Best of Scientific Sessions: Award Winners in Resuscitation

Thursday February 8, 2018

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American Heart Association. life is why

SCIENTIFIC SESSIONS 2017

GET WITH THE GUIDELINES.

Do Race and Sex Differences Exist for "Do Not Attempt Resuscitation" Orders in Patients Successfully Resuscitated from In-Hospital Cardiac Arrest?

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AHA Resuscitation Webinar

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Disclosures

- Building Interdisciplinary Research Careers in Women's Health (BIRCWH)
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Mentors

- Ed Havranek, MD
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- Benjamin Abella, MD MPhil

Background

- 200,000 individuals suffer an in-hospital cardiac arrest annually in the US[1] and survival is approximately 22.3%[2]
- Variability has been observed in survival to hospital discharge[2]
- Individuals with DNAR orders have lower likelihood of survival in comparison to those without DNAR orders[3]

1. Merchant, et al. CCM 2011; 2. Girotra et al. NEJM 2012;
3. Fendler et al., JAMA 2015

Sex and Race/Ethnicity Affect Establishment of DNAR

- **Women vs. Men**
  - Intra-cerebral hemorrhage:

    Women ↑ likely to have early DNAR vs. Men[1]

  - Emergency surgery:

    Women ↑ likely to receive DNAR vs. Men with similar prognosis[2]

- **Black/Latino vs. White**
  - Advanced cancer:

    Black and Latino patients ↓ likely to have DNAR orders than White patients[3]

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1. Nakagawa, et al. Stroke 2013; 2. Eachempati, et al. J Trauma 2006; 3. Garrido, et al. Cancer 2014

Is there variability in incidence and timing of DNAR orders by sex and race/ethnicity?

- Women will have more frequent and earlier establishment of DNAR
- Underrepresented minorities will have less frequent establishment of DNAR

Inclusion & Exclusion Criteria

- Get With the Guidelines – Resuscitation
  - National quality assurance registry of in-hospital cardiac arrest
  - 4/1/06 - 12/31/2016

- Inclusion:
  - ≥ 18 years
  - Primary cardiac arrest event
  - Return of spontaneous circulation

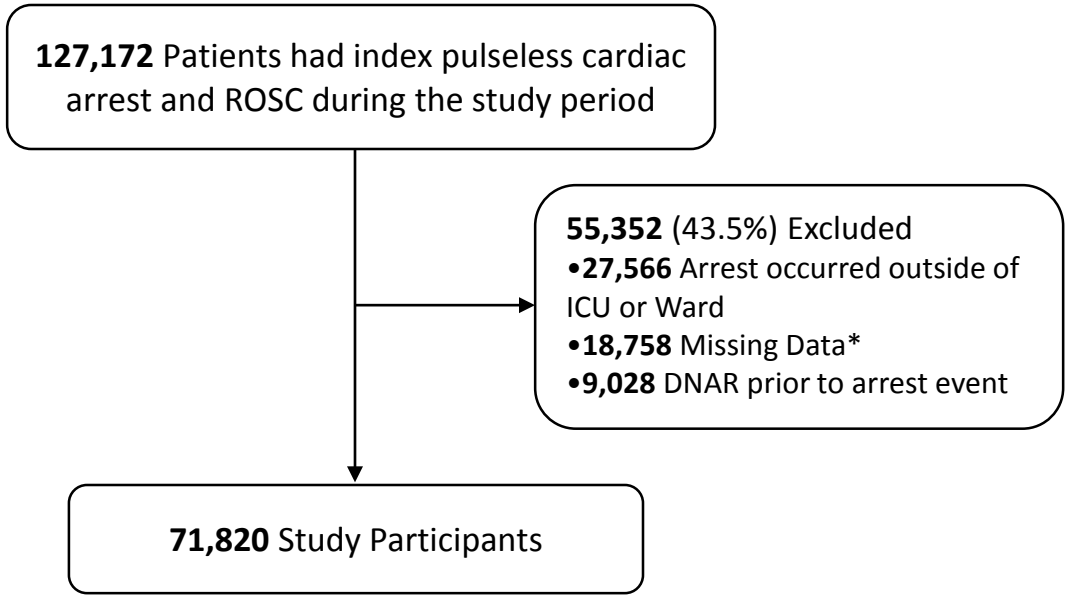
- Exclusion:
  - Arrest in a procedural area or ED
  - Missing time data (time of ROSC, time of DNR, time of death/dc)
  - Pre-existing DNR

