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UAB MEDICINE.

# Persistent Complications Following Snake Envenomation: Results of a Specialized Snake Post Discharge Clinic

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## Background

Comprehensive Snakebite Program of UAB and COA	
Established	June 2021
Purpose	To provide a multidisciplinary approach to snake envenomation during and after hospitalization and to advance research in snakebite care
Specialists Involved	Medical and clinical toxicologists Wound care experts
Patient Population	Patients age ≥5 years old throughout Alabama
Referral Process	Clinic follow up offered by poison center SPIs during hospitalization Patient contact information obtained prior to hospital discharge
Clinic Appointments	Scheduled 3-7 days after discharge Additional appointments as indicated
Interventions Provided	Compression modalities Wound care procedures (e.g. debridement) Physical therapy referrals

Table 1. Overview of the Comprehensive Snakebite Program of UAB and Children's of Alabama.

## Methods

Study Design	retrospective observational study
Population	all patients evaluated in snakebite clinic between 6/1/21-12/31/22
Data Sources	clinic records, poison center charts
Statistics	Fisher's exact test, t-test
Objective	determine associations between: <ul style="list-style-type: none"><li>■ factors during acute hospitalization after envenomation</li><li>■ complications/treatments at clinic follow up</li></ul>

Table 2. Design of the study.

## Results

Characteristics of Clinic Patients (n=40)	
Male	20 (50%)
Age (mean, range)	34 years (5-75 years)

Table 3. Demographics of the patients seen in the clinic.

