ICU Nurse Perception of Self-Efficacy Following Participation in a Formal ECMO Education Program

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Porter Adventist Hospital Critical Care Unit is a 36 bed mixed medical/surgical ICU caring for patients with complex medical problems, general surgery, thoracic surgery, cardiac surgery, vascular surgery, renal/liver transplants, complex head & neck surgery, as well as behavioral health patients.

Includes a six bed cardiovascular surgery step down unit.
What is ECMO?

• ECMO – Extracorporeal Membrane Oxygenation
• Use of modified cardiopulmonary bypass circuit for temporary life support for patients with potentially reversible cardiac and/or respiratory failure (ELSO, 2014)
• ECMO provides a mechanism for gas exchange as well cardiac support thereby allowing for recovery from existing lung and/or cardiac disease
Objectives

At the conclusion of this presentation, the participant will be able to:

– Describe the researcher development of the ECMO Circuit Self-Efficacy Scale

– Describe the self-efficacy among ICU nurses in managing an ECMO circuit without a perfusionist present at the patient bedside following participation in a formal ECMO education program.
Perfusionist Run ECMO Program

- 2016 – several young patients were placed on ECMO for pulmonary and/or cardiopulmonary support with optimal outcomes for the patients
- We started seeing increased use of this treatment modality
- At the time, a perfusionist run ECMO program was in place. This resulted in higher financial costs, as well as staffing constraints due to their contractual agreements among multiple, community hospitals
- A decision was made by our facility to transition to a RN/RT run ECMO specialist program with perfusionist support
Education Needed for Transition

- Consulted with outside ECMO education company to provide ECMO education but this format was rejected
- Elected to develop our own two day ECMO education program that included both didactic content and simulation
- Program was developed according to content published in the ELSO Guidelines for Training and Continuing Education of ECMO Specialists (ELSO, 2010)
- Program was written by the ICU educator and reviewed by CT surgeon, ICU Intensivist and perfusionist
Don’t Share Chocolate with your Nurse Scientist!

• During a casual conversation in my office at the end of the day, over a little bit of chocolate, I shared how apprehensive the RNs were about the transition.

• I commented it would be interesting to see if RNs’ perceptions changed in regards to their ability to perform the ECMO Specialist role after education.

• Our nurse scientist said “Let’s make this a research project”!
Background

• Critical care nurses are required to have specialized skills and knowledge which enable them to rapidly assess and problem solve life or death situations. High level cognitive and emotional competencies are associated with technical and relational dilemmas encountered daily in critical care settings (Goldsworthy, 2016).

• The relationship between general self-efficacy and critical care ECMO self-efficacy is unknown in regards to a formal ECMO education program.
Self-Efficacy

• Self-efficacy can be broadly defined as “people’s judgements about their capabilities to organize and execute courses of action required to attain designated types of performance; it is concerned not with the skills one has but with judgements of what one can do with whatever skills one possesses” (Judge, Erez, & Bono, 1998)
General and Domain-Specific Self-Efficacy

- General self-efficacy is defined as “an individual’s perception of their ability to perform across a variety of situations” (Judge, Erez, & Bono, 1998)

- Domain-specific self-efficacy refers to how an individual feels capable of approaching and performing specific tasks, such as managing an ECMO circuit (Judge, Erez, & Bono, 1998)
Improving Self-Efficacy

- Self-efficacy can be enhanced through formal education and training programs, particularly when the individual perceives the training to be like the work environment where they will apply their learned skills (Louthans & Youssef, 2007)
- Self-efficacy has been reported to moderate training methods for outcomes, such as transfer of learning (TOL) (Pham, Mien, & Gijsealaers, 2010; Saks, 1995)
- TOL refers to the ability to transfer skills learned in the educational environment (i.e. classroom or simulation laboratory) to the practice area (Machin & Fogarty, 1997)
- Importantly, Chen and colleagues (2008) concluded that “high general self-efficacy can maintain employees’ work motivation throughout rapidly changing stressful job demands and circumstances and buffer them from the potentially demotivating impact of failure.”
Purpose of Research Study

• To examine the difference in pre- and post- perception of general self-efficacy and ECMO circuit self-efficacy among ICU nurses in relationship to managing an ECMO circuit without a perfusionist present at the patient bedside following participation in a formal ECMO education program.

