Institutional Experience Using a treatment Algorithm for Electrical Injury

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Background

- Electrical injury is associated with significant morbidity and mortality.
- There is some variability in the initial diagnosis and management of patients with electrical injury among institutions and non-burn specialists, which may result in unnecessary testing, monitoring, and admissions to the hospital.
- The goal of this retrospective study was to examine the effectiveness of an electrical injury treatment algorithm (figure), aimed to identify patients at risk for complications and reduce unnecessary investigations and hospital admissions.

Methods

- A retrospective study of patients admitted to a regional burn center during December 2012 to September 2018 with electrical injury.
- Data on demographics, laboratory tests, length of stay, telemetry monitoring, and disposition were collected from patients' charts.
- Results were compared for patients who were admitted with electrical injury before and after implementation of the algorithm in July 2015.
- Paired t-test and chi-squared tests were used to determine significance at a level of $p<0.05$

Demographics

	2013-2015 (n = 57)	2015-2018 (n = 38)	P-value
Demographics			
Age (Years)	36 ± 12	36 ± 12.5	0.97
Sex			0.87
Male	53 (93)	35 (92)	
Female	4 (7)	3 (5)	
Race			0.53
Caucasian	27 (47)	18 (47)	
Hispanic	22 (39)	12 (32)	
African-American	6 (10)	8 (21)	
Asian	2 (3)	0	

DANGER ELECTRIC SHOCK RISK

Electrical Injury Treatment Algorithm
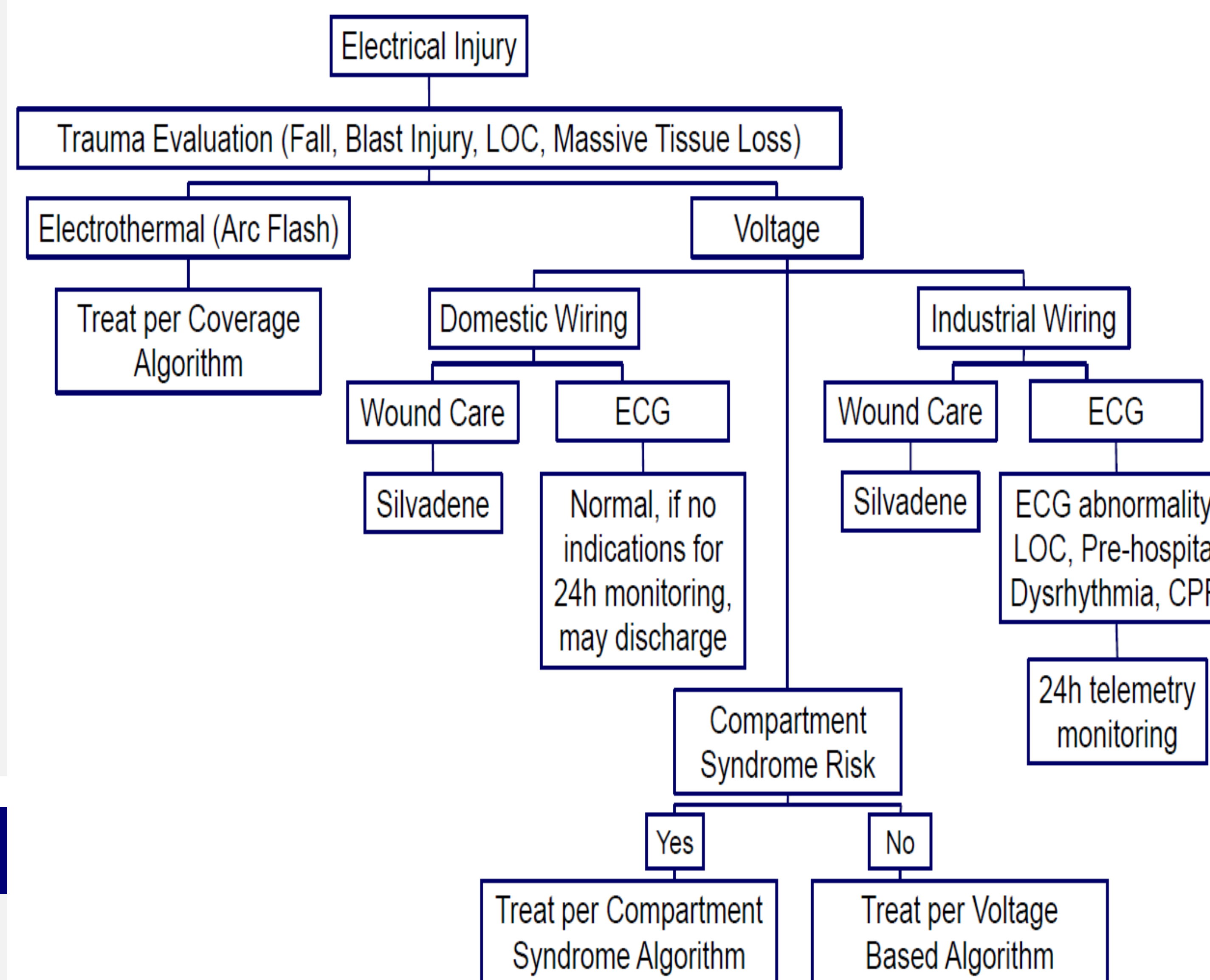
Outcomes Pre and Post Treatment Algorithm Implementation

