



APSA

Annual Meeting
May 3-6, 2018

JW MARRIOTT DESERT SPRINGS RESORT & SPA | PALM DESERT, CA USA

FINAL PROGRAM



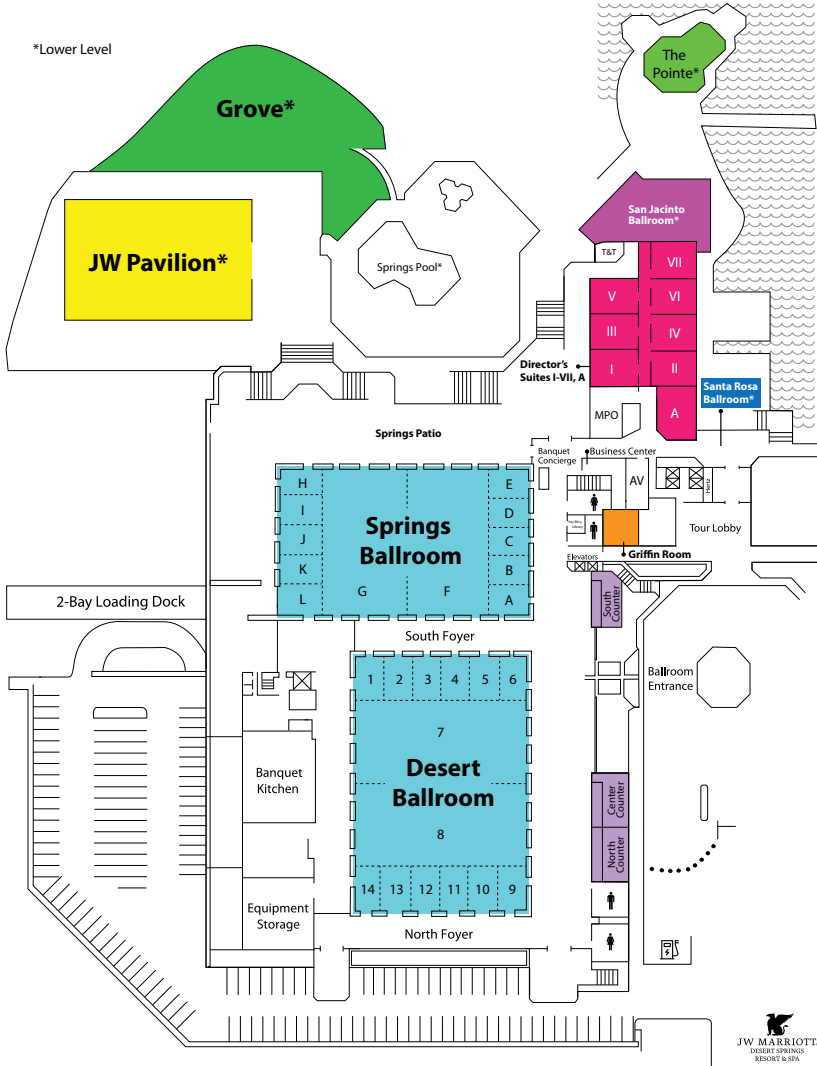
@APSASURGEONS
#eAPSA2018



THE AMERICAN PEDIATRIC SURGICAL ASSOCIATION

www.eapsa.org

JW Marriott Desert Springs Resort & Spa Floorplan





American Pediatric Surgical Association Mission

To ensure optimal pediatric surgical care of patients and their families, to promote excellence in the field, and to foster a vibrant and viable community of pediatric surgeons.

We do this by:

- Developing and advocating for standards of care for infants and children and influencing public policy around the surgical care of children
- Encouraging discovery, innovation and improvement of care
- Providing rich venues for the dissemination of up-to-date knowledge
- Offering high quality continuing education to members
- Creating identity and community among pediatric surgeons
- Promoting a supportive health care environment for patients, staff and surgeons and making certain that it is sustained by economic health

American Pediatric Surgical Association

Administrative Offices

One Parkview Plaza, Suite 800

Oakbrook Terrace, IL USA • Telephone: +1-847-686-2237

Fax: +1-847-686-2253

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APSA Staff

Lee Ann Clark

Executive Director
lclark@eapsa.org

Marina Petrulla

Administrative Director
mpetrulla@eapsa.org

Annie Cox

Administrator
acox@eapsa.org

Katherine Segreti

Administrator
ksegreti@eapsa.org

Liz Freyn

Conference Director
lfreyn@eapsa.org

Brenda Howe

Conference Registration and
Exhibits Manager
bhowe@eapsa.org

Meagan Comerford

Marketing Communications Manager
mcomerford@eapsa.org

Raven Hardin

Marketing Communications Manager
rhardin@eapsa.org

Kismet Saglam

Education Director
ksaglam@eapsa.org

Kyle Vermillion

Accountant
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Rita Wallace

Order Processing Specialist
rwallace@kellencompany.com



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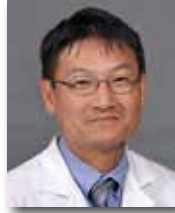


Governance

Board of Governors 2017 – 2018



Henri R. Ford
President
2017-2018
323-361-2104
hford@chla.usc.edu



Mike K. Chen
Treasurer
2017-2020
205-638-9688
mike.chen@
childrensal.org



Ronald B. Hirschl
President-Elect
2017-2018
734-764-6482
rhirschl@umich.edu



Gail E. Besner
Governor
2016-2019
614-722-3900
gail.besner@
nationwidechildrens.org



Diana L. Farmer
Immediate Past President
2017-2018
916-734-3190
dlfarmer@ucdavis.edu



Jessica J. Kandel
Governor
2017-2020
773-702-6175
jkandel@surgery.bsd.
uchicago.edu



John H.T. Waldhausen
Secretary
2015-2018
206-987-1177
john.waldhausen@
seattlechildrens.org



Rebecca L. Meyers
Governor
2015-2018
801-662-2950
rebecca.meyers@
imail2.org



APSA Congratulates Incoming Board Members



Joseph P. Vacanti
President-Elect
2018-2019
617-724-1725
jvacanti@partners.org



Peter W. Dillon
Governor
2018-2021
717-531-8939
pdillon1@
hmc.psu.edu



Max R. Langham, Jr.
Secretary
2018-2021
901-287-6300
mlangham@uthsc.edu

Past Presidents



Robert E. Gross
1970-1971



Thomas M. Holder
1975-1976



C. Everett Koop
1971-1972



Alexander H. Bill
1976-1977



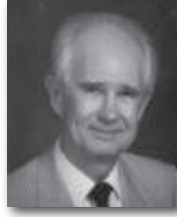
H. William Clatworthy, Jr.
1972-1973



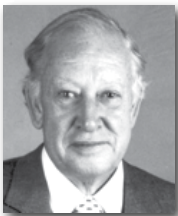
E. Thomas Boles, Jr.
1977-1978



Orvar Swenson
1973-1974



Morton M. Woolley
1978-1979



Harvey E. Beardmore
1974-1975



Robert G. Allen
1979-1980



Past Presidents (cont.)



Thomas V. Santulli
1980-1981



Dale G. Johnson
1985-1986



William B. Kiesewetter
1981



J. Alex Haller, Jr.
1986-1987



W. Hardy Hendren
1981-1983



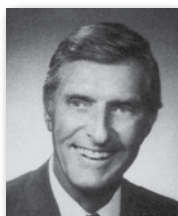
Robert J. Izant, Jr.
1987-1988



Lester W. Martin
1983-1984



James A. O'Neill, Jr.
1988-1989



Judson G. Randolph
1984-1985



Eric W. Fonkalsrud
1989-1990

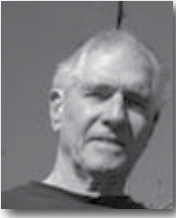
Past Presidents (cont.)