Statistical Analysis

- Multivariable mixed effects modeling
  - Adjust for patient and cardiac arrest factors
  - Explore the associations between sex, race/ethnicity and *de novo* establishment of DNAR orders
    - at any time after ROSC
    - within 12 hours of ROSC
    - Within 72 hours of ROSC

- All models included a random effect for hospital to account for clustering

Flow Chart to Describe Excluded Subjects



***Missing data includes DNAR, Event duration, Discharge status, Discharge date, Pre-existing conditions, Initial pulseless rhythm, Sex**

Patient and Arrest Characteristics by Subject Sex

Characteristic	Female (n=30,454)	Male (n=41,366)	p-value
Age, Mean (sd)	65.5 (15.8)	64.6 (15.1)	<0.0001
Race, n (%)			
Caucasian	18774 (61.7)	27934 (67.5)	<0.0001
African-American	7916 (26.0)	8022 (19.4)	
Hispanic/Other	3764 (12.4)	5410 (13.1)	
Initial Rhythm			
Non-shokable	24842 (81.6)	32241 (77.9)	<0.0001
Shockable	5612 (18.4)	9125 (22.1)	
Duration			
0-5 min	9902 (32.5)	13244 (32.0)	0.15
6-10 min	7243 (23.8)	9763 (23.6)	
11-20 min	7124 (23.4)	9994 (24.2)	
21 min +	6185 (20.3)	8365 (20.2)	

Patient and Arrest Characteristics by Subject Race/Ethnicity

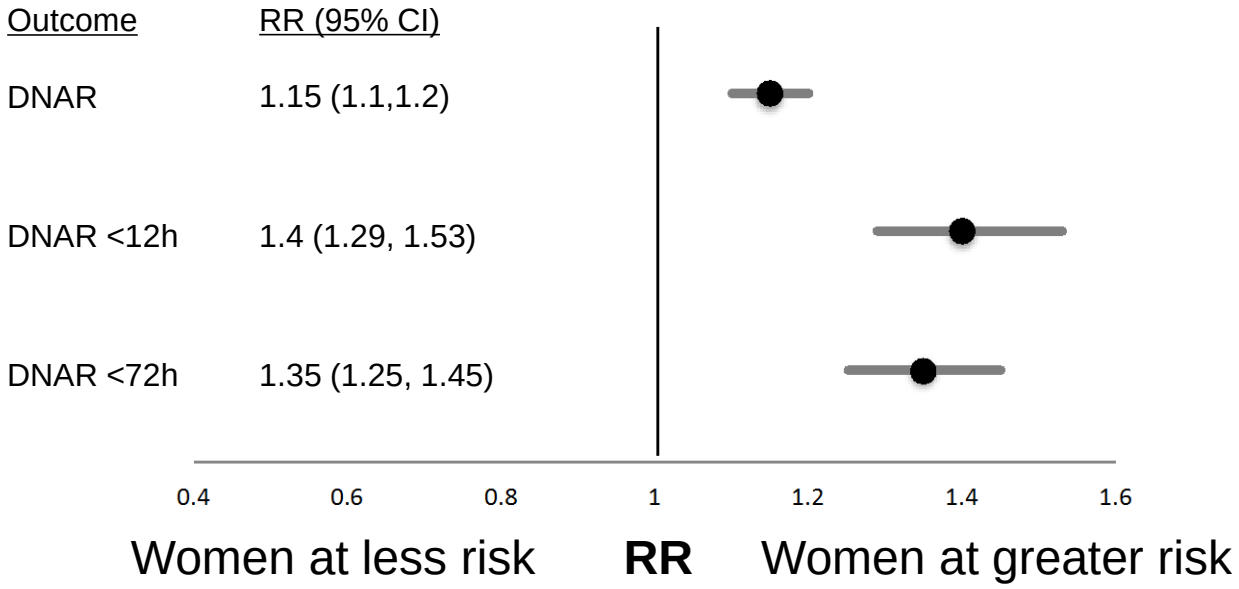
Characteristic	Caucasian (n=46,708)	AA (n=15,938)	Hispanic/Oth. (n=9,174)	p-value
Age, Mean (sd)	66.6 (14.8)	61.4 (15.9)	62.6 (16.2)	<0.0001
Female, n (%)	30455 (42.4)	7916 (49.7)	3764 (41.0)	<0.0001
Initial Rhythm				
Non-shockable	35866 (76.8)	13797 (86.6)	7420 (80.9)	<0.0001
Shockable	10842 (23.2)	2141 (13.4)	1755 (19.1)	
Duration				
0-5 min	15433 (33.0)	4847 (30.4)	2866 (31.2)	0.0001
6-10 min	10897 (23.3)	3916 (24.6)	2193 (23.9)	
11-20 min	10969 (23.5)	3964 (24.9)	2185 (23.8)	
21 min +	9409 (20.1)	3211 (20.2)	1930 (21.0)	

