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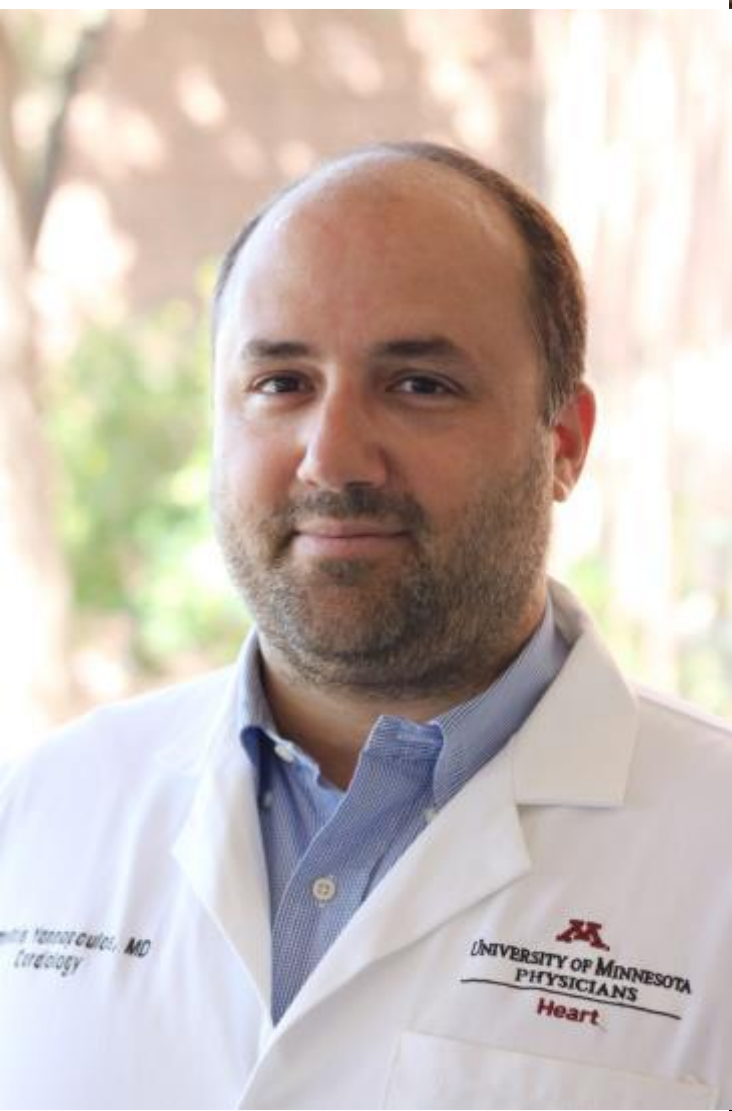
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# Conflicts of Interest

I have no conflicts of interest.



# State of the Future of Resuscitation Conference

## The Minnesota Bundle of Care

Oakland CA, September 2018

# State of the Future of Resuscitation Conference

- There are no state wide protocols in Minnesota, especially at the ALS level.
- The following discussion has primarily to do with services which are under the medical direction of Regions Hospital EMS (RHEMS).
- Most of RHEMS guidelines are consistent with AHA guidelines and the other services in the Twin City area.

# General Approach to OHCA

The following comments have primarily to do with VF/VT and PEA, concentrating on what may vary from the current standard practice in the US.

# To begin with...

- Twin City medical directors are completely sold the intrathoracic pressure regulation theory of CPR.
- Almost all services in the Twin City area have ACD/ITD CPR as their base line method. This is based on the ResQ Trial<sup>1,2</sup> and the FDA package insert.
- Caveat- all pts get ITD, ACD not so much.

1. Aufderheide, T.P., Frascone, R.J., Wayne, M.A., Mahoney, B.D., Swor, R.A., Domeier, R.M., Olinger, M.L., Holcomb, R.G., Tupper, D.E., Yannopoulos, D. and Lurie, K.G., 2011. Standard cardiopulmonary resuscitation versus active compression-decompression cardiopulmonary resuscitation with augmentation of negative intrathoracic pressure for out-of-hospital cardiac arrest: a randomised trial. *The Lancet*, 377(9762), pp.301-311.
2. Frascone, R.J., Wayne, M.A., Swor, R.A., Mahoney, B.D., Domeier, R.M., Olinger, M.L., Tupper, D.E., Setum, C.M., Burkhart, N., Klann, L. and Salzman, J.G., 2013. Treatment of non-traumatic out-of-hospital cardiac arrest with active compression decompression cardiopulmonary resuscitation plus an impedance threshold device. *Resuscitation*, 84(9), pp.1214-1222.