Robert M. Filler
1990-1991



Arvin I. Philippart
1995-1996



Alfred A. deLorimier
1991-1992



Keith W. Ashcraft
1996-1997



Dick G. Ellis
1992-1993



H. Biemann Othersen, Jr.
1997-1998



Raymond A. Amoury
1993-1994



Marc I. Rowe
1998-1999



Jay L. Grosfeld
1994-1995



Kathryn D. Anderson
1999-2000



Past Presidents (cont.)



David Tapper
2000-2001



M. Judah Folkman
2005-2006



Arnold G. Coran
2001-2002



Patricia K. Donahoe
2006-2007



R. Peter Altman
2002-2003



Moritz M. Ziegler
2007-2008



Bradley M. Rodgers
2003-2004



Michael R. Harrison
2008-2009



Robert J. Touloukian
2004-2005



Keith E. Georgeson
2009-2010

Past Presidents (cont.)



Marshall Z. Schwartz
2010-2011



Michael D. Klein
2014-2015



Robert C. Shamberger
2011-2012



Mary E. Fallat
2015-2016



Keith T. Oldham
2012-2013



Diana L. Farmer
2016-2017



Thomas M. Krummel
2013-2014



Past Officers

Secretary

Thomas M. Holder	1970-1973
Dale G. Johnson	1973-1976
James A. O'Neill, Jr.	1976-1979
Robert J. Touloukian	1979-1982
Anthony Shaw	1982-1985
Raymond A. Amoury	1985-1988
Kathryn D. Anderson	1988-1991
Keith W. Ashcraft	1991-1994
Howard C. Filston	1994-1997
Keith T. Oldham	1997-2000
Robert M. Arensman	2000-2003
Donna A. Caniano	2003-2006
Ronald B. Hirschl	2006-2009
Diana L. Farmer	2009-2012
Mary L. Brandt	2012-2015

Treasurer

Alfred A. deLorimier	1970-1972
Lucian L. Leape	1972-1975
Robert G. Allen	1975-1978
Dick G. Ellis	1978-1981
J. Alex Haller, Jr.	1981-1984
Dick G. Ellis	1984-1987
William P. Tunell	1987-1990
Bradley M. Rodgers	1990-1993
Donald R. Cooney	1993-1996
Robert M. Arensman	1996-1999
Moritz M. Ziegler	1999-2002
Michael D. Klein	2002-2005
Neil J. Sherman	2005-2008
Dennis P. Lund	2008-2011
Charles J. Stolar	2011-2014
Daniel von Allmen	2014-2017

Governor

Federico A. Arcari	1970-1971
Robert J. Izant	1970-1972
Tague C. Chisholm	1971-1973
Robert G. Allen	1972-1974
Morton M. Woolley	1973-1975
Marc I. Rowe	1974-1976
George W. Holcomb, Jr	1975-1977
Eric W. Fonkalsrud	1976-1978
Dale G. Johnson	1977-1979
Lester W. Martin	1978-1980
Bernard J. Spencer	1979-1981
Harry C. Bishop	1980-1982
Judson G. Randolph	1981-1983
Robert M. Filler	1981-1984
Keith W. Ashcraft	1982-1985
Alfred A. deLorimier	1983-1986

Past Officers (cont.)

Jay L. Grosfeld	1984–1987
Robert T. Soper	1985–1988
H. Biemann Othersen, Jr	1986–1989
Robert J. Touloukian	1987–1990
Arvin I. Philippart	1988–1991
Albert W. Dibbins	1989–1992
Patricia K. Donahoe	1990–1993
Arnold G. Coran	1991–1994
Moritz M. Ziegler	1992–1995
David Tapper	1993–1996
Eugene S. Wiener	1994–1997
Samuel H. Kim	1995–1998
R. Peter Altman	1996–1999
Michael D. Klein	1997–2000
Richard G. Azizkhan	1998–2001
Thomas M. Krummel	1999–2002
Keith E. Georgeson	2000–2003
Marshall Z. Schwartz	2001–2004
John Noseworthy	2002–2005
George W. Holcomb, III	2003–2006
Kurt D. Newman	2004–2007
Thomas F. Tracy	2005–2008
Robert C. Shamberger	2006–2009
Mary E. Fallat	2007–2010
Henri R. Ford	2008–2011
Fredrick J. Rescorla	2009–2012
Brad W. Warner	2010–2013
Kevin P. Lally	2011–2014
Erik D. Skarsgard	2012–2015
Marleta Reynolds	2013–2016
David J. Schmeling	2014–2017



APSA Representatives

APSA members volunteer and hold positions within many professional organizations worldwide, and we commend their dedication to advancing the field of pediatric surgery. The list below consists of those representatives who have been elected, nominated or otherwise appointed by the APSA Board of Governors. We appreciate their time serving as official APSA representatives.

American Academy of Orthopaedic Surgeons (AAOS)

Writing panel of the Appropriate Use Criteria for Pediatric Supracondylar Humerus Fractures

Fizan Abdullah

Review panel of the Appropriate Use Criteria for Pediatric Supracondylar Humerus Fractures

Sara K. Rasmussen

American Academy of Pediatrics

SoSu Smart Tots Operations

Brian Kenney

American Board of Surgery (ABS)

Pediatric Surgery Board (PSB)

Kenneth S. Azarow - Chair

Marjorie J. Arca

John H.T. Waldhausen

American College of Radiology (ACR)

Appropriateness Criteria Panel

Richard A. Falcone, Jr.

American College of Surgeons (ACS)

Quality Assurance – Trauma

Joseph J. Tepas, III

Advisory Council for Pediatric Surgery Specialty Society Representative

Robert Sawin

Young Surgeon Representative

Robert T. Russell

Board of Governors

Brad W. Warner

Central Line Task Force

Gary E. Hartman

Commission on Cancer (CoC)

Kenneth W. Gow

American Medical Association

RUC Advisor

Brendan Campbell

RUC Advisor Alternate

Samuel D. Smith

National Institute of Child Health and Human Development

National Advisory Committee

Charles S. Cox, Jr.

Trauma Center Association of America (TCAA)

Pediatric Committee

Michael L. Nance

Venous Access: National Guideline and Registry Development (VANGUARD)