Medical comorbidities across demographics

Condition	Female (n=71,820)	Male (n=41,366)	p-value	Caucasian (n=46,708)	AA (n=15,938)	Hispanic (n=9,174)	p-value
Stroke	1262 (4.1)	1613 (3.9)	0.10	1649 (3.5)	847 (5.3)	379 (4.1)	<.0001
CHF*	5115 (16.8)	7305 (17.7)	0.01	8280 (17.7)	2783 (17.5)	1357 (14.8)	<.0001
Diabetes	10586 (34.8)	14199 (34.3)	0.26	15311 (32.8)	6167 (38.7)	3307 (36.1)	<.0001
Hepatic Insufficiency	2222 (7.3)	3720 (9.0)	<.0001	3499 (7.5)	1463 (9.2)	980 (10.7)	<.0001
Hypotension Hypo perfusion	7504 (24.6)	10110 (24.4)	0.57	11324 (24.2)	4088 (25.7)	2202 (24.0)	0.0008
Metastatic/Hematologic Malignancy	3492 (11.5)	4604 (11.1)	0.22	5235 (11.2)	1949 (12.2)	912 (9.9)	<.0001
MI*	3786 (12.4)	6346 (15.3)	<.0001	7421 (15.9)	1464 (9.2)	1247 (13.6)	<.0001
Electrolyte abnormality	5926 (19.5)	7742 (18.7)	0.03	8553 (18.3)	3485 (21.9)	1630 (17.8)	<.0001
Pneumonia	4611 (15.1)	6530 (15.8)	0.03	7222 (15.5)	2692 (16.9)	1227 (13.4)	<.0001
Renal Insufficiency	11107 (36.5)	16056 (38.8)	<.0001	16049 (34.4)	7669 (48.1)	3445 (37.6)	<.0001
Respiratory Insufficiency	14023 (46.1)	18588 (44.9)	0.007	21350 (45.7)	7473 (46.9)	3788 (41.3)	<.0001
Septicemia	6237 (20.5)	7790 (18.8)	<.0001	8677 (18.6)	3616 (22.7)	1734 (18.9)	<.0001

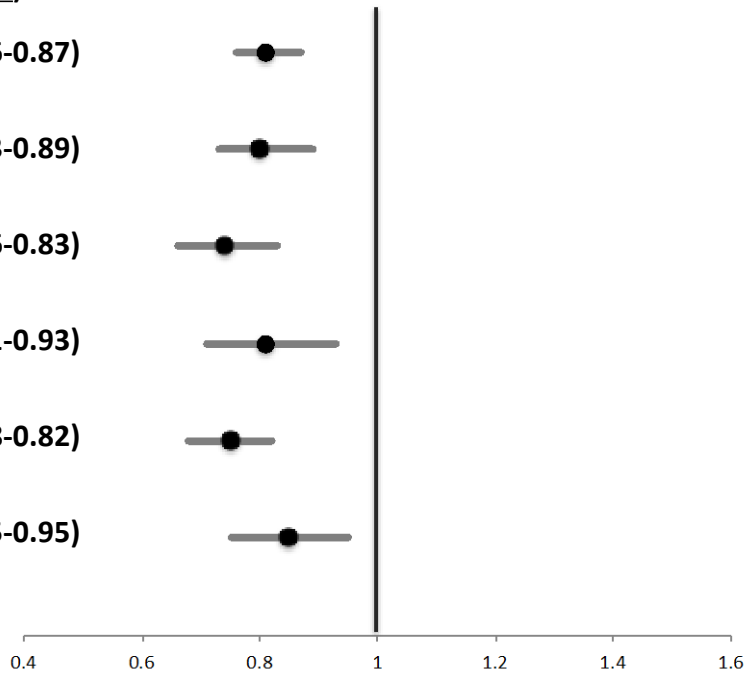
*On this admission

Women have greater relative risk of DNAR compared to men



Non-white patients have less relative risk of DNAR compared to white patients

Outcome*	RR (95% CI)
DNAR, AA	0.81 (0.76-0.87)
DNAR, H/O	0.80 (0.73-0.89)
DNAR <12h, AA	0.74 (0.66-0.83)
DNAR <12h, H/O	0.81 (0.71-0.93)
DNAR <72h, AA	0.75 (0.68-0.82)
DNAR <72h, H/O	0.85 (0.75-0.95)



