable sometimes." <i>(Veterinary Technician)</i>  "I am also the safety person at our place, and I get ignored a lot" <i>(Veterinary Technician)</i>
	The hospital environment can negatively affect animal behavior	"And the environment. Sometimes you get that cat in, there's a dog barking that's in the hospital, and it sets the cat off. It gets angry." <i>(Veterinary Technician)</i>
Human Factors	Pet owners' discomfort of safety practices negatively hinder the use of safety practices in the clinic	"Also clients would be another one. In the back, it's really easy to use that stuff, but using that stuff in front of a client just to do a shot is not really practical, I guess. Your boss essentially is too worried of what the clients think essentially. So if you go in there to their cat and throw a muzzle on it, and the client's like, "What are you doing?" You know, stuff like that." <i>(Veterinary Assistant)</i>
Behavior	Working alone is a common risky practice	"The only thing in my situation was that if I'd had a second set of hands to hold the dog, so I would have had one person, my tech, holding just the head while we took the muzzle off. As opposed to trying to keep the whole dog on the table. And in hindsight. This is what we do all the time. In that situation, if I had had a second set of hands there to watch the dog, so they could have just held the head—which actually now we tend to in an aggressive dog have that extra set of hands available. Even when they're apparently under anesthesia, there's somebody there." <i>(Veterinarian)</i>
	Worker emphasis on the task	"Just get it done" <i>(Veterinary Technician)</i>  "I'm sure everybody in the room [knows] that mindset. There's just so much to do, and you have to get it done fast. You get cut and you get stuck, you get whatever, and you just keep going." <i>(Veterinary Technician)</i>

593

594 BEHAVIORAL FACTORS

595 Behavioral factors include those negative behavior patterns or bad habits possessed by  
596 veterinary workers that this study directly aims to address. In the case of ARIs, veterinary  
597 personnel admitted to either working alone or being too understaffed to complete the work

598 properly during the study. These personnel also admitted to placing an emphasis on completing  
599 the task over their own personal health and safety. One veterinary technician suggested that this  
600 mindset is pervasive among workers in this occupation, and a primary reason for injury in her  
601 statement, “I’m sure everybody in the room [knows] that mindset. There’s just so much to do, and  
602 you have to get it done fast. You get cut and you get stuck, you get whatever, and you just keep  
603 going.” A veterinarian further emphasized this point highlighting her failure to wait for help when  
604 handling an animal:

605           “The only thing in my situation was that if I’d had a second set of hands to hold the dog,  
606           so I would have had one person, my tech, holding just the head while we took the muzzle  
607           off as opposed to trying to keep the whole dog on the table.”

608 In combination, these and other negative behavior patterns have been shown to lead to injury in  
609 the small animal clinical veterinary setting in our study participants.

#### 610 HUMAN FACTORS

611           Human factors associated with ARIs in the veterinary setting were related to the presence  
612 or absence of other persons in the room and engaging with these individuals. In this setting, these  
613 people include veterinary colleagues and support staff as well as the pet owner. Pet owners,  
614 however, were specifically listed as potential barriers to safety practices. Owners stating plainly,  
615 “My dog doesn’t bite,” and “Well, doesn’t the muzzle hurt him?” were mentioned as common  
616 phrases stated by owners that implied their resistance to the use of muzzles and other animal  
617 restraint techniques, thus negatively influencing safety behaviors among veterinary workers.  
618 Others mentioned the potential of extreme reactions even when the use of the devices were  
619 warranted:

620 "I was also working in an area where there was a lot of really aggressive dogs at the time.  
621 But it was shocking to me how many owners would come in and say, "Oh, my dog's not  
622 going to bite you; you don't need the muzzle," and then they would throw a fit about me  
623 wanting me to put a muzzle on their dog."

624 As a result, veterinary personnel mentioned attempting to change their work to conducting it  
625 outside the owner's view and yet were still met with resistance:

626 "In the back, it's really easy to use that stuff, but using that stuff in front of a client just to  
627 do a shot is not really practical, I guess. Your boss essentially is too worried of what the  
628 clients think essentially. So if you go in there to their cat and throw a muzzle on it, and the  
629 client's like, "What are you doing?"

630 In the small animal clinical veterinary setting the presence and/or outright resistance of the  
631 veterinary client, i.e. the pet owner, to the use of animal restraint equipment was noted as a barrier  
632 for personnel trying to protect themselves from ARIs.

### 633 ENVIRONMENTAL FACTORS

634 Environmental factors primarily included the physical characteristics of the clinic  
635 environment. One veterinary technician clearly stated the impact of the environment in her  
636 statement "And the environment. Sometimes you get that cat in, there's a dog barking that's in the  
637 hospital, and it sets the cat off. It gets angry." Other environmental factors related to ARIs were  
638 associated with safety culture as it related to hierarchies and job control. A social hierarchy appears  
639 to exist in the veterinary workplace setting further exacerbating negative behavioral patterns with  
640 veterinary support staff including veterinary technicians and assistants not feeling appropriately  
641 empowered to conduct their job in such a way that they feel safe. One technician shared an  
642 anecdote in which she was injured for not speaking up for herself:

643           “The only other time I remember was—and this led to my injury—we were  
644           restraining a Komondor on a table, and he was under a slight chemical sedation, and we  
645           were doing a deep ear cleaning, and the doctor was removing some kind of foreign body  
646           from the ear. The dog was not under enough, and I should have stood up to the doctor and  
647           said, “I’m not doing this until we get more drugs on board.” He was thrashing around, and  
648           he lifted his head enough that he threw me against the wall. It aggravated a previous injury  
649           and resulted in a bulging disk. Because I landed against the white board that was on the  
650           wall.”

651           Another technician mentioned being taught to sacrifice her safety in order to protect her superior,  
652           the veterinarian:

653           "... when I first started out as a technician, we weren't taught to read the pets, and the thing we  
654           were taught is, “Don't let your veterinarian get hurt,” and so you did everything you could, even  
655           sacrifice yourself, so that they wouldn't get hurt."

656           These teachings directly impact the workplace environment, promoting social hierarchies and  
657           placing veterinary support staff at risk of injury.

658           The impact of these social hierarchies on worker moral was made evident by a technician  
659           when she stated, “I kind of feel like we're expendable sometimes.” For those self-proclaimed  
660           safety champions in the profession, the feeling was mutual. A senior technician with an inclination  
661           for safety, “I am also the safety person at our place, and I get ignored a lot”

662           Despite their views on safety however, study participants, admitted a need to improve their own  
663           behaviors in order to improve the safety culture overall as well as be a model for others. One  
664           veterinarian discussed this need in her own actions while admitting how difficult such a change  
665           would be:

666 “I myself could stand to hold myself more accountable to follow safety practices and to  
 667 make sure that my coworkers do. ... If I’m going to really follow through on it, then I have  
 668 to stop them from doing it, and also, more importantly, make sure I don’t. So that kind of  
 669 accountability. Which is hard.”

670 Despite a perceived lack of belief in behavior change expressed by this group of veterinary  
 671 workers, a better understanding of the factors that influence safety behaviors was gained from this  
 672 work.

673 NEEDLE HANDLING

674 The second half of the focus group interviews discussed needle-handling practices that  
 675 predispose one to injury as well as potential solutions for improving safety behaviors. All study  
 676 participants acknowledged recapping needles routinely and/or handling needles improperly. A  
 677 number of participants also indicated uncapping needles with their mouths. NSIs were either self-  
 678 induced or as a result of the mishandling by a co-worker while handling needles as well as when  
 679 administering treatments to animals. As with ARIs, study themes from this portion of the interview  
 680 spanned all sectors of the OHOSH model and included negative behavior patterns, workplace  
 681 safety culture, and a need to protect other workers present around needles. (Table 3).

682 TABLE 2-3: STUDY IDENTIFIED THEMES IN RELATIONS TO NSIS

OHOSH Dimension	Theme	Supporting Quote
Animal Factors	Animals' reactions to needles can lead to worker injury	"Yeah, I’ve vaccinated myself a couple of times. When the dog wiggles, the cat wiggles, something like that, and you’re trying to like tent and poke and, “Oh, look that was my finger.” ( <i>Veterinarian</i> )
		"I would say one time I was helping do a blood draw on a cat. The cat was fractious, and the technician holding it was having difficulty. I feel that under stress and me trying to focus on the vein and take the blood draw, I accidentally grabbed the butterfly needle incorrectly and poked myself." ( <i>Veterinary Assistant</i> )

Environmental Factors	Sharps container not close by and want to prevent injury to others	" And so you're re-capping the needle because you've got to take it to the sharps container and you don't want to take this uncapped needle across the room." <i>(Veterinary Technician)</i>
Human Factors	Workers lack focus when needle handling	" I had a technician that used to take the cap off with her mouth and then re-cap it afterwards, but one time she forgot she already took the cap off, and she went to go take the cap off again, and she poked herself in the face." <i>(Veterinary Technician)</i>
Behavior	Recapping is a bad habit that is hard to break without consequence	"... I still recap and I've got sharps right next to me and everything. For me it's a habit and I just haven't—It works and I haven't been injured, so I haven't changed my behavior. Honestly." <i>(Veterinary Technician)</i>
	Risky behaviors become bad habits	"I'm guilty of the cardinal sin of a [gestures uncapping a needle with mouth]. ..your mouth, and so when you're trying to get blood or do something, and you're just... Yeah." <i>(Veterinary Technician)</i>

683

684 ANIMAL FACTORS

685 Animal related factors believed to lead to NSIs were primarily related to animal temperament or  
686 behavior. A dog or cat being “wiggly” or a fractious cat putting up a fight during a blood collection attempt  
687 were all listed as potential scenarios by which personnel are injured:

688 “I would say one time I was helping do a blood draw on a cat. The cat was fractious, and the  
689 technician holding it was having difficulty. I feel that under stress and me trying to focus on the  
690 vein and take the blood draw, I accidentally grabbed the butterfly needle incorrectly and poked  
691 myself.”

692 Animals’ responses to needles use is one factor that leads to NSIs in the animal care worker setting.

693 HUMAN FACTORS

694 Human factors that precipitated NSIs dealt primarily with a lack of focus on a given task and/or  
695 multitasking while handling needles. One technician shared an example of how lack of focus in  
696 combination with poor needle handling practices led to needlestick injury in one of her co-workers, " I had  
697 a technician that used to take the cap off with her mouth and then re-cap it afterwards, but one time she  
698 forgot she already took the cap off, and she went to go take the cap off again, and she poked herself in the

699 face.” This type of exposure due to lack of focus and need to complete a task in a given amount of time  
700 was also mentioned as a source by a veterinarian who also admitted uncapping needles with her mouth,  
701 “...we do some things, even taking things off with your mouths, because you’re in the middle of  
702 something, and you have to give it right then and there.” Competency and focus when handling needles is  
703 important to preventing such injuries.

#### 704 BEHAVIORAL FACTORS

705 Behavioral factors related to NSIs mirrored those for ARIs and consisted primarily of negative behavior  
706 patterns that were likely formed as a result of a poor safety culture and/or safety training when personnel  
707 entered the profession. One technician, suggested that she was “guilty of the cardinal sin” of uncapping  
708 with her mouth, but justified this behavior as both involuntary as well as a means to complete a task  
709 efficiently when they did not have an extra set of hands or even “too many things in your hands”. Another  
710 technician also justified her poor needle handling habits and disposal techniques in the statement, “... I still  
711 recap and I’ve got sharps right next to me and everything. For me it’s a habit and I just haven’t—It works  
712 and I haven’t been injured, so I haven’t changed my behavior. Honestly.” An overall emphasis on the task  
713 at hand and lack of a good reason to change negative behavior patterns reinforce poor needle handling.

#### 714 ENVIRONMENTAL FACTORS

715 Environmental and human factors leading to NSIs in the small animal clinical veterinary setting were  
716 closely linked and found to be due in part to the absence of safety devices in the nearby vicinity as well as  
717 the presence of other veterinary staff in a given area. One participant, a veterinary technician expressed fear  
718 of injuring co-workers or pet owners/clients from inappropriately handling needles: “And so you’re re-  
719 capping the needle because you’ve got to take it to the sharps container and you don’t want to take this  
720 uncapped needle across the room.” This sentiment was echoed by a veterinarian in the following quotation,  
721 “Oh, yeah, I was told that it’s better not to, but I never worked in a situation where you almost  
722 didn’t have to do it. Otherwise, you’re walking around with the needle.” This same veterinarian  
723 later suggested that “more infectious diseases from needles from our animals” would be needed to  
724 eliminate this bad habit among veterinary personnel. As is evident from these comments, veterinary

725 workers justified their behavior by prioritizing the health of others over their own given the absence of a  
726 sharps container in the nearby environment. A lack of dire consequences and an altruistic concern of  
727 causing unnecessary harm to a co-worker and others present in the workplace environment appear to  
728 encourage poor needle handling in the clinical veterinary setting.

## 729 IMPROVING BEHAVIOR

730 Solutions for changing the safety practices around needle handling, more specifically  
731 recapping needles, spanned all four realms of the One Health explanatory model (Figures 2 &3).  
732 These ideas included purchasing and training personnel on using safety syringes such as the  
733 retractable needles (human/behavioral), having more sharps containers present in the workplace  
734 (environment), and/or cheaper sharps or medical waste disposal costs that would enable veterinary  
735 personnel to discard of the needles with the syringe still attached. Having someone restrain the  
736 animal during the administration of a vaccine was also mentioned as a way to prevent NSIs  
737 resulting from animal movement during needle handling.

## 738 DISCUSSION

739 Occupational injury in the small animal clinical veterinary setting is prevalent and  
740 influenced by a number of human, animal, environmental, and behavioral factors(3, 55, 56). Our  
741 study found that ARIs were attributed to animal species and behavior, the presence or absence of  
742 the pet owner and/or other personnel, as well as safety devices, negative behavior patterns and  
743 poor workplace safety culture. NSIs were linked to similar factors including animal behavior, an  
744 altruistic attitude, and a lack of sharps containers in the nearby environment. These factors all map  
745 directly back to the OHOSH model and prove the multifactorial nature of these injuries.

746 Both cats and dogs were equally cited as the most common source of injury in the small  
747 animal clinical setting; however, the root cause of injury varied between the two species with dogs'  
748 physical size and strength being listed as the primary cause while cats for their behavior and

749 reflexes. Previous studies suggest that cats are the primary source of injury in clinical practice  
750 despite financial expenditure reports suggesting dog owners spend more funds on veterinary care  
751 and other services than cat owners leading to increased dog exposures to animal care workers (37,  
752 80-83). Both cat and dog bites and scratches provide the potential for exposure to dangerous  
753 zoonotic diseases; however, cat bites are reportedly more likely to become infected. (84, 85) Given  
754 the potential health consequences of ARIs, personnel should work to minimize potential exposures  
755 by implementing safety procedures at all times.

756 Worker safety culture was an overarching theme that explained in part many of the  
757 reported ARIs and NSIs discussed during focus group and telephone interviews. Specific  
758 components that influenced injury incidence included workers prioritizing tasks and over personal  
759 safety and poor needle handling practices. Participants also indicated working alone and/or being  
760 rushed at the time of a given injury suggesting that workers prioritize completion of the task over  
761 their own safety. Workplace hierarchies, an individual's self-efficacy and job control all negatively  
762 influenced a participant's ability to speak up when they felt endangered (86). These factors have  
763 been found to negatively influence similar workplace practices in interpersonal human health care  
764 teams (71). Improving safety culture has been shown to improve safety behaviors and reduce the  
765 incidence of injury (87-91). Doing so requires engagement by management who are responsible  
766 for setting the tone for culture in a given workplace setting (92-100). Thus, improving veterinary  
767 worker behaviors requires a change in safety culture which should be led by clinic management.

768 The presence of other persons in the clinic environment at the time of a procedure, whether  
769 veterinary personnel or pet owners, was listed as a major influencing factor in the implementation  
770 of safety practices. Pet owner resistance to the use of safety devices was a barrier to safe practices  
771 frequently noted in the study. The veterinary medical profession as an industry follows a consumer

772 driven model offering elective services to the general public (80, 101). Despite this business model,  
773 few veterinary schools require formal training in business, more specifically pet owner specific  
774 communication (31, 33, 102, 103). In the case of veterinary worker safety and health, satisfying  
775 the customer may mean forgoing a muzzle when needed, placing the worker at increased risk of  
776 injury. As a result, personnel must work to communicate with pet owners to get their buy-in on  
777 safety practices. Few studies, however, outline how best to achieve this aim (33, 92, 103, 104).  
778 Published studies focus on client-personnel interactions characterizing client perceptions of the  
779 cost of veterinary care and communication as a whole, failing to address occupational safety and  
780 health issues. Our work suggests the need for improved communication between veterinary  
781 personnel and their pet owner clients (Chapter 3).

782 Human factors identified in this qualitative study dealt primarily with veterinary team  
783 communication, as well as communication between veterinary personnel and pet owners. In this  
784 study, veterinary personnel expressed feeling undervalued and even expendable, highlighting a  
785 need for immediate improvement in workplace safety culture. These feelings were expressed  
786 solely by veterinary support staff, including both veterinary technicians and assistants, implying a  
787 workplace hierarchy that may be contributing to unsafe practices. Worker job satisfaction, control  
788 and occupational stress have been found to contribute to workplace safety behaviors (73, 74, 105).  
789 Furthermore, communication has been noted as being the glue that holds interdisciplinary  
790 healthcare teams together, thus breakdowns in communication can have severe consequences on  
791 the quality of medicine and resulting incidence of injury in the veterinary worker setting (76).  
792 Veterinary personnel must work to establish healthy communication strategies within the team as  
793 well as with the pet owner in order to overcome potential barriers to the implementation of safety  
794 practices.

795 All participants indicated recapping needles after loading syringes and/or administering  
796 injections, though they all admitted this behavior to be due in part to an established negative  
797 behavior pattern. Sources of this behavior were listed as being taught to recap needles and/or doing  
798 so out of necessity to prevent injury to themselves and others. Lacking focus and/or multitasking  
799 while handling needles were also identified as potential sources of injury. External factors  
800 including infectious disease consequences, increased number of sharps containers in the clinical  
801 setting, and reduced sharps disposal costs were listed as potential solutions for improving needle  
802 handling among veterinary personnel. Currently, bloodborne pathogen exposure regulations and  
803 recommendation do not directly pertain to veterinary medicine beyond that of nonhuman primates  
804 (44, 49, 50, 106). A number of adverse health outcomes including infectious disease, tissue  
805 necrosis, abortion, and death have been reported in the veterinary literature as a result of  
806 needlestick/sharps related injuries; however, these outcomes maybe seen as rare to those  
807 participating in our study(44-52). Having dire consequences such as severe infectious disease from  
808 NSIs and/or more sharps containers in the workplace environment are potential solutions but not  
809 guaranteed to improve needle handling behaviors (107-109). Identified solutions to reduce the  
810 incidence of NSIs suggest the need for a safety culture centered approach to improving safety  
811 behavior.(94, 110, 111) Furthermore, personnel should be taught minimize recapping and to use  
812 the one hand scoop technique when recapping is deemed necessary (46, 65).

### 813 LIMITATIONS

814 Limitations of this study include the sample size and convenience sampling method  
815 employed for study subject recruitment. Two focus groups each of veterinarians and of veterinary  
816 technicians were completed as part of this study. One-on-one telephone interviews were completed  
817 with veterinary assistants after initial recruitment efforts of study participants at the veterinary  
818 conference failed to yield even one focus group. Generally, at least three focus groups consisting

819 of six to ten persons are required to constitute a robust qualitative study (72). Given difficulties in  
820 recruitment, this goal could not be achieved. In addition, the mixing of methods, in this case focus  
821 groups and one-on-one interviews, leads to a variable amount of data collected per respondent as  
822 those in the one-on-one interviews could contribute more qualitative data to the study. Despite  
823 these limitations, our study provides insights into the behaviors of veterinary personnel about the  
824 human factors influencing safety practices in the small animal veterinary realm.

## 825 CONCLUSION

826 Occupational injuries in the small animal clinical veterinary setting are common and due  
827 to a combination of human, animal, behavioral and environmental factors. As a result, a One  
828 Health approach adds utility in providing a holistic assessment of this issue allowing one to identify  
829 and address human, animal, behavioral and environmental factors as they relate to ARIs and NSIs  
830 with the goal of improving safety behaviors in veterinary clinics. We found that animal behavior,  
831 workplace safety, and communication were the major factors governing safety behaviors. As a  
832 result, educational interventions that engage members of the veterinary clinic may be effective at  
833 improving safety behaviors. Occupational health professionals should focus on addressing  
834 modifiable factors when looking to improve injury prevalence in this occupational group.

## 835 **Footnote**

836 <sup>a</sup>ATLAS.ti version 7.5.16 USA

837 <sup>b</sup>Microsoft Office Excel 2007, Microsoft, Redmond, WA, USA

838 <sup>c</sup>Rstudio. R version 3.3.3. 2017 The R Foundation for Statistical Computing Platform

839

840

841 CHAPTER 3: PET OWNERS' PERCEPTIONS OF  
842 VETERINARY SAFETY BEHAVIORS

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857 **ABSTRACT**

858 **Objective**– To explore the role of pet owners in promoting and/or hindering safety behaviors in  
859 the small animal clinical veterinary setting

860 **Design**– Focus group interviews

861 **Sample** – Small animal, i.e. cat and dog, pet owners in the Seattle metropolitan area

862 **Materials and Methods**- Three semi-structured focus group interviews of small animal pet  
863 owners were carried out in the Seattle metropolitan area of Washington State during November  
864 2016. Pet owners who received veterinary services at least once in the 12 months prior to the  
865 study's inception were invited via the NextDoor App to participate in focus group discussions  
866 regarding their perception of safety practices and clinic policies used to reduce physical injury to  
867 veterinary personnel in the veterinary hospital setting. Two independent coders conducted  
868 thematic content analysis and reached agreement on discordant results. Study codes were derived  
869 from the One Health Occupational Safety and Health (OHOSH) model that describes primary  
870 factors that lead to injury in the animal care worker settings (deductive) as well as new codes that  
871 were borne out of the study analysis (inductive). Primary and overarching themes were identified  
872 and summarized.

873 **Results** – Twenty pet owners participated in three focus groups in the Seattle metropolitan area.  
874 Study themes arising from the responses to interview questions spanned all four sectors of the  
875 OHOSH model. Communication was the main overarching theme identified, suggesting that  
876 veterinary personnel-client communication plays a key role in the delivery of veterinary services  
877 and can negatively impact the use of safety practices among veterinary personnel. Furthermore,

878 communication was found to influence how pet owners chose their veterinarian, as well as  
879 influence their perceptions of the treatment areas, safety practices, and clinic policies.

880 **Conclusions and Clinical Relevance** – Veterinary personnel-client communication plays a key  
881 role in the delivery of veterinary services. It is imperative for personnel to facilitate healthy  
882 communication and actively engage the veterinary client in order to effectively avoid situations  
883 that precipitate injury. Furthermore, personnel must continue to work to reduce physical injuries  
884 by implementing safety practices and communicating these actions to clients to receive their  
885 support.