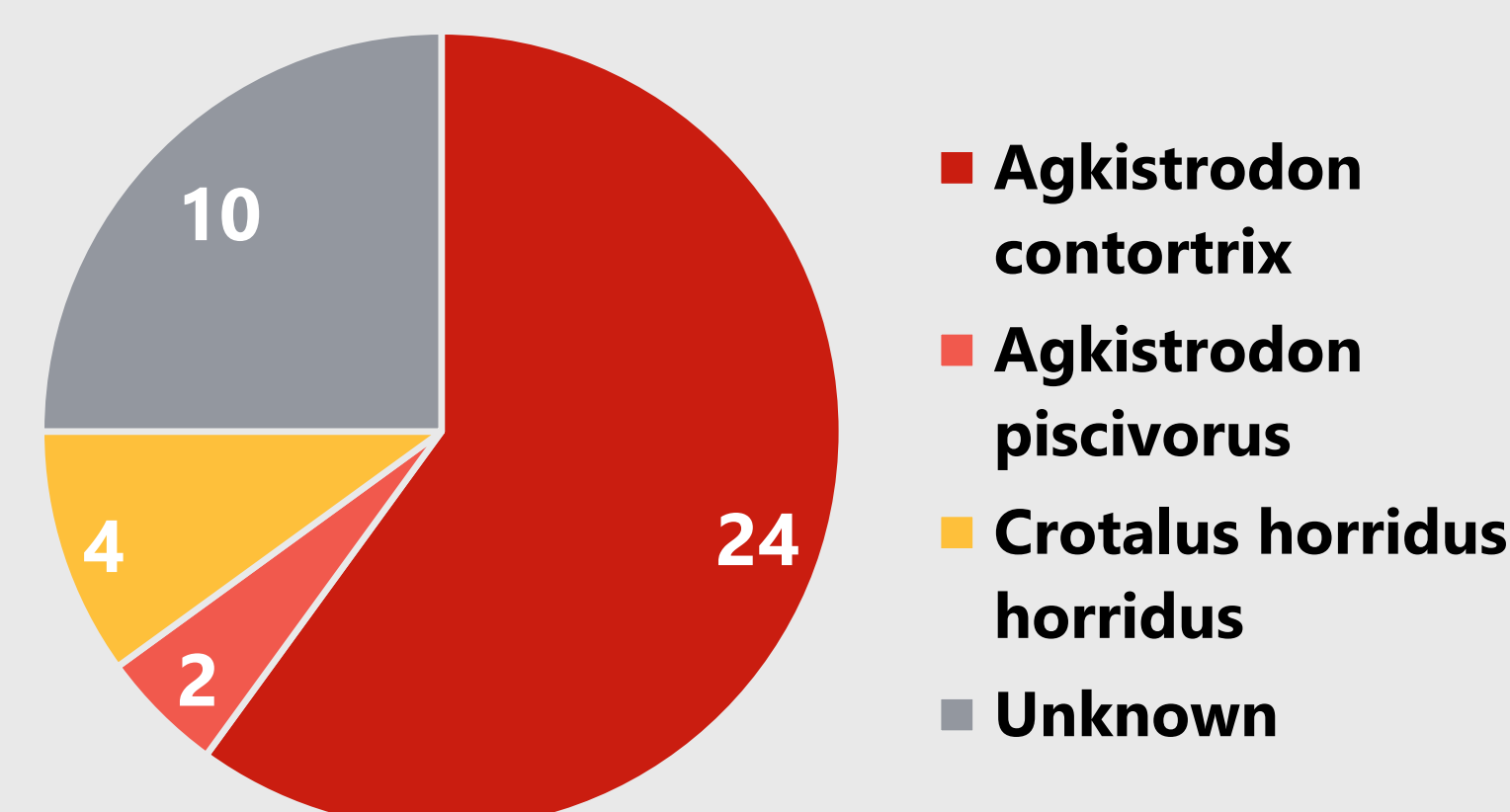


Figure 1. Species of snake involved in envenomations evaluated in clinic.