Patrick J. Javid

APSA Committees 2017–2018

Anniversary/History ad hoc

Louis M. Marmon, *Co-chair*

lmarmon@childrensnational.org

Moritz M. Ziegler, *Co-chair*

mmzieglermd@aol.com

William T. Adamson

Dean M. Anselmo

Marjorie J. Arca

Casey M. Calkins

Mike K. Chen

Henri R. Ford

Philip L. Glick

Ronald B. Hirschl

Dale G. Johnson

Michael D. Klein

Thomas M. Krummel

Steven L. Lee

Rebecka L. Meyers

Don K. Nakayama

David M. Powell

Robert C. Shamberger

Diana L. Farmer, *Ex Officio*

Women in Pediatric Surgery Subcommittee

Mary E. Fallat, *Chair*

mefall01@louisville.edu

Kathryn D. Bass

Danielle S. Walsh

Audit

Michael J. Allshouse, *Chair*, 2017-2019

mallshouse@valleychildrens.org

Steven Stylianos, *Vice Chair*, 2017-2019

Brendan T. Campbell, 2015-2018

Philip L. Glick, 2016-2019

Dennis P. Lund, 2016-2019

William Middlesworth, 2016-2019

Edward P. Tagge, 2015-2018

David W. Bliss, *Ex Officio*, 2017-2020

Mike K. Chen, *Board Liaison*, 2017-2020

Bylaws

Ronald B. Hirschl, *Chair*, 2017-2018

rhirschl@umich.edu

Adam C. Alder, 2016-2019

Christopher P. Coppola, 2015-2018

C. Thomas Black, 2017-2020

Paul D. Danielson, 2016-2019

Bryan J. Dicken, 2017-2020

Peter F. Ehrlich, 2016-2019

Walt L. Pipkin, 2017-2020

Rebecca M. Rentea, 2017-2020

David T. Schindel, 2015-2018

Sandra S. Tomita, 2015-2018

Henri R. Ford, *Board Liaison*, 2017-2018

Cancer

Roshni A. Dasgupta, *Chair*, 2017-2019

roshni.dasgupta@cchmc.org

Peter F. Ehrlich, *Vice Chair*, 2017-2019

Rebecca Stark, 2016-2019

Shahab F. Abdessalam, 2016-2019

Mary T. Austin, 2016-2019

Stephanie F. Polites, 2017-2020

Todd E. Heaton, 2015-2018

Timothy B. Lutz, 2017-2020

Mary Beth Madonna, 2015-2018

Marcus M. Malek, 2016-2019

Jaimie D. Nathan, 2015-2018

Daniel S. Rhee, 2017-2020

Alicia M. Waters, 2017-2019

Brent R. Weil, 2016-2018

Max R. Langham, *Ex Officio*, 2017-2019

Rebecka L. Meyers, *Board Liaison*,
2017-2018

Childhood Obesity

Mark J. Holterman, *Chair*, 2016-2018

mh@mariamglobal.com

Joy Collins, *Vice Chair*, 2016-2018

Jeremy T. Aidlen, 2016-2019

Aleksander Bernshteyn, 2017-2020

Patrick C. Bonasso, 2015-2018

Kanika A. Bowen-Jallow, 2017-2020

Mike K. Chen, 2015-2018

Sandra M. Farach, 2017-2019

Jason D. Fraser, 2017-2020

Robert Carr Kanard, 2016-2019

Tamar L. Levene, 2017-2020

Evan P. Nadler, 2016-2019

Mikael Petrosyan, 2017-2020

Kirk W. Reichard, 2015-2018

Beth Walford, 2016-2019

Mark L. Wulkan, 2015-2018

Jeffrey L. Zitsman, 2016-2019

John H.T. Waldhausen, *Board Liaison*,
2017-2018



APSA Committees 2017–2018 (cont.)

Education

Marjorie J. Arca, *Chair*, 2015–2018
 marca@chw.org

Steven L. Lee, *Vice Chair*, 2015–2018

Elizabeth A. Beierle, 2013–2019

Kathryn Bernabe, 2015–2018

Pavan Brahmamdam, 2016–2019

Matias Bruzoni, 2016–2019

Casey M. Calkins, 2015–2018

Diana L. Diesen, 2016–2019

Sherif G. S. Emil, 2017–2020

Shinjiro Hirose, 2016–2019

John D. Horton, 2015–2018

Eunice Y. Huang, 2015–2018

Romeo C. Ignacio, 2013–2019

Brian A. Jones, 2017–2020

Charles M. Leys, 2015–2018

Andrea Yan-Sin Lo, 2016–2019

Harold N. Lovvorn, 2016–2019

Grace Mak, 2016–2019

Jonathan A. Meisel, 2017–2020

Demetri J. Merianos, 2017–2020

Holly L. Neville, 2017–2020

Hannah G. Piper, 2015–2018

Pramod S. Puligandla, 2017–2020

Cathy E. Shin, 2017–2020

Eveline Shue, 2017–2020

Janice A. Taylor, 2017–2020

Jill S. Whitehouse, 2015–2018

Jill M. Zalieckas, 2015–2018

John H.T. Waldhausen, *Board Liaison*, 2017–2018

Patient and Family Subcommittee

Romeo C. Ignacio, *Chair*, 2015–2019
 rcignacio@yahoo.com

Kathryn Bernabe, 2018

Pavan Brahmamdam, 2018–2019

Sherif G. S. Emil, 2018–2020

Eunice Y. Huang, 2018

Hannah G. Piper, 2015–2018

Janice A. Taylor, 2018–2020

Simulation Subcommittee

Diana L. Diesen, *Chair*, 2018–2019
 dld5b@hotmail.com

Student and Resident Education Subcommittee

Grace Mak, *Chair*, 2018–2019
 graciemak@hotmail.com

Holly L. Neville, 2018–2020

Andrea Yan-Sin Lo, 2018–2019

Demetri J. Merianos, 2018–2020

Janice A. Taylor, 2018–2020

Jonathan A. Meisel, 2018–2020

Jill S. Whitehouse, 2018

Ethics

Erin E. Rowell, *Chair*, 2015–2018
 erowell@luriechildrens.org

Carlos A. Angel, 2017–2020

Daniel A. Beals, 2015–2018

John F. Bealer, 2015–2018

Erica M. Carlisle, 2017–2020

Arthur Cooper, 2015–2018

Mauricio A. Escobar, 2015–2018

Jeremy G. Fisher, 2015–2018

Richard D. Glick, 2015–2018

Catherine J. Hunter, 2017–2020

Patrick J. Javid, 2016–2019

Sidney Johnson, 2016–2019

Sarah A. Jones-Sapienza, 2015–2018

Deborah S. Loeff, 2015–2018

William Middlesworth, 2016–2019

Claudia M. Mueller, 2013–2019

Konstantinos Papadakis, 2016–2019

Veronica F. Sullins, 2017–2020

Aviva L. Katz, *Ex Officio*, 2015–2018

Henri R. Ford, *Board Liaison*, 2017–2018

Fetal Diagnosis and Treatment

Terry L. Buchmiller, *Chair*, 2016–2018
 terry.buchmiller@childrens.harvard.edu

Shinjiro Hirose, *Vice Chair*, 2016–2018

Loren Berman, 2015–2018

Stephen J. Fenton, 2015–2018

Cynthia A. Gingalewski, 2015–2018

Eric B. Jelin, 2017–2020

Amanda Jensen, 2017–2019

Aviva L. Katz, 2017–2018

Rony Marwan, 2016–2019

Oliver J. Muensterer, 2015–2018

Zaria C. Murrell, 2015–2018

Erin E. Perrone, 2016–2019

Avraham Schlager, 2016–2019

David T. Schindel, 2017–2020

Charles J. Smithers, 2016–2019

Shaun A. Steigman, 2017–2020

David Stitelman, 2017–2020

Diana L. Farmer, *Board Liaison*, 2015–2018

Global Pediatric Surgery

APSA Committees 2017–2018 (cont.)

