Faculty Disclosure

Melanie Kuelbs, BSN, RN, CCRN, Jamie Heil, BSN, RN, and Catherine M. Smith, RN have disclosed no actual or potential conflicts of interest in relation to this educational activity.

During this presentation, the speakers will not be discussing the use of any commercial or investigational product not approved for any purpose by the FDA.

Evidence-Based Practice Scholars: Critical Care & Surgery Topics

Wednesday, October 14, 2009 & Wednesday, November 11, 2009

Melanie Kuelbs, BSN, RN, CCRN
“Hypothermia Therapy in Pediatric Cardiac Arrest Patients”

Jamie Heil, BSN, RN
“24 Hour Family Care”

Catherine M. Smith, RN
“Discharge Medication Teaching for Ambulatory Surgery Patients”

At the end of this presentation, the learner will be able to:
1. Discuss the process used for exploring evidence-based practice.
2. Articulate key findings of this exploratory work.
3. Describe several proposed clinical changes based on evidence.

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Accreditation

Children’s Hospitals and Clinics of Minnesota is accredited as a provider of continuing nursing education by the American Nurses Credentialing Commission on Accreditation.

Children’s Hospitals and Clinics of Minnesota designates this educational activity for 0.5 continuing education hour.

Hypothermia Therapy in Pediatric Cardiac Arrest Patients

Melanie Kuelbs BSN, RN, CCRN
Evidence Based Practice Scholar

Applying for EBP Scholar

- BSN, RN, CCRN
- PICU 7 years, ECMO 1 year
- Interest, curiosity
- Expand knowledge base
- Improve my practice
- Be a part of the conversation
- Share new knowledge with others
**Background**

- Therapeutic hypothermia guidelines were recently introduced for some pediatric age ECMO patients
- Successful use in NICU for newborns with hypoxic-ischemic encephalopathy
- Used in adult population
- Prompted discussion about lack of pediatric studies

**Hypothermia Therapy**

- What is the evidence?
- Can we?
- Should we?

**Why Consider Hypothermia Therapy?**

- >60% survival rate after initial resuscitation
- <35% survival rate after 1 year
- Hypoxic-ischemic encephalopathy most important cause of morbidity & mortality after resuscitation
- Nearly half of all patients experience neurological insult after resuscitation
- Recommended therapy for adults and neonates
- American Heart Association recommends consideration of hypothermia therapy (HT) in children who remain comatose following resuscitation. Recommendation based on extrapolation from existing non-pediatric studies

**1. Ask the Question**

Does induced hypothermia therapy reduce mortality and improve neurological outcomes in pediatric cardiac arrest patients?

**2. Find the Evidence**

- Search terms: hypoxic-ischemic brain injury, cardiac arrest, hypothermic therapy, hypothermic protocol
- Limits: infant, preschool child, child, adolescent, English
- Databases: PubMed, Cochrane Collaboration, CINAHL, Google, Google Scholar

**3. Critique the Evidence**

No current studies of hypothermia therapy after pediatric cardiac arrest are available
What I Did Find...

- Reperfusion injury cascade
- Early use of hypothermia therapy in pediatrics
- Adult cardiac arrest resuscitation practices
- Newborns with hypoxic-ischemic encephalopathy
- Differences between pediatric cardiac arrest patients vs. newborn and adult patients
- Current practices and studies in pediatrics
- Exclusions: traumatic brain injury, drownings, cardiac surgery

Mechanisms of Neuroprotection

- Energy Failure and Anaerobic Metabolism
  - Brain depleted of glucose and ATP stores
  - HT decreases cerebral metabolism, decreases anoxic decline in ATP potential
- Excitotoxicity/Mitochondrial Injury/Reactive Oxygen Species
  - Release, Release of Nitric Oxide, Catecholamines, Calcium Ion Shifts
  - Attacks cell membranes → mitochondrial damage → apoptosis
  - HT suppresses apoptosis, slows down production of radical formation
- Cerebral Blood Flow
  - Calcium ion shifts disrupts blood brain barrier increases cerebral edema
  - Reperfusion followed by several minutes of hyperperfusion then several hours of low cerebral blood flow
  - HT may improve delayed hypoperfusion and decrease disruption of blood brain barrier
- Inflammatory/Immune System
  - Neutrophils and macrophages released whose actions release more oxygen radicals which cause death of injured cells
  - HT decreases neutrophil and macrophage function < 35°C