Non-white at less risk **RR** Non-white at greater risk

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*AA: African American; H/O: Hispanic/Other

Limitations

- Registry study
  - Cannot account for unmeasured confounding or bias
  - Missing data (14.8%)
- Decision to establish DNAR
  - Cannot account for patient/surrogate preferences

Future Directions

- Does a similar association occur with decisions to Withdraw Life Sustaining Therapy?
- How does early DNAR affect survival and neurologic recovery?
- Why are there differences by sex and race/ethnicity in timing and utilization of DNAR?
  - Factors driving this association
  - Patient preference versus implicit bias

Conclusion

- Female sex was associated with higher risk of DNAR (<12 hours and <72 hours) after successful resuscitation
- Non-white race/ethnicity was associated with lower risk of DNAR after resusciation
- These differences should be further explored to identify barriers and facilitators to equitable healthcare delivery

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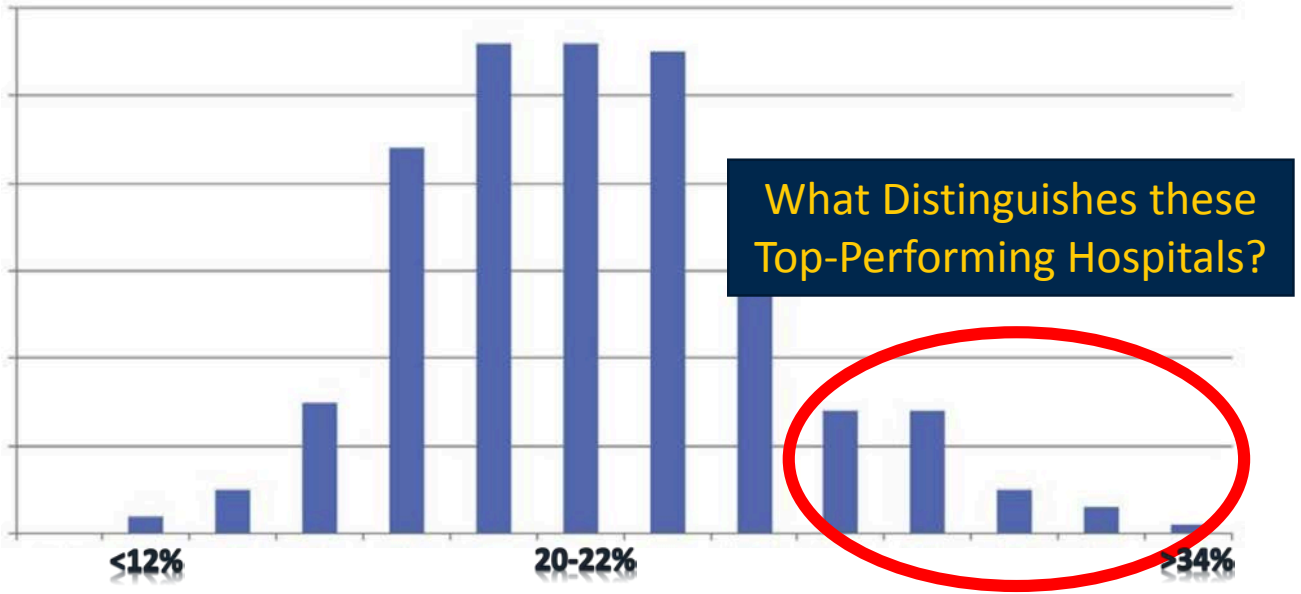
DO RESUSCITATION TEAMS AT TOP HOSPITALS FOR IN-HOSPITAL CARDIAC ARREST DIFFER?