Ai-Xuan L. Holterman, *Chair*, 2016–2018

aithanh@uic.edu

J. Ted Gerstle, *Vice Chair*, 2016–2018

Georges Azzie, 2012–2018

Marilyn W. Butler, 2016–2019

Daniel DeUgarte, 2015–2018

Tamara Fitzgerald, 2016–2019

Philip K. Frykman, 2016–2019

Michael Ganey, 2015–2018

Erik N. Hansen, 2016–2019

Sanjay Krishnaswami, 2016–2019

Monica Langer, 2015–2018

Donald E. Meier, 2014–2019

Zaria C. Murrell, 2016–2019

Nathan M. Novotny, 2015–2018

Benedict C. Nwomeh, 2012–2018

Doruk E. Ozgediz, 2012–2019

Robin T. Petroze, 2017–2019

David H. Rothstein, 2015–2018

Julie Sanchez, 2015–2018

Marshall M. Stone, 2015–2018

Jorge E. Uceda, 2017–2020

Keith T. Oldham, *Ex Officio*, 2012–2018

Diana L. Farmer, *Board Liaison*, 2017–2018

Health Policy and Advocacy

Marion C. Henry, *Chair*, 2017–2019

mcwheny@surgery.arizona.edu

Kathryn D. Bass, *Vice Chair*, 2017–2019

David P. Bliss, 2015–2018

Mike K. Chen, 2016–2019

Brian A. Coakley, 2017–2020

Cynthia D. Downard, 2017–2020

Audrey C. Durrant, 2017–2020

Mary L. Hilfiker, 2017–2020

Aviva L. Katz, 2015–2018

J. Leslie Knod, 2017–2020

Julius Lister, 2017–2020

J. Duncan Phillips, 2015–2018

Kimberly A. Ruscher, 2017–2020

Patrick Bailey, *Ex Officio*

Mary E. Fallat, *Ex Officio*

Charles D. Vinocur, *Ex Officio*

Gail E. Besner, *Board Liaison*, 2017–2019

Industry and Institutional Advisory

Marc P. Michalsky, *Chair*, 2016–2018

marc.michalsky@nationwidechildrens.org

Karen A. Diefenbach, *Vice Chair*, 2016–2018

Payam Saadai, 2017–2020

Clint D. Cappiello, 2017–2020

Shannon L. Castle, 2017–2020

Mike K. Chen, 2016–2019

Matthew S. Clifton, 2016–2019

Carroll M. Harmon, 2016–2019

Thomas H. Inge, 2016–2019

Sang Lee, 2015–2018

Marc A. Levitt, 2017–2019

Richard H. Pearl, 2016–2019

David E. Sawaya, 2015–2018

Sean C. Skinner, 2017–2020

Steven Teich, 2016–2019

Gail E. Besner, *Board Liaison*, 2017–2019

Informatics and Telemedicine

Benedict C. Nwomeh, *Chair*, 2017–2019

benedict.nwomeh@nationwidechildrens.org

Eric L. Lazar, *Vice Chair*, 2017–2019

Mary L. Brandt, 2016–2019

Nicholas E. Bruns, 2015–2018

David G. Darcy, 2017–2018

Belinda Dickie, 2015–2018

Samir K. Gadepalli, 2016–2019

Ian C. Glenn, 2017–2018

Matthew T. Harting, 2013–2019

Celeste Hollands, 2017–2020

Jonathan Kohler, 2017–2020

Eugene S. Kim, 2016–2019

Aaron P. Leshner, 2016–2019

Francois I. Luks, 2016–2019

Barry M. Newman, 2017–2020

Samir R. Pandya, 2016–2019

Steven S. Rothenberg, 2013–2019

Sohail R. Shah, 2015–2018

Bethany J. Slater, 2016–2019

Oliver S. Soldes, 2015–2018

Allison L. Speer, 2017–2020

Benjamin D. Tabak, 2017–2020

Edward P. Tagge, 2016–2019

Sarah K. Walker, 2017–2020

Ronald B. Hirschl, *Board Liaison*, 2017–2020



APSA Committees 2017–2018 (cont.)

Social Media Subcommittee

Eric L. Lazar, *Chair*, 2016-2019
eric.lazar@atlantichhealth.org
Mary L. Brandt, 2016-2019
Samir K. Gadepalli, 2016-2019
Eugene S. Kim, 2016-2019
Francois I. Luks, 2016-2019
Bethany J. Slater, 2016-2019
Oliver S. Soldes, 2016-2018
Edward P. Tagge, 2016-2019

Telemedicine Subcommittee

Sohail R. Shah, *Co-chair*, 2016-2018
srshah2@texaschildrens.org
Abigail E. Martin, *Co-chair*, 2015-2018
Belinda Dickie, 2016-2019
Matthew T. Harting, 2016-2019
Celeste Hollands, 2017-2020
Aaron P. Leshner, 2016-2019
Samir R. Pandya, 2016-2019

Visual Abstract Subcommittee

Allison L. Speer, *Chair*, 2017-2020
Allison.L.Speer@uth.tmc.edu
Nicholas E. Bruns, 2017-2018
Celeste Hollands, 2017-2020
Bethany J. Slater, 2017-2019
Sarah K. Walker, 2017-2020

Website Subcommittee

Francois I. Luks, *Chair*, 2017-2019
francois_luks@brown.edu
Nicholas E. Bruns, 2017-2018
Barry M. Newman, 2017-2020
Samir R. Pandya, 2017-2019
Bethany J. Slater, 2017-2019

Membership and Credentials

Robert A. Cowles, *Chair*, 2017-2019
robert.cowles@yale.edu
Kevin P. Mollen, *Vice Chair*, 2017-2019
Obinna O. Adibe, 2015-2018
Nicole M. Chandler, 2015-2018
Jeffrey W. Gander, 2015-2018
Paul D. Danielson, 2016-2019
Loretto A. Glynn, 2015-2018
Troy A. Markel, 2016-2019
Richard H. Pearl, 2010-2019
Rajeev Prasad, 2017-2020

Ravi S. Radhakrishnan, 2015-2018

Katie W. Russell, 2017-2020
Thomas M. Schmelzer, 2017-2020
Samuel Z. Soffer, 2016-2019
Shawn J. Stafford, 2015-2018
Gail E. Besner, *Board Liaison*, 2017-2019

New Technology

Sean J. Barnett, *Chair*, 2017-2019
barnetts@childrensdayton.org
Nam Nguyen, *Vice Chair*, 2017-2019
Patrick C. Bonasso, 2017-2019
Anthony DeRoss, 2016-2019
Ian C. Glenn, 2015-2018
Harsh Grewal, 2015-2018
Marcus Jarboe, 2012-2018
Jeremy J. Johnson, 2017-2020
Aviva L. Katz, 2015-2018
Sunghoon Kim, 2015-2018
Mikael Petrosyan, 2016-2019
Dorothy V. Rocourt, 2016-2019
Beth A. Rymeski, 2017-2020
Mark L. Saxton, 2016-2019
Joshua J. Short, 2017-2020
Bethany J. Slater, 2015-2018
Edmund Yi-Bin Yang, 2016-2019
Osnat Zmora-Beloosesky, 2015-2018
Mike K. Chen, *Board Liaison*, 2017-2020

Nominating

Brad W. Warner, *Chair*, 2017-2018
brad.warner@wustl.edu
Charles J. Stolar, 2017-2018
Kenneth S. Azarow, 2017-2018
Mary E. Fallat, 2016-2019
Diana L. Farmer, 2017-2020
Andrea A. Hayes-Jordan, 2017-2018
Michael D. Klein, 2015-2018
Anthony D. Sandler, 2017-2018

APSA Committees 2017–2018 (cont.)

Outcomes and Evidence-based Practice

Adam B. Goldin, *Chair*, 2017-2019
 adam.goldin@seattlechildrens.org
 Shawn D. St. Peter, *Vice Chair*, 2017-2019
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APSA Foundation



APSA FOUNDATION

In 1991, a small group of APSA members led by Dr. Albert H. Wilkinson, Jr., of Jacksonville, Florida, discussed establishing a foundation for APSA to foster support for scientific investigation in the field of children's surgery by providing an Annual Grant to qualified applicants. Led by Dr. Jay Grosfeld, the APSA Foundation has provided funding to more than 30 young pediatric surgeon-scientists. The return on investment has been extraordinary! The grants were renamed the Jay Grosfeld, MD Scholar Grants in 2017 to honor Dr. Grosfeld's contributions.

With the election of Dr. Thomas Krummel as chair, the APSA Foundation continues to invest in the future of pediatric surgery through its grant programs – and not only in the United States and Canada, but throughout the world by supporting the Travel Fellow program. In 2016 the Foundation, together with APSA, extended its support to other international pursuits in an effort to identify and address children's surgical needs throughout the resource-poor countries in the world. Over its lifetime, the Foundation has raised more than \$1,000,000 in donations and provided almost \$700,000 in research grants. Fifty percent of APSA members have donated to the Foundation over the years.

Make plans to visit with the APSA Foundation board about the direction of the organization and future plans. Thank you for all you do for pediatric surgery and especially for what your next gift to the APSA Foundation can achieve in the future!

