

# Burn State of the Science: Research Consensus Conference

Tina L. Palmieri, MD

Shriners Hospitals for Children  
Northern California and University  
of California, Davis

# Presentation Goals

- Introduce Burn State of the Science meeting purpose, goals
- Describe the concepts covered in the Acute Care Topic day
- List the goals for each Acute Care Topic

# Burn State of the Science Meeting: How it Happened

- ABA Burn Multicenter Trials group organizing consensus conference to define goals/priorities for burn research
- National Institute of Disability and Rehabilitation Research (NIDRR) organizing consensus conference for rehabilitation research
- Forces combined into one conference to present unified research front for burns

# Meeting Support

- Telemedicine and Advanced Technology Research Center (DOD)
- ABA (American Burn Association): advertisement, meeting coordination, hotel negotiations
- Shriners Hospitals for Children
- NIDRR (National Institute of Disability and Rehabilitation Research)
- VA (Veteran's Administration)
- NIGMS (National Institute of General Medical Sciences)

# *Burn State of the Science: Research Meeting Goals*

- Develop and prioritize a national research agenda for evidence-based burn care
- Outline the resources needed to accomplish the research goals

# Purpose of the Meeting

The consensus conference will unite the leaders in burn care with experts in federal disaster management, multicenter outcomes research, and the military to develop and prioritize a national research agenda for evidence-based burn care. The findings of this conference will be disseminated both locally and nationally and will be the basis for improving the delivery of health care services to burn patients.

# Burn State of the Science Meeting Overview

- Meeting date: October 26-28, 2006
- Location: J.W. Marriott, Washington, DC
- Duration: 2.5 days
- Format:
  - Day 1: Acute Care Research
  - Day 2: Rehabilitation Research
  - Day 3: Grant agency presentations, Editors' Forum, Research Teams of the Future

# Who Attended

- Anticipated enrollment: 100 participants
- Actual enrollment: 253 participants
- Basic science and clinical burn researchers
- Burn Center Directors: both U.S. and abroad
- Editors of burn and rehabilitation journals
- NIDRR, NIGMS, VA representatives
- Burn survivors
- Research coordinators, nurses
- Department of Defense representatives
- Shriners Hospitals for Children director of research

# Conference Organization

- Day 1: Acute burn care research-agenda set by Dr. Tina Palmieri
- Day 2: Burn rehabilitation research-agenda set by Dr. Matt Klein
- Day 3: Journal editor forum, grant agency presentations, research teams of the future set by Drs. Palmieri and Klein

# Agenda – Acute Burn Care

- Introduction of topics
- Round table discussion of issues
- Summary of Research Priorities and Needs

# Day 1 Morning Topics

Introduction: David G. Greenhalgh, MD,  
FACS, ABA President

Current Basic Science Initiatives: The Glue  
Grant

Presenter: Ron Tompkins, MD, FACS

Multicenter Research in Burns: Where We  
Were, Where We Are Now

Presenter: Jeffrey Saffle MD, FACS

# Day 1 Morning Topics (cont)

Topic 1: Inhalation Injury

Presenter: Tina L. Palmieri, MD, FACS

Topic 2: Resuscitation

Presenter: David Greenhalgh MD, FACS

Topic 3: Inflammation/Sepsis

Presenter: Richard Gamelli, MD, FACS

Breakout Discussion Results

Presenters: Palmieri, Greenhalgh, Gamelli

# Day 1 Afternoon Topics

Topic 4: Metabolism/Nutrition

Presenter: Steve Wolf, MD, FACS

Topic 5: Burns in Children and the Elderly

Presenter: Robert Sheridan MD, FACS

Topic 6: Wound Healing

Presenter: Nicole Gibran MD FACS

Breakout Discussion Results

Presenters: Wolf, Sheridan, Gibran

Summary of Acute Burn Research Priorities and  
Needs: The Next 10 Years

Presenters: Palmieri, Klein

# Agenda Day 2– Rehabilitation

- Moderators oversee presentations by two experts
- Presentation of “What is not known” and “what should be known”
- 30 minute audience participation discussion

# Day 2 Morning Agenda

Program Leader: Lynn Solem, MD, FACS

Topic 1: The Hand

Moderator: Karen Kowalski, MD

Topic 2: Psychological Health

Moderator: James Fauerbach, PhD

Topic 3: Scar Management

Moderator: Matthew Klein, MD

# Day 2 Afternoon Agenda

Community Integration

Moderator: Patricia Blakeney, PhD

Reconstructive Surgery

Moderator: Loren Engrav, MD

Restoration of Function:

