# Rapid Response System Research: Lessons Learned

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# Disclosures

No conflicts of interest

# Objectives

1. To review lessons learned while conducting and reviewing recent RRS research projects

2. To highlight a few key concepts to consider when designing RRS research studies

# Outcome Measures

- Important to precisely define outcomes of interest:
  - Compare apples to apples & oranges to oranges
    - -Looking at the impact of an intervention
      - -Initial clinical trials
    - -Track progress (forwards or backwards) over time
      - -Ongoing quality assurance efforts
    - -Aggregate the data from numerous studies
      - -Meta-analyses

# Outcome Measures

- Important to precisely define outcomes of interest:

"Respiratory Arrests"

# Outcome Measures

- Important to precisely define outcomes of interest:

  -Respiratory Arrests

  -Respiratory Arrests + Severe Respiratory Distress

  -Operational Definition AKA surrogate outcome measure

  “RA” = Child requiring intubation on the wards

# Outcome Measures

Respiratory Arrests

-RA = Child requiring intubation on the wards

-What about?

-"Semi-elective Intubations" for:

-Airway protection

- prolonged seizures

-Respiratory Arrests/ Severe Respiratory Distress/

+ *Respiratory Insufficiency*

# Outcome Measures

Respiratory Arrests

-RA = Child requiring intubation on the wards

-What about?

-"Semi-elective Intubations" for:

-Neuroprotection (new onset asymmetric pupil)

# Outcome Measures

Respiratory Arrests

-RA = Child requiring intubation on the wards

-What about?

-"Semi-elective Intubations" for:

-Airway protection

- massive GI bleed

# Outcome Measures

Respiratory Arrests

-RA = Child requiring intubation on the wards

-What about?

-"Semi-elective Intubations" for:

-Airway protection and/or respiratory insufficiency

- prolonged seizures
- massive GI bleed

-Neuroprotection

# Outcome Measures

Respiratory Arrests

-RA = Child requiring intubation on the wards

-What about?

-Child in respiratory distress…

… who gets CPAP on the floor with an Anesthesia bag… while being transported to the PICU…

And avoids intubation for several hours…or all together!

# Outcome Measures

- Important to precisely define outcomes of interest…

Oh… and who decides which patients have met the definition?

"Preventable Arrests"

# Outcome Measures

- Important to precisely define outcomes of interest…

## “Preventable Arrests”

-9 month infant

-Sickle Cell Disease

-RSV + bronchiolitis

-Admitted for tachypnea and oxygen requirement

-Respiratory arrest ⇒Cardiac arrest

# Outcome Measures

- Important to precisely define outcomes of interest…

"Preventable Arrests"

- Key decision required *blinded reviewer*

# Outcome Measures

- Important to precisely define outcomes of interest:

  -Incidence of Cardiac arrest

    -Pulseless?

      -(bradycardia with poor perfusion)

    -Received compressions?

      -(does compressions for 30 seconds count?)

    -What is the denominator???

# Outcome Measures

- Important to precisely define outcomes of interest:

  -Survival from Cardiac arrest

    -Which definition..

      -ROSC - Return of Spontaneous Circulation

        -… but for how long?

        -Utstein Definitions

      -ROSC - Return of *Sustained* Circulation…

        -ECMO and ECPR

# Outcome Measures

- Important to consider variables that might impact the outcomes of interest:

-Survival from Cardiac Arrest:

-Quality of Resuscitation

-Time to Defibrillation (Chan et al)

-No Flow Fractions (Abella et al)

-Pre-shock pause (Edelson et al)

-Existing guides on quality measures to consider

-Kramer-Johansen et al

# Outcome Measures

Cardiac Arrest, cont…

- Are all cardiac arrests equal?
  - Predictable
    - Inevitable
      - account for DNR/NFR
    - Preventable
  - Surprising/unpredictable
    - Inevitable
    - Preventable

# Outcome Measures

Cardiac Arrest, cont…

-Pediatric Cardiac Arrest Categorization

- Types I- IV
  - preventable?
  - duration of preceding symptoms
  - hypoxic/vagal sudden event with progressive bradycardia
  - sudden pulseless event

# Fundamentals of Causality

- Temporality
  - Were things getting better *before* you started the intervention (I.e. must have baseline data)
- Biologic Plausibility
  - Ex. debate regarding In-hospital mortality rates
- Dose Response
  - Did they get the "dose"
    - Number of calls
    - Intention to Treat Analysis
- Reversibility
  - When they stop calling the team do the outcomes get worse?

# Conclusions

- Do your homework before you start collecting data
  - Review the literature
  - Look for standard definitions
  - Make sure you have baseline data
  - Consider a pilot study
  - Definitely pilot your data collection tools
  - Include data on variables that will affect your outcome measure
  - Report data in a way that it can be aggregated later
    - Even if you report a new metric, include the old/standard if possible
    - Always include denominators (rates are essential!)