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Jay Grosfeld, MD Scholar Grant Recipients

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2017

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Genomic Analysis of Bilateral Wilms Tumors
\$25,000

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Prevention and Treatment of Traumatic Brain Injury by Inhibition of TLR4 Signaling in a Murine Model
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Effect of Midazolam on the Developmental and Maturation of Hippocampal Neuronal Circuitry
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Elisabeth T. Tracy, MD
Bleeding and Thrombosis in Infants and Children
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2015

William H. Peranteau, MD
In Utero Hematopoietic Cell Transplantation for the Treatment of Congenital Disorders
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Bradley J. Segura, MD
The Role of Enteric Glia in Pediatric Intestinal Inflammation
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2014

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The Role of Intestinal Microbiota in Children with Intestinal Failure and Bacterial Overgrowth
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In Utero Delivery of Synthetic Nanoparticles for Gene Editing in the Central Nervous System
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Splenic Neurovascular Units in Hirschsprung's Associated Enterocolitis
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David M. Gourlay, MD
IAP Prevents Intestinal Inflammation in the Newborn Intestine
\$25,000

Shawn D. Larson, MD
Inflammasome Activation is Critical for Neonatal Emergency Myelopoiesis and Expansion of Hematopoietic Stem Cells for Inflammation
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Jay Grosfeld, MD Scholar Grant Recipients (cont.)

2012

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Induced Pluripotent Stem Cells for the Study of Wilms' Tumorigenesis
\$25,000

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Errors and Adverse Events in the Setting of the Neonatal Surgery Performed in the NICU
\$25,000

2011

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Mesenchymal Stem Cell Regulation of Fetal Lung Development in Diaphragmatic Hernia
\$25,000

Peter F. Nichol, MD

Using a Genetic Model of Duodenal Atresia to Understand Regenerative Mechanisms within the Intestine
\$25,000

2010

Cynthia D. Downard, MD

Control of Intestinal Microcirculation in NEC
\$25,000

Cassandra M. Kelleher, MD

Extracellular Components Critical to Alveolarization: Contributions of Elastin
\$25,000

2009

Tippi C. MacKenzie, MD

Maternal Immune Response In Utero Hematopoietic Stem Cell Transplantation
\$25,000

Kelly A. Miller, MD

The Pathogenic Role of Enteric Glia in Hirschsprung's Enterocolitis
\$25,000

2008

Douglas N. Miniati, MD

Role of Notch4 Signaling in Aberrant Pulmonary Vascular Development
\$25,000

2007

Allan M. Goldstein, MD

Role of Sonic Hedgehog in Enteric Nervous System Development
\$25,000

2006

James C.Y. Dunn, MD

Enteric Nervous System Regeneration for Hirschsprung's Disease
\$25,000

2005

Elizabeth A. Beierle, MD

Focal Adhesion Kinase and Vascular Endothelial Growth Factor Receptor-3 in Human Neuroblastoma
\$10,000

Jay Grosfeld, MD Scholar Grant Recipients (cont.)

Kerilyn K. Nobuhara, MD
Intestinal Dysmotility in Fetal Repair of Gastroschisis
\$10,000

2004

Karl G. Sylvester, MD
Liver Regeneration and Stem Cell Regulation via the WNT Signaling Pathway
\$10,000

Christopher K. Breuer, MD
Do Tissue Engineered Venous Conduits Grow? Investigating the Growth Potential of Tissue Engineered Venous Conduits in a Juvenile Lamb Model
\$10,000

2003

Peter F. Ehrlich, MD
Injury Prevention through Brief Intervention: A Novel Approach to Pediatric Injury Prevention
\$10,000

2002

Mary Beth Madonna, MD
Growth Factor Receptor Signaling and its Relationship to Cell Proliferation and Differentiation in a Neuroblastoma Cell Line
\$10,000

2001

Anthony Stallion, MD
Intestinal Ischemia Reperfusion Injury Contributes to the Initiation of the Systemic Inflammatory Response Syndrome
\$10,000

2000

Edward M. Barksdale, Jr., MD
The Therapy of Neuroblastoma-induced Disorders of Dendropoiesis of Dendritic Cell Development
\$10,000

1999

Steven Stylianios, MD
Evidence-Based Guidelines for Resource Utilization in Pediatric Spleen/Liver Injury
\$5,000

1998

Gail E. Besner, MD
Heparin-Binding EGF-like Growth Factor (HBEGF) and Intestinal Ischemia Reperfusion Injury
\$7,500

1997

Charles N. Paidas, MD
Septation of the Cloaca
\$8,000

1996

Michael G. Caty, MD
Preservation of Intestinal Mucosal Structure and Function with Intraluminal Oxygenated Perfluorocarbon
\$9,825



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APSA's highest honor is given in recognition of a lifetime commitment to, and wide-reaching impact on, the field of pediatric surgery. It has only been awarded a handful of times in the organization's history.

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The award recognizes a seminal contribution by an individual who has made a major impact on pediatric surgery.

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The American College of Surgeons and the American Pediatric Surgical Association offer an annual scholarship to subsidize attendance and participation in the Executive Leadership Program in Health Policy and Management at Brandeis University.

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APSA/Association of Pediatric Surgery Training Program Directors M. Judah Folkman Memorial Award

Awarded to two outstanding research presentation given by residents. Judging is based on scientific merit and actual presentations.

2017

Basic Science

Patrick E. McGovern, MD
 Neuroprotection and Development in Extremely Premature Lambs Supported on the Extracorporeal Environment for Neonatal Development (Extend) Device

Clinical Science

Brenna Sullivan Fullerton, MD
 Severe Neurodevelopmental Disability and Healthcare Needs Among Survivors of Medical and Surgical Necrotizing Enterocolitis - a Prospective Cohort Study

2016

Basic Science

Megan Berger, MD
 Outcomes of Total Pancreatectomy and Islet Autotransplantation in Young Children

Clinical Science

Simone Langness, MD
 Low D-Dimer Predicts the Absence of Intracranial Hemorrhage in Pediatric Blunt Head Trauma

Award Recipients (cont.)

2015

Basic Science

Baddr A. Shakhsheer, MD
Host and Bacterial Factors Cooperatively Disrupt Healing of Intestinal Anastomoses

Clinical Science

Barrett P. Cromeens, DO, PhD
Implementation of a Pediatric Surgical Quality Improvement (QI)-Directed M&M Conference

2014

Basic Science

Connie H. Keung, MD
Propranolol as a Novel Therapy for Lymphatic Malformations

Clinical Science

Blair A. Wormer, MD
Home Intravenous Versus Oral Antibiotics Following Appendectomy for Perforated Appendicitis, a Randomized Controlled Trial

Best Podium Presentation

2013

Basic Science

Eric D. Girard, MD
Amniotic Fluid Stem Cells in a Bioengineered Scaffold: a New Frontier in Patient Specific Therapy for Premature Lung Disease

Clinical Science

Ryan P. Cauley, MD
Higher Costs Charges and Resource Utilization do not Affect Survival in Congenital Diaphragmatic Hernia

2012

Amar Nijagal, MD
Fetal Intervention Triggers the Activation of Paternal Antigen-Specific Maternal T Cells

2011

Amar Nijagal, MD
The Maternal Adaptive Immune Response Against Paternal Antigens Incites Fetal Demise After Fetal Intervention

2010

Mehul V. Raval, MD
Pediatric ACS NSQIP: Feasibility of a Novel Prospective Assessment of Surgical Outcomes – a Phase I Report

2009

Eric Jelin, MD
Effects of Notch4 on Lung Vascular Remodeling

2008

Emily T. Durkin, MD
The Ontogeny of Human Fetal NK Cell Allorecognition: A Potential Barrier to *in Utero* Transplantation

Best Poster Presentation

2012

Eric J. Stanelle, MD
Pediatric Synovial Sarcoma: Prognostic Factors, Management of Pulmonary Metastasis, and Survival Outcomes

2011

Barrie S. Rich, MD
Predictors of Survival in Childhood and Adolescent Cutaneous Melanoma

2010

Allison L. Speer, MD
Tissue-Engineered Esophagus is a Versatile *in Vivo* Mouse Model with Intact Architecture

2009

Laura A. Boomer, MD
Cholangiocyte Apoptosis During Lamprey Metamorphosis

2008

Henry L. Chang, MD
In Vivo Metastatic/Invasion Assay to Identify Cancer Stem Cells and their Markers



Award Recipients (cont.)

APSA Posters of Distinction

Awarded to two outstanding poster presentations in Clinical and Basic Science.