• Approved by Catholic Health Initiatives Institute for Research and Innovation Institutional Review Board (CHIRB).
Study Design

• Exploratory non-randomized pre- and post-test one group quasi-experimental without comparators design using a generalized self-efficacy tool and an ECMO circuit self-efficacy tool
Generalized Self-Efficacy Scale

- Measured by the Generalized Self-Efficacy Scale (GSES) (Schwarzer & Jerusalem, 1995)
- Measures the RNs perception or belief in his or her own ability to respond to novel or difficult situations and to detail with associated obstacles and setbacks (Schwarzer & Jerusalem, 1995)
- Self-administered 10-item scale
- Indicate the extent to which each of the statements applies to the respondent
- High internal consistencies were found in five sample studies using the GSES and the Cronbach’s alphas ranged from 0.82 to 0.93
Researchers developed the ECMO Circuit Self-Efficacy Scale using Bandura’s guide for developing domain-specific self-efficacy scale (Bandura, 2006)

Scale references include ECMO specific technology

- Blood Pump
- Oxygenator
- ECMO Emergency Situations

Cronbach’s alpha for this scale was determined during the analysis of the data

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**ECMO Circuit Self-Efficacy Scale**

Instructions: Please rate how certain you are that you can do the things discussed below by writing the appropriate number. Your answers will be kept strictly confidential and will not be identified by name.

Rate your degree of confidence by recording a number from 0 to 100 using the scale given below:

<table>
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<th>0</th>
<th>10</th>
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<td>Cannot do at all</td>
<td>Moderately can do</td>
<td>Highly certain can do</td>
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**TandemHeart™**
- Regulate blood flow
- Troubleshoot console alarms
- Assess TandemHeart™ circuit

**Quadrox™ Oxygenator**
- Approximately regulate sweep flow
- Assess for air entrainment
- Assess for blood clots
- Regulate FiO2

**Manage Emergency Situations**
- Manage ECMO circuit when patient has potentially fatal dysrhythmia
- Manage ECMO circuit with identified air entrainment
- Manage ECMO circuit with unplanned decannulation

Confidence (0-100)
Participants – Sample

- Convenience sample of 32 ICU RNs who attended the formal ECMO education program
- Participation was voluntary and written informed consent was obtained
- At the beginning of day one of education, the pre-test was administered, collected, and dated
- At the end of day two of education, the post-test was administered, collected, and dated
- The 2-Day course was offered on two separate occasions, 10 days apart
- Data were analyzed using descriptive statistics, Wilcoxon signed-rank and factor analysis yielding an ECMO Study Power of 0.854 (adequate sample size)
Results – ECMO Circuit Self-Efficacy

• ECMO self-efficacy significantly changed after attending a formal ECMO education program (Wilcoxon signed-rank test; $Z = -4.782$, $p < 0.0001$)

• All ten ECMO Circuit Self-Efficacy Scale questions demonstrated significant change ($p < 0.0001$)

• Principal Component Factor Analysis using Varimax rotation with Kaiser Normalization showed the ECMO scale loaded into three factors accounting for 77% of total variance
  – Factor 1 (Quadrox) 34%
  – Factor 2 (TandemHeart) 23%
  – Factor 3 (ECMO Circuit) 20%

• Reliability and internal consistency was adequate (Cronbach’s alpha – 0.84)
Results – Generalized Self-Efficacy Scale

- The formal ECMO education class did not significantly change general self-efficacy (Wilcoxon signed-rank test; $Z = 0.178$, $p = 0.178$)
- GSES tool demonstrated reliability and internal consistency (Cronbach’s alpha – 0.82)
Implications for Practice

• Nurses’ perception of ECMO Circuit self-efficacy significantly improved following participation in a formal ECMO education program.

• An individual nurse’s perception of domain-specific self-efficacy can be enhanced through formal education programs and training.
Limitations

• Limited to a single 36 bed ICU
• Small sample size (although adequate for this study)
• Unable to replicate the study in this ICU as apprehension regarding caring for patients as an ECMO specialist no longer exist
Implications for Further Study

• Would a similar pre- and post-test study regarding self-efficacy have the comparable results after education for other domains in our ICU?

• Would a similar pre- and post-test study regarding self-efficacy have comparable results after education in other hospital settings within this facility?

• Would a similar pre- and post-test study regarding self-efficacy have comparable results in other facilities?
A Special Thank You

- Special thank you to Cynthia Oster, PhD, RN, APRN, MBA, ACNS-BC, ANP, additional researcher on this study
- Her support and guidance throughout this entire research project was invaluable
- Colleague, mentor and friend
- We all need a little push sometimes....
References

Questions?