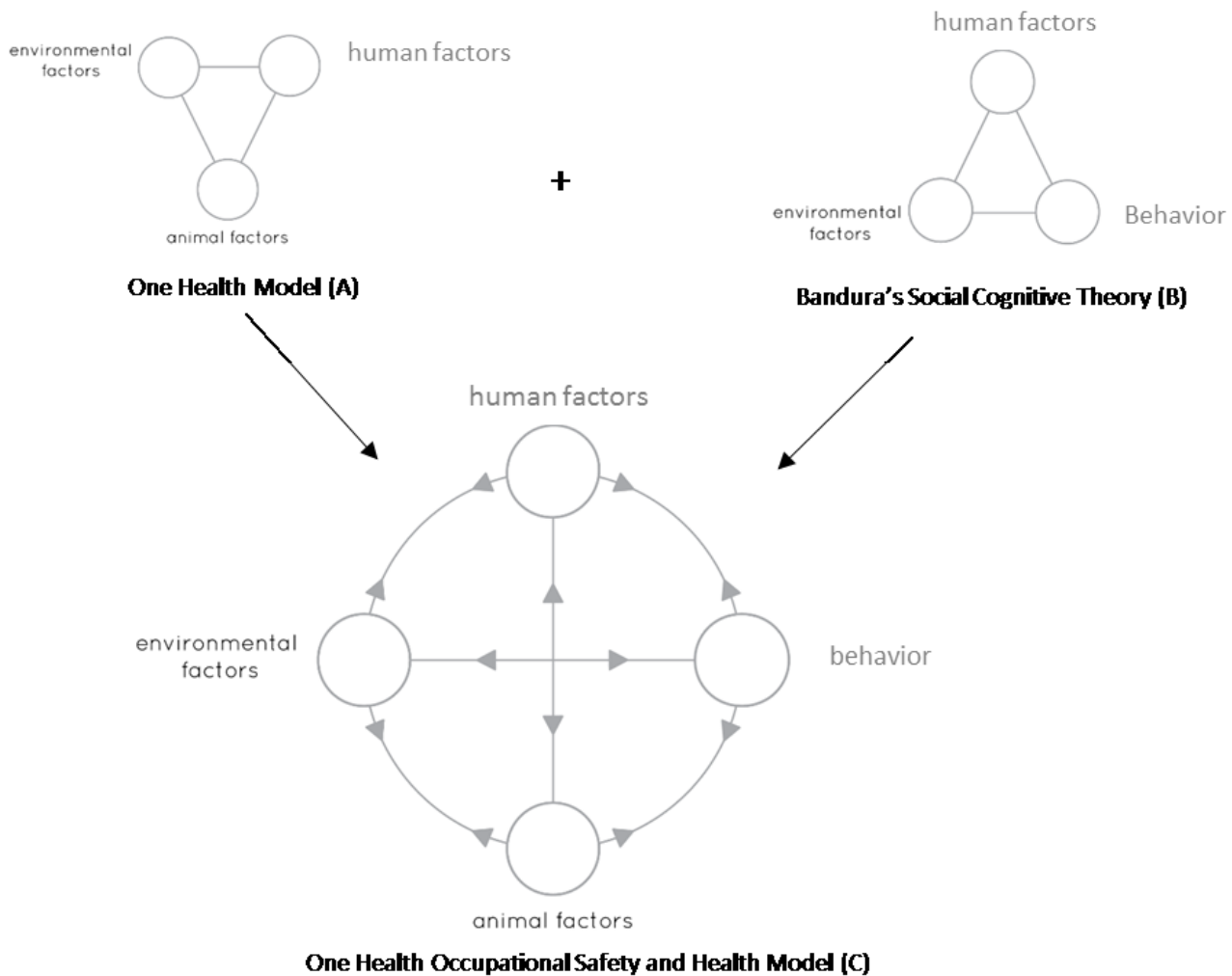
886

887 INTRODUCTION

888 Occupational hazards in the clinical veterinary setting are numerous (3, 38, 40, 43, 55, 59-63, 112-  
889 115). Regardless of animal focus (e.g. exotics, food animal, companion animal, etc.), physical  
890 hazards in veterinary settings, more specifically animal-related trauma such as animal bites, kicks,  
891 scratches, or getting stepped on, or crushed by animal-equipment, are the most common injury  
892 types reported by veterinary personnel(3, 28-30, 56). The primary reasons behind a given injury  
893 occurrence is likely species -dependent though common precipitating factors between each event  
894 are likely present (3, 7, 43, 52, 55, 58, 62, 63, 116, 117). These factors include the impact of the  
895 clinical environment on animal and worker behavior, skill set of the worker themselves and other  
896 animal-specific characteristics.

897 The One Health approach is a research approach based on the premise that the health of humans,  
898 animals, and the environment are inextricably linked (8, 118, 119). This approach suggest that  
899 connections between these sectors are so co-dependent, that researchers must simultaneously  
900 assess all three sectors in health in order to properly address a given problem (12, 120). Previously,  
901 this approach has been reserved for addressing infectious, zoonotic disease outbreaks and risks;  
902 however, we suggest utilizing this approach as it relates to other public health issues including  
903 those workplace safety situations where all three sectors are represented. In the case of veterinary  
904 medicine, the One Health approach provides added benefit to the traditional occupational safety  
905 and health model by explaining and/or characterizing the mechanisms by which occupational  
906 injury and illness occur as a result of animal and environmental factors thereby identifying primary  
907 sources that can later be addressed to improve health outcomes.

908 The One Health Occupational Safety and Health (OHOSH) Model (Chapter 1) is an explanatory  
 909 conceptual model that can be used in the animal care worker setting to describe the human, animal,  
 910 behavioral, and environmental factors that influence injury occurrence in the clinical setting  
 911 (Figure 1). In the veterinary setting, these factors include the health and mental state of animal  
 912 patients, the presence or absence of other personnel, pet owners, and /or safety devices in the  
 913 workplace environment, as well as personal relationships and safety culture possessed by an  
 914 individual veterinary worker. Together, these factors influence injury incidence in this clinical  
 915 setting by encouraging or discouraging the utilization of safety devices, practices, and policies for  
 916 injury prevention by personnel.



917

918 *FIGURE 1: COMPONENTS OF THE ONE HEALTH OCCUPATIONAL SAFETY AND HEALTH MODEL.*

919 The (A) One Health Model and (B) Bandura’s Social Cognitive Theory are combined for the  
920 purposes of addressing occupational safety and health issues of animal care workers creating the  
921 One Health Occupational Safety and Health Model (C). This model describes the key factors at  
922 play in all animal care worker settings that predispose them to injury

923           Previous studies focusing on the role of veterinary clients in the clinical setting have assessed cost  
924 of care, communication around these costs as well as delivery of care, and other client-focused issues, but  
925 none have assessed client perceptions of safety behaviors. (69, 70, 79). In order to understand the role the  
926 pet owner in this pathway (Figure 1), we set out to conduct interviews with pet owners in our area. The  
927 objective of this study is to confirm the role of pet owners along the causal pathway of ARIs and NSIs in  
928 the small animal setting. It is our hope that the findings from this study can be used to strengthen the  
929 relationship between pet owners and their local veterinarian while simultaneously removing barriers that  
930 are either consciously or subconsciously perpetuated by pet owners regarding safety practices and policies  
931 in veterinary medicine. This study is part of a larger project aimed at preventing injuries in veterinary  
932 workers called the Prevention of Injuries in Veterinary Occupational Tasks (PIVOT) study. Other  
933 study methods included veterinary worker focus groups, worker task observation, and a  
934 population-based cross-sectional survey of worker injury and illness.

## 935 MATERIALS AND METHODS

### 936 Study design

937           A qualitative focus group study of small animal pet owners was carried out in the Seattle  
938 metropolitan area in Washington State during November 2016. Three focus group sessions  
939 consisting of four to 10 participants each surveyed pet owners on factors related to animal restraint  
940 and related policies, and client-veterinary personnel communication (See Appendix A-3). Prior to  
941 the study commencement, pet owners were asked to complete a short, written survey that collected  
942 information on number of pets owned, animal signalment including species, breed, age, sex, and

943 reproductive status, history and frequency of veterinary visits, as well as pet owner demographic  
944 information (See Appendix A-4). The interview guide was piloted and finalized using a  
945 convenience sample of pet owners working in or around the research center office. Focus groups  
946 were facilitated by the authors with non-veterinary backgrounds as to not interfere with data  
947 collection or invoke social desirability (72). Questions asked during the focus group covered  
948 information related to veterinary worker behavior and practices, clinic environment, animal  
949 behavior, and human behavior and practices (See Appendix A-3). Each focus group lasted  
950 approximately 60 minutes and was recorded for future transcription and analysis. The goal of each  
951 focus group was to determine pet owner impressions on safety policies and practices in veterinary  
952 care. Participants were restricted from referring to their veterinarian or clinic by name. Each  
953 participant was given a \$25 gift card for his or her participation.

#### 954 Study recruitment

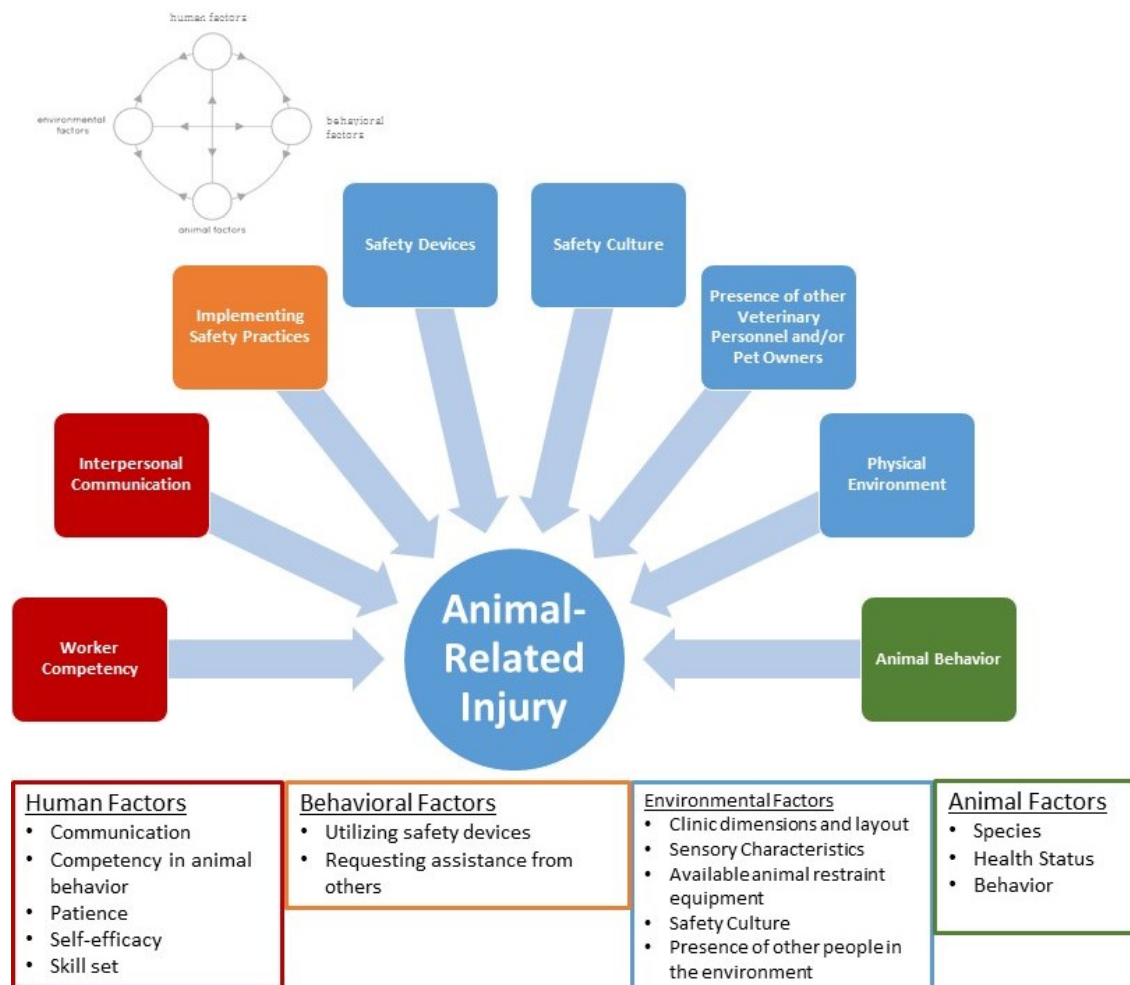
955 Pet owners were recruited using the “Nextdoor” app, a free social network app servicing local  
956 communities, targeting 16 neighborhoods in the Seattle metropolitan area that were east of the  
957 Interstate 5 corridor spanning from Montlake Blvd north to NE 178th Street in Lake Forest Park,  
958 Washington. Using this platform, an advertisement was posted soliciting pet owners’ opinions on  
959 veterinary care. The advertisement outlined eligibility requirements and a link was included that  
960 allowed participants to complete a short screening survey confirming their eligibility and register  
961 for the focus groups. Respondents who owned at least one cat or dog and had taken at least one  
962 pet in for veterinary care in the past 12 months prior to study enrollment were invited to participate  
963 in the focus groups. All focus groups were held in private meeting rooms at public libraries serving  
964 the neighborhoods where participants were recruited. Focus group interviews were recorded and  
965 transcribed in preparation for qualitative analysis and theme identification.

966 EXPLANATORY MODEL

967 An explanatory model outlining the issues that lead to ARIs in the small animal veterinary setting  
968 was used to develop key deductive domains to be used in the content analysis (Figure 2). This  
969 model was based on the OHOSH conceptual model outlining the human, animal, behavioral, and  
970 environmental factors present in all animal care worker settings that precipitate injury (Figure 1).  
971 A similar figure was also created for NSIs (figure not shown; Chapter 1). In this model the human,  
972 animal, behavioral, and environmental factors relate specifically to that of the worker but can be  
973 used to describe the role of the pet owners. Human factors relate specifically to the individual as  
974 outlined in Bandura's Social Cognitive Theory. These factors include communication with other  
975 people present in the veterinary clinic setting, skill set or competency in a specific area, and  
976 feelings of self-efficacy or ability to affect change or enact a given behavior in a specific scenario  
977 (13, 14). Environmental factors relate to the physical characteristics of the workplace setting  
978 including the clinic layout and sensory characteristics that can influence the behaviors of animal  
979 patients. These factors also include the presence and/or absence of restraint equipment as well as  
980 other workers or clients that may influence worker behavior. Workplace safety culture, i.e. the  
981 combination of the knowledge, beliefs, and practices possessed by workers in a specific workplace  
982 setting or profession also falls in the realm of environmental factors. Animal factors describe  
983 factors related to the animal itself including species and temperament or behavior as well as the  
984 age, breed and reproductive status or signalment of the pet. Finally, behavioral factors describes a  
985 specific safety or human behavior that either protects or predisposes a worker to injury. In this  
986 case, the pet owner represents only one component of the explanatory model displayed in Figure  
987 2 yet can potentially influence all four factors of the OHOSH model that lead to worker injury.  
988 These factors can also be used to describe the pet owner's role in worker injury. For instance pet  
989 owner behaviors in the veterinary settings and how they interpret their pet's behavior and respond

990 to the workplace environment as well as interact with veterinary personnel describe all four factors  
 991 highlighted in the OHOSH model.

992



993

994 *FIGURE 2: EXPOSURE PATHWAY OF VETERINARY WORK INJURY.*

995 In the clinical veterinary setting, a number of influencers are none to precipitate injury. These  
 996 influencers are denoted in the figure above and are color coded according to the OHOSH factor it  
 997 represents. The presence of the pet owner in the clinical veterinary setting is thought to play a  
 998 role in the incidence of ARIs.

999 **Data analysis**

1000 Pet owner demographic and ownership information were summarized to describe the study sample.

1001 Deductive and inductive coding strategies were used to identify major themes. Data were coded

1002 by two coders independently and agreement reached on discordant results. Statistics on all  
 1003 quantitative data were computed using commercially available statistical software programs.<sup>a,b</sup>  
 1004 Quantitative data were cleaned in data management software<sup>b</sup> and analyzed using an analysis  
 1005 software program<sup>c</sup>. This study was approved by the University of Washington Institutional Review  
 1006 Board

1007 **RESULTS**

1008 Twenty persons participated in the study. Focus group participants were primarily white  
 1009 females (n=17, 85%) who were middle aged, with a range from 30-80 years old. Participants  
 1010 owned an average of two pets consisting of cats, dogs, and a bird. Eighty percent of participants  
 1011 possessed at least a Bachelor's degree and 73% earned at least \$65,000 per year.

1012 *TABLE 3-1: SMALL ANIMAL PET OWNER CHARACTERISTICS*

Pet Owner demographics, n=20	N (%)
<b>Age in years, mean (range)</b>	60 (30-80)
<b>Gender, N (%)</b>	
Female	17(85)
<b>Race, N (%)</b>	
White	18(90)
Black	0(0)
Asian	2(90)
<b>Individual income, N (%)</b>	
Less than \$45,000	3 (17)
\$45,000-\$64,999	2 (11)
\$65,000-\$79,999	3 (17)
\$80,000-\$99,999	3 (17)
Greater than \$100,000	7 (39)
<b>Education, N (%)</b>	
High school diploma/GED	1 (5)
Associate's degree	3 (15)
Bachelor's degree	7 (35)
Graduate school (Master's or PhD)	9 (45)
<b>Total number of pets owned, mean (range)</b>	2.3 (1-8)
<b>Type of pet owned, N (%)</b>	

Cats	11 (55)
Dogs	15 (75)
Pet Birds	1 (5)

---

1013 CLIENT PERCEPTIONS OF VETERINARY SAFETY PRACTICES

1014 Over the course of the focus groups, pet owners discussed attributes of veterinary personnel they  
 1015 valued the most, their thoughts on animal restraint equipment and handling policies, as well as  
 1016 overall thoughts and feelings towards safety signage present in clinical settings. Answers collected  
 1017 over the course of the focus groups spanned all four sectors of the One Health Occupational Safety  
 1018 and Health model (See Table 3-2). Additional overarching themes were identified that highlighted  
 1019 the role of the pet owner in influencing human and behavioral factors in veterinary personnel  
 1020 including communication and transparency (See Table 3-3).

1021 ANIMAL FACTORS

1022 Animal related factors identified in the analysis related to the pet owners' relationship with their pets. Pet  
 1023 owners often referred to their pets as their "children" and spoke from a position of authority and expertise  
 1024 when it came to their pet's behavior in the clinical veterinary setting. One pet owner described her dog's  
 1025 behavior as being the antithesis of aggression stating, "My dog, she doesn't even know what biting is."  
 1026 This owner then continued to comment on her dissent of veterinary personnel's use of physical restraint  
 1027 on her dog in the quote, "I would be very offended if the vet came out and said, "Well, you know, I think  
 1028 we need to do this." "Well, I don't think so. If you let me come with her, she'll be calm. She's fine. She'll  
 1029 let you do anything." In a similar vein, two other pet owners described their pet's temperament as being  
 1030 "calm" and/or readily calmed down during a veterinary procedure, especially if they the owners could be  
 1031 present. For pet owners, animal factors were personal and dealt primarily with their close relationship  
 1032 with their pets as well as their interpretation of their pet's behavior.

1033 ENVIRONMENTAL FACTORS

1034 The major theme related to the environmental factors domain of the OHOSH model dealt primarily with  
 1035 pet owner's interpretation of transparency in the veterinary clinic as well as their views on the utilization  
 1036 of safety signage in the clinical setting. During the course of the focus group interview, participants

1037 were shown two images of signs that are commonly found in veterinary clinics to promote  
1038 worker safety. These signs included text such as “For your safety please allow our staff to  
1039 restrain your animal during the exam” and “Only personnel beyond this point” (Figure4 A & B).  
1040 Pet owners expressed discomfort when shown these images especially as it related to restricted  
1041 treatment areas in the clinic. They felt that the sign about the off limits treatment areas was  
1042 unclear, and there were negative feelings expressed toward the practice and veterinary personnel  
1043 as a result of what was perceived as a lack of transparency and communication perpetuated by  
1044 the signs: “I’d be very put off by that... I mean, I would want to be asked, but a sign puts up a  
1045 whole different—you can’t communicate verbally with me.” Informational signs and posters  
1046 about the treatment area were confusing to some pet owners and thus policies were negatively  
1047 viewed.



1050 *FIGURE 4 A & B: SAFETY SIGNS USED IN VETERINARY PRACTICE.* 4A provides an example of a safety sign  
1051 that would be placed in a veterinary practice to facilitate worker restraint of animal during a given  
1052 appointment while B is used to label areas off limits to pet owners.  
1053

1054 While discussing hospital practices involving removing the animal from the room and out of the  
1055 sight of the owner, pet owners expressed feelings of anxiety. One pet owner expressed discomfort  
1056 that their pet was being taken out of their sight for procedures they viewed as stressful/painful for  
1057 their pet:

1058         "We've noticed that instead of the procedures occurring in front of us in the room, they're  
1059         starting to take our dogs back to a procedure room and separating them from us, and that's  
1060         just a practice that my wife and I do not appreciate. And we have vowed that the next time  
1061         they try to take our dog back to a procedure room to do an abscess or some sort of  
1062         procedure, that we would like to ask to accompany them, if at all possible. It just makes us  
1063         uncomfortable to hear our dogs unhappy or howling in another room if we aren't there."

1064 The anxiety expressed by pet owners was largely related to the lack of communication between  
1065 veterinary care providers and the owners. Some pet owners expressed relief when there was clear  
1066 and open communication about the delivery of care to their pet, "But if I saw like my dog who was  
1067 injured or something be restrained, it would probably be stressful for me, but if they explained it  
1068 well or why they have to do it..." be nervous. I think it's good to give an option." This same  
1069 sentiment was mirrored by another pet owner when discussing a recent nail trimming experience  
1070 with her 80 pound Labrador Retriever:

1071         "The last time they clipped my dog's nails...they ended up, muzzling him because—he didn't snap  
1072         at them, but he was very vocal, and they said, "Do you mind?" "If it's going to make you feel  
1073         better, you go right ahead. Let's just get this over with." So I really think that, for most of these  
1074         things, communication and [it has to go] both ways. You have to say what your preferences are,

1075 and they have to be upfront about what's happening and why they're doing it, and sometimes  
1076 whatever they're doing is unpleasant ...” Although open communication did alleviate some of the  
1077 anxiety communicated by pet owners, when asked about anything the staff could have done to ease  
1078 tensions, some expressed their desire for surveillance cameras or other media that would increase  
1079 transparency of the treatment process their pets received when out of their sight: “It's a certain  
1080 amount of a leap of faith, particularly, if I've seen that, it's because they are that injured, and they  
1081 do need to go back there and be treated or x-rayed or whatever...They could do a webcam.” Thus,  
1082 it is important to note that visibility of pets during potentially stressful or painful procedures is  
1083 important to pet owners.