Basic Science

2017

Christine Finck, MD
Esophageal Scaffolds Seeded with Epithelial Cells for Esophageal Replacement Therapy

2016

Julie Monteagudo, MD
Ex Vivo Comparison of Extracorporeal Membrane Oxygenation Circuits and Cannulae to Evaluate Sources of Hemolysis

2015

Elizabeth Clark, DVM
Characterization of Tissue Engineered Tracheal Grafts in an Ovine Model

2014

Catherine J. Hunter, MD
Defining the Role of Protein Kinase A and Apoptosis in Necrotizing Enterocolitis

2013

Leo Andrew O. Benedict, MD
Spinal Cord Expression of Virally Derived Mullerian Inhibiting Substance Extends Life and Promotes Survival of Motor Neurons in Transgenic SOD1 Mutant Mice

2012

Syamal D. Bhattacharya, MD
Temporal Relationships Between Positive Urine Culture and Onset of Necrotizing Enterocolitis

2011

R. Dawn Fevurly, MD
Novel Zebrafish Model Reveals Critical Role for MAPK in Lymphangiogenesis

2010

Hayden W. Stagg, MD
Matrix Metalloproteinase-9 Induces Hyperpermeability Following Traumatic Burn Injury

2009

Francois I. Luks, MD
Reflectance Spectrometry for Realtime Hemoglobin Determination of Placental Vessels During Endoscopic Laser Surgery for TTTS

Clinical Science

2017

Joseph Church, MD
Avalon Catheters in Pediatric Patients Requiring ECMO: Placement and Migration Issues

2016

Daniel L. Lodwick, MD, MS
Lymphocyte Depression and Postoperative Abscess after Appendectomy in Children

2015

Yinin Hu, MD
Cumulative Sum: an Individualized Proficiency Metric for Laparoscopic Fundamentals

2014

Cerine Jeanty, MD
Procedural Management of Cholelithiasis in Infants Under One Year of Age

2013

Deidre C. Kelleher, MD
Impact of a Checklist on ATLS Task Performance During Pediatric Trauma Resuscitation

2012

Alejandro Garcia, MD
The Role of Notch Inhibition in a Novel Hepatoblastoma Orthotopic Model

Award Recipients (cont.)

2011

Jesse R. Gutnick, MD
Circulating Thyrotropin Receptor mRNA for
Evaluation of Thyroid Nodules and
Surveillance of Thyroid Cancer

2010

Diana L. Diesen, MD
Temporal Association Between Blood
Transfusion and Necrotizing Enterocolitis in
Premature Infants

2009

Henry L. Chang, MD
Mullerian Inhibiting Substance Inhibits
Migration of Epithelial Cancer Cell Lines

Innovation Award

Recognizes one outstanding innovation
abstract presented in the Innovation
Session at the annual meeting. From 2011
to 2016 this award was generously funded
by the Sheikh Zayed Institute for Pediatric
Surgical Innovation.

2017

Nhan T. Huynh, MD
Three-Dimensionally Printed Surface
Features to Anchor Endoluminal Spring for
Distraction Enterogenesis

2016

Matthew A. Hornick, MD
Toward Physiologic Extracorporeal Support
of the Premature Infant: Umbilical Cord
Cannulation Provides Superior Oxygenator
Flows, Oxygen Delivery and Hemodynamic
Stability

Edward Hannon, MBChB, MRCS
Xenogeneic Decellularized Oesophageal
Transplantation is Achievable in a Large
Animal Model

2015

Maxime M. Mahe, PhD
Generation of Functional Intestine from
Patient Derived Pluripotent Stem Cells

2014

Shahab Shaffiey, MD
Generation of an Artificial Intestine and
Validation in Dogs: a Proof-of-Concept
Study

2013

Veronica F. Sullins, MD
A Novel Biodegradable Device for Intestinal
Lengthening

2012

Sabina Siddiqui, MD
Development of an Isolation Bed for
Patients Undergoing MIBG Treatment for
Neuroblastoma

2011

Maridelle B. Millendez, MD
Evaluation of Intestinal Viability Using
3-CCD (Charge Coupled Device) in
Children Undergoing Appendectomy

APSA Quality, Safety and Value Award in Surgery

Awarded to the manuscript that best
demonstrates quality improvement
principles, patient safety initiatives and/
or addresses the value proposition by
demonstrating an improvement in outcomes
while at the same time reducing cost or
other measures of resource utilization.

Andrew Nordin, MD - 2017
Jamie R. Robinson, MD - 2016
Kathy Schall, MD - 2014
Jason W. Nielsen, MD - 2014



Award Recipients (cont.)

Travel Fellowship

APSA and the APSA Foundation, together with a generous five-year grant from the Sidra Medical Research Center, have joined together to institute the Travel Fellow Scholarship. It was designed to recognize pediatric surgeons from countries that do not enjoy the same quality of medical care, and to give young pediatric surgeons the opportunities to learn from their counterparts in APSA.

2018

Sohail Dogar, MD
Pediatric Surgery and the Healthcare System in Pakistan
The Indus Hospital, Karachi, Pakistan

Oluwaseun Ladipo-Ajayi, MD
Giving Respite from the Bite: Neonatal Care Challenges in a Developing Country
University of Lagos College of Medicine, Lagos, Nigeria

2017

Martin Situma, MD
Development of a Pediatric Surgical Unit in a Resource-Constrained Setting in Western Uganda
Mbarara University of Science & Technology, Mbarara, Uganda

Sushil Dhungel, MD
Pediatric Surgical Specialty in Nepal: Then and Now
Western Regional Hospital, Pokhara Nepal

2016

Christian País, MD
Military Hospital-Ecuador
Quito, Ecuador
Pediatric Surgery, My "Axis of Action"

Esther Saguil, MD
College of Medicine, University of the Philippines
Manila, Philippines
The Practice of Pediatric Surgery in the Philippines

2015

Opeoluwa Adesanya, MBBS
Federal Medical Centre, Abeokuta
Ogun State, Nigeria
Pediatric Surgery in Nigeria – Defying the Odds

Tiyamike Chilunjika, MBBS
COSECSA, Queen Elizabeth Central Hospital
Blantyre, Malawi
Pediatric Surgery in Malawi

2014

John K.M. Nyagetuba, MB, ChB
Bethany Kids at Kijabe Hospital
Nairobi, Kenya
Paediatric Surgery in Kenya: Challenges and Solutions

Tran Anh Quynh, MD, PhD
National Hospital of Pediatrics
Hanoi, Vietnam
The Development of Vietnam Pediatric Surgery

2013

Omolara Williams, MD
Lagos State University College of Medicine and Lagos State University Teaching Hospital, Ikeja, Lagos, Nigeria
Practicing in a Resource Constrained Environment: Stumbling Blocks and Stepping Stones

New Members 2017–2018

The APSA Board of Governors and Membership Congratulates our Newest Members

July 2017 – March 2018

Regular Members

Alexander J. Bondoc
 Kanika A. Bowen-Jallow
 Erica M. Carlisle
 Claudia N. Emami
 John W. Fitzwater
 James Franklin Green, Jr.
 Alejandro Garcia
 Brian W. Gray
 Richard S. Herman
 Michael R. Irish
 Carl-Christian Andrew
 Jackson
 Jeremy J. Johnson
 Eric B. Jelin
 Kelly Kogut
 Matthew P. Landman
 Katrine Lofberg
 Tara J. Loux
 Demetri J. Merianos
 Mark S. Molitor
 Gary Nace
 Amar Nijagal
 Kartik A. Pandya
 Erin E. Perrone
 Daniel S. Rhee
 Samuel E. Rice-Townsend
 Barrie S. Rich
 Connie J. Rossini
 Matthew T. Santore
 Michael G. Scheidler
 David Stitelman
 Rajan Thakkar
 Manuel B. Torres
 Sifrance Tran
 Christopher G. Turner
 Derek S. Wakeman

