Simulation – Principles, Progress and Possibilities

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No Conflict of Interest

Cell phone tower Knysnaa, SA
Objectives

• To demystify Simulation
• Introduce the basis for Simulation Education
• Highlight the nSMARTT interprofessional team initiative
• Simulation in clinical practice, education and research in Neonatology
The need for a new approach
The Need for Simulation

• The traditional “See one, Do one, teach one and hope not to harm one “apprentice model of graduated responsibility in the care of real patients and for acquisition of clinical, procedural and leadership skills has been termed “education by random opportunity”
The Need for Simulation

• The rationalization of work hours during residency
• The increasing breadth of technical skills required
• Limited opportunity to acquire competence in the context of safety and time
• Public outcry for accountability

Both a Challenge and an opportunity to embrace innovative learning strategies
The 10,000 hours - Novice to Expert
The Making of an Expert
by K. Anders Ericsson, Michael J. Prietula, and Edward T. Cokely

The Role of Deliberate Practice in the Acquisition of Expert Performance
K. Anders Ericsson, Ralf Th. Krampe, and Clemens Tesch-Römer

Insanity: doing the same thing over and over again and expecting different results.

Albert Einstein
Top athletes and singers have coaches. Should you?

by Atul Gawande October 3, 2011
Avoiding the “July” effect and more

A July Spike in Fatal Medication Errors: A Possible Effect of New Medical Residents

David P. Phillips, PhD¹ and Gwendolyn E. C. Barker, BA²

¹Department of Sociology, University of California at San Diego, La Jolla, CA, USA; ²School of Public Health, University of California at Los Angeles, Los Angeles, CA, USA.

Avoid the Hospital in July
Why? New doctors and nurses report to work for the first time
by Sid Kirchheimer, AARP, Updated June 2013
Institute of Medicine report 1999

**Principle 5 – Create a learning environment**

- Use Simulations Whenever Possible
- Health care organizations and teaching institutions should participate in the development and use of simulation for training novice practitioners, problem solving, and crisis management, especially when new and potentially hazardous procedures and equipment are introduced.
Cognitive, Technical and Behavioural and Communication skills

- In the following video you will see a novice German coast guard officer on his first day on the Job!
Definition of Simulation

- Modern day simulation is an immersive instructional strategy, used to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner.
Simulation and Patient Learner Safety

• Simulation enables repeated procedural exposure in a safe environment without compromising patient safety.
• Simulation protects the learner and prepares the individual for the real deal
Growth in Academic Interest in Simulation
Simulation and its role in medical education

Col Rashmi Datta*, Brig KK Upadhyay, VSM¹, Surg Cdr CN Jaideep⁸

The Education Theory - Principles

- Blooms Taxonomy
- Kolb’s Cycle of Experiential learning
- Circumflex model of affect
Blooms Taxonomy
Simulation And Kolbs Cycle

- Concrete Experience
  - Feeling
- Processing
- Continuum
- Reflective Observation
  - Watching
- Active Experimentation
  - Doing
- Perception
- Abstract Conceptualisation
  - Thinking
Circumflex mode – Getting to learning state

Integrated innovative approaches

The educational strategies best suited to address acquisition of skills include not only didactic sessions and content acquisition but also:

- audio visual review
- supervised clinical experiences
- simulated experiences
- addressing knowledge gaps
- developing competence and mastery
What we’ve done so far...
nSMARTTT

Neonatal Simulation Medicine and Resuscitation Team Training

N Sneath, MScN, NNP*, G Srinivasan, MD, F Postolow, MD, R Heese, RRT, C Porter RN, BN and B Wheeler RN, MN.
Basic assumption

- We believe that everyone participating in activities at the Clinical Learning and Simulation Facility is intelligent, well-trained, cares about doing their best, and wants to improve.
Project Goals and Objectives

1. Implementation of the Golden Hour
   • Providing opportunity to practice golden hour skills in real-time in an inter-professional group
   • Improve compliance with checklist completion
   • Pre-ductal saturation monitoring by 2 minutes of age
   • Transitioning on nasal continuous positive airway pressure

