INSPIRE
Advancing Pediatric Patient Safety Through Simulation Science

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Network Co-chairs

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Disclosures and Conflict of Interest

• Aaron Calhoun
  • No relevant financial or intellectual disclosures.
  • Presenting as co-chair of INSPIRE, and content of this lecture does not necessarily reflect the official position of the University of Louisville

• INSPIRE Network – Funding/support from the following
  • Society for Simulation in Healthcare (SSH)
  • International Pediatric Simulation Society (IPSS)
  • R Baby Foundation
  • The American Heart Association
  • B-line Medical
  • Laerdal Foundation for Acute Care
INSPIRE – Who We Are...
"To improve the lives of children through healthcare simulation science"
INSPIRE VISION

“To serve as a global community that catalyzes discoveries and promotes collaboration in simulation-based research, scholarship, and innovation”
INSPIRE CORE VALUES

COMMUNITY   DISCOVERY   INTEGRITY

International Network for Simulation-based Pediatric Innovation, Research and Education
We strive to create a collaborative environment with open-sharing of ideas and accessibility between members while breaking down silos.
We encourage innovation through taking risks and challenging the status quo.
We believe in transparency, trust, respect, and high standards for quality in all of our endeavors.
The INSPIRE Community...
INSPIRE Global Reach - Current Snapshot

685 community members  314 sites  40 countries
INSPIRE Growth Since Its Inception

International Network for Simulation-based Pediatric Innovation, Research and Education
Productivity

29 new projects in 2019
>163 presentations and abstracts
>159 publications last year
>6 million in funding

http://inspiresim.com/annual-report/annual-report/
The INSPIRE Process

International Network for Simulation-based Pediatric Innovation, Research and Education
The INSPIRE Process

**Project Submission**
- Online Scientific Review Committee Consult
- Development of “ALERT” (Advance Look Exploratory Research Template) Presentation

**Shaping the Idea**
- Presentation of the idea at an INSPIRE national/international meeting
- “Deep Dive” discussion with worldwide simulation experts to shape the project idea

**Acquire Multi-site Support**
- Develop multiple site protocol based on contacts developed at the meeting
- Ethical Review and implementation of the project

**Project Support**
- Ongoing project support via engagement with the Project Support Committee
- Tracking of global programs of research within the network, progress ALERT presentation

**Financial Support**
- Development and adjudication of donor funded awards, with a focus on outcomes, patient safety, and innovation
- Support of novice researchers and researchers from low/middle income countries

**International Network for Simulation-based Pediatric Innovation, Research and Education**
## Current INSPIRE Funded Projects

<table>
<thead>
<tr>
<th>Projects Funded in 2019</th>
<th>Projects Funded in 2020</th>
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<tbody>
<tr>
<td><strong>Clinical Outcomes</strong></td>
<td><strong>Innovation</strong></td>
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<tr>
<td>CPR COACH – CPR Optimization and ACHievement Stepped Wedge Randomized Trial (2-year Award) – Dr. Betsy Hunt</td>
<td>3D-Printed Pediatric and Neonatal Models for Simulation – Dr. Michael Wagner</td>
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<td></td>
<td>$170,000</td>
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<tr>
<td><strong>Novice Researcher</strong></td>
<td><strong>Patient Safety</strong></td>
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<td>Deliberate Practice to Improve Interdisciplinary Communication - A Pilot Study – Dr. Veronica Godsey</td>
<td>Impact of Visual Distraction on Skills Performance – Dr. Isabel Gross</td>
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<tr>
<td></td>
<td>$10,000</td>
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<tr>
<td><strong>Novice Researcher</strong></td>
<td><strong>LMIC Research Accelerator</strong></td>
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<tr>
<td>Does Implicit Racial Bias Impact Simulated CPR Performance – Dr. Samreen Vora</td>
<td>Sequential Simulation in Zambia to Develop Paediatric Perioperative Patient Safety – Dr. Sonia Akrimi</td>
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<td>$10,000</td>
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<td><strong>Systems-based Care Research Accelerator</strong></td>
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<td>Implementation of a Resuscitation Bundle for Neonatal Resuscitation – Dr. Nora Ali</td>
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<td>$15,000</td>
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<td></td>
<td><strong>LMIC Travel</strong></td>
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<td>Implementation of Basic Life Support (BLS) and Pediatric Advanced Life Support (PALS) courses in low resources settings – Dr. Eugene Tuyishime</td>
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<td>$4,000</td>
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<tr>
<td></td>
<td><strong>LMIC Travel</strong></td>
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<td>Evolution of communication training through Simulation in India – Dr. Geethanjali Ramachandra</td>
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<td>$4,000</td>
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- **Fully funded by donors**
- **2019 Total- $190,000**
- **2020 Total- $113,000**
- **$82,000 allocated for 2021**
INSPIRE - Key Patient Safety Projects
Key Patient Safety Projects

• **ImPACTS** (Marc Auerbach, MD, MSc) – Longitudinal system-level diagnosis and improvement of care at community hospitals

• **CPR COACHES** (Adam Cheng, MD and Betsy Hunt, MD, MPH, PhD) – Translational simulation research – from simulation lab (bench) to bedside

• **PEAK** (Tensing Maa, MD) – Using simulation registries to detect latent safety threats

• **CONSORT/STROBE Statement Extensions** (Adam Cheng, MD) – Deploying network resources to improve global research quality