Associate Member

Christopher A. Gitzelmann

Candidate Members

Anwar Abdul-Hadi
 Hanna Alemayehu
 Clint D. Cappiello

Shannon L. Castle
 Muriel Aya Cleary
 Alex Cuenca
 Enrico Danzer
 James Solomon Davis
 Farokh R. Demehri
 Jose Luis Diaz-Miron
 Andrea Doud
 Jeremy G. Fisher
 Margaret E. Gallagher
 Erin MacKenzie Garvey
 Britney L. Grayson
 Ivan M. Gutierrez
 Ihab Halaweish
 Danielle Marlene Hsu
 Justin T. Huntington
 Zachary Jon Kastenber
 J. Leslie Knod
 Nathaniel Koo
 Louis D. Le
 Daniel Levin
 Alpin D. Malkan
 Jarod P. McAteer
 Teerin T. Meckmongkol
 Cristina A. Metildi
 Bharath D. Nath
 Dan W. Parrish
 Erik G. Pearson
 Elliot C. Pennington
 Michael Phillips
 Andrei Radulescu
 Jason Owen Robertson
 Carmelle Romain
 Katie Rowland
 Chethan Sathya
 Ryan Spurrier
 Veronica F. Sullins
 Arunachalam Thenappan
 Michelle Veenstra
 Jesse Vrecenak
 Justin Philip Wagner
 Ryan Walk
 Daniel Watkins
 David J. Worhunsky
 Benjamin Zendejas-
 Mummert

Resident Members

Amin Afrazi
 Omar Ahmed
 Jamie Anderson
 Michael Ray Arnold
 Naina Bagrodia
 Elizabeth Blears
 Stephanie Yi-Tsi Chen
 Young Mee Choi
 Barbara Elizabeth Coons
 Kristine S. Corkum
 Rachelle Damle
 Jonathan DeAntonio
 Matthew Dellinger
 Natalie A. Drucker
 Katherine Gonzalez
 Kristin Gee
 Carolyn Gosztyla
 Cornelia Griggs
 Richard A. Guyer
 Byron D. Hughes
 Ruth Ellen Jones
 Angela Marie Kao
 Mitchell Ryan Ladd
 Randi Lassiter
 Heather Liebe
 Allison Linden
 Cristen Nicole Litz
 Kendall McEachron
 Shin Miyata
 Armando Salim Munoz
 Abraham
 Rohini Khatri Olson
 Utsav Patwardhan
 Alexander Peters
 Marko Rojnica
 Paul K. Waltz, II



New Members 2017–2018

Pledge for New Members of the American Pediatric Surgical Association

This pledge will be read before the New Member Induction Ceremony.

As president of the American Pediatric Surgical Association, it is my pleasure to welcome you into regular membership and to stress the obligations that you assume by such membership.

The American Pediatric Surgical Association was founded on April 15, 1970, by 200 surgeons drawn together to encourage specialization in the field of pediatric surgery; to make available the benefits to be derived from the services of qualified pediatric surgeons; to promote and maintain the quality of education in pediatric surgery through meetings, lectures and the distribution of printed materials; to raise the standards of the specialty by fostering and encouraging research and scientific progress in pediatric surgery and by establishing standards of excellence in the surgical care of infants, children and teenagers; and to provide a forum for the dissemination of information with regard to pediatric surgery.

The association expects its new members to support the objectives and obligations of the association as set forth in the Articles of Incorporation and to reflect the values expressed in the Principles of Medical Ethics as stated in the Preamble to the Bylaws. The members are also expected to support the association through active participation in its meetings. We look forward to your contributions in advancing its proud traditions.

If you pledge to exemplify the high ethical and professional standards of the American Pediatric Surgical Association in your practice of surgery, and if you will participate actively in future meetings, please respond by stating "I will." Since you have indicated your intent to become an active and worthy member and since you have been duly elected, I now declare you to be a regular member of the American Pediatric Surgical Association.

I now call upon the current members and guests of the American Pediatric Surgical Association to rise and join me in welcoming our new colleagues.

In Memoriam (2017–2018)

Eric W. Fonkalsrud, 2017

Aviva L. Katz, 2018

Samuel B. Rosser, 2018

Founding Members

Fred Arcari, Royal Oak, MI

E. Thomas Boles, Columbus, OH

John L. Cahill, Indian Wells, CA

John R. Campbell, Portland, OR

Alfred A. de Lorimier, Geyserville, CA

Frank G. DeLuca, Barrington, RI

Robert M. Filler, Toronto, ON, Canada

Eric W. Fonkalsrud, Santa Monica, CA

Edward A. Free, Prescott, AZ

Dale G. Johnson, Salt Lake City, UT

Peter K. Kottmeier, Rutledge, TN

Lucian L. Leape, Boston, MA

Julius Lister, Framingham, MA

John Raffensperger, Sanibel, FL

Mark I. Rowe, Sanibel, FL

William K. Sieber, Yerona, PA

Robert T. Soper, Iowa City, IA

James A. Talbert, Gainesville, FL

Edward S. Tank, Portland, OR

Charter Members

Raymond A. Amoury, Kansas City, MO

H. Paulsen Armstrong, Baton Rouge, LA

A. Robert Beck, New York, NY

Jerrold M. Becker, New Hyde Park, NY

Clifford R. Boeckman, Salem, SC

Scott J. Boley, Bronx, NY

William E. Bomar, Gray Court, SC

John D. Burrington, Colorado Springs, CO

John L. Cahill, Indian Wells, CA

Walter S. Cain, Birmingham, AL

Gordon S. Cameron, Dunas, ON, Canada

Daniel T. Cloud, Phoenix, AZ

David L. Collins, San Diego, CA

Elizabeth Coryllos, Mineola, NY

C. Peter Crowe, Tucson, AZ

Joseph S. David, Eagle, ID

Jean G. DesJardins, Saint-Laurent, QC,
Canada

Pieter A. deVries, Larkspur, CA

George W. Dorman, Prescott, AZ

Jacques C. Ducharme, Mont Royal, QC,
Canada

Dick G. Ellis, Fort Worth, TX

John H. Fisher, Marshfield, MA

Eric W. Fonkalsrud, Santa Monica, CA

Eugene Garrow, Jersey City, NJ

Marvin Glicklich, Fox Point, WI

Leonard Graivier, Dallas, TX

Jacob A. Haller, Glencoe, MD

Daniel M. Hays, Riverside, CA

Bruce M. Henderson, Corpus Christi, TX

W. Hardy Hendren, Duxbury, MA

Jack H. Hertzler, Franklin, MI

George W. Holcomb, Nashville, TX

Thomas M. Holder, Prairie Village, KS

James W. Hopkins, Windsor Heights, IA

George A. Hyde, Horare, Avondale,
Zimbabwe

Patrick F. Jewell, Lincoln, CA

Frank R. Johnson, Frankfort, MI

Kenneth Kenigsberg, Glen Cove, NY

William N. Kincannon, Santa Barbara, CA

Murray R. Kliman, Vancouver, BC, Canada

Charles H. Klippel, Paxton, MA

Irwin H. Krasna, Forest Hills, NY

Dennis J. Lafer, Jacksonville, FL

J. Eugene Lewis, St. Louis, MO

Peter S. Liebert, White Plains, NY

Hugh B. Lynn, Winchester, VA

Enrique Marquez, San Juan, PR

Lester W. Martin, Bellbrook, OH

R. W. Paul Mellish, Dhahran, Saudi Arabia



Charter Members (cont.)