#### 1084 BEHAVIORAL FACTORS

1085 Behavioral factors of pet owners in the clinical veterinary setting revolved around the behavior and care  
1086 of their pets, pet owners' interactions with their pets during veterinary appointments, and a desire of pet  
1087 owners to be involved in the delivery of care to their pets whom they were concerned were either stressed  
1088 or fearful by a given procedure. Many pet owners voiced concern when it came to allowing personnel to  
1089 restrain their pet during an appointment given the additional stress it appears to add to a situation. One pet  
1090 owner felt she was better equipped to assist in this process stating, “I like to [restrain] my dog [she] is  
1091 very responsive to me. She just stays really calm if I'm there, and I pet her...” Another pet owner  
1092 admitted to interfering in the work of veterinary personnel as they attempted to restrain her pet in order to  
1093 alleviate the stress of the animal: “I intervened when they restrained my dogs.” The connection between  
1094 the pet owner and their pet appears to directly affect the pet owner's behavior in the clinical veterinary  
1095 setting when it comes to utilizing animal restraint.

#### 1096 HUMAN FACTORS

1097 Human factors identified in this study related directly to communication between veterinary personnel  
1098 and the pet owner. In several instances, however, pet owners expressed some resistance to animal restraint  
1099 as performed by the veterinary staff. At times, these individuals also admitted to being open to many

1100 procedures if the personnel explained the reasoning behind it as seen in the case of one pet owner when  
1101 discussing care of her dog:

1102 “Probably explaining why they need to do it, that it’s not necessarily about your animal. It’s about  
1103 their safety, too. They are at risk every time...But I think you’re so focused on your pet that you  
1104 don’t always think about what it means to the person caring for your pet.”

1105 This same sentiment was expressed by a pet owner who had to take in their dog for an emergency visit, an  
1106 already high stress situation:

1107 “I’ve gone into emergency or I went to emergency recently actually for a dog with a  
1108 broken foot, and they were very clear about why they were taking him back. What they  
1109 did well was, “We need to take him back. We’re going to do an x-ray. We’re going to do  
1110 this. We’re going to set it in a splint, and we’ll examine his walking.” So they talked me  
1111 through the entire thing. And that was a good—I did appreciate that that they knew  
1112 exactly what they were going to do. They came back and told me. That helped as well,  
1113 that they would come back in, and say, “Here’s what we’re finding. Here’s what we’re  
1114 going to do next.”

1115 Overall, members of the veterinary team taking the time to communicate to the pet owner their  
1116 wants and needs as it relates to safety and/or general business policies in the practice were  
1117 mentioned as being well accepted. This step is crucial to enabling personnel to execute a given  
1118 task in a safe manner.

1119 *TABLE 3-2: PETOWNER FOCUS GROUP STUDY THEMES*

OHOSH Dimension	Theme	Supporting Quote
Animal Factors	Pet owners consider themselves	

	<p>competent in interpreting their pet's behavior and felt that their pets behaved better when they, the owners, were allowed to participate in the delivery of care</p>	<p>"My dog is very responsive to me. She just stays really calm if I'm there, and I pet her, .."</p> <p>"...I could hear him fighting them, and he was a big guy. So they would try to muzzle him and such, and finally I had to say, "If you let me go with him, that won't happen. He will calm down." Yeah, and he did, and I think they were afraid of him more than they were.... particularly a big powerful dog like that.."</p> <p>"My dog, she doesn't even know what biting is. She just doesn't even go there. I would be very offended if the vet came out and said, "Well, you know, I think we need to do this." "Well, I don't think so. If you let me come with her, she'll be calm. She's fine. She'll let you do anything."</p>
<p>Environmental Factors</p>	<p>Pet owners prefer to directly observe the delivery of care to their pets</p>	<p>"We've noticed that instead of the procedures occurring in front of us in the room, they're starting to take our dogs back to a procedure room and separating them from us, and that's just a practice that my wife and I do not appreciate. And we have vowed that the next time they try to take our dog back to a procedure room to do an abscess or some sort of procedure, that we would like to ask to accompany them, if at all possible. It just makes us uncomfortable to hear our dogs unhappy or howling in another room if we aren't there."</p> <p>"It's a certain amount of a leap of faith, [that] they do need to go back there [to the treatment area] and be treated or x-rayed or whatever... They could do a webcam."</p>
<p>Human Factors</p>	<p>Personnel communicating their needs as it relates to safety practices are paramount to receiving approval from pet owners</p>	<p>"Probably explaining why they need to do it, that it's not necessarily about your animal. It's about their safety, too. They are at risk every time... But I think you're so focused on your pet that you don't always think about what it means to the person caring for your pet."</p> <p>"I've gone into emergency or I went to emergency recently actually for a dog with a broken foot, and they were very clear about why they were taking him back. What they did well was, "We need to take him back. We're going to do an x-ray. We're going to do this. We're going to set it in a splint, and we'll examine his walking." So they talked me through the entire thing. And that was a good—I did appreciate that that they knew exactly what they were going to do. They came back and told me. That helped as well, that they would come back in, and say, "Here's what we're finding. Here's what we're going to do next."</p> <p>"But if I saw like my dog who was injured or something be restrained, it would probably be stressful for me, but if they explained it well on why they have to do it, and you also have to respect the fact that they don't want to get bit. But I do like the option, the vets that ask if I want to hold my dog while they give them the shot or whatever versus just bringing in another tech. But some clients probably wouldn't want to hold their pet. They'd be nervous. I think it's good to give an option."</p>
<p>Behavioral Factors</p>		<p>"I intervened when they restrained my dogs"</p>

Pet owners prefer to restrain their own pets and will interfere with animal restraint activities as they see fit
--

"I like to [restrain] my dog [she] is very responsive to me. She just stays really calm if I'm there, and I pet her..."

1120

1121 Overarching themes identified in this study dealt primarily with human factors including  
1122 personality traits, interpersonal communication, and personal wants and needs of the pet owners  
1123 (Table 3).

1124 **PREFERABLE VETERINARY CHARACTERISTICS**

1125 At the opening of the focus group interviews, pet owners were invited to express their  
1126 opinions on their current satisfaction with veterinary care and the delivery of care from veterinary  
1127 personnel. When asked about the qualities they looked for in small animal veterinary clinics and  
1128 in their veterinarian specifically, the majority of participants mentioned that communication and  
1129 compassion were qualities they valued most (Table 3-3). One participant described what she  
1130 preferred in veterinary personnel: "Compassion... not talking down to you, and treating you like  
1131 you might actually understand what they're talking about." During this same discussion,  
1132 competency in veterinary medicine was noted as a preferred trait among pet owners. For example,  
1133 pet owners mentioned their desire for veterinarians to have in-depth knowledge specific to their  
1134 breed:

1135 "I like her very much. She has an extremely in-depth knowledge of my breed. She's  
1136 a good listener and is a really good scientist, and I like that a lot. I want science as much  
1137 as anything ... but particularly for my breed, I like—that's what I like about it because  
1138 that's what I know, that she has been excellent on keeping up with the issues facing my  
1139 breed and canines in particular."

1140 Overall, knowledge of veterinary medicine and compassion were the two traits that were highly  
 1141 regarded by veterinary clientele.

1142 *TABLE 3-3: PET OWNER FOCUS GROUP OVERARCHING THEMES*

OHOSH Dimension	Theme	Supporting Quote
Human Factors	Veterinary personnel that are viewed as compassionate, knowledgeable, and who communicate well are preferred by pet owners	<p>“Compassion... not talking down to you, and treating you like you might actually understand what they're talking about.”</p> <p>“I like her very much. She's an extremely in-depth knowledge of my breed. She's a good listener and is a really good scientist, and I like that a lot. I want science as much as anything ... but particularly for my breed, I like—that's what I like about it because that's what I know, that she has been excellent on keeping up with the issues facing my breed and canines in particular.”</p>
Human Factors	Communication is needed to improve pet owner acceptance of animal handling techniques	<p>“Probably explaining why they need to do it, that it's not necessarily about your animal. It's about their safety, too. They are at risk every time...But I think you're so focused on your pet that you don't always think about what it means to the person caring for your pet.”</p>
Human Factors	Communication is needed to improve pet owner acceptance of safety procedures	<p>“I'd be very put off by that...I guess I've always assumed that the animal is going to be handled. I mean, I would want to be asked, but a sign puts up a whole different—you can't communicate verbally with me.”</p>

1143

1144 **ANIMAL RESTRAINT, COMMUNICATION**

1145 When asked about the use of animal restraint equipment and devices at the clinic, pet  
 1146 owners expressed a desire for more communication and owner input. One pet owner described  
 1147 what they considered to be poor communication by the veterinary staff when their pet required an  
 1148 injection:

1149 “... he was a big male dog, and the techs would take him back, and it would take three or  
 1150 four, and they would say, “Well, we're going to go give him the injection, and we're going  
 1151 to take him back,” and they would hold him down, and they told me they would do that,

1152 and then I could hear him fighting them, and he was a big guy. So they would try to muzzle  
1153 him and such, and finally I had to say, “If you let me go with him, that won't happen. He  
1154 will calm down.”

1155 Another participant recommended that veterinary personnel communicate with owners about why  
1156 they use restraining devices and what it means for safety:

1157 “Probably explaining why they need to do it, that it’s not necessarily about your animal.  
1158 It’s about their safety, too. They are at risk every time...But I think you’re so focused on  
1159 your pet that you don’t always think about what it means to the person caring for your pet.”

1160 Lack of communication appeared to cause confusion and misunderstanding in pet owners  
1161 concerning the intent and delivery of care from veterinary personnel. Pet owners felt that  
1162 communication and explanations from the veterinary personnel about why restraining devices are  
1163 used could promote trust, a healthy pet owner-veterinary personnel relationship, and improved  
1164 workplace safety for all.

1165 Overall, the main overarching theme that emerged from this analysis suggests that  
1166 communication with pet owners is crucial to improving relationships between pet owners and  
1167 veterinary personnel, thereby reducing owner driven barriers to safety practices in veterinary work.  
1168 Regardless of whether the topic discussed was animal restraint devices, hospital policy around  
1169 conducting procedures in front of the owner versus in a designated treatment area, and/or what  
1170 qualities in general denote a healthy pet owner-personnel relationship, communication was  
1171 repeatedly a key factor that pet owners looked for in their veterinary clinic.

## 1172 DISCUSSION

1173 Occupational injury in the clinical veterinary setting is caused by a variety of human,  
1174 animal, behavioral and environmental factors (Chapter 1)(3, 7, 55, 56, 62, 63). During our focus  
1175 group discussions, pet owners voiced their opinions on their views on the positive attributes of a

1176 good veterinarian and support staff as well as their impression of animal restraint and clinic  
1177 specific policies related to personnel safety. Major themes identified in the analysis spanned all  
1178 four sectors of the OHOSH model though human factors relating to pet owner-personnel  
1179 interactions predominated. Preferable traits in veterinary staff, a need for transparency in the  
1180 delivery of care, and the lack of acceptance of clinic-based policies for personnel safety were found  
1181 to influence pet owner behavior, thereby creating a barrier to safe practices in veterinary care.  
1182 Breakdowns in communication between pet owner and veterinary personnel, including personnel's  
1183 failure to explain the role of the pet owner in the restraint process, was seen as the overarching  
1184 theme in the study. These results suggest that improving communication is one potential route for  
1185 protecting animal care workers from injuries in the clinical veterinary setting.

1186         Lack of open communication as it relates to animal restraint as well as clinic safety  
1187 policies, such as removing the pet from the view of the owner to conduct procedures, were  
1188 scenarios that cause reported anxiety among the focus groups participants. A lack of familiarity of  
1189 the physical space and procedures to be carried out in designated treatment areas out of the owner's  
1190 view were said to be stress inducing. Several respondents, however, suggested the addition of  
1191 surveillance cameras or some other mode of improving visualization would increase transparency  
1192 in these cases, helping to reduce the anxiety many felt when their beloved pet was removed from  
1193 their view. One study of companion animal ICU patients in a hospital in the Netherlands utilized  
1194 surveillance cameras referred to as the Telepet system allowing virtual pet visits between pets and  
1195 their owners. This study found that 72% of pet owners reported less anxiety and 40% felt less need  
1196 to visit their pets in-person during their hospitalization as a result of this system(121). This study  
1197 is based on an understanding of the human-animal bond present between pet owners and their pets  
1198 (122, 123). We suggest the use of surveillance cameras in off limit treatment areas to increase

1199 owner compliance with safety procedures. If surveillance cameras are unavailable, personnel  
1200 should consider inviting owners to view treatment area spaces and/or implement some other mode  
1201 to increase visibility of the spaces in order to reduce negative emotions among owners that could  
1202 potentially lead to resistance in allowing personnel to conduct their work in a safe manner.

1203         Pet owners suggested knowing their pets' behavior better than veterinary personnel and  
1204 insisting to assist in the restraint process during veterinary exams. In a focus group study of  
1205 veterinary personnel in Washington State, personnel expressed fears of injuring the pet owners  
1206 during procedures either from mishandling needles and/or as a result of restraining their pets,  
1207 suggesting that pet owner safety was a major concern of these workers (Chapter 2). Additionally,  
1208 pet owners restraining their own pets during a veterinary procedure can pose a serious liability  
1209 issue if the owner is injured in the process (46, 53, 124, 125). Veterinary personnel-pet owner  
1210 communication is needed to reach consensus on a given restraint approach among these two parties  
1211 in order to ensure the safety of everyone involved.

1212         Negative perceptions of veterinary clinic policies including signage that denotes restricted  
1213 areas and personnel use of equipment and other tactics to restrain pets can block the  
1214 implementation of safe practices among veterinary personnel. The clinical veterinary profession  
1215 consists primarily of small employers and is consumer-driven (80, 126-128) As a result, the  
1216 concern over client satisfaction can negatively impact worker behavior as it relates to safety in  
1217 order to appease the client (78, 128-130). Focus groups of veterinary personnel including  
1218 veterinarians, veterinary technicians, and veterinary assistants in Washington State affirms this  
1219 issue as they all mentioned that the presence and perception of the pet owner negatively influences  
1220 their safety behavior (Chapter 2). The solution for this issue as with all other themes identified in  
1221 this chapter relate back to client-personnel communication. Veterinary personnel must work to

1222 strengthen relationships with as well as educate clients on these policies in order to prevent  
1223 unnecessary injuries on the job.

1224         The need for communication between veterinary personnel and pet owners to receive pet  
1225 owner support to conduct a given procedure in the veterinary clinic was the main overarching  
1226 theme identified in our study. Veterinary-client communication is key to the delivery of veterinary  
1227 care and thus related to all aspects of veterinary care, not just safety (33, 69, 70, 79, 103, 128, 129).  
1228 One study by Coe et al found five major themes that arise during communication between  
1229 personnel and their client base(70). These themes spanned both positive and negative factors  
1230 involved in communication including educating clients, providing choices, engaging owners in  
1231 conversation, breakdowns in communication, and challenges to effective communication. This  
1232 body of work by Coe et al further explored the topic of veterinary-client communication in other  
1233 articles, focusing on specific topics including discussing the cost of veterinary care as well as  
1234 soliciting information on pet health(79, 128). Other work emphasized the need for communication  
1235 and building rapport with clients in order to improve client satisfaction(129, 130). Collectively,  
1236 these studies further reinforce the importance of communication between veterinary personnel and  
1237 owners in order to provide the appropriate care for the pet patient while simultaneously improving  
1238 workers' safety behaviors. Competencies in veterinary training programs surrounding  
1239 communication have improved in recent years as this issue has gained more attention in the field  
1240 (31, 34, 103, 104, 131).

#### 1241 LIMITATIONS

1242         Limitations of this study primarily relate to the limited sample of the pet owners included in this  
1243 study. Participants were pet owners from the Seattle metropolitan area who made between \$65,000 and  
1244 \$100,000 on average. It is possible that pet owner perceptions will vary by income limiting the scope of  
1245 study results and representation. Despite these limitations in the participant demographics, our study

1246 provides one of the first assessments of pet owner perceptions of safety behaviors in small animal veterinary  
1247 clinics and thus has the potential to provide insight on the factors that adversely affect pet owner  
1248 perceptions. These study findings should be utilized by veterinary personnel to improve safety behavior  
1249 through communication and outreach.

## 1250 CONCLUSION

1251 Occupational injury in the clinical veterinary setting is caused by a variety of human,  
1252 animal, behavioral and environmental factors (Chapter 1)(3, 38, 43, 55, 56, 59, 62, 63). Our study  
1253 confirms the role of the veterinary client as a potential human, behavioral, and environmental  
1254 barrier to safe practices in the small animal clinical setting. The main overarching theme identified  
1255 in this study suggests that veterinary-client communication is the primary factor influencing pet  
1256 owner behaviors in this clinical occupational setting. Effective communication is key to ensuring  
1257 pet owners' satisfaction and removing owner-enacted barriers to safety practices by personnel.  
1258 Thus, veterinary personnel must prioritize client communication in the delivery of veterinary care  
1259 in order to ensure their ability to prioritize their safety on the job.

## 1260 **Footnote**

1261 <sup>a</sup>ATLAS.ti version 7.5.16 USA

1262 <sup>b</sup>SAS version 9.4, SAS Institute Inc., Cary, NC, USA

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1264

1265 CHAPTER 4: AN ASSESSMENT OF OCCUPATIONAL  
1266 INJURY EXPOSURES IN SMALL ANIMAL VETERINARY  
1267 WORK, SEATTLE, WA

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1282 **ABSTRACT**

1283 **Objective** To characterize tasks and frequency of risk-related activities in small animal veterinary  
1284 practice.

1285 **Materials and Methods:** We conducted a task-based exposure assessment of veterinary workers  
1286 in the Seattle metropolitan area to describe the frequency and variability of occupational tasks  
1287 employed by these workers that put them at risk for needlestick/sharps (NSIs) and animal-related  
1288 injuries (ARIs). Between November 2016 and February 2017, veterinary personnel at two types  
1289 of veterinary clinics, one general practice and one specialty clinic, were enrolled in our study.  
1290 Each observation lasted approximately two hours and was recorded using a video camera that was  
1291 mounted on the head of the observer. Direct observation notes were documented on a task card at  
1292 the time of observation. Videos were then analyzed to count the frequency of designated high-risk  
1293 activities that would predispose participants to ARIs, i.e. bites or scratches from a cat and dog  
1294 patients, and NSIs during a given observation period. In addition, prolonged animal contact,  
1295 defined as direct contact with an animal lasting more than 60 seconds, as well as moves and lifts  
1296 of animals were scored using a modified version of the rapid upper limb assessment (RULA) tool  
1297 which measures trunk flexion to determine musculoskeletal injury risk. Mean scores per facility  
1298 as well as for the study population overall in the study are presented as well as recommendations  
1299 to reduce the incidence of such risky behaviors.

1300 **Results** A total of twelve personnel representing two facilities and three job titles, veterinarian,  
1301 veterinary technician and veterinary assistant, were included in the study. Fifty activities that may  
1302 predispose one to an ARI were witnessed during this study. Direct animal contact was witnessed  
1303 32 times, 16 times at each clinic, during the study making it the most common task noted. Animals  
1304 were moved and/or lifted 42 times, 21 times at each clinic, with RULA scores equaling 2.4 on

1305 average for each clinic, with a range from one to four. Needle handling in the form of administering  
1306 medications or vaccines and recapping needles after use was witnessed 17 times at the primary  
1307 clinic and 19 times at the specialty clinic.

1308 **Conclusions:** Veterinary personnel frequently engaged in activities that may predispose them to  
1309 ARIs and NSIs including lifting animals as well as handling and recapping syringes. Furthermore,  
1310 their positions while conducting this work may place them at increased risk for chronic overuse  
1311 injuries. A combination of engineering controls and behavior change solutions are needed to  
1312 reduce the incidence of injury among this group of professionals.

1313

1314 INTRODUCTION

1315 Occupational hazards are an inherent part of any workplace setting (3, 28, 30). In the veterinary  
1316 setting, these hazards span biological, chemical, and physical with a variety of hazards making up  
1317 these broad categories(59). Of the hazard categories present, physical hazards including animal-  
1318 related injuries (ARIs), such as include being bitten, scratched, stepped on or crushed by an animal,  
1319 as well as needlestick/sharps injuries (NSIs), are the most prevalent injuries experienced in  
1320 veterinary medicine(37, 67). Work-related musculoskeletal disorders (MSDs), however, which are  
1321 caused by either acute trauma or chronic overuse injurie are by far the most costly(67). Specific  
1322 situations leading to injury involving these hazards, however, remain elusive (28-30, 132-134).

1323 A number of cross-sectional studies have attempted to estimate the prevalence of  
1324 occupational hazards in various veterinary settings including, but not limited to, the small and large  
1325 animal realm as well among various members of the veterinary profession such as veterinarians,  
1326 veterinary technicians, and assistants(3, 29, 134). These studies confirm the high prevalence of  
1327 physical hazards and incidence of injury in the veterinary realm (28-30, 56, 67, 135). In fact, one  
1328 study, using an epidemiologic model, attempted to identify risk factors for these types of injuries  
1329 (28, 29). Few studies, however, have attempted to identify the primary activities that led to these  
1330 types of injuries via the use of task observation (53, 136, 137).

1331 One Health is the study of issues lying at the intersection of human, animal, and  
1332 environmental health (8, 118). The underlying principle of this concept is that these three sectors  
1333 of health are inextricably linked, and thus must be studied simultaneously. In order to achieve this  
1334 aim, professionals representing key disciplines in these sectors of health must engage in research  
1335 in a collaborative fashion (12). In the veterinary medical setting, all three sectors are represented,  
1336 and a One Health approach be used to better understand sources and solutions for occupational

1337 injury and illness (Chapter 1). In addition, key industrial hygiene methodology including task  
1338 observation should be utilized to characterize the work and associated risks (138, 139) . To date,  
1339 little to no work of this kind has been conducted in the realm of occupational health as it relates  
1340 to the clinical veterinary setting (53, 137, 140, 141).

1341 Task observation provides a systematic approach to assessing workplace hazards (141,  
1342 142). This technique is often employed by industrial hygienists as part of the hazard identification  
1343 step of assessing and/or characterizing risks associated with a new job or following a report of  
1344 injury in a worker(118). Using this approach provides occupational safety professionals with the  
1345 information needed to either qualitatively or quantitatively rank or categorize a given task based  
1346 on its risk as well as identify potential controls for improving safety in the workplace. This  
1347 approach have been used in a variety of workplaces including other healthcare settings, but to date  
1348 few reports exist for the veterinary realm (68, 136, 137, 140, 143-146). Using this approach, we  
1349 set out to conduct task observation of veterinary professionals with the goal of identifying the  
1350 prevalence and frequency of potential high-risk activities that predispose personnel to both acute  
1351 and chronic occupational injury. The objective of this study was to gain a deeper understanding of  
1352 veterinary tasks in order to facilitate the development of training materials aimed at reducing the  
1353 incidence of occupational injury in this group of professionals. This study is part of a larger project  
1354 aimed at preventing injuries in veterinary workers called the Prevention of Injuries in Veterinary  
1355 Occupational Tasks (PIVOT) study. Other study methods included veterinary worker and pet  
1356 owner focus groups, and a population-based cross-sectional survey of worker injury and illness.