Moderator: David Herndon, MD, FACS

Survivor Perspective

Discussant: Amy Acton, RN, BSN

# Additional Faculty, Day 2

Matthias Donelan, M.D. Harvard University

Robert Spence, M.D., Johns Hopkins University

Warren Garner, M.D, University of Southern California

Ted Tredget, M.D., University of Alberta

David Greenhalgh, M.D. , UCDCMC, Shriners Hospital

Scott Ward, Ph.D., University of Utah

James Partridge, OBE, DSc, Changing Faces

Nichola Rumsey, PhD, University of the West of  
England

Thomas Pruzinsky, Ph.D. Qunniapiac University

Glenn Saxe, M.D. Boston University

Barbara DeLateur, M.D. Johns Hopkins University

Burn Survivors: Chris Gilyard, Regions Burn Center,  
Erin Mounsey

# Day 3 Agenda: The Future From the Experts

- Journal Editor Round Table Discussion
  - Burns*: Steven Wolf, MD, FACS
  - Journal of Burn Care and Research*:  
Richard Gamelli, MD, FACS
  - Journal of Trauma*: Basil Pruitt, MD,  
FACS
  - Rehabilitation Psychology*: Timothy  
Elliott, MD

# Day 3 Agenda (cont)

- Funding Opportunities
  - Theresa San Agustin, MD (NIDRR)
  - Danielle Kerkovich, PhD (VA)
  - Scott Somers, PhD (NIGMS)
- Building Research Teams of the Future –  
David N. Herndon, MD

# Conference Findings Dissemination

- Publication in *Journal of Burn Care and Research*
- Presentation at annual ABA Research Symposium
- ABA web site posting
- Shriners, Department of Defense, NIGMS, NIDRR reports

# Day 1: Acute Burn Care

## Inhalation Injury

# Priority 1: Just the Basics

- Develop and validate a clinical
  1. definition for inhalation injury
  2. diagnostic criteria and severity grading system for inhalation injury
- Rationale: a uniform definition for inhalation injury is lacking; studies have different definitions and endpoints

# Priority 2: Inhalation Injury

## Treatment: The Lung

- Determine the optimal treatment of the respiratory system in inhalation injury
  1. What is the best ventilator strategy for inhalation injury?
  2. What inhalational agents should we be using and how should we use them?
  3. What systemic agents should we use in inhalation injury?

# Priority 3: Inhalation Injury

## Treatment: The Acute Phase

- Determine the optimal treatment for other organ systems in inhalation injury
  1. Define standard of care for resuscitation in the patient with inhalation injury, inhalation+burn
  2. Determine the optimal nutritional regimen for the patient with inhalation injury, inhalation+burn
  3. Define the role of tracheostomy in inhalation injury

# Priority 4: Outcomes After Inhalation Injury

- Determine the long-term impact of inhalation injury
  1. How does inhalation injury, inhalation injury/burn effect pulmonary function years after injury?
  2. What is the effect of inhalation injury/burn on health related quality of life?
  3. What are the psychosocial effects of inhalation injury?

# Priority 4: What Do We Need to Do?

- Develop mechanism for long-term followup of patients with inhalation injury
- Standardize methodology for measuring pulmonary function and exercise capacity for all age groups after inhalation injury
- Develop, validate, and administer health related quality of life and psychosocial tools for patients with inhalation injury

# Inhalation Injury: What We Need to Do

- Meeting of inhalation injury researchers with publication of consensus definition on definitions, endpoints
- Pilot study: funding to test preliminary definition, researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Inhalation Injury: Resources Needed to Accomplish the Goal

- Consensus conference: funding, researchers willing to define and publish group findings; database for outcomes
- Pilot study: funding to test preliminary definition, researchers willing to do the work; database development and maintenance
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Resuscitation: Basic Questions

- Have we made much progress?
- Is there agreement?
- Can we do a better job?
- What should be our endpoints?
- Do we need to a better job?

# Priority 1: Develop Criteria for the Endpoint of Resuscitation

- All future clinical studies need unified diagnosis of resuscitation endpoint
- Urine output not adequate
  - Tolerate lower urine output
- Multiple endpoints
  - Endpoints frequently conflict

# Priority 1: Endpoints

- Need indicator for cardiac function
  - Few use PAC's
  - What/should inotrope be used in burns?
- Cellular markers
- Perfusion indicators
  - Laser doppler
  - Base deficit/lactate
  - Gut/skin perfusion indicators (not accurate)

# Priority 2: Fluid Creep

- Identify the reasons for “fluid creep” in burn resuscitation
- Have we become complacent or are there physiologic reasons for the increase in delivered fluids?
- Will performance improvement strategies reverse this trend?
- Is there a role for “closed loop” resuscitation?