# To begin with...

- LUCAS has completely penetrated the Twin City market. It is used by all services in Minnesota and Wisconsin under the medical direction of RHEMS.<sup>1,2</sup>
- Is high quality CPR possible for more than 5 minutes.<sup>3</sup>
- Allows for safe transfer and for ECMO and PCI.
- HEMS IFCA

1. Rubertsson, S., Lindgren, E., Smekal, D., Östlund, O., Silfverstolpe, J., Lichtveld, R.A., Boomars, R., Ahlstedt, B., Skoog, G., Kastberg, R. and Halliwell, D., 2014. Mechanical chest compressions and simultaneous defibrillation vs conventional cardiopulmonary resuscitation in out-of-hospital cardiac arrest: the LINC randomized trial. *Jama*, 311(1), pp.53-61.

2. Perkins, G.D., Lall, R., Quinn, T., Deakin, C.D., Cooke, M.W., Horton, J., Lamb, S.E., Slowther, A.M., Woollard, M., Carson, A. and Smyth, M., 2015. Mechanical versus manual chest compression for out-of-hospital cardiac arrest (PARAMEDIC): a pragmatic, cluster randomised controlled trial. *The Lancet*, 385(9972), pp.947-955.

3. Yannopoulos, D., Aufderheide, T.P., Abella, B.S., Duval, S., Frascone, R.J., Goodloe, J.M., Mahoney, B.D., Nadkarni, V.M., Halperin, H.R., O'Connor, R. and Idris, A.H., 2015. Quality of CPR: an important effect modifier in cardiac arrest clinical outcomes and intervention effectiveness trials. *Resuscitation*, 94, pp.106-113.



# Dispatch

- We do not do NO-NO-GO dispatch or have PulsePoint in place, but we plan to begin both this quarter.

# Epinephrine

- We administer epinephrine q 10 minutes, (not q 3-5 minutes). This is based on bench work published in 2012<sup>1</sup>, and a prospective, observational Japanese trial that same year.<sup>2</sup>
1. Burnett, A.M., Segal, N., Salzman, J.G., McKnite, M.S. and Frascone, R.J., 2012. Potential negative effects of epinephrine on carotid blood flow and ETCO<sub>2</sub> during active compression–decompression CPR utilizing an impedance threshold device. *Resuscitation*, 83(8), pp.1021-1024.
  2. Hagihara, A., Hasegawa, M., Abe, T., Nagata, T., Wakata, Y. and Miyazaki, S., 2012. Prehospital epinephrine use and survival among patients with out-of-hospital cardiac arrest. *Jama*, 307(11), pp.1161-1168.

# STEMI Resuscitated Arrests

- STEMI → pre-hospital CCL activation.

# Non-STEMI Cardiac Arrest in Twin Cities

- Non-STEMI, with initial VF → “Attempt” early CCL. <sup>1,2</sup>
- CCL (within 6 hours) = **66%** (86/130) survival with favorable neurological function [CPC] ≤2).
- CCL (>6 hours or no access to CCL) = **52%** (37/73).

1. Yannopoulos, D., Bartos, J.A., Martin, C., Raveendran, G., Missov, E., Conterato, M., Frascone, R.J., Trembley, A., Sipprell, K., John, R. and George, S., 2016. Minnesota resuscitation consortium's advanced perfusion and reperfusion cardiac life support strategy for out-of-hospital refractory ventricular fibrillation. *Journal of the American Heart Association*, 5(6), p.e003732.
2. Noc, M., Fajadet, J., Lassen, J.F., Kala, P., MacCarthy, P., Olivecrona, G.K., Windecker, S. and Spaulding, C., 2014. Invasive coronary treatment strategies for out-of-hospital cardiac arrest: a consensus statement from the European Association for Percutaneous Cardiovascular Interventions (EAPCI)/Stent for Life (SFL) groups. *EuroIntervention*, 10(1), pp.31-37

# Non-STEMI Resuscitated Arrests

- VF/VT accounts for 25-30% of all cardiac arrests.
- 70% of resuscitated patients from VT/VF **do not have** ST-segment elevation on their 12-lead electrocardiogram (non-STEMI).
- Overall ~75% of all patients resuscitated from VT/VF cardiac arrest have been shown to have ischemic heart disease, potentially treatable by timely percutaneous coronary intervention (PCI).