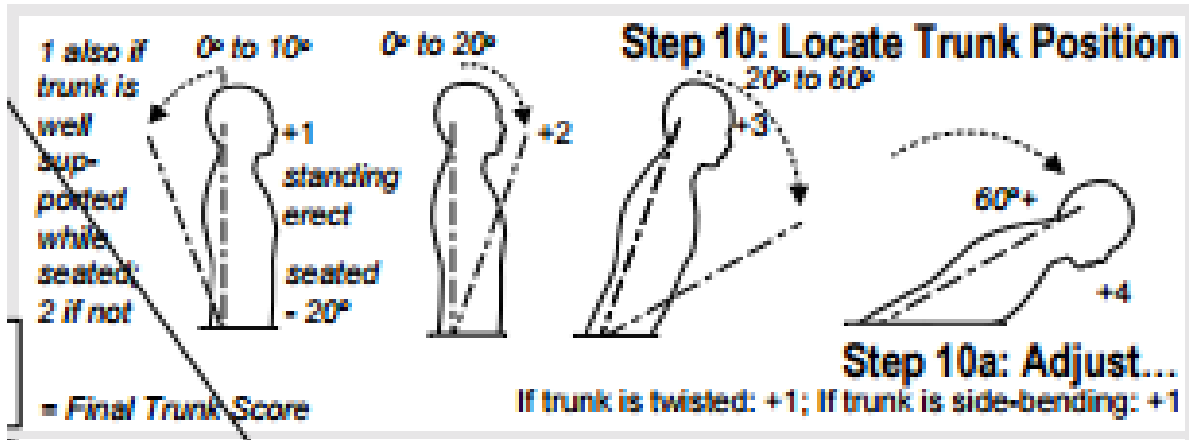
## 1357 MATERIALS AND METHODS

### 1358 TASK OBSERVATION

1359 Task observation of small animal veterinary personnel including veterinarians, veterinary  
1360 technicians and veterinary assistants was conducted between November 2016 and February 2017.

1361 A primary care and specialty care veterinary clinic were approached for inclusion in this study.  
1362 Six personnel from each clinic, including two each of veterinarians, veterinary technicians and  
1363 veterinary assistants were enrolled in the study and their individual actions observed and recorded  
1364 using a mountable wireless camcorder. An emphasis was placed on observing those actions that  
1365 were theorized to predispose participants to ARIs and NSIs by agitating animal patients and/or  
1366 performing previously defined high-risk tasks such as needle recapping (2, 4, 5, 44-47, 53, 65,  
1367 109, 137, 147, 148). These risky tasks were defined as needle handling, direct animal contact, and  
1368 lifting or moving animals from one location to another. Each observation period lasted two hours,  
1369 and notes were entered into a task observation card throughout observation (See Appendix A-5).  
1370 Task Observation cards contained a list of common tasks as well as activities that are thought to  
1371 predispose one to ARI and/or NSIs. Tasks lists were based on a working knowledge of the small  
1372 animal veterinary setting possessed by the first author. Another member of the study team then  
1373 reviewed recorded footage and the task observation form was updated and data entered. An  
1374 abbreviated ergonomic assessment based on the Rapid Upper Limb Assessment (RULA) tool was  
1375 used to assign scores for lower back bends in tasks involving prolonged direct contact defined as  
1376 greater than or equal to 60 seconds of animal contact at a given time and/or lifting of an animal to  
1377 determine potential ergonomic risks from postural activities in practice(149). As shown in figure  
1378 5, RULA scores for trunk flexion range from one to four and are dependent on the angle of the  
1379 back at the time of work. A score of one is considered neutral, while those positions yielding a  
1380 score greater than one are considered potentially risky for they place the worker at increased risk  
1381 of back injury as a result of acute insult or chronic overuse (149-152). Therefore, it is correct to  
1382 assume that lifting or moving animals and/or having prolonged animal contact with the trunk in a

1383 non-neutral position predisposes personnel to musculoskeletal disorders and/or can exacerbate pre-  
1384 existing conditions.



1385

1386 FIGURE 5: RAPID UPPER LIMB ASSESSMENT (RULA), TRUNK FLEXION SCORING SYSTEM  
1387

1388 Prior to or immediately following the observation period participants were invited to complete a  
1389 brief, 12-item survey detailing their injury prevalence as it relates to ARIs and NSIs (Appendix A-  
1390 6). All participants were given a \$25 gift card for their participation. Prior to study commencement  
1391 the task observation card was piloted in a wildlife clinical veterinary setting.

#### 1392 DATA ANALYSIS

1393 Summary statistics describing the study sample including demographic information and work and  
1394 injury history were calculated. Frequencies of injury occurrence in the past year and month were  
1395 summarized for workers for each facility as well as overall for the study population. Study defined  
1396 risk related activities that occurred during the observation periods are summarized to create a  
1397 proposed rate of frequency of occurrence.

1398 Activities resulting in a RULA score greater than two were summarized across the study  
1399 population. The duration and/or frequency of risk-related activities were calculated and are  
1400 summarized below. All data were stored in a data management software system<sup>b</sup> and analyzed

1401 using a statistical analysis program <sup>c</sup>. This study was approved by the Institutional Review Board  
1402 (IRB) at the University of Washington.

### 1403 RESULTS

1404 Twelve veterinary personnel from two different facilities participated in the study, four of each job  
1405 title, veterinarian, veterinary technician, and veterinary assistant. Participants were predominately  
1406 white (10, 83%), female (10, 83%), and middle-aged (36 years, 24-53 years), midcareer veterinary  
1407 personnel with an average of 9.8 years of experience in veterinary practice (Table 1). These  
1408 participants reported working on average four days out of a typical five to six day workweek  
1409 though put in an average of 35.5 hours a week with a range of 10-45 hours for nearly a 7 hour  
1410 work day on average. The prevalence of ARIs and NSIs were determined by the presence of at  
1411 least one injury reported over one's entire career. Though a majority of participants voiced  
1412 difficulty estimating the total number of injuries incurred over their career they were able to recall  
1413 the injuries experienced in the past year and month. ARIs and NSIs were reported by 100% and  
1414 92% of participants, respectively. Very few injuries were reported in the past month at the time of  
1415 the survey for both NSIs (0.25, 0-2 needlesticks) and ARIs (0.8, 0-4 injuries) though ARIs  
1416 appeared to be more frequent. This same trend was also seen for annual injury incidence reported  
1417 [ARIs (6, 0-30), NSI (1.9, 0-5)].

1418 Musculoskeletal disorders (MSDs) were reported by five study participants (42%), three from the  
1419 primary care setting and two from the specialty care facility. Of those with MSDs, two persons  
1420 (40%) reported greater than one MSD or body part affected. The most common body site for a  
1421 MSD was the back with four out of five of those with MSDs reporting a back injury. The shoulder  
1422 (3, 60%), neck (2, 40%), and hip (1, 20%) were also mentioned. Personnel were split when it came  
1423 to determining the presence of an occupational safety and health program at their job with five

1424 (42%) indicating there wasn't a program, five(42%) indicating there was and two (17%) saying  
 1425 they were unsure. Of those five personnel endorsing the presence of an occupational safety and  
 1426 health program, three were from the specialty care facility and two from the primary care facility.  
 1427 Both of the "don't know/unsure" responses were from the primary care facility. What constituted  
 1428 an occupational health program however was not formally defined in the survey.

1429 *TABLE 4-1: TASK OBSERVATION PARTICIPANT JOB AND INJURY HISTORY CHARACTERISTICS*

	All (n=12)
Race, n (%)	
White, Non-Hispanic	7 (58%)
White, Hispanic	3 (25%)
Asian	1 (12%)
Other	1 (12%)
Gender, Female, n (%)	10 (83%)
Age (yrs.), mean (range)	36 (24-53)
Years in practice (yrs.), mean (range)	9.8 (2-28)
Average weekly work hours (nearest hr.) , mean (range)	35.5 (10-45)
Average work days per week, mean (range)	4.0 (3-5)
Average patient interactions/day, mean (range)	13.8 (6-25)
Average reported Needlestick/Sharps Injuries/yr. , mean (range)	1.9 (0-5)
Average reported Animal-Related Injuries/yr. , mean (range)	6 (0-30)
Average reported Needlestick/Sharps Injuries/mo. , mean (range)	0.25 (0-2)
Average reported Animal-Related Injuries/mo. , mean (range)	0.8 (0-4)
At least one MSD, n (%)	5 (42%)
Ongoing	3 (60%)
Resolved	1 (20%)
Greater than 1 MSD	2 (40%)
Body Site, n (%)	3 (60%)
Shoulder	4 (80%)

Back	2 (40%)
Other	
Neck	2 (100%)
Hip	1 (50%)
Occupational health program at work, n (%)	
Yes	5 (42%)
No	5 (42%)
Don't Know	2 (17%)

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1430

1431 RISK-RELATED ACTIVITIES

1432 Risk related activities include those that may provoke an animal to respond in an aggressive  
1433 manner by causing pain and/or stress. These activities include physically restraining healthy  
1434 animals and/or having contact with a sick or injured animal. The means and ranges of these  
1435 potentially risky tasks that predispose personnel to ARIs as defined above are summarized in Table  
1436 2. Activities that involve needle handling including drawing up solutions in a syringe, collecting  
1437 blood samples, administering medications via a syringe and recapping syringes all place one at  
1438 increased risk of a needlestick injury (Chapter 2) (44-47, 53, 65, 109, 137, 147). Fifty of these  
1439 types of activities were noted over the twelve observation periods. Recapping was the most  
1440 commonly observed needlestick-related risky behavior and was observed 19 times, followed by  
1441 administering drugs and/or other fluids via a syringe, which was noted 17 times. Only one blood  
1442 specimen collection was witnessed throughout the entire study. The mean number of recapping  
1443 and administering medications via a syringe events witnessed per person during the observation  
1444 period was 1.6 and 1.4 events, respectively.

1445 TABLE 4-2: FREQUENCY OF RISK-RELATED ACTIVITIES OBSERVED (# OBSERVED ACTIVITIES PER OBSERVED  
1446 2-HOUR WORK SESSION)

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Veterinary Clinic Type

All n=12

RISK-RELATED PROCEDURES	General Practice n=6		Specialty Practice n=6			
	mean (range)	Total	mean (range)	Total	mean (range)	Total
<b>Needlestick/Sharps</b>						
Draw up Meds/Fluids/Drugs	0.2 (0-1)	1	0.8 (0-3)	5	0.5 (3-6)	6
Blood draw (per site)	0.2 (0-1)	1	0 (0-0)	0	0.08 (0-1)	1
Administer Drugs, Vaccinations, or Other injections)	1.2 (0-3)	7	1.7 (0-5)	10	1.4 (0-5)	17
Recap Needles	1.5 (0-4)	9	1.7 (0-4)	10	1.6 (0-4)	19
Other Sharps Use	0.7 (0-3)	4	0.5 (0-2)	3	0.6 (0-3)	7
<b>Animal Related Injury</b>						
Oral Examination	0.17 (0-1)2	1	0.50 (0-1)	3	0.30 (1-1)	4
Oral Medication	0.3 (0-1)	2	0 (0-0)	0	0.2 (0-1)	2
Animal Contact	2.7 (0-5)	16	2.7 (1-5)	16	2.7 (0-5)	32
Physical Exam	0.8 (0-2)	5	0.7 (0-2)	4	0.8 (0-2)	9
Surgical Procedure	0.2 (0-1)	1	0.3 (0-2)	2	0.3 (0-2)	3
<b>Ergonomic Tasks</b>						
Prolonged Animal Contact (>1min)	2.3 (0-7)	14	1.7 (0-4)	10	2 (0-7)	24
Move/lift patient (counts)	3.5 (0-9)	21	3.5 (0-9)	21	3.5 (0-9)	42
Move/lift patient (RULA)	2.5 (1-4)	N/A*	2.4 (1-4)	N/A*	2.4 (1-4)	N/A*

1447 \*RULA scores not summed. Only mean and range presented

1448 ARIs are due in part to direct contact with animals. In the veterinary setting, the primary purpose  
1449 of direct animal contact is often to restrain or evaluate an animal for a physical examination.  
1450 Specific components of the clinical physical examination including opening and evaluating the  
1451 mouth during an oral exam (102, 153). Administering oral medications may be considered

1452 especially risky given proximity to the mouth. A total of 50 activities that may predispose one to  
1453 an animal-related injury including bites or scratches from cat and dog patients were witnessed  
1454 during this study. Direct animal contact for any purpose was the most common exposure overall  
1455 (n=32 observations, 2.7 events per person on average). The physical exam was the most common  
1456 specific animal contact activity witnessed with nine events occurring over the 12 observation  
1457 periods with an average of 0.75 events per person overall.

1458 Within the area of direct animal contact, lifting and moving animals can predispose one to not only  
1459 physical injuries in the form of bites, scratches, and other ARIs but also musculoskeletal disorders  
1460 or MSDs that can affect the back, neck, and shoulder, either individually or in combination. Using  
1461 the RULA tool, we assessed specific animal lifts that may predispose one to injury by assessing a  
1462 score of one through four. Forty-two animal lifts/moves were witnessed during the study, on  
1463 average 3.5 per participant. In addition, 24 animal contact encounters involving a RULA score  
1464 greater than two were also witnessed, on average two per participant. Average RULA scores for  
1465 these lifts and moves ranged from 1-4 with an average score of 2.4 per lift.

## 1466 DISCUSSION

1467 Our study set out to identify the prevalence and frequency of potentially high-risk activities  
1468 in the small animal clinical setting using a task-based exposure assessment approach. Over the 12  
1469 two hour observation periods (for a total of 24 hours of observation) we found that veterinary  
1470 personnel frequently participated in activities that increased their risk for injury including having  
1471 direct contact with animal patients and poor needle handling including recapping syringes. The  
1472 frequency of the tasks witnessed as part of this study suggest a need for improved worker safety  
1473 in this occupational setting by limiting the exposures to tasks that increase chances of injury.

1474 ANIMAL BEHAVIOR AND RESTRAINT

1475 Animal contact was one of the most frequently witnessed activities in this study. Animal  
1476 care workers including veterinary personnel are required to directly interact with animal patients  
1477 in order to conduct their work (3, 28). For instance, direct animal contact is required to conduct a  
1478 complete physical examination including auscultation of the heart, lungs, and gut, palpation of the  
1479 abdomen and potentially injured areas, as well as to conduct oral and ocular examinations along  
1480 with other components of the physical examination(35). Conducting such tasks safely requires a  
1481 minimum a working knowledge of the behavior of the species one is working with, in this case  
1482 cats or dogs, including how they manifest signs of pain, stress, discomfort and aggression (22, 23,  
1483 25-27, 35, 154-157). Proper identification of these signs will allow personnel to implement the  
1484 appropriate precautions to avoid injury and illness. Personal protective and safety equipment can  
1485 be used to create a physical barrier between the worker and the animal and/or prevent injury (49).  
1486 Other personnel can physically restrain animals or use chemical restraint in the form of injectable  
1487 or oral sedatives in order to reduce the animal's possibility of causing an injury(114). Complete  
1488 elimination of this hazard or reduction of the frequency of the exposure of direct animal contact is  
1489 nearly impossible given the type of work veterinary personnel conduct and thus safety solutions  
1490 must focus on reducing the incidence of injury by way of improving safety practices and culture.

1491 NEEDLE HANDLING

1492 Needle/sharps handling was the second most commonly observed activity. Of note,  
1493 recapping needles was witnessed more often than the actual administration of medications or  
1494 vaccines to animals suggesting how ubiquitous the use of needles truly is. Recapping needles is a  
1495 known risk factor for NSIs (3, 53, 137, 148). In fact, one study suggested that the odds of NSIs at  
1496 least doubled when needles were recapped instead of merely discarded (3, 148). Reasons  
1497 veterinary personnel provided for recapping needles were discussed in Chapter 2 and include the

1498 absence of a sharps container, the financial cost of medical waste, and the overall safety culture in  
1499 veterinary medicine that perpetuates recapping and other negative behavior patterns in the  
1500 profession. In addition, OSHA blood borne pathogen regulations apply only to human blood  
1501 products and other infectious organisms that may contain human immunodeficiency virus (HIV)  
1502 or hepatitis B virus (HBV) that may result from contact with nonhuman primates (44, 106).  
1503 Veterinary clinics are otherwise exempted from this rule. Therefore, risks in veterinary medicine  
1504 for the most part are not covered in this rule allowing the recapping of needles in the veterinary  
1505 setting to go undeterred and/or unchanged. The literature however does contain examples of  
1506 infectious disease transmission, abortion and death that resulted from needlestick injury (45-48,  
1507 50-52). Educational interventions that take into consideration this lack of regulation coupled with  
1508 a lax safety culture are needed to reduce the frequency by which this practice and other unsafe  
1509 needle handling practices take place.

#### 1510 ERGONOMIC ISSUES

1511 One of the most common job activities witnessed in this study included moving and/or  
1512 lifting animals. In the small animal clinical setting animals are often lifted and moved to or from  
1513 the examination table by a member of the veterinary team (22, 23, 25-27, 35, 157-159). The body  
1514 position of the worker is dependent primarily on the animal characteristics themselves including  
1515 the age, health, weight, height, and temperament of a given animal patient(22, 24, 159). This  
1516 animal-dependent variability was noted in the form of the RULA scores used to assess these lifts.  
1517 A trunk flexion score of  $>2$  suggests a potential source of injury and should be corrected(149). The  
1518 average RULA scores witnessed in these lifts suggest that veterinary personnel maybe at risk for  
1519 MSDs in the form of back and/or shoulder injuries(149). In addition, five (42%) personnel reported  
1520 suffering from at least one MSD. To date, no evidence exists of the application of the RULA score  
1521 to veterinary personnel; however, this score has been utilized in part or as a whole in other

1522 healthcare settings (150, 151). These studies suggest that slight variations in patient positioning  
1523 can help reduce the RULA score and thereby the risk associated with a given motion; however,  
1524 given the often unpredictability of a patient's movements in the veterinary realm such hopeful  
1525 findings may not always translate to feasible solutions (134, 160). Possible solutions instead may  
1526 involve minimizing such activities by changing the manner in which the work is delivered, e.g.  
1527 conducting a physical exam on an elevated exam table, or training animal patients to remain still  
1528 during veterinary visits to eliminate the need for physical restraint (35, 158, 159, 161). Veterinary  
1529 personnel should work with occupational health professionals to identify creative yet feasible  
1530 solutions to reducing physical and musculoskeletal injury on the job.

#### 1531 LIMITATIONS

1532         Limitations in this study include the sample size, number of study sites and inter-site  
1533 differences. Twelve persons were observed for 2 hours each, for a total of 24 hours of observations,  
1534 or 12 hours at two different facilities. At the primary care facility personnel filled a given position  
1535 but covered a wide range of activities in that role, while at the specialty care facility the tasks  
1536 performed by a given worker by job title was more specialized given their work in medicine,  
1537 emergency medicine, and/or oncology (154, 162). In addition, the appointment-based structure of  
1538 both veterinary clinics introduced variability in the amount of animal contact and other tasks  
1539 performed on a given day. As a result, the type and variety of tasks performed at the general  
1540 practice varied far more than the specialty care facility. Despite the differences in tasks, this study  
1541 provides what we believe to be one of the first task-based observation studies in the clinical  
1542 veterinary setting and as a result provides new data on the potential high-risk activities present in  
1543 this line of work.

1544 **CONCLUSION**

1545       Physical and ergonomic hazards are prevalent in the work of small animal veterinary  
1546 workers. Of those hazards present, NSIs, which are often caused by recapping needles, are the  
1547 most common injury types. Other potential sources of injury such as animal bites and scratches  
1548 and musculoskeletal disorders related to direct animal contact including moving, lifting or  
1549 positioning an animal for care are also seen commonly in the clinical veterinary setting. These  
1550 hazards can be reduced with increased knowledge of animal behavior, use of safety devices such  
1551 as muzzles, gloves, utilizing assistance by other personnel and/or conditioning animals to  
1552 cooperate with a given procedure. The establishment of a formal program that outlines areas of  
1553 injury risk as well as preventative measures, including safe needle handling, the importance of  
1554 body positioning when working, as well as tools on interpreting animal behavior and using  
1555 appropriate safety equipment to prevent ARIs and NSIs can help to improve worker safety by  
1556 increasing competency in various techniques as well as improving safety culture. Though ARIs  
1557 and NSIs are an inherent risk in veterinary work, steps can be taken to reduce the incidence. We  
1558 encourage personnel to work with occupational health professionals to reduce injury outcomes on  
1559 the job.

1560 **Footnote**

1561 <sup>a</sup>GoPro HERO 11.0 MP Action Camera. GoPro, Inc., USA

1562 <sup>b</sup>Microsoft Office Excel 2007, Microsoft, Redmond, WA, USA

1563 <sup>c</sup>RStudio. R version 3.3.3. 2017 The R Foundation for Statistical Computing Platform

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1566 CHAPTER 5: PREVALENCE OF EXPOSURES TO OCCUPATIONAL  
1567 HAZARDS IN SMALL ANIMAL VETERINARY SETTING,  
1568 WASHINGTON STATE

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1585 ABSTRACT

1586 **Objective** To characterize the prevalence of injury and illness as well as the sources of these  
1587 injuries among small animal veterinary personnel in Washington State.

1588 **Materials and Methods:** We conducted a cross-sectional survey assessing occupational injury  
1589 and illness history as well as risk factors for injury among small animal veterinary personnel in  
1590 Washington State. Between August 1, 2015 and March 1, 2017, an online survey was advertised  
1591 to veterinary personnel in the state. The survey tool collected information on work history, injury  
1592 prevalence, personal protective equipment (PPE) use, as well as information on safety culture  
1593 and/or climate and other hazards present in the clinical veterinary environment.

1594 **Results** Fifty-eight persons completed the survey in its entirety, including 23 veterinarians and 35  
1595 veterinary technicians and assistants. Eighty three percent of respondents reported at least one  
1596 animal-related injury (ARI) in their career while 66% reported at least one needlestick or sharps  
1597 related injury (NSI). Cats were reported as the most common source of animal-related injuries.  
1598 Less than one-fifth of participants (n=10, 17%) were familiar with infectious disease Veterinary  
1599 Standard Precautions Compendium created by the National Association of State Public Health  
1600 Veterinarians. Just over two-thirds (n=37, 67 %) of participants reported always or often washing  
1601 their hands after setting up a stool sample for microscopic evaluation. A majority of participants  
1602 responded favorably to safety culture questions used in a previous assessment of veterinary  
1603 workplace safety culture in Minnesota, though values from the validated Nordic Safety Climate  
1604 Questionnaire (NOSACQ-50) suggested an need for immediate improvement in safety climate.  
1605 The presence of an in-office occupational health and/or training programs, was the only clinically  
1606 significant finding in our study that was also found to be statistically significant between  
1607 veterinarians and veterinary support staff.

1608 **Conclusions:** Small animal veterinary personnel in Washington State commonly encounter a  
1609 variety of occupational hazards as a result of their work in veterinary practice, placing this  
1610 workforce at increased risk of occupational injury and/or illness. Formal occupational health  
1611 training highlighting major hazards and modes of prevention are needed to reduce the incidence  
1612 of these outcomes in the veterinary setting.