Early Use of Hypothermia in Pediatrics

- HT used in many PICUs during late 1970s and early 1980s
  - after asphyxial cardiac arrest in children
  - Reye syndrome
  - traumatic brain injury
- Considered standard of care

Kochanek et al 2009, Hutchison JS et al 2008

Chilling Effect

- Bohn et al (1986) and Biggart and Bohn (1990) suggested that HT increased infectious complications with no improvement in outcomes
- Study limited in scope
  - ~ 40 drowning victims over 5 years
  - wide range of target temperatures 30-31°C
  - wide range of duration – as long as 13 days
  - combined with aggressive hyperventilation, fluid restriction, rapid re-warming
- Influenced decisions to abandon hypothermia therapy in pediatrics

Another Route

- Busto et al (1987) described successful application of extremely mild hypothermia therapy
- Ultimately lead to successful clinical application in adult cardiac arrest victims due to ventricular fibrillation
- Two studies published in the New England Journal of Medicine

Hypothermia Therapy in Adults

- Two studies in the New England Journal of Medicine 2002
- European, multi-center trial, blinded assessment of outcome
- Australian, prospective, controlled trial, blinded assessment of outcome
- Based on results of these studies, use of HT in adult survivors of cardiac arrest is recommended in treatment guidelines

The Hypothermia After Cardiac Arrest Study Group 2002, Bernard et al 2002
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**European Trial**
- Adults 18-75 years old
- Cooled for 24 hours
- Target core temp 32-34°C
- Complications: Sepsis more likely in HT group, but not statistically significant

<table>
<thead>
<tr>
<th></th>
<th>HT</th>
<th>NT</th>
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<tbody>
<tr>
<td>Favorable outcomes</td>
<td>55%</td>
<td>39%</td>
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<tr>
<td>Mortality at six months</td>
<td>41%</td>
<td>55%</td>
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</tbody>
</table>

HT = hypothermia therapy
NT = normothermia therapy

The Hypothermia After Cardiac Arrest Study Group, 2002

**Australian Trial**
- Adults (excluded females < 50 years old)
- Core temp 33°C
- Cooled for 12 hours
- "Difference in mortality did not reach statistical significance" vs. HT group

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<thead>
<tr>
<th></th>
<th>HT</th>
<th>NT</th>
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<tbody>
<tr>
<td>Good outcomes</td>
<td>49%</td>
<td>26%</td>
</tr>
<tr>
<td>Mortality* 51%</td>
<td>68%</td>
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</tbody>
</table>

HT = hypothermia therapy
NT = normothermia therapy

Bernard SA et al 2002

**Hypothermia Therapy in Adults**

Conclusions:
- Hypothermia therapy increases rate of favorable neurologic outcome and reduced mortality in adult cardiac arrest patients due to ventricular fibrillation who have been successfully resuscitated.
- Hypothermia therapy lasting for 12 hours is not associated with clinically significant adverse effects and that it appears to improve outcomes in patients with coma after resuscitation from out-of-hospital cardiac arrest.

Bernard SA et al 2002

**Hypothermia Therapy in Neonates**

- 2007 updated Cochrane review
- 8 randomized controlled trials
- Concludes there is evidence that therapeutic hypothermia is beneficial to term newborns with hypoxic-ischemic encephalopathy and that cooling decreases death without increasing major disability in survivors. The benefits outweigh the short-term adverse effects.

Jacobs, S et al 2007

**Differences Between Pediatric Cardiac Arrest Patients vs. Neonates & Adults**

Neonates & Adults
- Homogenous group
- Neonates witnessed event - resuscitated after birth asphyxia
- Adults cardiac arrest usually from v. fib

Pediatrics
- Many pediatric out-of-hospital cardiac arrests unWitnessed, usually asphyxia, with delayed and limited resuscitation
- In-hospital pediatrics often have chronic conditions and insidious physiological deterioration leading to cardiac arrest, affecting the overall outcomes


**Objectives:**
- Hypothesized that hypothermia therapy would be associated with improved outcomes after cardiac arrest
- Objectives:
  - Determine effect of hypothermia therapy on mortality and functional outcome
  - Describe any adverse effects of hypothermia therapy

Doherty et al 2002
• Retrospective observational study
• Four university-affiliated tertiary pediatric institutions in Canada and one in the UK
• Databases searched from Sept 1, 2001 through Aug 31, 2003
• All patients admitted to hospital who experienced out-of-hospital or in-hospital cardiac arrest