2. Neonatal Resuscitation Program renewals and updates (mandatory every 2 years)
3. Introduction to Simulation

- Improve critical thinking and problem solving skills in high-stress resuscitation situations
- Provide a forum for and practice the skill of debriefing “The Good Judgement approach”
- Trainees make sense of, learn from and apply simulation experience to change frames and actions
- Maintain psychological safety and give accurate evaluative feedback

4. Introduction to Fundamentals of Teamwork

- Improve teamwork and communication by practicing and reinforcing the importance of role clarification and identification of an event coordinator
Debriefing – The Good Judgement approach

• Goals

• Trainees make sense of, learn from and apply simulation experience to change frames and actions

• Maintain psychological safety and give accurate evaluative feedback
Pre-Evaluation Flag

NRP megacode's I have participated in have increased my confidence in resuscitating newborns.
NRP renewals provide me with valuable information I can apply to my practice.
I am aware of my institution's goals for babies born at less than 28 weeks gestation during the golden hour of care.
Identifying individual roles prior to Golden-Hour resuscitations is a useful step in promoting teamwork.
When I attend resuscitations of infants less than 28 weeks gestation, it is clear who is the team leader.
I feel my team works well together when resuscitating infants born at less than 28 weeks gestation.
I feel confident in my abilities when resuscitating infants born at less than 28 weeks gestation.
The golden-hour quality improvement initiative is a useful project.
Identifying names and roles of team members prior to attending resuscitations is a useful exercise.
When I attend newborn deliveries, I know who is in charge of the patients' care.
When I attend newborn deliveries, I am aware of the roles of all team members.
During resuscitations, my team will listen if I have something to add to the care of my patients.
I feel my team communicates well during resuscitations.
My experience with simulated scenarios has been useful in team building.
I feel simulation could help increase my confidence in being a valuable member of the team.
Debriefing is something I would like to participate in after resuscitations in my unit.
Debriefing is a useful exercise to enhance knowledge and teamwork.
The simulated exercises I have participated in have increased my confidence in treating these types of situations.
My previous experiences with simulated exercises have helped me gain knowledge in crisis management.
I feel simulation is a worthwhile learning tool.

Post-Evaluation Flag

NRP renewals in the sim lab provide better learning opportunities than those done outside of the sim lab.
I look forward to participating in NRP renewals done through simulation.
NRP megacode's I have participated in in the sim lab have increased my confidence in resuscitating newborns.
NRP renewals provide me with valuable information I can apply to my practice.
I am aware of my institution's goals for babies born at less than 28 weeks gestation during the golden hour of care.
Identifying individual roles prior to Golden-Hour resuscitations is a useful step in promoting teamwork.
When I attend resuscitations of infants less than 28 weeks gestation, I will clarify who is the team leader.
I feel my team works well together when resuscitating infants born at less than 28 weeks gestation.
I feel confident in my abilities when resuscitating infants born at less than 28 weeks gestation.
The golden-hour quality improvement initiative is a useful project.
Identifying names and roles of team members prior to attending resuscitations is a useful exercise.
When I attend newborn deliveries, I will clarify who is leading the team.
When I attend newborn deliveries, I will clarify who is in charge of the patients' care.
When I attend newborn deliveries, I will clarify the roles of all team members.
During resuscitations, my team will listen if I have something to add to the care of my patients.
I feel my team communicates well during resuscitations.
My experience with simulated scenarios has been useful in team building.
I feel simulation has increased my confidence in being a valuable member of the team.
I feel debriefing is something I would like to participate in after resuscitations in my unit.
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My previous experiences with simulated exercises have helped me gain knowledge in crisis management.
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What else are we using Simulation for?

- Simulation in Fellowship program
  - Resident Academic days simulation sessions
    - Procedural training and practice opportunities
    - Counselling, Breaking bad news,
    - Neonatal Ethics and communication module
- Respiratory therapy education
- Nursing education days
- Neonatal Resuscitation Program (NRP)
Background and Objectives

Neonatal resuscitation teams require the integrated acquisition of cognitive, technical and behavioral skills training as well as teamwork to support neonates during the critical period surrounding birth, provide optimal resuscitation care and minimize potential long-term morbidities.