Brahmajee K Nallamothu

11 November 2017

IHCA Outcomes Vary Across Hospitals



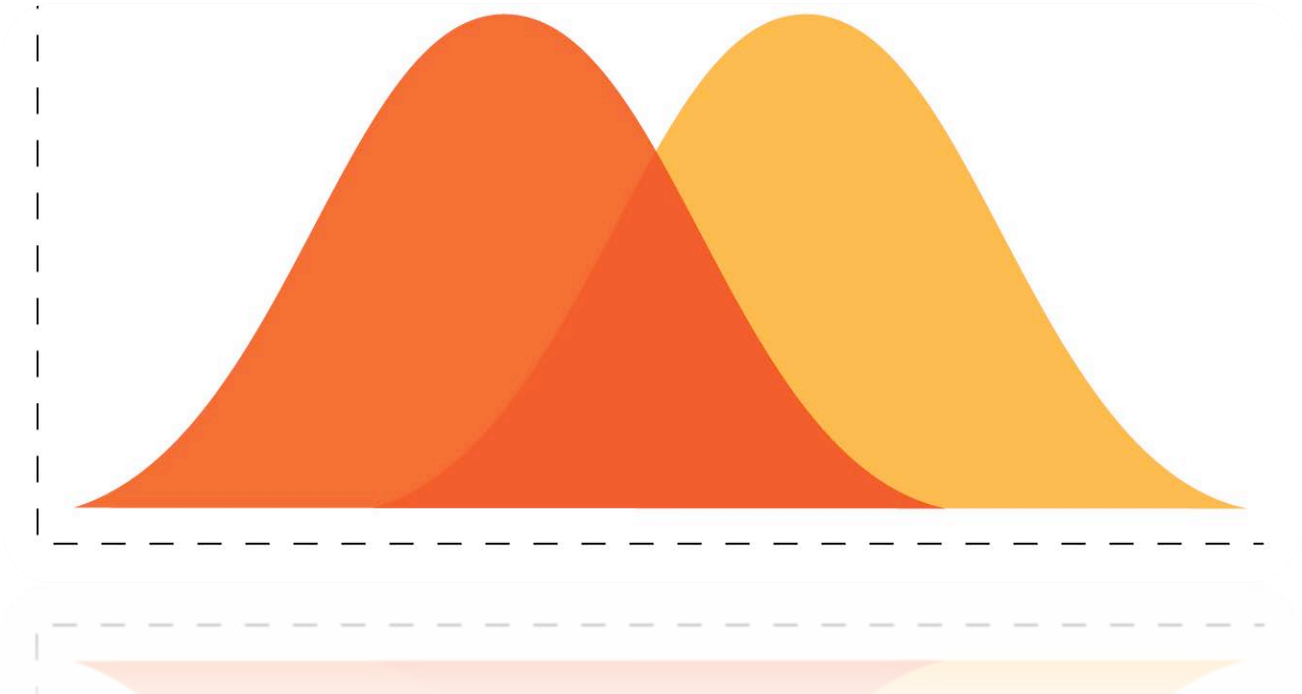
JACC 2013

Quantitative Studies Limited

- Mostly demonstrate structural factors differ between top-performing hospitals and others
  - Size
  - Geography
  - Teaching status
- Surveys find resuscitation practices differ but modestly explain outcomes variability

NEJM 2008; JAMA 2009; NEJM 2012; Lancet 2012; JAMA Cardiology 2016

What Hospitals Do Better?



Sequential Mixed-Methods Study

Survey of 150 U.S. hospitals followed by a qualitative phase consisting of semi-structured, in-person interviews and site visits at 9 hospitals

Qua

pha

Part

My presentation focuses on the role of resuscitation teams during IHCA

- Surveyed IHCA personnel at 150 hospitals
- Interviews with key informants at 9 hospitals across the U.S.
- Re-design of survey and its administration

Hospital Selection

- GWTG-R hospitals between 2012-2014
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Table 2. Hospital Characteristics

Hospital	Region	Staffed Beds	RSSR, percentile, 2014	Teaching Status
1	Midwest	>800	92.7	Major
2	Midwest	200 to 400	87.9	Minor
3	South	>400 to 800	97.8	Non-Teaching
4	Midwest	200 to 400	93.9	Major
5	West	200 to 400	2.5	Minor
6	South	>800	2.1	Minor
7	West	200 to 400	17.2	Non-Teaching
8	Northeast	>800	100	Major
9	Northeast	>400 to 800	10.3	Minor

