

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 \Rightarrow 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!)