1613

1614 INTRODUCTION

1615         The study of the occupational health of animal care workers is an understudied area in the  
1616 realm of occupational safety and health in comparison to other high-risk occupations such as in  
1617 the construction and labor industries (20, 94, 97, 141, 163-165). Recently the National Institute for  
1618 Occupational Safety and Health (NIOSH) update their National Occupational Research Agenda  
1619 (NORA) relocating animal care workers to the healthcare and social assistance (HCSA) sector  
1620 with other healthcare professionals(166). This new HCSA agenda was then updated to include the  
1621 occupational hazards present in veterinary medical and animal care worker settings that were both  
1622 shared among all groups represented in this sector as well as those that were unique to animal care  
1623 workers. Unique hazards included animal-related injuries (ARIs), zoonotic disease risks, and  
1624 reproductive hazards while shared hazards included musculoskeletal disorders (MSDs) and  
1625 needlestick/sharps related injuries (NSIs). Overall, the research agenda called for work that both  
1626 identifies and addresses sources of occupational injury and illness in animal care work.

1627         Our previous work suggests that given the uniqueness of veterinary medical and animal  
1628 care worker researchers must move beyond the traditional occupational safety and health  
1629 approaches and apply a more holistic One Health approach to workplace safety and health  
1630 assessments (Chapter 1). The proposed One Health Occupational Safety and Health (OHOSH)  
1631 model outlines the human, animal, behavioral, an environmental factors that influence injury  
1632 prevalence. Thus far this model has only been used to assess physical hazards, more specifically  
1633 ARIs and NSIs. While it is important to determine the factors that predispose one to injury it is as  
1634 important to first confirm an elevated prevalence of the injury type of interest in the study  
1635 population.

1636           Veterinary personnel are exposed to a variety of hazards as a result of their work with  
1637 animals(59). The most prominent of these hazards are those that cause physical trauma, including  
1638 animal bites, scratches and needlesticks (46, 56). To date numerous studies have assessed these  
1639 types of hazards in a variety of veterinary occupational settings among the variety of workers that  
1640 make up the veterinary medical and animal care workforce(3, 28, 30, 45). These studies confirm  
1641 that there is a high prevalence of physical injuries including ARIs and NSIs among veterinary  
1642 personnel with an even higher prevalence reported in veterinary support staff, i.e. veterinary  
1643 technicians and assistants. Potential predisposing factors related to occupational injury in the  
1644 veterinary setting are said to include age, years of experience in veterinary practice, and level of  
1645 physical activity (28, 29). These studies, however, did not identify individual behavioral factors  
1646 that could be related to injury occurrence. In addition, no such study has yet to include personnel  
1647 from the Pacific Northwest.

1648           This study set out to assess injury prevalence and risk factors associated with ARIs and  
1649 NSIs as well as other causes of occupational injury and illness in small animal veterinary setting  
1650 in Washington State. Workplace safety culture and safety climate which describe the thoughts and  
1651 beliefs held by members of a given workplace, as well as the profession as a whole as well as the  
1652 value placed on workplace safety in a given organization respectively, were also assessed as a  
1653 means to explain the prevalence of these injuries in this setting (19, 110, 167). This study is part  
1654 of a larger project aimed at preventing injuries in veterinary workers called the Prevention of  
1655 Injuries in Veterinary Occupational Tasks (PIVOT) study. Other study methods included  
1656 veterinary worker and pet owner focus groups, and worker task observation. This study was  
1657 approved by the Institutional Review Board at the University of Washington.

1658 MATERIALS AND METHODS

1659 STUDY DESIGN AND SUBJECT RECRUITMENT

1660 A statewide population-based survey was advertised to members of the veterinary profession  
1661 specializing in small animal care between August 1, 2015, and February 1, 2017. The study was  
1662 open to all veterinary personnel in the state. An attempt was made to recruit these personnel via a  
1663 variety of methods. Recruitment calls were made to all known small animal veterinary clinics in  
1664 the state from June 27, 2016 through September 13, 2016, n=830. Study team members used a  
1665 script to introduce and advertise the study as well as provided detailed information on registering  
1666 for the various activities to either the clinic manager or owner. If either were unavailable, this  
1667 message was left with a receptionist. If there was no answer a short message was left with a  
1668 callback number. Three attempts were made prior to marking a clinic unreachable. Recruitment  
1669 calls served two main purposes: raise awareness of the study as well as collect correct contact  
1670 information for the facilities to boost advertising and recruitment efforts via the dissemination of  
1671 follow up emails and hard copy mailings. Each recruitment call was followed by an email  
1672 confirmation containing pertinent information regarding the study including a study flyer and  
1673 instructions to forward to all veterinary personnel in a given facility. In addition to recruitment  
1674 calls, an email was sent to all 1901 veterinarians licensed in Washington State and/or who were  
1675 members of the state's veterinary medical association for which the study team had an email  
1676 address. Finally, hard copy mailings of the survey with a cover letter and flyers were sent out as  
1677 requested by phone contacts as well as to those facilities that could not be reached by phone. Online  
1678 surveys were operated by the Research Electronic Data Capture (REDCap) data capture tool hosted  
1679 at the University of Washington (168). REDCap (Research Electronic Data Capture) is a secure,  
1680 web-based application designed to support data capture for research studies, providing 1) an  
1681 intuitive interface for validated data entry; 2) audit trails for tracking data manipulation and export

1682 procedures; 3) automated export procedures for seamless data downloads to common statistical  
1683 packages; and 4) procedures for importing data from external sources.

#### 1684 ONLINE SURVEY TOOL

1685 A 50-item survey assessing injury prevalence as well as safety culture, climate, and practices was  
1686 made available to all small animal veterinary personnel in Washington State via a clinic-based  
1687 recruitment strategy (See Appendix A-7). Survey questions covered a variety of occupational  
1688 hazards with an emphasis on physical hazards including ARIs and NSIs (Appendix A-7).  
1689 Questions regarding other hazards included the prevalence and physical location of  
1690 musculoskeletal disorders, the frequency by which personnel conducted specific tasks that might  
1691 increase infectious disease transmission risk, as well as the frequency by which specific hygiene  
1692 practices were conducted. The survey ended with a set of questions aimed at assessing both safety  
1693 culture and safety climate. Safety culture of the clinical veterinary setting was assessed using a  
1694 face-validated scale used in previous work in Minnesota(3). This scale consisted of a variety of  
1695 questions assessing a respondent's perceptions of themselves, their co-workers and employers in  
1696 relation to safety practices. Safety climate on the other hand was assessed using a validated 50-  
1697 item Nordic Safety Climate Questionnaire (NOSACQ-50) scale (88). Twenty-four questions from  
1698 the NOSACQ-50 representing dimensions 1, 5, and 6 pertaining to "management safety priority  
1699 and ability" (9 items), "workers' safety priority and risk non-acceptance" (7 items), and "peer  
1700 safety communication learning, and trust in safety ability" (8 items) were used to evaluate key  
1701 aspects of safety climate in the veterinary profession(88). Members of the study team piloted the  
1702 survey and online platform prior to the study launch.

#### 1703 DATA ANALYSIS

1704 Data were limited to completed surveys. Using a combination of the job title and education status  
1705 variables the study population was divided into two populations: veterinarian and veterinary

1706 support staff including veterinary technicians and assistants. Summary statistics of reported  
1707 demographic information, work history, injury prevalence, safety culture, practices, and climate  
1708 were calculated and presented by job group and for the entire study population. Questions using  
1709 Likert scales to assess agreement with a statement or frequency of a given behavior were collapsed  
1710 into the two highest categories, for example, strongly agree and agree or always and often were  
1711 combined and the proportion summarized. NOSAC Q questions were calculated and scores  
1712 interpreted according to the original creator's suggestions (167). Pearson's chi-squared tests were  
1713 used to compare the distributions for categorical variables across the two job descriptions while  
1714 Student's t-test was used to test the mean difference between veterinarians and veterinary support  
1715 staff. All data were stored in in a data management software program<sup>a</sup> and analyzed using a  
1716 statistical analysis software program <sup>b</sup>.

## 1717 RESULTS

1718 Ninety-three veterinary personnel started the survey with fifty-eight veterinary personnel  
1719 completing it out of the estimated 7500 personnel in the state (0.80% response proportion with a  
1720 62% completion rate). Participants were predominately middle-aged, at 39 years old on average  
1721 (range: 21-77 years old), female (55, 95%), and white (n=52, 90%) (Table 1). Forty percent (n=23)  
1722 were veterinarians as denoted by education status, more specifically possessing a doctoral  
1723 veterinary degree, and/or job title while the remainder were characterized as support staff (n=35)  
1724 including veterinary technicians and assistants fulfilling a variety of roles in the clinic (Table 2).  
1725 Nearly all the participants (n=56, 97%) owned at least one pet with 80% (n=45) owning dogs and  
1726 75% (n=42) owning cats, suggesting that on average each participants owned at least one cat or  
1727 dog as a pet.

1728 TABLE 5-1: CHARACTERISTICS OF STUDY POPULATION

	Veterinarian, n=23	Veterinary Support Staff, n=35	All, n=58
<b>Age, mean (range)***</b>	45.7 (31-77)	33.6 (21-57)	39 (21-77)
<b>Gender, N (%)</b>			
<b>Female</b>	21 (91)	34 (97)	55 (95)
<b>Race, N (%)</b>			
White, Non-Hispanic	21 (91)	27 (77)	48 (83)
Black, Non-Hispanic	0 (0)	1 (3)	1 (2)
White, Hispanic	0 (0)	4 (11)	4 (7)
Asian	0 (0)	1 (3)	1 (2)
Native American	0 (0)	1 (3)	1 (2)
Other	1 (4.3)	0 (0)	8 (3)
Refused	1 (4.3)	0 (0)	1 (2)
<b>Education Level, N (%) ***</b>			
High School	0 (0)	8 (23)	8 (14)
Associate's	0 (0)	11 (31)	11 (19)
Bachelor's	0 (0)	13 (37)	13 (22)
Master's	0 (0)	2 (6)	5 (3)
Doctoral Degree	23 (100)	0 (0)	23 (40)
<b>Pet Ownership, N (%)</b>	23 (100)	33(94.3)	56 (97)
<b>Pets Owned, N (%)</b>			
Dog	18 (78)	27 (82)	45 (80)
Cat	18 (78)	24 (73)	42 (75)
Other			

1729 \*Statistically significant, p-value<0.05

1730 \*\*Statistically significant, p-value<0.01

1731 \*\*\*Statistically significant, p-value<0.001

1732

1733 TABLE 5-2: VETERINARY WORK HISTORY AND PET OWNERSHIP STATUS

	Veterinarian, n=23	Veterinary Support Staff, n=35	All, n=58
<b>Work History, mean (range)</b>			
Years worked in veterinary medicine	21 (5-46)	8 (0.1-34)	13 (0.1-46)
Years worked in small animal practice***	19 (3-46)	9 (0.1-35)	13 (0.1-46)
Average days worked per week	4 (2-6)	5 (2-7)	4. (2-7)
Average hours worked per week	40 (15-90)	38 (20-58)	39 (15-90)
Average patient contacts per day	17 (3-40)	19 (4-75)	18 (3-75)

<b>In office training program prior to work, N (%)</b>			
Program covers animal contact and Needle Handling	9 (39)	10 (29)	19 (33)
Program only covered animal contact	2 (9)	9 (26)	11 (19)
None	12 (52)	16 (46)	28 (48)
<b>Formal occupational health program at work, N (%)**</b>	8 (35)	16 (46)	24 (41)

1734 \*Statistically significant, p-value<0.05

1735 \*\*Statistically significant, p-value<0.01

1736 \*\*\*Statistically significant, p-value<0.001

1737

1738 WORK HISTORY AND OCCUPATIONAL HEALTH TRAINING

1739 Participants were on average in the middle of their careers with 13 years of experience in veterinary  
 1740 medicine and/or small animal work with a range of a few months to 46 years. Participants reported  
 1741 working 4 to 5 days a week on average and 39 hours in a given week (Table 2). The presence of  
 1742 some form of in-office occupational health program was endorsed by 24 (41%) of participants.  
 1743 Eleven (19%) and 19 (33%) respondents reported some form of occupational health training  
 1744 covering either animal restraint, needle handling, or a combination of the two on the job.

1745 OCCUPATIONAL INJURIES

1746 Eighty-three percent of participants reported having at least one ARI which was defined as an  
 1747 incident where a worker was “injured by an animal” on the job, e.g. bites, kicks, scratches, etc. in  
 1748 their career [19 (83%) veterinarians and 29(83%) veterinary support staff] (Table 5-2). Sixty-six  
 1749 percent of participants reported at least one NSI in their career [13 (57 %) veterinarians versus 25  
 1750 (71%) support staff]. Forty-seven percent, n=27, reported at least one musculoskeletal disorder  
 1751 (MSD) [12 (52%) veterinarians versus 15(43% support staff] (Table 2). Annual incidence of ARIs  
 1752 and NSIs ranged from 0-300 ARIs and 0-10 NSIs. Among those with MSDs, 17 (63%) reported  
 1753 that their conditions were ongoing while 11 (41%) reported they had resolved suggesting that some  
 1754 participants experienced more than one MSD. Reported body parts included the back (n=18, 31%),

1755 which was the most common body location noted, as well as the shoulder and other anatomic  
 1756 locations. Animal sources of injury in the small animal setting were primarily due to cats (n=42,  
 1757 72%) followed by dogs (n=2, 35%), although other species including exotics and pocket pets were  
 1758 also listed, 6(10%).

1759 *TABLE 5-3: INJURY PREVALENCE †*

	Veterinarian, n=23	Veterinary Support Staff, n=35	All, n=58
<b>Any ARI</b>	19 (83)	29 (83)	48 (83)
ARI per year, <b>mean (range)</b>	7.2 (0-60)	14.1 (0-300)	11 (0-300)
<b>Any NSI</b>	13 (57)	25 (71)	38 (66)
NSI per year, <b>mean (range)</b>	1.5 (0-10)	2.2 (0-8)	1.9 (0-10)
<b>Any MSD, N (%)</b>	12 (52)	15 (43)	27 (47)
MSD Ongoing	7 (30)	10 (29)	17 (29)
MSD Resolved	5 (22)	6 (17)	11 (19)
Acute source	7 (30)	8 (23)	15 (26)
Chronic source	8 (35)	8 (23)	16 (28)
<b>Body Part affected, MSD, N (%)</b>			
Back	7 (30)	11 (31)	18 (31)
Shoulder	4 (17)	3 (9)	7 (12)
Other	7 (30)	6 (17)	13 (22)
<b>Common Source of Animal Injury, N (%)</b>			
Dog	8 (35)	12 (34)	20 (35)
Cat	17 (74)	25 (71)	42 (72)
Other	12 (9)	4 (11)	6 (1)

1760 †No statistically significant differences identified

1761

1762 **INFECTIOUS DISEASE RISK**

1763 When assessing infectious disease risk it is important to determine the frequency by which  
 1764 protective practices are utilized such as personal protective equipment (PPE) and proper hand  
 1765 hygiene practices. When questioned in handwashing practices prior to eating, drinking, chewing  
 1766 gum, and other high hand to mouth activities, 22-91% of participants reported always or often

1767 handwashing prior to these activities (Table 3). When performing tasks that likely increased  
 1768 exposures to potentially infectious organisms including collecting and/or preparing stool  
 1769 specimens, collecting urine, restraining animal patients for various procedures, cleaning kennels,  
 1770 and doffing gloves after an activity, 57-88% of respondents reported either always or often  
 1771 handwashing after these activities. PPE use while performing these tasks varied greatly but  
 1772 included the use of thick, bite proof gloves, latex or disposable gloves, goggles, etc. Of the various  
 1773 types of PPE available, 3-83% of all respondents reported using any form of PPE while performing  
 1774 potentially risky tasks in the small animal setting. The highest proportions of PPE use were  
 1775 employed for the activities of taking radiographs, 48 (83%), and collecting stool specimens, 47  
 1776 (81%). Only 17% of participants, 14 (17%) veterinarians and 6 (17%) support staff, were familiar  
 1777 with the Veterinary Standard Precautions Compendium published by the National Association of  
 1778 State Public Health Veterinarians aimed at preventing occupational injury and illness in the  
 1779 veterinary profession (49, 50).

1780 *TABLE 5-4: INFECTIOUS DISEASE RISKS†*

	Veterinarian, n=23	Veterinary Support Staff, n=35	All, n=58
<b>Always/Often hand wash before...., N (%)</b>			
Eating	22 (96)	31 (89)	53 (91)
Drinking	14 (61)	18 (51)	32 (55)
Chewing gum	7 (17)	6 (30)	13 (22)
<b>Always/Often hand wash after..., N (%)</b>			
Stool specimen collection	18 (78)	30 (86)	48 (83)
Stool specimen preparation for analysis (setting up fecal float)	15 (65)	24 (69)	39 (67)
“Free catch” urine collection	18 (81)	32 (91)	30 (88)
Restraining animal patient	17 (74)	25 (71)	42 (72)
Cleaning kennels/clinic	15 (65)	26 (74)	41 (71)
Removing gloves	14 (61)	19 (54)	33 (57)
<b>Handwashing materials, N (%)</b>			
Bar Soap	2 (9)	1 (3)	3 (5)

Liquid Soap	23 (100)	32 (91)	55 (95)
Hand Sanitizer	13 (57)	23 (66)	36 (62)
Chlorhexidine scrub	16 (70)	19 (54)	35 (60)
Rinse with water only	2 (9)	4 (11)	6 (10)
Other	0 (0)	1 (3)	1 (17)
<b>Used any form of PPE when performing the following tasks, N (%)</b>			
Collecting Blood Specimen	5 (22)	11 (3)	16 (28)
Collecting Stool Specimen	19 (83)	28 (80)	47 (81)
While restraining animals	4 (17)	14 (40)	18 (31)
Cleaning Kennels*	9 (39)	25 (71)	34 (59)
Conducting Dental Procedures	17 (74)	21 (60)	38 (66)
Taking Radiographs	19 (83)	29 (83)	48 (83)
<b>Familiar with the NASPHV Compendium, Veterinary Standard Precautions, N (%)</b>			
	4 (17)	6 (17)	10 (17)
<b>Eat in a room separate from animals, N (%)</b>			
Yes	13 (57)	20 (57)	33 (57)
Sometimes	6 (26)	6 (17)	12 (21)
<b>Workplace clothing and clothing care, N (%)</b>			
Wears a uniform or specific work clothes*	16 (70)	33 (94)	49 (85)
Launder clothes at work	3 (13)	4 (11)	7 (12)
Launder clothes at home	21 (91)	34 (97)	55 (95)

1781 \*Statistically significant, p-value<0.05

1782 \*\*Statistically significant, p-value<0.01

1783 \*\*\*Statistically significant, p-value<0.001

1784 SAFETY CULTURE AND CLIMATE

1785 Safety culture questions used previously in a cross-sectional assessment of Minnesotan veterinary

1786 personnel assessed worker perception of their own abilities as well as those of their co-workers

1787 and employers (3). When questioned on the preventability of ARIs, participants strongly agreed

1788 or agreed with all statements regarding their abilities, as well as their boss' and co-workers ability

1789 to avoid injuries with personal perceptions having the largest proportion of agreement (48, 82%),

1790 followed by the employer's perception (44, 76%) and the co-workers (41, 71%) (Table 5). The

1791 highest proportions of agreement overall were expressed by all personnel when discussing animal  
 1792 restraint techniques and the availability of equipment needed for animal restraint in the facility.  
 1793 Throughout this set of safety culture questions, personnel's self-assessments were consistently the  
 1794 highest proportion reported while assessments of co-workers' beliefs were consistently the lowest  
 1795 in all occasions.

1796 Questions assessing safety climate, i.e. the values placed on safety by a given organization,  
 1797 were taken from the 50-item Nordic Safety Climate Survey(167). Three dimensions consisting of  
 1798 24 questions from the NOSACQ yielded average scores of 3.05 (1.8-4.0) for all three scales as  
 1799 well as 2.74 (1.9-3.6), 3.2 (2-4), and 3.08 (2-3.7) for dimensions 1, 5, and 6 respectively. When  
 1800 interpreting scores, higher values are better with scores reaching 3.30 or above indicating an  
 1801 excellent safety climate for a given dimension, 3-3.30 suggesting a fair safety climate and scores  
 1802 under 2.70 suggesting a need for immediately intervention to improve it (167). There were no  
 1803 statistically significant differences between the distributions of safety climate scores between the  
 1804 veterinarians and veterinary support staff surveyed.

1805 *TABLE 5-5: WORKPLACE SAFETY CULTURE AND CLIMATE†*

	Veterinarian, n=23	Veterinary Support Staff, n=35	All, n=58
<b>Strongly Agree/Agree with the following Statements. (MNVOSH Scale), N (%)</b>			
My employer believes that animal-related injuries are avoidable.	20 (87)	24 (69)	44 (76)
My co-workers believe that animal-related injuries are avoidable.	18 (78)	23 (66)	41 (71)
I believe that animal-related injuries are avoidable.	22 (96)	26 (74)	48 (83)
My employer takes adequate preventive measures against animal-related injuries in the workplace.	18 (78)	30 (86)	48 (83)

My co-workers take adequate preventive measures against animal-related injuries in the workplace.	16 (70)	28 (80)	44 (76)
I take adequate preventive measures against animal-related injuries in the workplace.	20 (87)	32 (91)	52 (90)
I take appropriate preventive measures against animal-related injuries in the presence of the owners of the animal.	19 (83)	33 (9)	52 (90)
I feel comfortable refusing to provide services when appropriate help or animal restraint is not available.	18 (78)	29 (83)	47 (81)
I feel confident when applying restraint techniques on animals.	20 (87)	33 (94)	53 (91)
I believe it is possible to predict most aggressive animal behavior.	20 (87)	25 (71)	45 (78)
Sufficient time is allowed in the schedule to perform adequate animal restraint.	18 (78)	22 (63)	40 (69)
There is adequate equipment for proper animal restraint.	21 (91)	31 (89)	52 (90)
There is adequate staff help available for proper animal restraint.	13 (57)	26 (74)	39 (67)
There is good communication among staff regarding injury prevention.	16 (70)	30 (86)	46 (79)
<b>Mean NOSACQ-50 SC scores, mean (range)</b>			
Overall (Dimensions 1, 5, and 6)	3.0 (1.7-4)	3.1 (1.9-4.0)	3.1 (1.8-4.0)
Dimension 1: Management safety priority and ability	2.7 (1.9-3.6)	2.8 (1.9-3.6)	2.7 (1.9-3.6)
Dimension 5: Workers' safety priority and risk non-acceptance	3.2 (2.4-3.9)	3.2 (2.0-4.0)	3.2 (2.0-4.0)
Dimension 6: Peer safety communication, learning, and trust in safety ability	3.0 (2-3.7)	3.0 (2.2-3.6)	3.1 (2.0-3.7)

1806 †No statistically significant differences identified

## 1807 DISCUSSION

1808 Occupational hazards present in the veterinary profession affect veterinarians and veterinary  
1809 support staff alike (3, 28-30, 43, 45, 46, 55, 59). Our study set out to identify the prevalence of  
1810 common hazards with the goal of quantifying differences among workers in the veterinary  
1811 workforce. Age, education level, total years worked in small animal clinic, and the presence of a

1812 formal occupational health program were the only categories that were statistically significant  
1813 between these two groups. A higher proportion of veterinary workers experienced an ARI in their  
1814 career than an NSI. Cats were the most commonly implicated source of animal related injury. A  
1815 majority of respondents indicated using some form of PPE when conducting high-risk tasks,  
1816 though less than one fifth of respondents indicated being aware of the Veterinary Standard  
1817 Precautions Compendium created by the NASPHV (49, 50). Safety climate scores ranged from  
1818 poor to excellent with some scores suggesting a need for improvements (167).