• **Virtual Reality Training in Pediatrics** (Todd Chang, MD, MAcM) – Ongoing engagement with new and emerging technologies
Baseline Assessment
- Simulation assessments facilitated by children’s hospital-based team
  - Infant Foreign Body
  - Infant Sepsis
  - Infant Seizure
  - Child Cardiac Arrest

Report Out
- Benchmarking of local pediatric readiness
  - Personalized global reports
  - Case specific reports
  - Action planning for future improvement

Process Improvement
- Community ED selects action items for next 6 months
- Resources for action plan provided by ImPACTS
- Meetings with Children’s Hospital at 2 and 4 months
- Support provided as needed
  - 6 month site visit

0 months → 2 weeks → 2, 4, 6 months

- 19 children’s hospitals
- 37 community emergency departments
Optimizing CPR performance with CPR coaching

multicentre RCT with

40 Teams (200 Part.)

intervention
feedback defibrillator, leader, airway expert,
2 CPR providers + CPR coach

control
feedback defibrillator, leader, airway expert,
2 CPR providers + provider

paediatric cardiopulmonary arrest simulation
PEAK (Prevalence of Errors in Anaphylaxis in Kids)

- INSPIRE point-prevalence project assessing global pediatric anaphylaxis care using in-situ simulation
- Usage of International Simulation Data Registry’s (ISDR) data entry infrastructure
- 28 institutions from 6 countries
- Poor (46%) access to epinephrine autoinjectors
- 36% of sites uncovered similar latent safety threats (Cognitive aids leading to dosing confusion)
- Provided site-specific actionable patient safety information
Reporting Guidelines for Healthcare Simulation Research

• Utilized the entire network infrastructure to enhance global simulation science
• Global review of existing guidelines with consensus building process
• Simulation specific extension items
  • CONSORT 11 items
  • STROBE 10 items
• Additional checklist of key elements
• Now a requirement of major simulation journals
Best Practices for Virtual Reality & Resuscitation Leadership Training

• Pediatric simulator fidelity decreases with size
• Virtual Reality (VR) is not yet widely used in pediatric simulation practice, but is a potentially powerful solution
• INSPIRE VR studies demonstrate:
  • Induction of necessary “eustress”
  • Replication of cognitive load
• Ongoing INSPIRE studies assessing ability of VR training to improve critical time metrics in acute care cases
An Expansive Focus...
What INSPIRE Offers to the Healthcare Modeling and Simulation Community...

- Proven project evaluation and development methodology
- Track record of high-impact multi-site patient safety and simulation research
- Capacity to mentor and train large numbers of promising new researchers
- Ability to effect pediatric outcomes using simulation on a worldwide scale
INSPIRE: Ready to Serve...

- Extensive design expertise available
  - Study structure
  - Quantitative and qualitative analysis
  - Technology (VR, etc.)
  - Dissemination
  - Data archival
- Mobilization of multiple pediatric centers
- Letters of support for projects and grants
- Open to communication and questions

https://inspiresim.com/contact-us/

Aaron.Calhoun@Louisville.edu
Questions?
Site Reports

EMSC readiness score: 82%
GED | 64%
PED | 90%

Teamwork score: 59%
GED | 74%
PED | 86%

Foreign body case score: 36%
GED | 80%
PED | 80%

Seizure case score: 36%
GED | 68%
PED | 78%

Sepsis case score: 43%
GED | 73%
PED | 100%

Cardiac arrest case score: 50%
GED | 52%
PED | 67%

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**ED Pediatric Performance Snapshot:** INFANT SEPSIS

**Case details**

10-month old female, presents with parent with vomiting/fever/lethargy

1. Mottled, cap refill 4 sec, tachycardia, normotensive, crying, CXR with pneumonia

2. Stops crying, more tachycardic, hypotensive, fluids improve HR

3. Fluids/pressors improve HR/BP

**Breakdown**

1. Begin high flow O₂
2. Establish 1ˢᵗ IV/IO
3. 60 mL/kg given over 15 minutes
4. Give appropriate antibiotics
5. Establish 2ⁿᵈ IV/IO
6. Push-Pull technique used
7. Start vasopressor after 3ʳᵈ bolus:

**Team 1/Team 2**

- ✓ ✓
- ✓ ✓
- ✗ ✗
- ✗ ✗
- ✓ ✓

**Safety threats**

1. Staff members using different applications for medication dosing

**Action items**

1. To increase percentage of teams that demonstrate delivery of 60 cc/kg in less than 10 minutes by 25% within 6 months

2. To increase the percentage teams that demonstrate the ability to calculate appropriate weight based dosing of medications in less than two minutes by 25% within 6 months.

**Site Reports**

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Improved CPR quality

- Excellent CPR (%): 31.5 % vs 63.3 %, p < 0.001
- Depth 50 – 60 mm (%): 38.0 % vs 69.5 %, p < 0.001
- Rate 100 – 120 bpm (%): 79.5% vs 88.0 %, p = 0.07
- Chest Compression Fraction (%): 76.5 % vs. 81.9 %, p = 0.04

Decreased Shock Duration

- Pre-shock duration: 5.4 sec vs. 2.6 sec, p = 0.018
- Post-chock duration: 4.0 sec vs. 2.9 sec, p = 0.012
- Peri-shock duration: 9.4 sec vs. 5.5 sec, p = 0.008
Patient vital signs return to default?

EVENT HR dropping SpO2 dropping

Is patient alive?

No decision

Yes

Nurse stops user

Vital signs drop slower, patient not stabilized

Game Over

Temporary effects of medication

Medication

User decision

Incubation equipment

Correct action 100% NRB

Other Airway Tool

Scene 3