# Priority 3: Burn Edema

- Determine the pathophysiology of burn edema
- What initiates the leak?
- Why are there changes in the entire cardiovascular system after burn injury?
- Is there a role for mathematical modeling?
- What is the cellular, molecular response?

# Priority 4: Define the Best Resuscitation Method

- What is the best resuscitation solution?
- Can we resuscitate a major burn without intravenous fluid?
- What is the role of oral resuscitation?
- Potential to enhance survival in third world countries and disaster management

# Priority 5: Stop Capillary Leak

- Should we stop the leak and how?
- Potential agents for altering capillary leak:
  - Vitamin C
  - Antioxidants
- Role of Xigris?
- Why do narcotics worsen leak? Should we use them during resuscitation?

# Resuscitation: What Do We Need to Do?

- Meeting of resuscitation researchers with publication of consensus definition on endpoints
- Pilot study: funding to test preliminary definition, researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Resuscitation: Resources Needed to Accomplish the Goal

- Consensus conference, resuscitation goals for burn injury: researchers willing to review existing data and publish group findings
- Pilot study: funding for translational research (test lab findings in people), researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Critical Injury, Inflammation and Sepsis

Is it too much of a good thing  
or is it bad?

# Priority 1: Define Infection vs. Sepsis vs. SIRS

- Confusion in terms of definition
  - Do current definitions meet the needs of burns?*
- Clinical proxies for quality or standard of care
- Need consensus on definitions to perform meaningful studies of sepsis in burns

# Priority 2: Early Identification of Infection

- Early detection=better survival
- How do we identify patients who are at risk?
- Are there markers for early identification of infection/inflammation?
- How do we stratify the severity of inflammation?

# Priority 3: Optimize Treatment of Infection

- What antibiotics should we use and when?
- What is the role of antibiotic rotation?
- What antibiotics should be used for the rotation
- Is there a role for gut decontamination?
- How long should we treat infection?

# Priority 4: Determine the Role of Inflammation in Burns

- When does inflammation become deleterious?
- When is inflammation good?
- Does burn size or age matter?
- What should we use to modify inflammation?
  - Glycemic control vs insulin
  - Beta blockade?
  - Oxandrolone?

# Sepsis/Inflammation: What Do We Need to Do?

- Meeting of sepsis researchers with publication of consensus definition for sepsis, SIRS
- Pilot study: funding to test preliminary definition, researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Sepsis/Inflammation: Resources Needed to Accomplish the Goal

- Consensus conference, resuscitation goals for burn injury: researchers willing to review existing data and publish group findings
- Pilot study: funding for translational research (test lab findings in people), researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Acute Burn Nutrition/Metabolism

- How do we best feed our patients?

# Priority 1: Determine the Endpoints for Nutrition Management

- What is the proper endpoint for measuring the effect of nutritional treatment?
  - During acute hospitalization?
  - During early convalescence (hospital discharge to 6 months after injury)?
  - During late convalescence (6 months after injury to 18 months after injury)?

# Priority 2: Optimize Feeding Regimens (Effectors)

- What is the best method of feeding for the burned patient?
- What is the proper substrate? CHO versus fat
- When and how long should supplementary feeding (intravenous or by tube) be given?  
**During resuscitation? Late hospitalization?**
- How many calories should be given?
  - During acute hospitalization?
  - During early convalescence?
  - During late convalescence?

# Priority 3: Determine the Optimal Nutrition Strategy by Populations

- Obesity
- Children
- Cancer
- Other trauma
- Pregnancy
- Diabetes
- Cirrhosis
- Outpatients

# Priority 4: Define the Role of Nutritional Adjuncts

- When and what nutritional adjuncts should be given to the severely burned?
- Which nutritional additives should be given?
  - When?
  - How much?
- Which pharmacologic manipulators should be given?
  - When?
  - How much?
- What are the mechanisms of action for these agents?
  - Do they have other beneficial effects such as on the immune system and wound healing? If so, how?