#### 1819 PHYSICAL HAZARDS

1820 Animal related injuries were experience by nearly 83% of study participants with no  
1821 statistically significant differences between veterinarians and veterinary support staff, while NSIs  
1822 were experienced by nearly two-thirds (66%) of all study participants. Other cross-sectional  
1823 studies suggested that NSIs were more prevalent than ARIs with nearly 100% of study participants  
1824 reporting an NSI at some point in their career (3, 28, 30, 40, 45, 46). A review of worker  
1825 compensation claims in Washington State showed no reports for NSIs; however, a majority of  
1826 worker claims were in fact due to ARIs such as bites and scratches(56). Direct animal contact as  
1827 well as needle use for the administrations of medications and vaccines are common practices in  
1828 veterinary medicine (44-47, 53, 147). In addition, these activities precipitate the inherent risk of  
1829 injury present in this workforce (53, 65). Though our study did not confirm a higher prevalence of  
1830 NSIs in comparison to ARIs, this work does suggest that both injury types occur commonly in  
1831 veterinary medicine.

#### 1832 MUSCULOSKELETAL DISORDERS

1833 MSDs were experienced by just less than 50% of study participants. The frequency of MSDs in  
1834 comparison to other occupational injuries has been described previously (56). In Washington State  
1835 and nationwide this injury type accounts for 8-12% of the claims reported annually; however, a

1836 majority of the funds disbursed for workers' compensations are due in part to work-related MSDs  
1837 (56, 67). It is important to note that the sources of these injuries are often as a result of acute ARIs  
1838 but can be as a result of chronic overuse injuries (134, 160, 169-172). As a result, an emphasis  
1839 must be placed on preventing and/or healing acute ARIs in order to affectively reduce the incidence  
1840 of chronic and costly MSDs.

#### 1841 INFECTIOUS DISEASE RISKS

1842 When reviewing infectious disease risk poor hand hygiene practices and PPE use were  
1843 prevalent. Though personnel reported always or often washing their hands before eating, a  
1844 substantially smaller proportion reported handwashing prior to conducting other high hand contact  
1845 activities such as drinking or chewing gum, placing them at increased risk for zoonotic diseases  
1846 that may be present in the clinical veterinary setting (49, 84, 140). Even more concerning were the  
1847 third of respondents that did not select either always or often washing their hands after preparing  
1848 a stool specimen for analysis. Zoonotic pathogens in small animal veterinary medicine include a  
1849 variety of parasites and bacterial and viral microbes, many of which have a fecal oral route of  
1850 transmission (85, 148). Though a majority of participants indicated using some form of PPE when  
1851 conducting tasks that placed them at increased risk of contracting an infectious disease, only 57%  
1852 indicated handwashing after doffing gloves suggesting a breakdown in risk management(140). A  
1853 possible contributing factor is the lack of familiarity with the Veterinary Standard Precautions  
1854 Compendium that outlines sources of disease risks and modes to reduce the incidence of  
1855 transmission(3).

#### 1856 SAFETY CULTURE

1857 Workplace safety culture involves the practices and beliefs maintained by workers in a  
1858 given setting while the safety climate refers specifically to the values placed on safety by an  
1859 organization and resulting workplace safety policies (19, 110, 167). In combination, these features

1860 of the workplace environment can have positive or negative impacts on workplace safety and  
1861 injury incidence (92, 93, 140, 173-177). In the veterinary profession, safety culture is often poor  
1862 and/or in need of improvement. Using three dimensions (1, 5, and 6) from the NOSACQ-50, we  
1863 were able to determine areas in which safety climate and potentially the safety culture can be  
1864 improved. This study found that dimension 1, “Management safety priority and ability”, in  
1865 comparison to the other dimensions were in need of immediate improvement, though no  
1866 statistically significant differences seen in the two veterinary groups assessed(88). The  
1867 NOSACQ50 has been translated into 30 languages and used in numerous countries around the  
1868 world as well as a variety of different worker settings making it the premier scale for assessing  
1869 workplace safety climate (167). This study is, however, the first time this scale has been used in  
1870 the veterinary setting (Kines, personal communication). Improving the workplace safety climate  
1871 and culture is imperative to reducing worker injury incidence (87-91, 99, 111, 178). The need for  
1872 immediate intervention in the first dimension in our study highlights the importance of managerial  
1873 support in promoting safety climate in any workplace setting(76, 88, 96, 174, 179). Additional  
1874 studies are needed to determine the primary source of the existing culture that directly determine  
1875 worker safety behavior as well as potential solutions for improving the safety climate and culture  
1876 within the profession with the ultimate goal of reducing workplace injury and incidence. All  
1877 members of the veterinary team including the practice manager and/or owner play a key role in  
1878 adjusting both safety culture and climate, and thus should be encouraged to participate in any and  
1879 all activities aimed at improving these features to ensure success.

#### 1880 LIMITATIONS

1881           Limitations of this study are primarily due to the low response rate. Fifty-eight persons  
1882 completed the survey in its entirety out of the estimated 7500 veterinary personnel in the state of

1883 Washington (Joy, Personal communication) yielding a 0.80% response rate. Potential reasons for  
1884 such a low response rate are likely due in part to recruitment strategies that targeted participants at  
1885 the clinic-level and not the individual level. In addition an overall lack of interest in the subject  
1886 matter may have also played a role in the response rate. Finally, fear of government regulations  
1887 resulting from this work may have also played a role as seen in previous studies on this worker  
1888 population (3). As a result, these study findings are not representative of the personnel practicing  
1889 in the state. Despite this major limitation, this study contributes to the literature by both confirming  
1890 values seen previously in regard to the high prevalence of ARIs, NSIs, and other occupational  
1891 hazards exposures while providing new data on the safety climate present in the veterinary field.

## 1892 CONCLUSION

1893 Occupational hazards present in the small animal veterinary clinical setting are ubiquitous. Our  
1894 study confirmed findings found previously in the literature as well as expanded upon the  
1895 knowledge of the safety culture and climate present in veterinary medicine via the use of a  
1896 validated survey tool. The often-low safety climate score suggests room for improvement in the  
1897 realm of occupational safety and health. Formal occupational safety and health programs are  
1898 needed to improve safety practices in the small animal setting. These programs should include  
1899 training on appropriate PPE use, key preventative practices, and modes for improving both safety  
1900 culture and safety climate in the clinic. This program must also take into consideration the human,  
1901 animal, behavioral and environmental factors present in order to effectively improve workplace  
1902 safety practice (Chapter 1-3). Through these methods, we may work to address the issue of the  
1903 incidence of ARIs and NSIs in the veterinary industry.

## 1904 **Footnote**

1905 <sup>a</sup>Microsoft Office Excel 2007, Microsoft, Redmond, WA, USA

- 1906 <sup>b</sup>RStudio. R version 3.3.3. 2017 The R Foundation for Statistical Computing Platform
- 1907 Personal Communication
- 1908 Kines, Peter. Instrument Author. Nordic Occupational Safety Climate Questionnaire (NOSACQ-
- 1909 50). October 18, 2015.
- 1910 Joy, Candace. EVP Washington State Veterinary Medical Association. September 21, 2015
- 1911

## CONCLUSIONS AND RECOMMENDATIONS

Sources of injury and illness in the small animal clinical veterinary setting are multifactorial (3, 28, 29). More specifically, these sources span the realms of human, animal, behavioral, and environmental health (Chapter 1-5). As a result, the One Health approach is essential to understanding the primary causes of occupational injury and illness in this workplace setting in order to effectively improve safety behavior and reduce the incidence of these events.

Our study of small animal veterinary workers suggests that occupational injuries including NSIs, ARIs and even MSDs that resulted from either acute injury or chronic overuse activities, were caused by a variety of factors. These factors included but were not limited to an unhealthy safety culture, lack of competency in animal behavior, restrictions of the physical environment, lack of assistance in completing a task and/or a perception of the need to work independently to meet scheduling demands, the presence of the owner in the examination or treatment area, and break downs in communication among members of the veterinary team as well as between veterinary personnel and the pet owner (Chapters 2-5). Furthermore, we found that ARIs and NSIs were prevalent in our study population and that exposures including repeated needle handling and recapping and direct contact with animal patients were likely the source of such injuries in this worker group. Feasible solutions to negative behavior patterns remain unidentified in part among the study population whom often cited the need for severe adverse consequences in order to effectively change the behaviors that predisposed them to injury (Chapter 2). Despite these findings, however, we still see potential for an educational intervention to positively impact safety behaviors in this occupational group.

1933 IMPROVING SAFETY BEHAVIORS: INTERVENTION DIRECTIONS

1934 Educational interventions provide a feasible solution for improving safety practices in animal care  
1935 workers as evident by successes in other related industries (100, 180-184). Our study suggests that  
1936 such interventions aimed at improving safety practices in the small animal clinical setting should  
1937 focus on three primary areas: communication, animal behavior and safety culture. We outline the  
1938 components of and implementation strategies for this program below.

1939 COMMUNICATION

1940 An educational intervention must aim to improve intra-veterinary team as well as veterinary  
1941 worker-pet owner communication pathways, empowering all parties involved to ask questions or  
1942 express doubt without consequence (Chapters 2 and 3) (32, 76, 88, 99, 185, 186). Within the  
1943 veterinary team, personnel should be encouraged to communicate the need for assistance as well  
1944 as concerns regarding personal or overall safety when engaging in a given activity. Furthermore,  
1945 mutual respect should be established within the veterinary team in order to remove any feelings of  
1946 inferiority or expendability (Chapter 2). The treatment plan and approach must then be  
1947 communicated to the owner and time taken to address their questions and concerns. Ample time  
1948 must be budgeted in the workplace to ensure these teachings are implemented appropriately.  
1949 Achieving this aim may require clinics to reorganize their appointment schedules to be effective.  
1950 Buy-in must also be achieved by all members of the veterinary team especially clinic managers (if  
1951 available) and the clinic owner(s) who play an integral role in both the adoption and enforcement  
1952 of the new policies. Without their participation, studies suggest that the safety culture is unlikely  
1953 to change (92-100).

1954 ANIMAL BEHAVIOR

1955 The role of the animal, more specifically animal behavior, in the injury pathway for worker ARIs  
1956 and NSIs is unavoidable and the primary factor that makes animal care work unique. Thus, any

1957 and all training aimed at reducing these injury types must focus on building and/or improving  
1958 competency in animal behavior. Formal training in animal behavior is a crucial part of the training  
1959 of veterinary personnel; however, predicting animal behavior, especially in cats who were  
1960 indicated as the most common injury source, is not fail proof(22, 23, 25, 26, 35). Furthermore, this  
1961 competency may not be emphasized in formal animal care training programs (103, 187, 188).  
1962 Specialties in this realm, require the completion of a formal residency program as well as  
1963 successful completion of a qualifying exam every 10 years to maintain a certification (153, 189).  
1964 Formal training in animal behavior should be made available for all veterinary personnel and  
1965 provide a broad overview of the topic with an emphasis in behavior interpretation and application.  
1966 Veterinary workers, especially those in charge of restraining, handling, or moving or lifting cats  
1967 and dogs at a given time, should receive formal training in animal behavior as well as animal  
1968 restraint. More specifically, behavior training should include the basic principles of animal  
1969 behavior including signs of fear, anxiety, stress, dominance, submission, and aggression in cats  
1970 and dogs (22, 35, 158, 159, 187, 190). Key facial expressions as well as body posturing associated  
1971 with these traits should also be covered in a training program. Low stress handling or  
1972 compassionate care techniques that utilize either chemical restraint and/or gentle restraint or  
1973 operant conditioning methods should be presented to personnel and applied as often as possible  
1974 to reduce the incidence of traumatic experiences that incite aggressive responses in the pet  
1975 patient(s) (23, 25, 35). Furthermore, these skills should be reinforced via periodic continued  
1976 education sessions and practical application in order to prevent injury in the future.

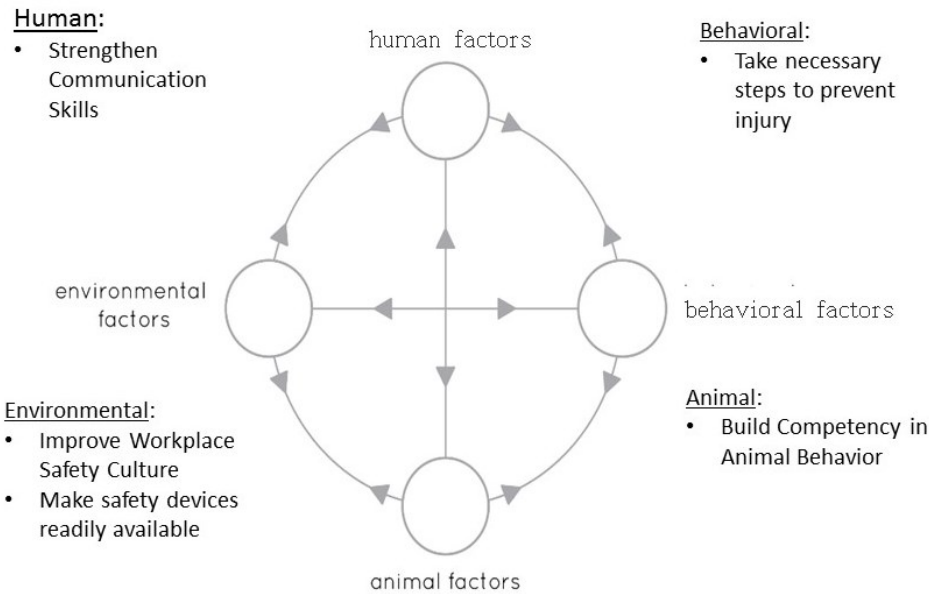
## 1977 SAFETY CULTURE

1978 Safety culture, which includes the common practices and beliefs of a given workplace  
1979 setting, must be improved by fostering a culture where worker health and safety is prioritized over  
1980 all tasks (3, 19, 86, 90, 94, 96, 100, 110, 173-175, 191-195)(Chapters 1-5). In this case, safety

1981 culture directly relates back to communication as well as animal behavior. Thus, improving these  
1982 two areas will directly contribute to the improvement of safety culture especially as it relates to  
1983 improving communication and collaboration between personnel and the pet owner to appropriately  
1984 care for a pet in a way that minimizes stress and resulting aggression. Other team building exercises  
1985 including encouraging safety champions can be used to improve workplace safety culture.  
1986 Management buy-in and participation is crucial to improving safety culture (92-100). Thus,  
1987 additional emphasis s must be placed on administrative staff to lead the charge in improving safety  
1988 culture.

#### 1989 THE PREVENTION OF INJURIES IN VETERINARY OCCUPATIONAL TASKS (PIVOT) STUDY

1990 The intervention phase of the Prevention of Injuries in Veterinary Occupational Tasks  
1991 (PIVOT) study will aim to reduce worker injury through behavior change. This program is based  
1992 on the OHOSH model which outlines the human, animal, behavioral, and environmental factors  
1993 that influence injury in the animal care worker setting (See Figures 1 and 6). A given safety  
1994 behavior be it recapping needles, failing to use a muzzle, or refusing to ask for help will be  
1995 corrected via modules addressing communication, workplace safety culture and animal behavior  
1996 as discussed above. This program should be piloted on a subset of the population prior to  
1997 distributing it widely. Training materials should be made available to all members of the veterinary  
1998 profession, starting when possible during the formal educational phase prior to entry into the  
1999 profession. Refresher courses should be use to reinforce key principles and occur at least every  
2000 three years and extend throughout the career of all personnel. The program should be presented  
2001 using a variety of different media allowing further acceptance of the program by the target  
2002 population.



2003

2004 *FIGURE 6: THE PREVENTION OF INJURIES IN VETERINARY OCCUPATIONAL TASKS (PIVOT) STUDY*  
 2005 *INTERVENTION OUTLINE*

2006 The above figure using the OHOSH model to outline the components of the intervention phase of  
 2007 the PIVOT study.

2008

2009 **IMPLEMENTATION STRATEGIES**

2010 The mode in which an intervention is implemented should be adjusted to meet the needs

2011 and respect the time constraints of this profession (90, 164, 183). Potential possibilities for

2012 implementation include short webinars covering the proposed topics in a series. Accessibility via

2013 the internet and/or smartphones via an app-based platform may further increase accessibility (196-

2014 199). In addition, a short conference or in-person session can be held to address these issues in a

2015 large audience at a given time. Given some of the issues, we experienced with recruitment with

2016 this study, this method maybe difficult to conduct successfully unless paired with an existing

2017 conference; however, if conducting the training at a professional meeting it is important to

2018 appropriately assess concurrent sessions to ensure reasonable attendance. These trainings should

2019 also be implemented at veterinary medical and technology institutions priming future personnel to

2020 enter the workforce with an appreciation for workplace safety and health. Regardless of the model

2021 of implementation, it is important to conduct pre and post surveys to assess knowledge and  
2022 feedback on the intervention content and methods. This step is crucial to evaluate the efficacy of  
2023 the program (183, 200, 201).

## 2024 FUTURE IMPLICATIONS

2025 Physical hazards in the veterinary profession are numerous. Our study assessed the factors  
2026 that influence injury prevalence among small animal veterinarians. Future studies should look to  
2027 gain a deeper understanding of those factors that influence injury prevalence in other areas in the  
2028 profession including equine practice, food animal practices, as well as other animal care worker  
2029 settings. Furthermore, additional studies on other hazards present in the profession including  
2030 chemical, infectious, reproductive, respiratory, and mental health hazards can and should be  
2031 studied in a similar mixed methods fashion in order to identify modifiable factors on which to  
2032 intervene. By understanding the mechanism of the human factors that influence safety behaviors,  
2033 as well as the animal and environmental factors that precipitate injury, scientists can work to  
2034 identify feasible solutions to improve safety outcomes among this workforce. Educational  
2035 interventions highlighting these four areas can then be used to improve safety outcomes.

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*A-1 Veterinary worker focus group/telephone interview*

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Date: \_\_\_\_\_

Meeting time: \_\_\_\_\_AM/PM                      Focus Group # \_\_\_\_\_  
Focus group location: \_\_\_\_\_ Moderator(s): \_\_\_\_\_  
# Participants: \_\_\_\_\_ Male: \_\_\_\_\_ Female: \_\_\_\_\_  
Digital file: \_\_\_\_\_ Total recording time: \_\_\_\_\_ minutes  
Notes: \_\_\_\_\_

**PIVOT Study Focus Group Interview Questions and Outline:**

*Start with greeting and introduction. Define the purpose of the study.*

Thank you very much for agreeing to participate in our The Prevention of Injuries in Veterinary Occupational Tasks (PIVOT) study. The purpose of this focus group is to help further hone in on what the potential barriers are to be identified in the proposed study. The interview will be broken into two sections animal related injuries or ARIs and Needlestick/sharps injuries (NSI). After going through the consent form for today's interview I will ask if you have any questions regarding the interview. If you have additional questions about this study I can answer them at the end of the interview.

This interview should take approximately one hour. I will be recording this conversation. I will discard the recording after reviewing your responses. The interview is set up to jog your memory on your experiences around implementing best practices. This will help us determine your personal opinions as well as overall feelings surrounding this issue.

**Do you have any questions about this process?**

*Answer question. If no (further questions)...Let's begin! Start recording*

Let's start out with introduction. Please introduce yourself and give the group a brief history of your experience at your clinic, i.e. how long you've worked in veterinary practice, etc.

Now moving on to the first set of questions pertains to animal-related injuries. These injuries include but are not limited to bites, kicks, scratches, being stepped on by an animal or crushed between an animal and a fixed object.

*Read questions. Remember to use probes. If a question comes up, feel okay to ask and add to next set.*

- **By a show of hands, how many of you have been injured by an animal on the job?**

- What are the most common injuries you've seen in small animal clinics? ( *no hearsay. personal experience included*)
- Thinking of the commonly occurring injuries you've mentioned, what are some factors that interfere with implementing preventive practices (such as using PPE, muzzle, etc) [to prevent these injuries]?
- Can you think of time that you didn't use some form of a safety feature/protection when working with animals (whether personal like gloves, masks, or animal restraint equipment/personnel)?
  - What was that situation?
  - Why did you choose to not use protection at that time?
  - Were you injured in that instance?
- Can you think of time when you thought did everything correctly, yet you were still injured?
  - What happened in that situation?
  - In retrospect, is there something else you could've done? (*ask if needed*)
- Can you think of any preventatives that you know are suggested in small animal practice but that don't work well in practice?
- Can you think of time you were injured and you weren't using PPE?
  - Why didn't you use it? (*if several instances, "name me a few..."*)
  - What would have made you use PPE in that instance?

The next set of questions refer to needlestick and/or sharps related injuries

*Read questions*

- Can you think of a time when you stuck yourself with a needle while working? What happened in this situation?
- Do you recap needles? (Show of hands, how many people here recap needles?)
- Best practices suggest you should never recap needles, (*but we know it happens all the time*), what would have to change in the clinic to stop personnel from recapping needles?
- Do you report your injuries (of any type) to anyone in your practice? To who do you report?

That was my last question. Do you have any questions for me about this project? *If no questions.....* Thank you so much for your time. I will now hand out your gift cards for participating today. *End recording.*

*Hand out gift cards and dismiss group.*

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*A-2 Veterinary worker focus group background survey*

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## THE PREVENTION OF INJURIES IN VETERINARY OCCUPATIONAL TASKS (PIVOT) STUDY

Thank you for participating in the Center for One Health Research's The Prevention of Injuries in Veterinary Occupational Tasks (PIVOT) study. This study seeks to identify the barriers present in clinical practice as they relate to preventing needlestick/sharps injuries and animal-related injuries. This short survey will be used to collect background data on your history as a worker employed in the veterinary field.

This survey is anonymous and is for all veterinary personnel who participate in the delivery of veterinary medical services. This includes anyone who handles animals such as veterinarians, veterinary technicians, veterinary assistants, etc. You must be at least 18 years old and have worked in the veterinary field for at least 12 months prior to this survey and focus group date to participate.