RSSR = risk-standardized survival rate

Data Collection

- 158 interviews performed between 2016-2017
  - CEOs, Chiefs of Staff, VPs, Directors, QI Staff
  - Hospitalists, Critical Care & Emergency Medicine Docs, Anesthesiologists, & Residents
  - Nurses (NPs, ICU nurses, floor nurses), RT, PAs, Pharmacy, IV Team, ACLS Staff, Security, Spiritual Services, & Biomed Engineering
- 78 hours 29 mins; 778,482 transcribed words

METHODS: INTERVIEWS

- Interviewees used semi-structured interview guide

Interview Guide Topics
1. Let's start by having you describe what you do.
2. Please describe your hospital's policies and practices **related to preventing IHCA and selecting patients appropriate for resuscitation care.**
3. Please describe the process by which your hospital responds to the event of IHCA.
4. Please describe how your hospital cares for patients following IHCA if they survive.
5. Who is responsible for oversight and QI efforts related to IHCA at your hospital? (e.g., CPR committee)
6. In the last 3 years, please describe the major initiatives your hospital has undertaken to improve care of patients with IHCA.
7. Please describe your **perception of administrative support for QI efforts and specifically for initiatives related to IHCA at your hospital.**
8. If you could change one thing about the IHCA care processes at your hospital, what would it be?
9. If you were helping other hospitals imp**rove IHCA care, how would you recommend they structure a program?**

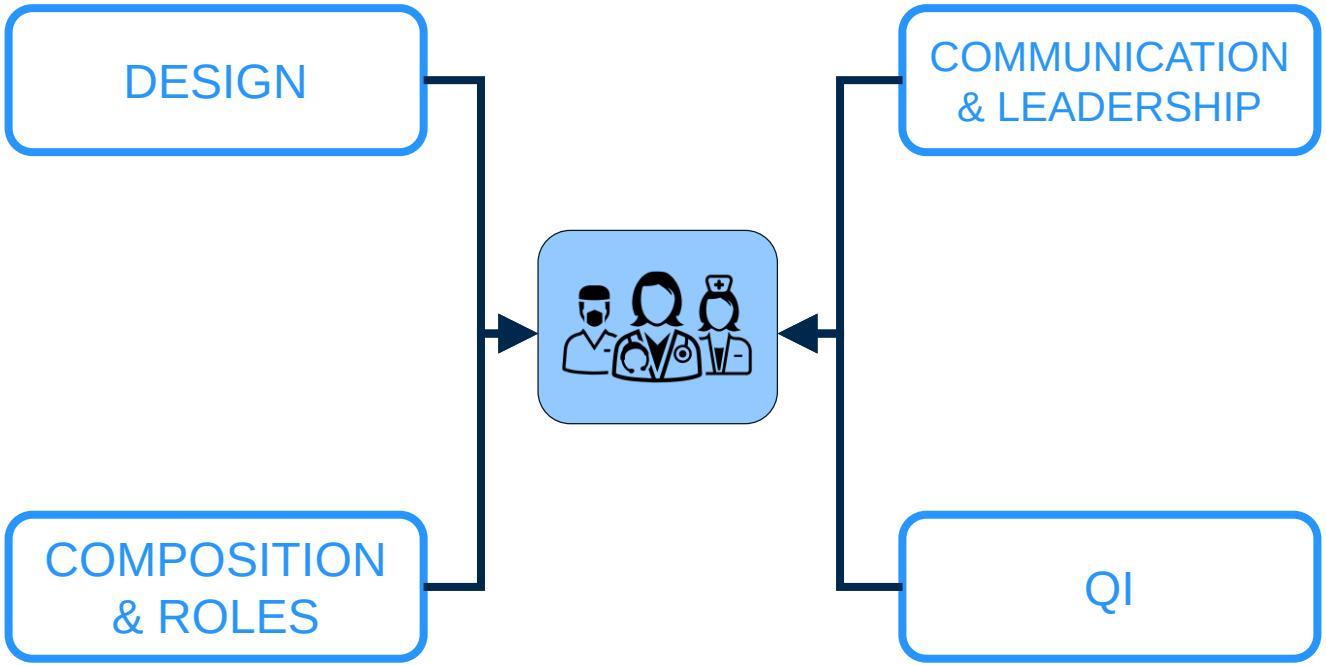
- 1 Clinician:1 Methods Expert paired in interviews; only 2 PIs "unblinded" to hospital performance

