

# Incidence and Outcomes of Adult Cardiac Arrest Associated with Toxic Exposure Treated with Therapeutic Hypothermia (ToxiCool)



Katharine L. Modisett, MD

March 30, 2014

ACMT Annual Scientific Meeting



Carolinan Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Disclosures

No financial disclosures or conflict of interest.



Carolinan Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Therapeutic Hypothermia (TH)

- 1950s → Used in cardiac surgery to decrease anoxic injury
- 1957 → First documented use of TH in cardiac arrest patient
- 1997 → First use in out-of-hospital arrests
- 2002 → ALS ILCOR Task Force; TH in unconscious adults with ROSC after ventricular fibrillation



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Therapeutic Hypothermia (TH)

- Protocols for in and out of hospital arrests
- Extension to rhythms beyond VF
- No studies on TH in toxic-induced arrests



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Objective

- Characterize the incidence, epidemiologic characteristics of patients with toxic cardiac arrest
- Describe outcomes of toxic arrest patients treated with therapeutic hypothermia



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Study Protocol

- IRB expedited approval
- Single, urban 874-bed academic center
- Retrospective review of post-cardiac arrest QI database, Nov 2007 to Feb 2013
- Toxin-induced arrest → exposure to a xenobiotic that directly and acutely caused the patient's arrest
  - Toxic vs. non-toxic determined by consensus of 2 out of 3 investigators



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Study Protocol

- Database, medical records, and autopsy reports reviewed for 49 variables
  - Demographics
  - Initial cardiac rhythm
  - Survival
  - Cerebral Performance Categories (CPC) Scale



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Cerebral Performance Categories (CPC)

CPC Score	Patient exam
1	Conscious and alert with normal function or only slight disability
2	Conscious and alert with moderate disability
3	Conscious with severe disability
4	Comatose or persistent vegetative state
5	Brain dead or death from other causes



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*



# Results: Epidemiology

- n = 389 patients
- 48 of 389 (12%) were deemed toxic arrests

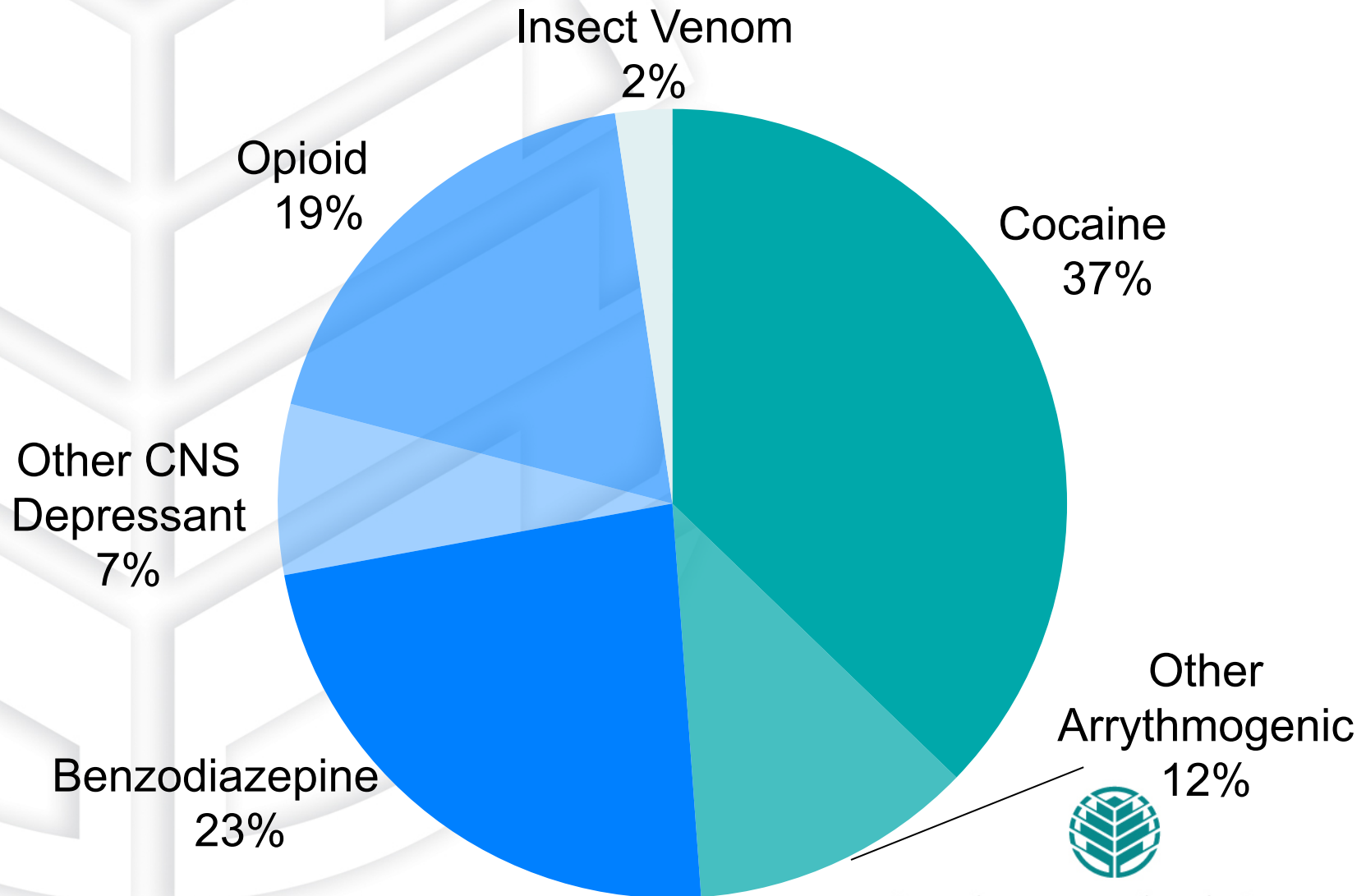
	Toxic	Non-toxic	p-value
Age range (years)	18-77	19-94	
Mean age +/- SD	47 +/- 13.6	59 +/- 19.1	<0.001
Male	29 (60%)	217 (64%)	0.75
Out-of-hospital arrests	73 (90%)	328 (96%)	1.00
Initial shockable rhythm	16 (33%)	215 (63%)	<0.001
Bystander CPR	21 (44%)	212 (62%)	0.03