### A. DEMOGRAPHICS

**This first section covers your general demographic information.**

<p>1. What is your gender?</p> <p>1 <input type="checkbox"/> Male      2 <input type="checkbox"/> Female</p>	<p>2. What is your age?</p> <p>_____ years</p>
<p>3. What is the highest level of education you've completed?</p> <p>1 <input type="checkbox"/> Junior high/middle school</p> <p>2 <input type="checkbox"/> High school diploma/GED</p> <p>3 <input type="checkbox"/> Associate's degree</p> <p>4 <input type="checkbox"/> Bachelor's degree</p> <p>5 <input type="checkbox"/> Graduate school or more</p> <p>6 <input type="checkbox"/> Veterinary school or more</p> <p>7 <input type="checkbox"/> Do not know/Not sure</p> <p>9 <input type="checkbox"/> Refused</p>	<p>4. What group best describes your race/ethnicity?</p> <p>1 <input type="checkbox"/> White Non-Hispanic</p> <p>2 <input type="checkbox"/> Black Non-Hispanic</p> <p>3 <input type="checkbox"/> White Hispanic</p> <p>4 <input type="checkbox"/> Black Hispanic</p> <p>5 <input type="checkbox"/> Asian</p> <p>6 <input type="checkbox"/> American Indian/Alaska Native</p> <p>8 <input type="checkbox"/> Other, please specify: _____</p> <p>9 <input type="checkbox"/> Refused</p>

**B. WORK HISTORY**

This next section deals with your work history.

<p>5. How long have you been working in the clinical veterinary medicine? (in any capacity) (round to the nearest year) _____yrs</p>	<p>6. How long have you been working at your current practice? (round to the nearest years) _____yrs</p>
<p>7. What is your current Job Title? (check all that apply)</p> <p>1 <input type="checkbox"/> Owner</p> <p>2 <input type="checkbox"/> Veterinarian</p> <p>3 <input type="checkbox"/> Veterinary Technologist</p> <p>4 <input type="checkbox"/> Veterinary Technician</p> <p>5 <input type="checkbox"/> Veterinary Assistant</p> <p>6 <input type="checkbox"/> Veterinary Student</p> <p>7 <input type="checkbox"/> Veterinary Technology Student</p> <p>8 <input type="checkbox"/> Practice Manager</p> <p>9 <input type="checkbox"/> Other, please specify: _____</p>	<p>8. In general, how many days per week and hours per week do you work in small animal practice? Days/week: _____</p> <p>Hours/week: _____</p> <p>9. How many years total have you worked in small animal practice? (round to the nearest year) ____Years</p>
<p>10. During a typical work day, how many <i>clients</i> do you come into close contact with?  _____ clients /day</p>	<p>11. During a typical work day, how many <i>patients</i> do you come into close contact with?  _____ patients /day</p>
<p>12. Did your employer provide formal training in animal-restraint and needle handling before you began working?</p> <p>1 <input type="checkbox"/> Yes, both</p> <p>3 <input type="checkbox"/> Yes, only animal</p> <p>5 <input type="checkbox"/> Yes, only needle</p> <p>2 <input type="checkbox"/> No</p>	<p>13. Does your employer have an occupational health program that you are aware of?</p> <p>1 <input type="checkbox"/> Yes</p> <p>7 <input type="checkbox"/> Don't know/Not sure</p> <p>2 <input type="checkbox"/> No</p>

	9 <input type="checkbox"/> Refused
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### C. INJURY PREVALENCE AND PPE USE

**The last section asks you about the number of injuries you've sustained in the past 12 months and during your career (i.e. time since starting work in any capacity in veterinary clinical practice)**

<p>14. During <b>the past year</b>, how many times have you been hurt or injured by an animal (patient) on the job? Animal-related injuries include bites, kicks, scratches, etc.</p> <p style="text-align: center;">_____ injuries</p>	<p>15. During <b>your career</b> in veterinary medicine, how many times have you been hurt or injured by an animal (patient) on the job? Animal-related injuries include bites, kicks, scratches, etc. _____ injuries</p>
<p>16. During <b>the past year</b>, how many times have you been stuck yourself with a needle or cut yourself with a surgical instrument like a scalpel?</p> <p style="text-align: center;">_____ Needlestick/sharps injuries</p>	<p>17. During <b>your career</b> in veterinary medicine, how many times have you been stuck yourself with a needle or cut yourself with a surgical instrument like a scalpel?</p> <p style="text-align: center;">_____ Needlestick/sharps injuries</p>

18. Of all the animal-related injuries you've sustained in your career, what animal was most commonly the source of your injury?

- 1  Cat
- 2  Dog
- 7  Other, please specify: \_\_\_\_\_

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*A-3 Pet owner focus group interview guide*

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Date: \_\_\_\_\_

Meeting time: \_\_\_\_\_ AM/PM                      Focus Group # \_\_\_\_\_  
Focus group location: \_\_\_\_\_ Moderator(s): \_\_\_\_\_  
# Participants: \_\_\_\_\_ Male: \_\_\_\_\_ Female: \_\_\_\_\_  
Digital file: \_\_\_\_\_ Total recording time: \_\_\_\_\_ minutes  
Notes: \_\_\_\_\_

**PIVOT Study Focus Group Interview Questions and Outline:**

*Start with greeting and introduction. Define the purpose of the study.*

Thank you very much for agreeing to participate in our Preventing Injuries in Veterinary Occupational Tasks (PIVOT) study. *Introduce yourself* (e.g. My name is Heather Fowler and I am collecting this data as part of my PhD research). The purpose of this focus group is to help identify client opinions on current small animal clinic policies and practices. After providing an overview of today's interview I will ask if you have any questions prior to proceeding. If you have additional questions about this study, I can answer them at the end of the interview.

This interview should take approximately 60minutes total. I will be recording this conversation. I will let you know exactly when I begin the recording as well as end the recording. I will delete the recording after reviewing your responses. I will also be taking notes throughout the interview. Your names will not be included in the interview notes. Please show one another respect and avoid interrupting someone that is speaking.

This interview is set up to jog your memory of your previous experiences in the small animal veterinary clinic and your feelings toward the veterinary personnel providing care toward your pets. This information will help us determine factors that influence the development and maintenance relationships between veterinary clients and their pets and veterinary personnel.

*Again, this is an interview to learn about policies and practices and less about the cost of veterinary care, so please refrain from discussing this matter. We are more interested in your opinions related to the policies and procedures at your local veterinary practice. Finally, please do not refer to your practice or veterinarian by name during this interview. (Feel free to restate throughout the interview as needed)*

Do you have any questions about this process?

*Answer question. If no (further questions)...Let's begin! (Turn on recorder)*

I have now started the recording.

Let's start first with some introductions. Please introduce yourself, providing your name, current pets you own, their names, and a brief description of yourself. I will start. As I mentioned before my name is *Introduce yourself* (e.g. John Snow. I own two 9 year old Chihuahuas named Lucy and Monkey. I am an animal lover. I've owned pets all my life ranging from the common cat/dog to the exotic bird and hedgehog (*Ask person to left to introduce themselves and move in clockwise motion around the table*)

Now we will begin the meat of the interview.

THE FIRST SET OF QUESTIONS PERTAIN TO YOUR CURRENT SATISFACTION WITH THE CARE AND DELIVERY OF CARE FROM YOUR VETERINARY PRACTICES.

*Read questions. Remember to use probes. If a question comes up, feel okay to ask and add to next set. NOTE try to avoid getting trapped in discussions about money.*

- What qualities do you look for in a small animal veterinary practice?
- What qualities do you look for in your veterinarian? *Specifically the doctor providing care to your pet.*
- Are you currently happy with the care provided by your veterinary clinic?
  - Why or why not are you (dis)satisfied with your vet?
- Have you ever had a bad experience with a veterinarian and/or veterinary staff in regards to how they handled or cared for your pet?
  - What happened in this situation? (*If the cost of veterinary care is mentioned, state "We are not looking at money in this study, can you provide any other examples?"*)
  - Have you ever had to change practices because of a bad experience with a veterinarian and/or veterinary staff?
    - What happened in this situation? (*If the cost of veterinary care is mentioned, state "We are not looking at money in this study, can you provide any other examples?"*)
- Was there ever a time when someone at your current or previous veterinary clinic asked to take your animal in the back or outside of the exam room out of your sight?
  - What happened in that situation?
  - How did the staff inform you that that is what they wanted to do?
- How does it make you feel when veterinary staff take your animal into another exam room?
  - (*If participant felt unhappy*) Was there anything the personnel at the veterinary clinic could've said or done to make you feel better about the process?
- How does it make you feel towards the personnel at the clinic when they take your pet away into another room?

- Do you feel that there is ever a need to take the animal out of the exam room? When?
- (If unhappy experiences mentioned) Thinking about the bad experiences you mentioned earlier, is there something else you wish the staff could've done to improve that situation?
  - Do you think there is something you could have done to improve that situation?
- (if no one mentions a bad experience with animal being taken into the back, read) How would you recommend veterinary personnel handle a situation in which an owner got upset over taking the animal in the back? What should they say? What should they do?

THE NEXT SET OF QUESTIONS ARE ABOUT THE USE OF ANIMAL RESTRAINT EQUIPMENT AND DEVICES USED AT THE CLINIC.

- Can you tell me about a time where the personnel at your current or previous veterinary clinic ever had to use a muzzle or a similar device (for restraint) to restrain your animal?
  - In your opinion, was the need for the animal-restraining equipment made clear to you by the clinic staff?
  - How did it make you feel as a pet owner?
  - How did it make your feel towards the personnel at the clinic?
  - Was there anything the veterinary clinic could've done to address your feelings, i.e. make you feel better about the situation?
  - In retrospect, is there something else you wish you could've done?
  - (if no one mentions a bad experience with animal being restrained/muzzled, read) How would you recommend veterinary personnel handle a situation in which an owner got upset over the use of animal restraint equipment like a muzzle, towel or other device? What should they say? What should they do?

THIS LAST SET OF QUESTIONS PERTAIN TO SIGNS AND OTHER FORMS OF COMMUNICATIONS USED IN THE VETERINARY PRACTICE SURROUNDING ANIMAL RESTRAINT AND SAFE. (Take out first poster—"For your safety...." and show it to the group)

- Show of hands, how many of you have seen this in your veterinary practice? \_\_\_\_
  - How does this sign make you feel?

(Take out next poster—"Only personnel beyond this point")

- How many of you have seen this sign at your veterinary clinic? \_\_\_\_
- How does this sign make you feel?
- Has the staff at your vet's office ever taken your pet into a room that had this sign on it? \_\_\_\_ / \_\_\_\_ Yes
  - How did that make you feel?
  - (if someone mentions a negative experience....)Was their anything the staff could've done to comfort you or ease your tensions when having your pet separated from you while they looked at it in the staff only area?
- Are there any signs or policies in your practice that really stick out to you? What are they? Please remember we are focusing on animal handling in the clinic.

That was my last question. Do you have any questions for me about this project? *If no questions.....* Thank you so much for your time. *End recording.* I have stopped the recording. I will now hand out your gift cards for participating today.  
*Hand out gift cards and dismiss group.*

DRAFT

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*A-4 Pet owner focus group background survey*

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## THE PREVENTION OF INJURIES IN VETERINARY OCCUPATIONAL TASKS (PIVOT) STUDY: PET OWNER QUESTIONNAIRE

Thank you for participating in the Center for One Health Research's The Prevention of Injuries in Veterinary Occupational Tasks (PIVOT) study. The purpose of this study is to help identify client opinions on current small animal clinic policies and practices. This short survey will be used to collect background data on your pet ownership history as well as how often you use/purchase veterinary services.

This survey is anonymous and is for all pet owners who routinely take their pets in for veterinary care. In order to participate, you must be at least 18 years old, have at least one pet, and have taken at least one pet to see the veterinarian in the last 12 months.

### A. PET OWNERSHIP HISTORY

**This first section deals with your history as a pet owner.**

1. How many pets do you currently own? _____ pets	2. How many pets have you owned in your lifetime? _____ pets
3. What kind of pets do you <b>currently</b> own? (Check all that apply) 1 <input type="checkbox"/> Cat 2 <input type="checkbox"/> Dog 3 <input type="checkbox"/> Fish 8 <input type="checkbox"/> Other, please specify: _____	4. What kind of pets <b>have you owned in your lifetime</b> ? (Check all that apply) 1 <input type="checkbox"/> Cat 2 <input type="checkbox"/> Dog 3 <input type="checkbox"/> Fish 8 <input type="checkbox"/> Other, please specify: _____
5. When was the last time you took at least one of your pets to see the veterinarian? 1 <input type="checkbox"/> <1 month ago 2 <input type="checkbox"/> 1-3 months ago 3 <input type="checkbox"/> 4-6 months ago 4 <input type="checkbox"/> 6-12 months ago 5 <input type="checkbox"/> 1-2 years ago	6) On average, how often do you take your pets in to see the veterinarian? 1 <input type="checkbox"/> Once a week 2 <input type="checkbox"/> Once a month 3 <input type="checkbox"/> Every 4-6 months 4 <input type="checkbox"/> Once a year 5 <input type="checkbox"/> Only when sick

8 <input type="checkbox"/> Other, please specify: _____	8 <input type="checkbox"/> Other, please specify: _____
---	---

7) Please use this space to list up to 7 cats and dogs you currently own using the format below.  
The first line is provided as an example:

Name	Species	Age (years)
Eg.) Rover	Dog	10years
1) _____	_____	_____years
2) _____	_____	_____years
3) _____	_____	_____years
4) _____	_____	_____years
5) _____	_____	_____years
6) _____	_____	_____years
7) _____	_____	_____years

**B. VETERINARY CLINIC HISTORY**

The next section asks you about your history with your current and previous practices as well as the amount of money spent on your pets each year.

8) How long have you been a client of your current practice? (round to the nearest year)  ____years, ____ months	9) What's the longest time period you've been a client to any veterinary practice? (round to the nearest year)  ____years, ____ months
10) Approximately how much money (in dollars) do you spend on veterinary care each year (including medications and veterinary prescribed pet foods)?	11) Approximately how much money (in dollars) do you spend on other pet related services and supplies (e.g. pet food (non-prescription ONLY), grooming, toys, etc.) each year?

\$ _____	\$ _____
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**C. DEMOGRAPHICS**

**This last section covers your basic demographic information.**

<p>12) What is your gender?                  1 <input type="checkbox"/> Male      2 <input type="checkbox"/> Female</p>	<p>13) What is your age?                  _____ years</p>
<p>14) What is the highest level of education you've completed?</p> <p>1 <input type="checkbox"/> Junior high/middle school                  2 <input type="checkbox"/> High school diploma/GED                  3 <input type="checkbox"/> Associate's degree                  4 <input type="checkbox"/> Bachelor's degree                  5 <input type="checkbox"/> Graduate school or more                  6 <input type="checkbox"/> Veterinary school or more                  7 <input type="checkbox"/> Do not know/Not sure                  9 <input type="checkbox"/> Refused</p>	<p>15) What group(s) best describes your race/ethnicity? (check all that apply)</p> <p>1 <input type="checkbox"/> White Non-Hispanic                  2 <input type="checkbox"/> Black Non-Hispanic                  3 <input type="checkbox"/> White Hispanic                  4 <input type="checkbox"/> Black Hispanic                  5 <input type="checkbox"/> Asian/Pacific Islander                  6 <input type="checkbox"/> American Indian/Alaska Native                  8 <input type="checkbox"/> Other, please specify: _____                  9 <input type="checkbox"/> Refused</p>
<p>16) What's your household income?</p> <p>1 <input type="checkbox"/> &lt;\$45,000                  2 <input type="checkbox"/> \$45,000-\$49,999                  3 <input type="checkbox"/> \$50,000-\$64,999                  4 <input type="checkbox"/> \$65,000-\$79,999                  5 <input type="checkbox"/> \$80,000-\$99,999                  6 <input type="checkbox"/> ≥\$100,000                  9 <input type="checkbox"/> Refused</p>	<p>17) How many people (including yourself) live in your house/apt?                  _____</p> <p>17a.) Of those in the household, how many are children under 18 years of age? (If none, enter "NA") _____</p>

*A-5 Task observation Card*

	__ <input type="checkbox"/> AM/ <input type="checkbox"/> PM			
<b>Tasks</b>	:	:	:	:
Animal Contact				
Administer Drugs or Vaccinations (All Modes of Delivery)				
Clean Room, Kennels, etc.				
Lunch, Break, Meeting, etc.				
Move/Lift Animals				
Physical Exam				
Radiographs				
Surgical Procedure				
Other				
<b>Animal Factors</b>				
Animal Status: Sedated (S), Anesthetized (A), Nothing on Board (N)				
Animal Restraint Equipment: Muzzle (M), Towel (T), Physical Restraint (P) Other (O)				
<b>Pet Identification #</b>				
<b>Risk-Related Procedures</b>	<b>Frequency</b>			
Direct Contact				
Draw up Meds/Fluids/Drugs				
Administer Drugs or Vaccinations (All Modes of Delivery)				
Recap Needles				
Other Sharps Use				
Oral Examination				
Oral Medication				
<b>Environmental Factors</b>				



**VETERINARY PERSONNEL –OBS**

**Name:** \_\_\_\_\_

**Date:** \_\_\_\_/\_\_\_\_/\_\_\_\_

**Circle One: Vet /Tech /Asst**  
**Collection Time:** \_\_\_\_\_

Notes:

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*A-6 Task Observation Background Survey*

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## THE PREVENTION OF INJURIES IN VETERINARY OCCUPATIONAL TASKS (PIVOT) STUDY

Thank you for participating in the Center for One Health Research's The Prevention of Injuries in Veterinary Occupational Tasks (PIVOT) study. This study seeks to identify the barriers present in clinical practice as they relate to preventing needlestick/sharps injuries and animal-related injuries. This short survey will be used to collect background data on your history as a worker employed in the veterinary field.

This survey is anonymous and is for all veterinary personnel who participate in the delivery of veterinary medical services. This includes anyone who handles animals such as veterinarians, veterinary technicians, veterinary assistants, etc. You must be at least 18 years old and have worked in the veterinary field for at least 12 months prior to this survey and focus group date to participate.

### A. DEMOGRAPHICS

**This first section covers your general demographic information.**

<p>1. What is your gender?</p> <p>1 <input type="checkbox"/> Male      2 <input type="checkbox"/> Female</p>	<p>2. What is your age?</p> <p>_____ years</p>
<p>3. What is the highest level of education you've completed?</p> <p>1 <input type="checkbox"/> Junior high/middle school</p> <p>2 <input type="checkbox"/> High school diploma/GED</p> <p>3 <input type="checkbox"/> Associate's degree</p> <p>4 <input type="checkbox"/> Bachelor's degree</p> <p>5 <input type="checkbox"/> Graduate school or more</p> <p>6 <input type="checkbox"/> Veterinary school or more</p> <p>7 <input type="checkbox"/> Do not know/Not sure</p> <p>9 <input type="checkbox"/> Refused</p>	<p>4. What group best describes your race/ethnicity?</p> <p>1 <input type="checkbox"/> White Non-Hispanic</p> <p>2 <input type="checkbox"/> Black Non-Hispanic</p> <p>3 <input type="checkbox"/> White Hispanic</p> <p>4 <input type="checkbox"/> Black Hispanic</p> <p>5 <input type="checkbox"/> Asian</p> <p>6 <input type="checkbox"/> American Indian/Alaska Native</p> <p>8 <input type="checkbox"/> Other, please specify: _____</p> <p>9 <input type="checkbox"/> Refused</p>

**B. WORK HISTORY**

**This next section deals with your work history.**

<p>5. How long have you been working in the clinical veterinary medicine? (in any capacity) (round to the nearest year) _____yrs</p>	<p>6. How long have you been working at your current practice? (round to the nearest years)_____yrs</p>
<p>7. What is your current Job Title? (check all that apply)</p> <p>1 <input type="checkbox"/> Owner</p> <p>2 <input type="checkbox"/> Veterinarian</p> <p>3 <input type="checkbox"/> Veterinary Technologist</p> <p>4 <input type="checkbox"/> Veterinary Technician</p> <p>5 <input type="checkbox"/> Veterinary Assistant</p> <p>6 <input type="checkbox"/> Veterinary Student</p> <p>7 <input type="checkbox"/> Veterinary Technology Student</p> <p>8 <input type="checkbox"/> Practice Manager</p> <p>9 <input type="checkbox"/> Other, please specify: _____</p>	<p>8. In general, how many days per week and hours per week do you work in small animal practice? Days/week: _____ Hours/week: _____</p> <p>9. How many years total have you worked in small animal practice? (round to the nearest year) ____Years</p>
<p>10. During a typical work day, how many <i>clients</i> do you come into close contact with?  _____ clients /day</p>	<p>11. During a typical work day, how many <i>patients</i> do you come into close contact with?  _____ patients /day</p>
<p>12. Did your employer provide formal training in animal-restraint and needle handling before you began working?</p> <p>1 <input type="checkbox"/> Yes, both</p> <p>3 <input type="checkbox"/> Yes, only animal</p> <p>5 <input type="checkbox"/> Yes, only needle</p> <p>2 <input type="checkbox"/> No</p>	<p>13. Does your employer have an occupational health program that you are aware of?</p> <p>1 <input type="checkbox"/> Yes</p> <p>7 <input type="checkbox"/> Don't know/Not sure</p> <p>2 <input type="checkbox"/> No</p>

	9 <input type="checkbox"/> Refused
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### C. INJURY PREVALENCE AND PPE USE

The next section asks you about the number of injuries you've sustained in the past 12 months and during your career (i.e. time since starting work in any capacity in veterinary clinical practice)

#### Animal-related injuries and needlestick/sharps injuries:

<p>14. During <b>the past year</b>, how many times have you been hurt or injured by an animal (patient) on the job? Animal-related injuries include bites, kicks, scratches, etc.</p> <p style="text-align: center;">_____ injuries</p>	<p>15. During <b>your career</b> in veterinary medicine, how many times have you been hurt or injured by an animal (patient) on the job? Animal-related injuries include bites, kicks, scratches, etc. _____ injuries</p>
<p>16. During <b>the past year</b>, how many times have you been stuck yourself with a needle or cut yourself with a surgical instrument like a scalpel?</p> <p style="text-align: center;">_____ Needlestick/sharps injuries</p>	<p>17. During <b>your career</b> in veterinary medicine, how many times have you been stuck yourself with a needle or cut yourself with a surgical instrument like a scalpel?</p> <p style="text-align: center;">_____ Needlestick/sharps injuries</p>
<p>18. During <b>the past month</b>, how many times have you been hurt or injured by an animal (patient) on the job? Animal-related injuries include bites, kicks, scratches, etc.</p> <p style="text-align: center;">_____ injuries</p>	<p>19. During <b>the past month</b>, how many times have you been stuck yourself with a needle or cut yourself with a surgical instrument like a scalpel?</p> <p style="text-align: center;">_____ Needlestick/sharps injuries</p>

**Musculoskeletal Disorders (MSDs):**

**Physical demands of work and/or the work environment can affect the body's muscles, joints, tendons, ligaments and nerves and cause musculoskeletal disorders (MSDs). MSDs typically develop over time but also can be a result of a single event (e.g. back injury from lifting a patient). Examples of work-related causes include lifting or restraining animals, maintaining awkward positions while performing surgery, or repetitive tasks such as rectal palpation.**

<p>20. Have you ever suffered from a musculoskeletal disorder as a result of your work in veterinary medicine?</p> <p>1 <input type="checkbox"/> Yes</p> <p>7 <input type="checkbox"/> Don't know/Not sure</p> <p>2 <input type="checkbox"/> No</p> <p>9 <input type="checkbox"/> Refused</p>	<p>21. Are these problems ongoing or have they resolved?</p> <p>1 <input type="checkbox"/> Ongoing, I currently suffer from one or more MSDs</p> <p>2 <input type="checkbox"/> Resolved, I do not currently suffer from any MSDs</p> <p>7 <input type="checkbox"/> Not Applicable</p>
<p>22. Were/Are your MSDs due to an acute (traumatic) injury or developed over a period of time (cumulative) e.g., "overuse" injury? (check all that apply)</p> <p>1 <input type="checkbox"/> Acute</p> <p>2 <input type="checkbox"/> Overuse</p> <p>3 <input type="checkbox"/> Other, please specify: _____</p> <p>7 <input type="checkbox"/> Not Applicable</p>	<p>23. What body part(s) is (are) affected? (check all that apply)</p> <p>1 <input type="checkbox"/> Shoulder</p> <p>2 <input type="checkbox"/> Back</p> <p>3 <input type="checkbox"/> Other, please specify: _____</p> <p>7 <input type="checkbox"/> Not Applicable</p>

24. Of all the animal-related injuries you've sustained in your career, what animal was most commonly the source of your injury?