Conclusions:
• Hypothermia therapy does not have a statistically significant adverse impact on survival or functional outcome
• Variations in practice exist between centers – not using standardized guidelines for cooling and re-warming
• Supports need for randomized controlled trials

Children’s Hospital of Pittsburgh
• Largest experience reported on the use of mild HT in pediatric cardiac arrest
• Chart review of all patients who had in- and out-of-hospital cardiac arrest from 2000-2006
• HT used at discretion of physician – 193 pts.
• Concludes:
  – HT is feasible
  – HT does not increase adverse side effects
  – HT effectiveness needs further studies

“2 former St. Cloud rivals share bond after cardiac arrests”
• Two St. Cloud area 17 year old boys experienced cardiac arrests in June 2009
• Michael collapsed on the basketball court
• Kyle collapsed at his high school’s lock-in party
• CPR and defibrillators used
• Both cooled at local hospital to “limit brain damage”
• MDs said the teens had less than 50% chance of walking out with a normal life
• Both survived, neurologically intact, and will need internal defibrillators

Current Studies
• University of Pittsburgh – recruiting participants
  – Evaluate cooling for 24 or 72 hours
  – 40 children in their hospital
• The Hospital for Sick Children – currently recruiting
  – Hypothesize HT will improve proportion of patients with a good functional outcome compared to NT group
  – Begun 3-site study, expanding study to 11 sites
• University of Michigan C.S. Mott Children’s Hosp. & University of Utah – currently recruiting
  – Multi-center study to investigate whether HT can prevent/reduce brain damage in children after cardiac arrest – children will be randomly assigned
  – Total of six years, 30 trial sites, up to 900 participants in US and Canada

4. Integrate Into Practice
• Hypothermia therapy can safely be done in an ICU environment with no increase adverse effects in cardiac arrest pediatric patients
• 38% MDs occasionally use HT; 9% always use HT after pediatric cardiac arrest (Doherty et al 2009)
• 2005 survey of pediatric critical care MDs 47% already use HT at least “sometimes” and 95% are willing to randomize their patients to HT and NT groups for a definitive study (Kochanek et al 2009)
5. Evaluate the Practice Change

- Hypothermia therapy requires collaboration with physicians for this intervention

Can we? Should we?

- Our Mission
  We champion the special health needs of children and their families. We are committed to improving children's health by providing high-quality, family centered pediatric services. We advance these efforts through research and education.

- Our vision
  is to become one of the nation’s best pediatric providers, accessible to all children.

Recommendations

- Recruit members for a multi-disciplinary team to design and implement hypothermia therapy
- Consider use of hypothermia therapy for pediatric patients who meet criteria
- Based on medical criteria for hypothermia therapy use, develop nursing clinical standards for care of patients receiving hypothermia therapy
- Write IRB for clinical research study of patient response to hypothermia therapy
- Consider participation in existing randomized control trials of hypothermia therapy for pediatric patients

References


My Background

- 5 years in the PICU
- Helped to open IMC 4 years ago
- Member of IMC unit council for 3 years
- Currently involved in the Technological Transitional Support for Patients (TTSP) Group
  - Group working on discharge process for trach/vent patients
**A Not-So-Simple Question**

In children being discharged from the hospital for the first time with a trach and ventilator, does a 24 hour family care stay improve family confidence and satisfaction at the time of discharge?

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**Why This Question?**

- Lack of structured discharge education in IMC
  - Families inadequately prepared for transition to home
    - Results in readmissions
    - Decreases family satisfaction
  - Prolonged hospitalizations due to education needs
- Observed lack of confidence and competence in the families of patients

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**Why This Question?**

- “Here the staff are in control of everything so you don’t even need to think.”
- “I’m guaranteed 24 hour home care.”

**Nyqvist, et al. (2009)**

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**A Means To An End**

Why I joined the EBP Scholarship Program

- TTSP group working on discharge process for trach/vent patients
  - Care pathway with 24 hour family care stay at the end before discharge
- Unique opportunity to review the literature
- Advance my goal of a hospital wide 24 hour Family Care Protocol

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**Computer Time (Research)**

- **Databases**
  - PubMed, CINAHL, Cochrane Collaboration
- **Criteria**
  - Research and expert opinion based publications
  - Within the past 13 years
- **Search terms**
  - Discharge
  - Education
  - Ventilator
  - “Family care”
  - “Care-by-parent”

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**A Difficult Search**

- Lack of strong research on patient discharge process
- Most research in neonates or adults
- No research on inpatient parent or family care focus on discharge teaching
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**What “They” Say…**