Carolinan Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Results: Xenobiotics



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Results: Outcomes

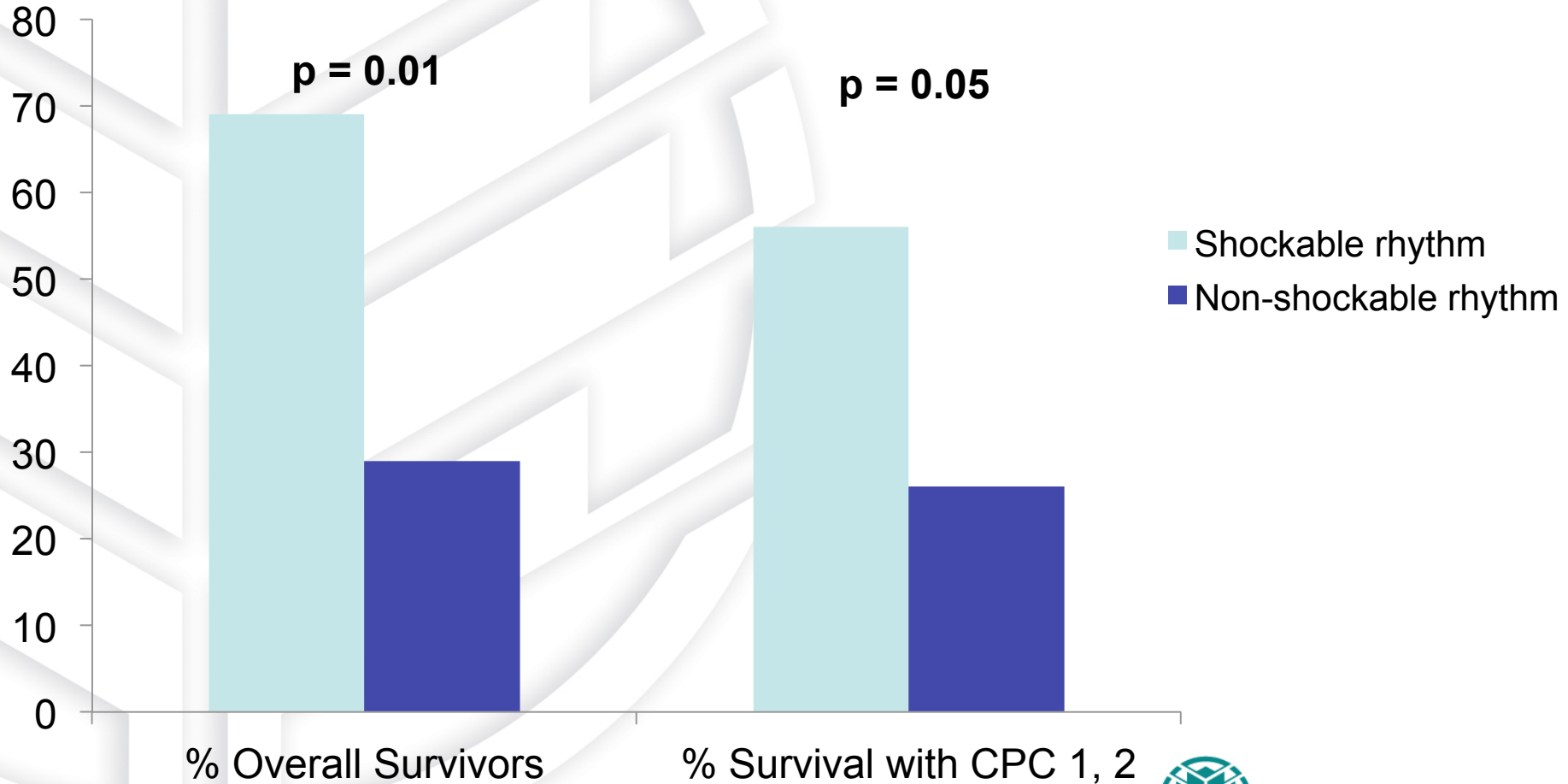
	Toxic	Non-toxic	p-value
Survival	20 (42%)	152 (45%)	0.76
High functioning survivors (CPC 1, 2)	17 (35%)	139 (41%)	0.53