# Nutrition/Metabolism: What Do We Need to Do?

- Meeting of nutritional researchers with publication of consensus definition on nutritional endpoints
- Pilot study: funding to test preliminary definition, researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Nutrition/Metabolism: Resources Needed to Accomplish the Goal

- Consensus conference, nutrition goals for burn injury: researchers willing to review existing data and publish group findings
- Pilot study: funding for translational research (test lab findings in people), researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Acute Burn Treatment

Wound Healing

# Priority 1: Development of Standardized Tools to Assess Wound Healing

- How do we evaluate wound depth?
- How do we define healing as an endpoint?
- How do we evaluate the late complications of healing?
- How do we assess scar?

# Priority 2: Optimization of Wound Healing

- How can we develop a wound healing model in animals that is relevant to humans?
- How can we minimize scar after injury?  
After grafting?
- What is the role for pressure garments?  
Silicone?
- How do we accelerate donor site healing?

# Priority 3: Development of Definitions and Models for Pruritis

- What is pruritis?
- How do we grade it?
- What is the pathophysiology behind pruritis?
- How should we treat pruritis?
- How does pruritis influence outcomes?

# Priority 4: Develop Innovative Treatment Modalities for Wound and Scar Management

- Is there a role for topical nutrients?
- Does hyperbaric oxygen make a difference?
- How can we accelerate keratinocyte migration and proliferation?
- What is the role of “cultured” skin?
- Can we influence the genetics behind wound healing?

# Wound Healing: What Do We Need to Do?

- Meeting of wound healing researchers with publication of consensus definition on endpoints of healing
- Pilot study: funding to test preliminary definition, researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Wound Healing: Resources Needed to Accomplish the Goal

- Consensus conference: researchers willing to review existing data and publish group findings
- Pilot study: funding for translational research (test lab findings in people), researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Acute Burn Treatment

Burns in Children and the  
Elderly

# Priority 1, Children: Determine Optimal Airway Management After Burn Injury

- How should airway access be maintained in children?
- When should a cuffed endotracheal tube be used?
- What is the optimal ventilator strategy for children with inhalation injury?
- What are the long-term outcomes for children who require prolonged ventilatory support?

# Priority 2, Children: Determine Appropriate Endpoints for Resuscitation

- What should be the target for resuscitation in children?
- What is the role of pharmacologic agents (such as beta blockers) during acute resuscitation?
- How do we predict which children will have increased fluid requirements after injury?
- Is there a role for oral resuscitation?

# Priority 3, Children: Optimize Nutritional Support

- What should be the nutritional support targets for children? Do they change with age?
- What is the ideal substrate for nutritional support in children?
- Is there a role for supplementary intravenous nutrition in children?
- What is the role of anabolic agents in children?

# Priority 4, Children: Optimize Pain and Sedation Management

- How do we differentiate between pain and anxiety in children?
- What agents should be used and how?
- How does the pharmacology of pain medications change over time after burn injury?
- Is there a relationship between sedation and post-traumatic stress disorder in children?

# Priority 1, Elderly: Develop an Accurate Model for Outcome Prediction

- What is “old” for a burn patient?
- How do we define physiologic age?
- What pre-injury characteristics impact outcome?
- What genotypes are associated with good or poor outcome?
- How do we measure outcome for the elderly?

# Priority 2, Elderly: Optimize Resuscitation and Nutritional Regimens

- Should we be using standard resuscitation formulas for the elderly?
- What should our resuscitation endpoints be?
- Is there a role for inotropes or beta blockers in the resuscitation of the elderly?
- What should our nutritional goals be?
- When is it time to stop?

# Priority 3, Elderly: Define Optimal Strategy for Wound Closure

- Is early excision better than delayed excision in the elderly?
- Should we be using staged excision in the elderly?
- What is the role of skin substitutes and cultured skin in the elderly?

# Priority 4, Elderly: Develop Standard of Care for Rehabilitation

- How can we optimize elderly cognitive and physical function after injury?
- Should the elderly have an exercise program during hospitalization to increase strength, stamina?
- How do we measure success in rehabilitation?

# Burns in Children/Elderly: What Do We Need to Do?

- Meeting of pediatric and geriatric burn researchers to review existing data, set up database for studies, define endpoints
- Pilot study: funding to test preliminary definition, researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Burns in Children/Elderly : Resources Needed to Accomplish the Goal

- Consensus conference: researchers willing to review existing data and publish group findings
- Pilot study: funding for translational research (test lab findings in people), researchers willing to do the work
- Multicenter clinical study to validate accuracy of the definition: funding, infrastructure (database, statistician, etc)

# Conclusions: Acute Burn Care

- Much progress made
- Need to agree on basic definitions prior to embarking on major studies
- Set up networks of researchers in each area of interest
- Funding necessary for infrastructure for all studies

Questions?