We sought to train an inter-Professional group as teams using a focused integrated educational strategy with the following goals:

1. Introduction to Simulation based training using high fidelity neonatal simulators and video debriefing. Goal: Improve critical thinking and problem solving in high-stress resuscitation situations and provide a platform for practice the skill of debriefing
2. Introduction to the fundamental concepts in Team training. Goal: Improve teamwork and communication, role clarification, identification of team leader and event coordinator
3. Neonatal Resuscitation Program renewals and updates
4. "Golden Hour" and the use of Checklists. Goal: Improving transition for neonates born at less than 33 weeks gestation, significance of checklists and transition checklist completion

Conclusions

A significant positive shift in participants perceptions to the four learning objectives was noted. Ongoing evaluation of completed transition checklists to evaluate the effect of direct patient care is continuing. The nSMARTT model was well received by adult learners despite initial concerns about video debriefing and helped harness the collective experience of neonatal health care professionals working as teams.

Method and Evaluation

The nSMARTT concept was designed by an inter-professional core group trained in medical simulation who obtained support from stakeholders of the Child Health Program of the WRHA.

Ten one-day simulation workshops were conducted for 163 participants including nurses, respiratory therapists, nurse practitioners and physicians from the two tertiary neonatal care facilities in Winnipeg, Manitoba. This multilayered format included interactive didactic sessions, simulation and debriefing sessions. These sessions were conducted at the Clinical Learning and Simulation facility, University of Manitoba. Informed consent for audio and video recording was obtained from all participants. Pre and post evaluations using predesigned questionnaires aligned with the four main objectives were used along with the Student DASH© SV tool developed by the center for Medical simulation, Harvard for rating the debriefing experience.

Results

The Pre-evaluation Flag

- I am aware of...
  - The golden...
  - When I attend...
  - I feel...

Results: The Post-evaluation Flag

- NRP...
  - I am aware of...
  - The golden...
  - When I...
  - I feel...

Method and Evaluation

The nSMARTT concept was designed by an inter-professional core group trained in medical simulation who obtained support from stakeholders of the Child Health Program of the WRHA. Ten one-day simulation workshops were conducted for 163 participants including nurses, respiratory therapists, nurse practitioners and physicians from the two tertiary neonatal care facilities in Winnipeg, Manitoba. This multilayered format included interactive didactic sessions, simulation and debriefing sessions. These sessions were conducted at the Clinical Learning and Simulation facility, University of Manitoba. Informed consent for audio and video recording was obtained from all participants. Pre and post evaluations using predesigned questionnaires aligned with the four main objectives were used along with the Student DASH© SV tool developed by the center for Medical simulation, Harvard for rating the debriefing experience.

Results DASH-SV©

- The Pre-evaluation Flag
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Results: The Post-evaluation Flag

- NRP...
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Implications for health care policy

The nSMARTT inter-professional high fidelity simulation based team training model is an innovative educational strategy which facilitated inter-professional collaboration and practice, while re-energizing and enhancing the culture of safety.

References

Laryngeal Mask Airway is Equivalent to Endotracheal Intubation During Positive Pressure Ventilation and Chest Compressions in Neonatal Resuscitation High Fidelity Simulation Model

Ayman Abou Mehrem¹, Ron Heese², Bertram Unger³, Ganesh Srinivasan¹

¹ Neonatology Division, Department of Pediatrics and Child Health, ² Department of Respiratory Therapy, ³ Department of Medical Education
Faculty of Medicine, University of Manitoba, Winnipeg, Canada

BACKGROUND

- Positive pressure ventilation (PPV) is the most effective action in resuscitating a compromised newborn.
- Effective ventilation can be achieved using a laryngeal mask airway (LMA), especially if face mask ventilation is unsuccessful.
- Chest compressions (CC) may interfere with effective ventilation. It is therefore recommended that an endotracheal tube (ETT) be placed to provide PPV with CC.¹,²
- LMA placement requires less training compared to the ETT.³
- The use of LMA to provide PPV with CC has not been studied.