- **Cochrane Review**
  - "The impact of discharge planning… is uncertain."
  - Lack of clear evidence
  - Difficult to do research related to the discharge process
  - Different reported measures of outcome
  - Discharge planning may have a small impact on length of stay and readmissions
    - Not statistically significant

  Shepperd, et al. (2009)

- **Expert Opinion**
  - Caregivers should spend at least 2-3 days at the hospital providing total care under observation of RN (Dettenmeier, 1990)
    - "Trial by fire"
    - Inadequacies corrected before discharge
  - "Trained caregivers provide total care for 24 hours or for extended periods on consecutive days." (Burns, 2007)
    - Quoted from the AACN Protocols for Practice: Care of Mechanically Ventilated Patients
    - Decreases family stress

- **Clinical Research**
  - Overwhelming evidence in the neonatal research states that Care-by-Parent programs have positive outcomes
    - Parents room-in and provide ALL patient care with the RN acting only as a resource
    - Confirmed both the parents’ own and their infants’ readiness for discharge home
    - Gave the parents an opportunity to test the reality of caregiving
    - Helped the parents realize that it was their baby and not the nurses’ baby

  Costello, et al. (1998)

- **In Other Words…**
  - Though there is lack of research specifically related to 24 hour family care prior to discharge, similar research suggests that it would be beneficial to the families of complex patients.
  - More research is needed to evaluate it’s true benefits.

**So Now What?**

**My Recommendations**

- Implement a structured, hospital wide "24 Hour Family Care Protocol" in Children’s
  - Protocol is written as a policy or procedure
  - Specific guidelines on what happens during protocol
  - Conduct a research study to evaluate it’s effect on family confidence and satisfaction

**Where Did This Info Come From?**

**References**

Info Continued…


PICO Question

For the parents/guardians of children in an ambulatory surgical setting who are receiving discharge medications, does the education of discharge medications during the intra-op phase, as compared to education of discharge medications at the time of accompanying discharge teaching (just prior to discharge), increase better parental retention of discharge medication teaching?

What, Where, Why?

- Desire to learn ways scientific research is accomplished in 2009
- Joint Commissions Commission’s National Patient Safety Goals (NPSGs)
- Goals 2, 3, 8 improve accuracy of medication reconciliation (MR).
- Suitable solutions to provide counseling to families.
- Committed to asking those everyday bedside nursing questions to advance practices.

Comparison

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<th>Current</th>
<th>Proposed</th>
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<td>Education of discharge medications just prior to discharge from Tower Day Surgery.</td>
<td>Education of discharge medications to Parent or Guardian during the Intraoperative Phase.</td>
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Clearly, I could see my objectives

To evaluate the evidence of latest methods in patient education of discharge medications. Compare discharge medication plans and critique the evidence of various studies.
**Search Strategy**

- Evidence
  - Teaching family
  - World Wide Web
  - Billings & learning for the patient

- Strategies
  - OMIM
  - Medscape
  - Reconciliation
  - Counseling
  - Discharge

- Database
  - PubMed
  - EMBASE
  - Cochrane
  - Scopus
  - ScopusWiley InterScience

**Evidence/Findings**

- Family identified barriers to MR process (Riley-Lawless, 2009)
- Need for counseling by nurses and attention to family comprehension of information (Kermack, 2006)
- Pediatrics for increased risk of errors due to a variety of reasons, such as forgetting dose and bring list of meds to reconcile on admission. (Wong, 2008)
- Pediatric nurses can utilize the principles of family centered care to promote successful outcomes. (Vira, 2005)

**Tower Day Surgery Center (TDSC) families**

Can experience delays in obtaining medication teaching due to multiple factors

- Nurse, provider, medication, interpreter, medication
- Are all available and ready to learn?
- May-June 2009: computerized provider order entry (CPOE) and opening of outpatient pharmacy has revamped policies & procedures for multidisciplinary team.
- Family navigating children’s campus changes

**Conclusions**

- There are no specific studies to support medication teaching to families during the intra-operative period.
- TDSC would benefit from a small scale inquiry as to if comparisons are efficacious to parental comprehension if the intervention is moved.
- Methods could be incorporated into a phone survey which is already a requirement. One study gave out a food voucher for participation.
- Other metro area hospitals are using SKYPE applications for families to obtain discharge MR and counseling.
- Medication reconciliation process is should flow fluently through out the patient’s stay, however brief. It does include our responsibility to educate families.

**References**