## Results

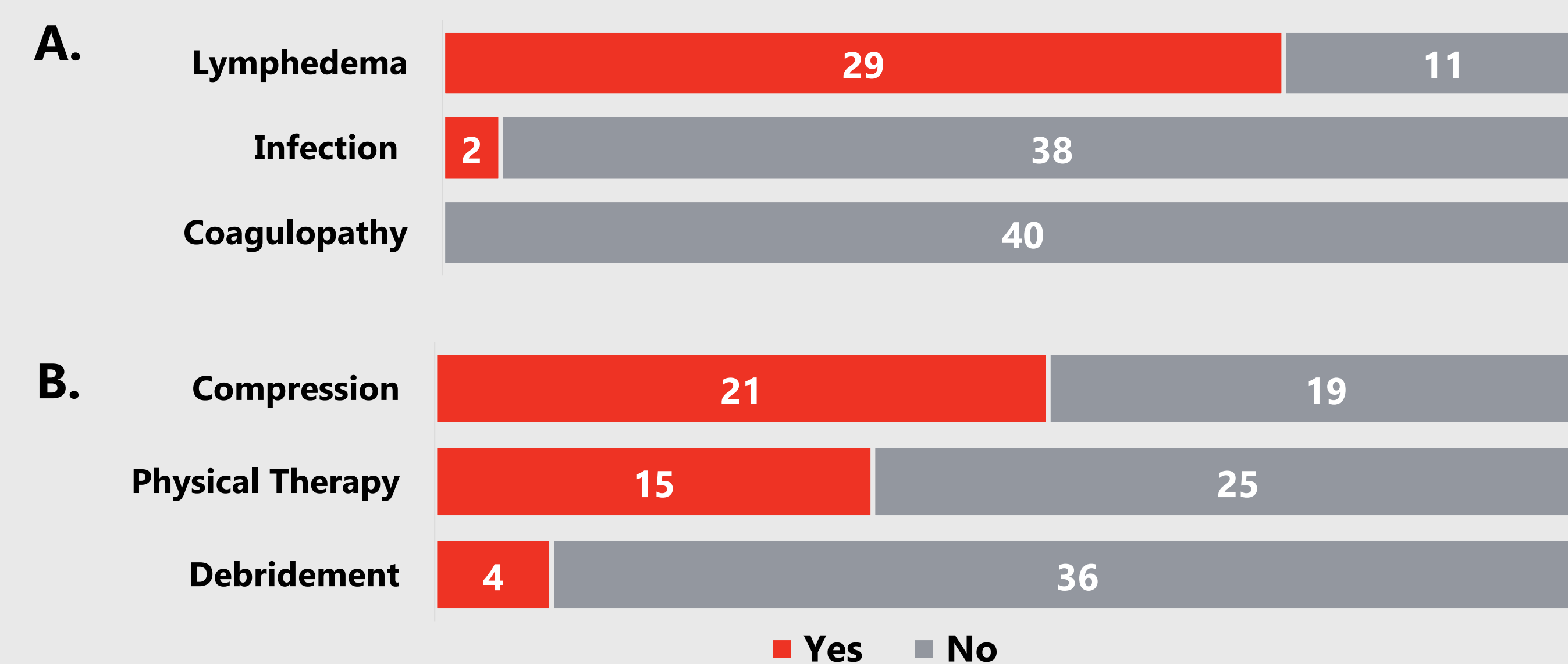


Figure 2. Rates of complications (A) and interventions provided (B) in patients seen in clinic. No late coagulopathy was seen.

Demographics				
	Lymphedema (n=29)	Compression (n=21)	Interventions Physical Therapy (n=15)	Debridement (n=4)
Sex				
Male (n=20)	13 (65%)	7 (35%)	9 (45%)	3 (15%)
Female (n=20)	16 (80%)	14 (70%)	6 (30%)	1 (5%)
p value	0.480	0.056	0.515	0.605
Age				
≥18yo (n=27)	23 (85.2%)	16 (59.3%)	11 (40.7%)	3 (11.1%)
<18yo (n=13)	6 (46.2%)	5 (38.5%)	4 (30.8%)	1 (7.69%)
p value	0.020	0.314	0.730	1

Table 3. Rates of complications/interventions by patient demographics.

Envenomation				
	Lymphedema (n=29)	Compression (n=21)	Interventions Physical Therapy (n=15)	Debridement (n=4)
Species				
Agkistrodon (n=26)	21 (80.8%)	17 (65.4%)	10 (38.5%)	3 (11.5%)
Rattlesnake (n=4)	1 (25%)	0 (0%)	1 (25%)	0 (0%)
p value	0.048	0.026	1	1
Extremity				
Upper (n=17)	10 (58.8%)	17 (73.9%)	8 (47.1%)	3 (17.6%)
Lower (n=23)	19 (82.6%)	4 (23.5%)	7 (30.4%)	1 (4.35%)
p value	0.153	0.003	0.336	0.294
Bite to Digit				
Yes (n=10)	7 (70%)	3 (30%)	6 (60%)	3 (30%)
No (n=30)	22 (73.3%)	18 (60%)	9 (30%)	1 (3.3%)
p value	1	0.148	0.135	0.042

Table 4. Rates of complications/interventions by envenomation circumstances.

Symptoms During Hospitalization				
	Lymphedema (n=29)	Compression (n=21)	Interventions Physical Therapy (n=15)	Debridement (n=4)
Swelling (maximal)				
≥1 Major Joint (n=31)	23 (74.2%)	15 (48.4%)	14 (45.2%)	4 (12.9%)
<1 Major Joint (n=9)	6 (33.3%)	6 (33.3%)	1 (11.1%)	0 (0%)
p value	0.686	0.457	0.117	0.557
Bullae (before discharge)				
Present (n=3)	2 (66.7%)	0 (0%)	3 (100%)	2 (66.7%)
Absent (n=37)	27 (72.9%)	21 (56.8%)	12 (32.4%)	2 (5.4%)
p value	1	0.098	0.046	0.022
Systemic Symptoms				
Present (n=7)	4 (57.1%)	1 (14.3%)	3 (42.9%)	0 (0%)
Absent (n=33)	25 (75.8%)	20 (60.6%)	12 (36.4%)	4 (12.1%)
p value	0.369	0.040	1	1

Table 5. Rates of complications/interventions by symptoms during initial hospitalization.