# Access Trial

- Prospective, randomized trial of resuscitated non-STEMI VF arrests triage to:
  - Initial CCL admission.
  - Initial ICU admission.
- EFIC trial
- Enrollment is slow
  - 37 pts screened
  - 16 pts randomized

# Non-resuscitated VF/VT arrest

- Pt is brought to ECMO capable hospital.
- Regions EMS services bring these patients to the U of M because of published data.

# You Have to Bring the Patient to the Right Hospital

You can't make chicken salad out  
of chicken poop,

But you can make chicken poop  
out of chicken salad.





# Application of ECMO in CA is different because:

- It is an emergency procedure, not an emergent procedure.
- It requires extensive training and experience.
- It has all of the complications of ECMO.
- The surroundings can be very chaotic.
- There is active CPR taking place in the operative field.
- These patients are very sick and require significant post procedure intensive care.\*

Bartos, J.A., Carlson, K., Carlson, C., Raveendran, G., John, R., Aufderheide, T.P. and Yannopoulos, D., 2018. Surviving Refractory Out-of-Hospital Ventricular Fibrillation Cardiac Arrest: Critical Care and Extracorporeal Membrane Oxygenation Management. *Resuscitation* (2018).

# Current Regions EMS Protocol (Inclusion Criteria)

If an arrest is felt to be of card etiol and the:

- Initial rhythm is V fib/V tach
- Pt is between ages of 18-75
- Pt is not DNR
- Pt fits into LUCAS
- Transport time under 30 min with time from 911 to CCL < 90 min

# Current Regions EMS Protocol (Exclusion Criteria)

Pt is not brought to the U of M if:

- Family/caregiver declines
- Contraindication to mechanical CPR
- Known to be pregnant
- NH resident
- Known terminal illness

# Current Regions EMS Protocol (under discussion)

Then:

- After 3 shocks
- And 300mg amiodorone
- Goal is to keep scene time under 10-12 minutes
- Transport to the U of M under LUCAS/ITD

# Current Regions EMS Protocol (details)

- Pt is placed on back board.
- Torso is lifted and back plate is loaded from head down and placed at level of the axillae.
- LUCAS and neck straps are attached and cup placement is marked with a marker.
- Compression interruption target time is 8.5 seconds.

# Current Regions EMS Protocol (details)

- Many CA patients are intubated.
- All RHEMS RSI services have CMAC.
- Training is intense to not interrupt compressions for airway management.

# JACC Article

- Linear case series of 72 pts delivered to the U of M for consideration of ECLS\*.

\*Yannopoulos, D., Bartos, J.A., Raveendran, G., Conterato, M., Frascone, R.J., Trembley, A., John, R., Connett, J., Benditt, D.G., Lurie, K.G. and Wilson, R.F., 2017. Coronary artery disease in patients with out-of-hospital refractory ventricular fibrillation cardiac arrest. *Journal of the American College of Cardiology*, 70(9), pp.1109-1117.

# Summary

- 42% survival compared to an historical control of 15%.
- 97% CPC was 1 at 3 months.



# Results

- Avg time from 911 to CCL was 58 minutes.
- Avg time from arrival to CCL to ECMO was 6.1 minutes.
- Avg time from ECMO to balloon inflation was 60 minutes.

# Results

- All pts had severe left ventricular compromise in the first 48 hours which recovered over 3-5 days. 45% required an IABP.
- De-cannulation occurred at day 3 on average.

# Other Interesting Results

- 91% CA was 1st evidence of CAD.
- No pts had ischemic sx's PTA.
- Avg age of survivors was 59.

# Results (continued)

- Best predictors of survival:
  - ETCO<sub>2</sub>
  - Lactate
  - Time
  - Episode(s) of ROSC prior to ECLS

# Thank You.

## Any Questions?

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