Methods: Analysis

- Transcripts coded by 4 team members
- Analyzed using MAXQDA
- Summary reports generated for each site and reviewed together
- Team members met regularly to question, discuss, and document interpretations and findings
- Key themes identified through rigorous analytic process and based on our conceptual framework

Results

Four Themes Distinguished Top Hospitals



Team Design

- Two axes (for Nursing)
  - **Dedicated Teams**: Were members specifically tasked to teams?
  - **Designated Teams**: Were members assigned to teams prior to IHCA?
- Top hospitals: Dedicated or Designated teams
- Middle & bottom hospitals did not

Dedicated Team

- *"I think what we have is again the fact that you have the 'team'…You have a dedicated team… That's this is all they're doing, waiting for us, like having a fire service…"*
  - Critical Care Doc, Hospital #1

Designated Team

- *“They come up with a plan beforehand, on who’s going to assume that role so they’re not doing it in the moment, during the crisis.”*
  - Nurse Supervisor, Hospital #2

Different at Bottom Hospitals

- *“We’ve tried to say, ‘okay, at the beginning of the shift, you're the code nurse,’ but it never…very rarely happened…so usually, we don’t assign code nurses anymore. As soon as we hear it called, you will see if there’s people in the hallway, or a head sticking out doors”*
    - Critical Care Nurse Hospital #7

Team Composition & Roles

- Not too different across hospitals for key staff: docs, nurses, RT, anesthesia
- Variable around pharmacy, IV, EKG, security…
- Major differences in Residents
  - Top Hospitals appeared to support residents
  - Bottom hospitals less support for HOs
- Universal complaint also of “crowd control”

Bottom Hospitals

- *“I don't mean they [residents] suck, but look at what we give 'em. They come in as first years, they don't know anything. They come in as second years, they sort of know what's going on. By the third year, their starting their stride. They start to get good at what they do, and then they graduate and leave, and then we're back to the people that are being fed through the PEZ container…”*
  - ACLS Instructor, Hospital 9

Composition & Roles

- Top hospitals had roles & responsibilities delineated prior to an IHCA and often trained specifically to perform these functions
- Bottom hospitals assigned roles after arrival leading to possible delays and confusion

Top Hospitals

- *"…When (Medical Director) took over and, and kind of structured everything, all of a sudden it was, it was…It was almost a slap in the face because they're like what do you mean, I can run this entire code. Now you've stuck me just on the d-fib. But, the more you do it, the more laid back and structured and calm you see these codes run…You just show up and you know what you're supposed to do, and there's no screaming and there's no yelling."*

Communication & Leadership

- Top hospitals emphasized communication & mutual respect with corrective mechanisms for dealing with problems
- Bottom hospitals struggled with communication and frequently described codes as “chaos”

QI Efforts

- “Mock Codes” universally praised but treated differently at top hospitals
  - Multidisciplinary
  - “Unplanned”
  - Focused with debriefs (“less than 20 mins”)

  “Imagine an orchestra that never practices…”

What Didn't Distinguish Top Hospitals?

- ACLS Certification Requirements
- Technology
  - Ultrasound
  - Mechanical Chest Compression
  - Bedside Laboratory Tests

Discussion

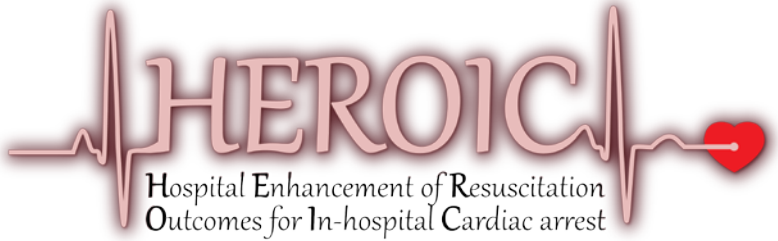
Study Limitations

- No estimates of effect size or statistical significance as with quantitative evaluation
- Extending our findings to the ~6000 US hospitals complicated by unique local contexts of each one
- We focused on resuscitation teams only

Conclusions

- We identified several characteristics that appear to distinguish top hospitals' resuscitation teams
- Adopting these characteristics may help hospitals wishing to improve IHCA outcomes
- Ideally, hospital administrators and clinicians may use our results to better inform the structure of resuscitation teams at their hospitals

Thank You!



- NEW HEROIC survey released end of February
- Please take time to review & submit!
- For questions or comments, contact:

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Contact Us to Learn More

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Thank you for your active participation and contributions to GWTG-Resuscitation!