Lab Abnormalities During Hospitalization				
	Lymphedema (n=29)	Compression (n=21)	Interventions Physical Therapy (n=15)	Debridement (n=4)
Fibrinogen (nadir)				
<170 (n=4)	0 (0%)	0 (0%)	1 (25%)	0 (0%)
≥170 (n=33)	26 (78.8%)	18 (54.5%)	13 (39.4%)	2 (6.1%)
p value	0.005	0.105	1	1
Platelets (nadir)				
<150 (n=3)	2 (66.7%)	1 (33.3%)	2 (66.7%)	0 (0%)
≥150 (n=37)	27 (73%)	20 (54.1%)	13 (35.1%)	4 (10.8%)
p value	1	0.596	0.545	1
WBC (peak)				
>11 (n=16)	11 (68.8%)	8 (50%)	10 (62.5%)	3 (18.8%)
≤11 (n=16)	11 (68.8%)	9 (56.3%)	4 (25%)	1 (6.25%)
p value	1	1	0.073	0.600

Table 6. Rates of complications/interventions by lab abnormalities during initial hospitalization.

Therapies During Hospitalization				
	Lymphedema (n=29)	Compression (n=21)	Interventions Physical Therapy (n=15)	Debridement (n=4)
Antivenom				
Given (n=36)	25 (69.4%)	17 (47.2%)	14 (38.9%)	4 (11.1%)
Not Given (n=4)	4 (100%)	4 (100%)	1 (25%)	0 (0%)
p value	0.560	0.108	1	1
Fab (n=32)	21 (65.6%)	13 (40.6%)	13 (40.6%)	4 (12.5%)
(Fab') <sub>2</sub> (n=4)	4 (100%)	4 (100%)	1 (25%)	0 (0%)
p value	0.290	0.040	1	1
Total Vials*	9.24 v 10.6	8 v 10.8	10.3 v 9.26	6.5 v 10.1
p value	0.525	0.105	0.586	0.088
Opioids				
Given (n=33)	26 (78.8%)	18 (54.5%)	15 (45.5%)	3 (9.1%)
Not Given (n=7)	3 (42.9%)	3 (42.9%)	0 (0%)	1 (14.3%)
p value	0.076	0.689	0.033	0.552

Table 7. Rates of complications/interventions by therapies during initial hospitalization. \*Total vials includes only patients who received Fab. Given as mean vials (with complication/intervention v without).

Disposition and Follow Up				
	Lymphedema (n=29)	Compression (n=21)	Interventions Physical Therapy (n=15)	Debridement (n=4)
Disposition				
Admitted (n=35)	25 (71.4%)	18 (51.4%)	12 (34.3%)	2 (5.71%)
ED (n=5)	4 (80%)	3 (60%)	3 (60%)	2 (40%)
p value	1	1	0.345	0.069
ICU (n=28)	21 (75%)	15 (53.6%)	9 (32.1%)	2 (7.14%)
Non-ICU (n=12)	8 (66.7%)	6 (50%)	6 (50%)	2 (16.7%)
p value	0.704	1	0.311	0.570
LOS (days)	3.31 v 2.82	2.9 v 3.47	3.67 v 2.88	2 vs 3.31
p value	0.392	0.411	0.351	0.001
Time to Follow Up (days)	8.93 v 10.5	8.19 v 10.6	8.13 v 10.1	6 vs 9.72
p value	0.493	0.170	0.262	0.047

Table 8. Rates of complications/interventions by hospitalization and follow up characteristics. LOS and time to follow up given as means (with complication/intervention v without).

## Conclusions

- Persistent lymphedema and functional deficits are common in snake envenomations after discharge
  - Infection was rare
  - More common concern than late coagulopathy in areas with primarily *Agkistrodons*
- Swelling that persists after discharge was more common with *Agkistrodons* vs rattlesnakes
- 100% of patients treated with Fab2 required compression therapy on follow up
- Need for specialized follow up to monitor for and treat sequelae of venom-induced tissue damage
- Limitations: small sample size, poison center data