HYPOTHESIS

We tested the hypothesis that LMA and ETT are able to provide comparable tidal volume (VT) during synchronized PPV and CC using a neonatal high fidelity simulation model.

METHODS

- We performed 2 minutes of PPV only and 2 minutes of synchronized PPV with CC (Neonatal Resuscitation Program).³
- We used a pediatric self-inflating bag with each of following devices: face-mask (FM), ETT (non-cuffed size 4 mm), and LMA (size 1 ½ ).
- We measured the expiratory VT, percentage of VT leak, and PPV rate using the inline flow sensor of a Drager Babylog® 8000 Plus ventilator.
- The data was recorded using a HD video camera, and extracted in 1-second intervals for 2 minutes.
- We performed ANOVA (level of significance P < 0.05) with a priori comparison between the ETT and LMA.

RESULTS

The results are shown in the tables below as mean ± SD and in the graphs as mean ± SE. We observed that the flow sensor recorded chest compressions as breaths with ETT and LMA but not with FM.

<table>
<thead>
<tr>
<th></th>
<th>FM</th>
<th>ETT</th>
<th>LMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT (ml)</td>
<td>17.7 ± 2.6</td>
<td>25.6 ± 0.8</td>
<td>23.0 ± 1.0</td>
</tr>
<tr>
<td>Leak %</td>
<td>14.6 ± 1.8</td>
<td>15.3 ± 1.6</td>
<td>15.8 ± 0.7</td>
</tr>
<tr>
<td>P value</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>PPV rate (bpm)</td>
<td>38.2 ± 2.0</td>
<td>38.3 ± 0.7</td>
<td>38.0 ± 1.8</td>
</tr>
<tr>
<td></td>
<td>0.195</td>
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</tbody>
</table>

The use of LMA to provide PPV without CC, but was interestingly less with LMA when PPV was combined with CC.

<table>
<thead>
<tr>
<th></th>
<th>FM</th>
<th>ETT</th>
<th>LMA</th>
</tr>
</thead>
<tbody>
<tr>
<td>VT (ml)</td>
<td>5.2 ± 3.6</td>
<td>9.2 ± 12.7</td>
<td>10.2 ± 12.7</td>
</tr>
<tr>
<td>Leak %</td>
<td>93.6 ± 2.6</td>
<td>1.9 ± 4.1</td>
<td>0.0 ± 6.0</td>
</tr>
<tr>
<td>P value</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>PPV rate (bpm)</td>
<td>33.5 ± 3.5</td>
<td>96.4 ± 6.5</td>
<td>102.1 ± 2.6</td>
</tr>
<tr>
<td></td>
<td>&lt; 0.001</td>
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</table>

Both LMA and ETT were superior to FM.

CONCLUSION

- We were able to provide comparable VT during synchronized PPV and CC using LMA and ETT in a high fidelity infant simulator.
- The leak percentage was not significantly different between ETT and LMA during PPV without CC, but was interestingly less with LMA when PPV was combined with CC.
- Both LMA and ETT were superior to FM.

REFERENCES

Ten Steps to a Successful Simulation
The 10 Steps to a Successful Simulation

1. Identifying and elucidating the specific learning objectives specifically amenable to simulation
2. Pre-practice activities in preparation for simulation
3. Choosing the optimal Simulator
4. A defined simulation environment
5. Pre scenario briefing
The 10 Steps to a Successful Simulation

6. Running the appropriately realistic, challenging and well-designed scenario
7. Recording and identifying the knowledge and performance gaps of the participants during the scenario
8. Post scenario Debriefing
9. Evaluation of the Simulation session
10. Repeat! Repeat! Repeat!
What are you going to Choose?

• The traditional “See one, do one, teach one and hope not to harm or kill one “
• See a lot, Simulate a lot, do a lot, teach a lot, learn a lot and harm none!
Example of a bad debriefing

• From the movie Monsters Inc
• Monsters use screams collected from children scared by monsters at night to power Monsterland
• If a child were to enter Monsterland it would destroy the evilness of monsters due to their innocence and friendliness
• Novice monsters train using the simulation to become experts at scaring children and collecting the loudest screams
Questions?

Nelson Mandela’s Prison cell