- 1  Cat
- 2  Dog
- 7  Other, please specify: \_\_\_\_\_

25. Are you currently employed anywhere other than this practice?

1  Yes

2  No

a) If yes, what category does your other job fall into?

1  Another small animal practice

2  Exotic/Pocket pet practice

3  Large or mixed animal practice

4  Other, non-veterinary related, please specify: \_\_\_\_\_

## THE PREVENTION OF INJURIES IN VETERINARY OCCUPATIONAL TASKS (PIVOT) STUDY

Thank you for participating in the Center for One Health Research's The Prevention of Injuries in Veterinary Occupational Tasks (PIVOT) study. This study seeks to identify the barriers present in clinical practice as they relate to preventing needlestick/sharps injuries and animal-related injuries. This survey will be used to collect data on exposures of individuals employed in the veterinary field.

This survey is anonymous and is for all veterinary personnel who participate in the delivery of veterinary medical services. This includes anyone who directly interact with animals such as veterinarians, veterinary technicians, veterinary assistants, etc. You must have worked in the veterinary field for at least 1 month prior to this survey date to participate.

### A. DEMOGRAPHICS

This first section covers your general demographic information.

1. What is your gender? 1 <input type="checkbox"/> Male      2 <input type="checkbox"/> Female	2. What is your age? _____ years
3. What is the highest level of education you've completed? 1 <input type="checkbox"/> Junior high/middle school 2 <input type="checkbox"/> High school diploma/GED 3 <input type="checkbox"/> Associate's degree 4 <input type="checkbox"/> Bachelor's degree 5 <input type="checkbox"/> Graduate school or more 6 <input type="checkbox"/> Veterinary school or more 7 <input type="checkbox"/> Do not know/Not sure 9 <input type="checkbox"/> Refused	4. What group best describes your race/ethnicity? 1 <input type="checkbox"/> White Non-Hispanic 2 <input type="checkbox"/> Black Non-Hispanic 3 <input type="checkbox"/> White Hispanic 4 <input type="checkbox"/> Black Hispanic 5 <input type="checkbox"/> Asian 6 <input type="checkbox"/> American Indian/Alaska Native 8 <input type="checkbox"/> Other, please specify: _____ 9 <input type="checkbox"/> Refused

### B. WORK HISTORY

This next section deals with your work history.

<p>5. How long have you been working in the clinical veterinary medicine? (in any capacity) (round to the nearest year) _____yrs</p>	<p>6. How long have you been working at your current practice? (round to the nearest years) _____yrs</p>
<p>7. What is your current Job title? (check all that apply)</p> <p>1 <input type="checkbox"/> Owner</p> <p>2 <input type="checkbox"/> Veterinarian</p> <p>3 <input type="checkbox"/> Veterinary Technologist</p> <p>4 <input type="checkbox"/> Veterinary Technician</p> <p>5 <input type="checkbox"/> Veterinary Assistant</p> <p>6 <input type="checkbox"/> Veterinary Student</p> <p>7 <input type="checkbox"/> Veterinary Technology Student</p> <p>8 <input type="checkbox"/> Practice Manager</p> <p>9 <input type="checkbox"/> Other, please specify: _____</p>	<p>8. In general, how many days per week and hours per week do you work in small animal practice? Days/week: _____ Hours/week: _____</p> <p>9. How many years total have you worked in small animal practice? (round to the nearest year) ____Years</p>
<p>10. During a typical work day, how many <i>clients</i> do you come into close contact with? _____ clients /day</p>	<p>11. During a typical work day, how many <i>patients</i> do you come into close contact with? _____ patients /day</p>
<p>12. Did your employer provide formal training in animal-restraint and needle handling before you began working?</p> <p>1 <input type="checkbox"/> Yes, both</p> <p>3 <input type="checkbox"/> Yes, only animal</p> <p>5 <input type="checkbox"/> Yes, only needle</p> <p>2 <input type="checkbox"/> No</p>	<p>13. Does your employer have an occupational health program that you are aware of?</p> <p>1 <input type="checkbox"/> Yes</p> <p>7 <input type="checkbox"/> Don't know/Not sure</p> <p>2 <input type="checkbox"/> No</p> <p>9 <input type="checkbox"/> Refused</p>

## C. INJURY PREVALENCE AND ANIMAL SOURCE

The next section asks you about the number of injuries you've sustained in the past 12 months and during your career (i.e. time since starting work in any capacity in veterinary clinical practice)

### Animal-related injuries and needlestick/sharps injuries:

<p>14. During <b>the past year</b>, how many times have you been hurt or injured by an animal (patient) on the job? Animal-related injuries include bites, kicks, scratches, etc.</p> <p style="text-align: center;">_____ injuries</p>	<p>15. During <b>your career</b> in veterinary medicine, how many times have you been hurt or injured by an animal (patient) on the job? Animal-related injuries include bites, kicks, scratches, etc. _____ injuries</p>
<p>16. During <b>the past year</b>, how many times have you been stuck yourself with a needle or cut yourself with a surgical instrument like a scalpel?</p> <p style="text-align: center;">_____ Needlestick/sharps injuries</p>	<p>17. During <b>your career</b> in veterinary medicine, how many times have you been stuck yourself with a needle or cut yourself with a surgical instrument like a scalpel?</p> <p style="text-align: center;">_____ Needlestick/sharps injuries</p>
<p>18. During <b>the past month</b>, how many times have you been hurt or injured by an animal (patient) on the job? Animal-related injuries include bites, kicks, scratches, etc.</p> <p style="text-align: center;">_____ injuries</p>	<p>19. During <b>the past month</b>, how many times have you been stuck yourself with a needle or cut yourself with a surgical instrument like a scalpel?</p> <p style="text-align: center;">_____ Needlestick/sharps injuries</p>

### Musculoskeletal Disorders (MSDs):

Physical demands of work and/or the work environment can affect the body's muscles, joints, tendons, ligaments and nerves and cause musculoskeletal disorders (MSDs). MSDs typically develop over time but also can be a result of a single event (e.g. back injury from lifting a patient). Examples of work-related causes include lifting

or restraining animals, maintaining awkward positions while performing surgery, or repetitive tasks such as rectal palpation.

<p>20. Have you ever suffered from a musculoskeletal disorder as a result of your work in veterinary medicine?</p> <p>1 <input type="checkbox"/> Yes</p> <p>7 <input type="checkbox"/> Don't know/Not sure</p> <p>2 <input type="checkbox"/> No</p> <p>9 <input type="checkbox"/> Refused</p>	<p>21. Are these problems ongoing or have they resolved?</p> <p>1 <input type="checkbox"/> Ongoing, I currently suffer from one or more MSDs</p> <p>2 <input type="checkbox"/> Resolved, I do not currently suffer from any MSDs</p> <p>7 <input type="checkbox"/> Not Applicable</p>
<p>22. Were/Are your MSDs due to an acute (traumatic) injury or developed over a period of time (cumulative) e.g., "overuse" injury? (check all that apply)</p> <p>1 <input type="checkbox"/> Acute</p> <p>2 <input type="checkbox"/> Overuse</p> <p>3 <input type="checkbox"/> Other, please specify: _____</p> <p>7 <input type="checkbox"/> Not Applicable</p>	<p>23. What body part(s) is (are) affected? (check all that apply)</p> <p>1 <input type="checkbox"/> Shoulder</p> <p>2 <input type="checkbox"/> Back</p> <p>3 <input type="checkbox"/> Other, please specify: _____</p> <p>7 <input type="checkbox"/> Not Applicable</p>

24. Of all the animal-related injuries you've sustained in your career, what animal was most commonly the source of your injury?

- 1  Cat
- 2  Dog
- 7  Other, please specify: \_\_\_\_\_

25. Are you currently employed anywhere other than this practice?

- 1  Yes
- 2  No

a) If yes, what category does your other job fall into?

- 1  Another small animal practice
- 2  Exotic/Pocket pet practice
- 3  Large or mixed animal practice
- 4  Other, non-veterinary related, please specify: \_\_\_\_\_

#### D. WORK TASKS & USE OF PPE

**The following questions ask about your veterinary work and use of personal protective equipment (PPE).**

26. a) What type(s) of work do you do in the clinic? In an average week, how many days do you do any work for this category? How many hours on a given day? *Note: use decimal if a monthly task.*

Category	Days/Week	Hours/Day
Blood specimen collection <input type="checkbox"/> Yes <input type="checkbox"/> No		
Stool specimen collection <input type="checkbox"/> Yes <input type="checkbox"/> No		
Take radiographs ("xrays") <input type="checkbox"/> Yes <input type="checkbox"/> No		
Perform dental procedures <input type="checkbox"/> Yes <input type="checkbox"/> No		
Cleaning (kennels, clinic, etc.) <input type="checkbox"/> Yes <input type="checkbox"/> No		

b) For each applicable category below, what activities do you perform?

<p><b>1 Blood specimen collection:</b> <span style="float: right;"><input type="checkbox"/> N/A</span></p> <p>1.1 <input type="checkbox"/> Restrain animals for specimen collection</p> <p>1.2 <input type="checkbox"/> Collect specimen</p> <p>1.3 <input type="checkbox"/> Process specimen using laboratory equipment</p>
<p><b>2 Maintenance:</b> <span style="float: right;"><input type="checkbox"/> N/A</span></p> <p>2.1 <input type="checkbox"/> cleaning patient care areas</p> <p>2.2 <input type="checkbox"/> disposing of waste including sharps containers</p>
<p>11 <input type="checkbox"/> <b>Other, please specify:</b></p>

27. What do you normally use to clean your hands at the practice? *(Check all that apply.)*

- 1  Bar soap
- 2  Liquid soap
- 3  Hand sanitizer/Alcohol
- 4  Chlorhexidine scrub
- 5  Rinse with water only
- 5  Other, please specify: \_\_\_\_\_

7  Don't know/Not sure

28. How often do you wash your hands...

a) ...before ...?	1 <input type="checkbox"/> Always	2 <input type="checkbox"/> Often	3 <input type="checkbox"/> Sometimes	4 <input type="checkbox"/> Rarely	5 <input type="checkbox"/> Never	7 <input type="checkbox"/> N/A
1. Eating						
2. Drinking						
3. Chewing gum						
4. Smoking/tobacco						
b) ...after...?						
1. Stool specimen collection						
2. Stool specimen preparation for analysis (setting up fecal float)						
3. "Free catch" urine collection						
4. Restraining animal patient						
5. Cleaning kennels/clinic						
6. Removing gloves						
7. Other (please specify)						

29. In your daily work, what type of personal protective equipment (PPE) do you use when performing the activities you have indicated?

PPE	* Reference Appendix A if needed.										
	Heavy gloves	Disposable gloves (Nitrile, vinyl, latex)	Surgical mask*	Faceguard	Eye Protection (Goggles, safety glasses)	Disposable garment (Tyvek)	Lead Apron	Lead gloves	Lead thyroid guard	Other, specify:	
Blood Specimen Collection											
Stool Specimen Collection											
Animal Restraint (Any purpose)											
Cleaning (kennels, exam rooms, etc.)											
Dental procedures											
Take radiographs											
Other task(s), specify:											

<b>E. PRACTICES &amp; BELIEFS ON ANIMAL HEALTH</b>
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**These questions ask about your current practices and awareness regarding disease prevention in the clinic.**

30. Have you ever been trained on how to prevent disease transmission or illnesses while working in your clinic?

1  Yes

2  No

7  Don't know/Not sure

31. Are you aware of the National Association of State Public Health Veterinarian's Veterinary Standard Precautions compendium containing guidelines for reducing or preventing disease transmission between animals and humans?

1  Yes... (Please specify): \_\_\_\_\_

2  No \_\_\_\_\_

7  Don't know/Not sure

32. Are you concerned about *getting* diseases *from* the animals you work with at your clinic?

1  Yes

2  No

33. Are you concerned about *giving* diseases *to* animals you work with at your clinic?

1  Yes

2  No

34. Can you tell when the animals you work with are possibly sick with a zoonotic disease (prior to examining them)?

1  Yes

2  No

35. Do you think animals that look healthy could still be sick?

1  Yes

2  No

36. When working with the animals at your clinic, how often do you have direct contact with the following...?

	1 <input type="checkbox"/> Always	2 <input type="checkbox"/> Often	3 <input type="checkbox"/> Sometimes	4 <input type="checkbox"/> Rarely	5 <input type="checkbox"/> Never
a) Blood					
b) Urine					
c) Feces					
d) Fluids (e.g., saliva, amniotic fluids)					

e) Other, specify: _____					
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**F. CONTACT WITH OTHER ANIMALS**

**This section covers your contact with any other animals outside your clinic.**

37. Do you currently have any household pets?

- 1  Yes
- 2  No (If 'No', skip to question 33.)

a) If yes, indicate the type of pet(s); b) number of pets for each type; and c) number of years owned. (Check all that apply.)

a) Kind of Pet	b) # Pets	c) Years Owned
1 <input type="checkbox"/> Dogs		
2 <input type="checkbox"/> Cats		
3 <input type="checkbox"/> Birds		
4 <input type="checkbox"/> Ferrets		
5 <input type="checkbox"/> Reptiles		
7 <input type="checkbox"/> Other: _____		

38. Do you ever bring your pets to work for reasons other than for medical care?

- 1  Yes
- 2  No (If 'No', skip to question 33.)

<i>In the past 12 months.....</i>	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No	7 <input type="checkbox"/> Not sure
39. Have any of your pet(s) been given antibiotics?			
40. Have you been in direct contact with any production animals <i>outside</i> your clinic?			

1) If yes, indicate what kind of animal.

1  Chicken                      4  Goats / sheep / lambs

2  Pigs

3  Horses                      10  Other, please specify: \_\_\_\_\_

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41. Have you come into close contact with any wildlife outside the clinic? [ ] [ ] [ ]

1) If yes, please specify and describe : \_\_\_\_\_

\_\_\_\_\_

**G. MEDICAL HISTORY**

Switching gears, the following questions ask about your health status and medical background.

42. As of today, how would you rate your general health?

- 1  Excellent
- 2  Good
- 3  Fair
- 4  Poor
- 9  Refused

43. What is your height \_\_\_\_\_ (ft.) and weight \_\_\_\_\_ (lbs.)? 9  Refused

44. Have you ever been diagnosed with any of the following? 8  N/A

<ul style="list-style-type: none"> <li>1 <input type="checkbox"/> Allergies</li> <li>2 <input type="checkbox"/> Asthma</li> <li>3 <input type="checkbox"/> Arthritis</li> <li>4 <input type="checkbox"/> Barrett syndrome</li> <li>5 <input type="checkbox"/> Blood disease</li> <li>6 <input type="checkbox"/> Brucellosis</li> <li>7 <input type="checkbox"/> Gastroesophageal reflux disease (GERD)</li> <li>8 <input type="checkbox"/> Cancer</li> <li>9 <input type="checkbox"/> Crohn's disease</li> </ul>	<ul style="list-style-type: none"> <li>11 <input type="checkbox"/> Emphysema</li> <li>12 <input type="checkbox"/> Dermatophytosis</li> <li>13 <input type="checkbox"/> Diabetes</li> <li>14 <input type="checkbox"/> Kidney disease</li> <li>15 <input type="checkbox"/> Salmonellosis</li> <li>16 <input type="checkbox"/> Chronic musculoskeletal disorder (MSD)                             <ul style="list-style-type: none"> <li>a <input type="checkbox"/> Back      b <input type="checkbox"/> Shoulder</li> <li>c <input type="checkbox"/> Other, specify: _____</li> </ul> </li> </ul>
--	---

10 <input type="checkbox"/> Cryptosporidiosis	17 <input type="checkbox"/> Other, specify: _____
---	---

45. In the past 3 months, have you taken any antibiotics? 1  Yes 2  No

a) If yes, what was the reason for taking antibiotics?

- 1  Ear, sinus, upper respiratory infection
- 2  Bronchitis/pneumonia
- 3  Urinary tract infection
- 4  Skin infections
- 5  Acne
- 6  Dental cleaning/oral surgery
- 8  Surgery
- 7  Don't know/ Not sure
- 9  Refused
- 10  Other, specify: \_\_\_\_\_

b) Which antibiotic(s) did you take? 7  Don't know/Not sure

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46. <i>In the past 12 months.....</i>	1 <input type="checkbox"/> Yes	2 <input type="checkbox"/> No	7 <input type="checkbox"/> Don't know	9 <input type="checkbox"/> Refused	3 <input type="checkbox"/> Related to work w/cattle?	4 <input type="checkbox"/> Saw a doctor?
a) Been admitted in the hospital for more than a day?						
b) Been diagnosed with Methicillin-resistant <i>Staphylococcus aureus</i> (MRSA)?						
c) Been diagnosed with <i>Clostridium difficile</i> ?						
d) Had an eye infection?						
e) Had a skin condition (e.g., rash, itching, discoloration)?						
f) Had diarrheal illnesses lasting 3 or more days?						
1) <i>If yes, what symptoms did you experience?</i> 1 <input type="checkbox"/> Bloody diarrhea      3 <input type="checkbox"/> Abdominal cramps 2 <input type="checkbox"/> Vomiting                      4 <input type="checkbox"/> Fever						
g) Any other illnesses?						
1) <i>If yes, please specify and describe :</i> _____ _____ _____						

**H. DIET, HYGIENE & OTHER ACTIVITIES**

The next set of questions involves your food preferences and daily routines at home and at work.

47. At work, do you eat your meals in a separate room away from animals?

- 1  Yes                      2  No                      3  Sometimes

48. While at work, what is your main source of drinking water?

- 1  Public water (e.g. tap water, water fountain, etc.)  
 2  Bottled water  
 3  Other, please specify: \_\_\_\_\_  
 4  Don't know/Not sure  
 5  Refused

49. Do you have clothes that are exclusively for work at this clinic?

1  Yes2  No

50. a) Where do you wash your outer work clothes; and b) How often do you wash them?

**a) Place**1  Home2  Work3  Laundromat4  Other, please specify: \_\_\_\_\_**b) Frequency**1  Every day2  1-3 times per *week*3  1-3 times per *month*

51. Do you wash work clothes with other laundry?

1  Yes2  No3  Sometimes

52. When and where do you bathe or shower?

1  Before work shift...at 1  Home 2  Work 4  Other\_\_\_\_\_2  After work shift.... at 1  Home 2  Work 4  Other\_\_\_\_\_53. In the past 12 weeks, have [ **you** or a **family member** ] (*circle one*) traveled outside of the US?1  Yes7  Don't know/Not sure2  No9  Refused

## I. SAFETY CULTURE

**This last section reviews your attitudes toward common practices in the clinic. Please indicate your agreement with the following statements by circling the appropriate number.**

	Strongly disagree	disagree	Neither agree nor disagree	Agree	Strongly Agree	Not Applicable
My employer believes that animal-related injuries are avoidable.	1	2	3	4	5	N/A
My co-workers believe that animal-related injuries are avoidable.	1	2	3	4	5	N/A
I believe that animal-related injuries are avoidable.	1	2	3	4	5	N/A
My employer takes adequate preventive measures against animal-related injuries in the workplace.	1	2	3	4	5	N/A
My co-workers take adequate preventive measures against animal-related injuries in the workplace.	1	2	3	4	5	N/A
I take adequate preventive measures against animal-related injuries in the workplace.	1	2	3	4	5	N/A
I take appropriate preventive measures against animal-related injuries in the presence of the owners of the animal.	1	2	3	4	5	N/A
I feel comfortable refusing to provide services when appropriate help or animal restraint is not available.	1	2	3	4	5	N/A
I feel confident when applying restraint techniques on animals.	1	2	3	4	5	N/A
I believe it is possible to predict most aggressive animal behavior.	1	2	3	4	5	N/A
Sufficient time is allowed in the schedule to perform adequate animal restraint.	1	2	3	4	5	N/A
There is adequate equipment for proper animal restraint.	1	2	3	4	5	N/A
There is adequate staff help available for proper animal restraint.	1	2	3	4	5	N/A
There is good communication among staff regarding injury prevention.	1	2	3	4	5	N/A

	Strongly Disagree	Disagree	Agree	Strongly Agree
<b>In the following section please describe how you perceive that the managers and supervisors at this workplace deal with safety. Although some questions may appear very similar, please answer each one of them.</b>				
Management encourages employees here to work in accordance with safety rules - even when the work schedule is tight	1	2	3	4
Management ensures that everyone receives the necessary information on safety	1	2	3	4
Management looks the other way when someone is careless with safety	1	2	3	4
Management places safety before production	1	2	3	4
Management accepts employees here taking risks when the work schedule is tight	1	2	3	4
We who work here have confidence in the management's ability to deal with safety	1	2	3	4
Management ensures that safety problems discovered during safety rounds/evaluations are corrected immediately	1	2	3	4
When a risk is detected, management ignores it without action	1	2	3	4
Management lacks the ability to deal with safety properly	1	2	3	4
<b>In the following section please describe how you perceive that employees at this workplace deal with safety</b>				
We who work here regard risks as unavoidable	1	2	3	4
We who work here consider minor accidents to be a normal part of our daily work	1	2	3	4
We who work here accept dangerous behavior as long as there are no accidents	1	2	3	4
We who work here break safety rules in order to complete work on time	1	2	3	4
We who work here never accept risk-taking even if the work schedule is tight	1	2	3	4
We who work here consider that our work is unsuitable for cowards	1	2	3	4
We who work here accept risk-taking at work	1	2	3	4
We who work here try to find a solution if someone points out a safety problem	1	2	3	4
We who work here feel safe when working together	1	2	3	4

We who work here have great trust in each other's ability to ensure safety	1	2	3	4
We who work here learn from our experiences to prevent accidents	1	2	3	4
We who work here take each other's opinions and suggestions concerning safety seriously	1	2	3	4
We who work here seldom talk about safety	1	2	3	4
We who work here always discuss safety issues when such issues come up	1	2	3	4
We who work here can talk freely and openly about safety	1	2	3	4

*Your comments are appreciated!*

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***Thank you for taking the time to complete this survey!***