	2013-2015 (n = 57)	2015-2018 (n = 38)	P-value
Type of admission			
ICU	19 (33)	10 (27)	0.47
Inpatient	27 (47)	24 (65)	0.09
Same day discharge	11 (19)	3 (8)	0.12
Physical Exam			
Cutaneous Burns	36 (63)	25 (66)	0.79
Total Body Surface Area Burn (%)	2 ± 5	1.3 ± 1.5	0.29
Loss of consciousness at the time of injury	24 (42)	8 (21)	0.04
Glasgow Coma Score on arrival to hospital	13.6 ± 3.6	14.7 ± 2	0.11
Investigations			
EKG (Y/N)	54 (95)	36 (95)	0.99
Troponin (Y/N)	45 (79)	13 (34)	<0.0001
Abnormal troponin	6 (13)	0	0.16
Urine myoglobin (Y/N)	46 (79)	17 (45)	0.0003
Abnormal myoglobin	3 (6.5)	1 (6)	0.93
Creatine kinase (Y/N)	47 (82)	18 (47)	0.0003
Abnormal creatine kinase	17 (36)	6 (33)	0.8
Outcomes			
Intensive Care Unit Admission	19 (33)	10 (27)	0.50
Length of Stay (Days)	5 ± 7.3	1.2 ± 0.4	0.09
Hospital Length of Stay (Days)	6 ± 11	3 ± 3.6	0.11
Telemetry	35 (61)	24 (63)	0.83
Days on telemetry	3.5 ± 6	1.1 ± 0.3	0.07
In-hospital mortality	1 (2)	1 (3)	0.55

Data expressed as mean ± SD or n (%) where appropriate
* p<0.05 considered statistically significant

Results

- Fifty-seven patients were included in the pre-algorithm cohort and 38 in the post-algorithm cohort.
- There were no significant differences between groups in age, cutaneous burn area or gender.
- Incidence of creatine kinase, troponin, and urinary myoglobin testing in pre-algorithm cohort was significantly higher compared to post-algorithm cohort
- There was a trend towards higher number of days on telemetry prior to the protocol implementation but this was not found to be significant .
- One patient in each cohort had a pre-hospital cardiac arrest and attended the hospital with ACLS in progress and was subsequently pronounced dead.
- There were no significant differences in length of stay or intensive care unit admission.
- There was a decrease in cost to patient due to fewer unnecessary investigations.

Conclusion

An electrical injury treatment algorithm provides a way to triage patients appropriately for admission to the hospital and reducing the number of laboratory tests. Overall, it decreased the cost of unnecessary testing to the patients and the hospital without compromising quality of care received by the patients and outcomes.

Applicability of Research to Practice:
Electrical injury treatment algorithm provides a way to triage patients appropriately for admission to the burn center and reduces unnecessary investigations.

Cost Reduction

Test	Cost per test to the patient ($)*	Percentage reduction	Estimated savings ($)
Troponin	225.12	45	3827
Creatine Kinase	69.21	35	900
Urine Myoglobin	136.82	13	1778

*Based on 2017-2018 prices