Carolinan Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Results: Toxic Sub-Group



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Limitations

- Accuracy of assigning causality
- Incomplete confirmation of exposures
- Relatively small study population
- CPC scores extrapolated from records
- Confounding co-morbid conditions



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Conclusions

- Toxin-induced arrests accounted for a significant proportion of database patients
- Survival and neurologic status for toxic vs. non-toxic arrests were similar for patients treated with TH
- Initial cardiac rhythm may be an outcome predictor for toxin-induced cardiac arrest



Carolinan Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Future Research

- Logistical regression model for prediction of outcome
- Larger studies to elucidate optimal role of TH in toxin-induced cardiac arrest
- Anticipate adding to ToxIC Consortium



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*



# Thank You

Dr. Russ Kerns

Dr. Steve Walsh

Dr. Alan Heffner

Dr. Dave Pearson

Indira Gowda, MS IV

CMC Department of Emergency Medicine

Einstein Medical Center

University of North Carolina SOM



Carolinan Medical Center

*Uncompromising Excellence. Commitment to Care.*



# References

- Benson DW, Williams GR, Spencer FC, et al. The use of hypothermia after cardiac arrest. *Anesth Analg*. 1959; 38: 423–428.
- Bernard SA, Jones BMC, Horne MK. Clinical trial of induced hypothermia in comatose survivors of out-of-hospital cardiac arrest. *Ann of Emerg Med*. 1997; 30: 146-153.
- ILCOR Advisory Statement Therapeutic Hypothermia After Cardiac Arrest. An Advisory Statement by the Advanced Life Support Task Force of the International Liaison Committee on Resuscitation. *Circulation*. 2003;108:118-121.
- Arrich J, Holzer M, Havel C, Müllner M, Herkner H. Hypothermia for neuroprotection in adults after cardiopulmonary resuscitation. *Cochrane Database of Systematic Reviews* 2012, Issue 9. Art. No.: CD004128. DOI: 10.1002/14651858.CD004128.pub3.
- American College of Medical Toxicology Website. [http://www.acmt.net/Toxic\\_Background1.html](http://www.acmt.net/Toxic_Background1.html). Accessed November 6, 2012.
- Safa P, Bircher N. *Cardiopulmonary cerebral resuscitation (World Federation of Societies of Anaesthesiologists)*, 3<sup>rd</sup> ed. Philadelphia: Saunders, 1988.



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*

# Questions?



Carolinus Medical Center

*Uncompromising Excellence. Commitment to Care.*