Ascher L. Mestel, Brooklyn, NY
 Richard C. Miller, Jackson, MS
 David R. Murphy, Kingston, ON, Canada
 James A. O'Neill, Jr., Nashville, TN
 H. Biemann Othersen, Charleston, SC
 Cedric J. Priebe, Stony Brook, NY
 Thomas C. Putnam, Rockland, ME
 Judson Randolph, Nashville, TN
 Lester R. Sauvage, Seattle, WA
 Louise Schnauffer, Philadelphia, PA
 John N. Schullinger, Woodstock, VT
 Lloyd Schultz, Omaha, NE
 Samuel R. Schuster, Westboro, MA
 Alan D. Shafer, Dayton, OH
 Barry Shandling, Toronto, ON, Canada
 Anthony Shaw, Pasadena, CA
 Walton K.T. Shim, Honolulu, HI
 Laurence A. Somers, Lafayette Hill, PA
 Bernard J. Spencer, Sanibel Island, FL
 Rowena Spencer, New Orleans, LA
 Nicholas M. Stahl, Charlestown, RI

Felicien M. Steichen, Mamaroneck, NY
 H. Harlan Stone, Glenville, NC
 Kamthorn Sukarochana, Pittsburgh, PA
 Orvar Swenson, Charleston, SC
 Jessie L. Ternberg, St. Louis, MO
 Robert J. Touloukian, New Haven, CT
 David S. Trump, Grants Pass, OR
 Kenneth R. Tyson, Burnet, TX
 Arie D. Verhagen, Hamilton, OH
 Vollrad J. Von Berg, Hot Springs, AR
 Theodore P. Votteler, Dallas, TX
 H. Warner Webb, Jacksonville, FL
 John J. White, Seattle, WA
 Albert H. Wilkinson, Jacksonville, FL
 Morton M. Woolley, Rancho Mirage, CA
 Earle L. Wrenn, Greensboro, NC



Schedule & Program



Schedule-at-a-Glance

Wednesday, May 2

7:00 a.m. – 2:00 p.m.	APSA Board of Governors Meeting	Directors Suite V
2:30 p.m. – 6:30 p.m.	Association of Pediatric Surgery Training Program Directors Meeting	Springs Ballroom C-E
3:00 p.m. – 7:00 p.m.	Registration Open	Desert Ballroom Foyer
3:00 p.m. – 7:00 p.m.	Speaker Ready Room Open	Springs Ballroom A
6:30 p.m. – 10:00 p.m.	Publications Committee Meeting	Directors Suite IV

Thursday, May 3 – EDUCATION DAY

6:00 a.m. – 7:30 a.m.	Committee Meetings See page 61 for Ancillary Meeting Schedules	
6:00 a.m. – 7:30 a.m.	Continental Breakfast	Desert Ballroom Foyer
6:30 a.m. – 2:00 p.m.	Poster Presenter Set Up	Desert Ballroom 1-7
6:30 a.m. – 5:00 p.m.	Registration Open	Desert Ballroom Foyer
6:30 a.m. – 5:00 p.m.	Speaker Ready Room Open	Springs Ballroom A
7:30 a.m. – 7:45 a.m.	President's Welcome	Desert Ballroom 8-14
7:45 a.m. – 10:45 a.m.	Education Session I: Endocrine	Desert Ballroom 8-14
8:00 a.m. – 10:00 a.m.	Companion Hospitality Suite Open	Aquifer 65, Lobby Bar
9:00 a.m. – 2:00 p.m.	Exhibitor Set Up	Desert Ballroom 1-7
10:45 a.m. – 11:00 a.m.	Refreshment Break	Desert Ballroom Foyer
11:00 a.m. – Noon	Outcomes and Evidence-based Practice Committee Systematic Reviews: Pilonidal Disease and Surgical Review of Undescended Testes	Desert Ballroom 8-14
Noon – 12:30 p.m.	Box Lunch Pick Up	Desert Ballroom Foyer
12:30 p.m. – 2:00 p.m.	Case Debates and Controversies	Desert Ballroom 8-14
2:00 p.m. – 4:30 p.m.	CONCURRENT EDUCATION SESSIONS II & III Education Session II: Pediatric Trauma, Joint Session with APSNA; Mass Shooting in Las Vegas	Desert Ballroom 8-14
	Education Session III: Current Trends in Translational, Clinical and Outcomes Research; Educational Resources Showcase	Springs Ballroom F
3:00 p.m. – 5:30 p.m.	Exhibit Hall Open	Desert Ballroom 1-7
3:00 p.m. – 5:30 p.m.	Poster Hall Open	Desert Ballroom 1-7
4:15 p.m. – 5:15 p.m.	Wine and Cheese Reception in the Exhibit Hall	Desert Ballroom 1-7
4:30 p.m. – 6:30 p.m.	Stop the Bleed	Desert Ballroom 1-7
4:45 p.m. – 6:30 p.m.	CONCURRENT ORAL POSTER PRESENTATIONS I & II Oral Poster Presentations I: Basic Science	Desert Ballroom 8-14
	Oral Poster Presentations II: Clinical Surgery	Springs Ballroom F
7:00 p.m. – 9:00 p.m.	Welcome Reception	JW Pavilion/The Grove

Schedule-at-a-Glance (cont.)

Friday, May 4

6:00 a.m. – 7:00 a.m.	Committee Meetings See page 61 for Ancillary Meeting Schedules	
6:00 a.m. – 7:00 a.m.	APSA Foundation Board Meeting	Directors Suite V
6:00 a.m. – 7:00 a.m.	Continental Breakfast	Desert Ballroom 1-7
6:00 a.m. – 1:00 p.m.	Exhibit Hall Open	Desert Ballroom 1-7
6:00 a.m. – 1:00 p.m.	Poster Hall Open	Desert Ballroom 1-7
6:00 a.m. – 1:00 p.m.	Exhibit Hall Open	Desert Ballroom 1-7
6:00 a.m. – 1:30 p.m.	Registration Open	Desert Ballroom Foyer
6:00 a.m. – 1:30 p.m.	Speaker Ready Room Open	Springs Ballroom A
7:00 a.m. – 8:30 a.m.	Plenary Session I	Desert Ballroom 8-14
8:00 a.m. – 10:00 a.m.	Companion Hospitality Suite Open	Aquifer 65, Lobby Bar
8:30 am. – 8:45 a.m.	International Lecture Professor Miliard Derbew, MD, President, College of Surgeons of East, Central and Southern Africa (COSECSA)	Desert Ballroom 8-14
8:45 a.m. – 9:15 a.m.	Jay and Margie Grosfeld Lecture Paul E. Farmer, MD, PhD, Kolokotronis University Professor of Global Health and Social Medicine, Department of Global Health & Social Medicine, Harvard Medical School	Desert Ballroom 8-14
9:15 a.m. – 9:45 a.m.	Refreshment Break	Desert Ballroom 1-7
9:45 a.m. – 11:15 a.m.	CONCURRENT SCIENTIFIC SESSIONS I & II Scientific Session I: Necrotizing Enterocolitis, Short Gut, Congenital Diaphragmatic Hernia	Desert Ballroom 8-14
	Scientific Session II: Trauma, Appendicitis, Hernia, General Pediatric Surgery	Springs Ballroom F
11:30 a.m. – 12:15 p.m.	Presidential Address Henri R. Ford, MD, MHA, Senior Vice President and Surgeon-in-Chief, Children's Hospital Los Angeles; Vice Chair and Professor of Surgery, Vice Dean of Medical Education, Keck School of Medicine, University of Southern California	Desert Ballroom 8-14
12:15 p.m. – 1:30 p.m.	CONCURRENT SCIENTIFIC SESSIONS III & IV Scientific Session III: Fetal, Transplant, Basic Science	Desert Ballroom 8-14
	Scientific Session IV: Anorectal Malformations, IBD, Thoracic	Springs Ballroom F
1:30 p.m.	Leisure Time	
1:30 p.m. – 3:30 p.m.	Benjy Brooks Luncheon (pre-registration required)	Santa Rosa (lower level)
1:30 p.m. - 6:00 p.m.	Stop the Bleed	Desert Ballroom 1-7



Schedule-at-a-Glance (cont.)

2:00 p.m. – 7:00 p.m.	Pediatric Ultrasound Course (pre-registration required)	Springs Ballroom G
2:00 p.m. – 7:00 p.m.	Essentials of Surgical Critical Care Course (pre-registration required)	Springs Ballroom H-L
4:30 p.m. – 5:30 p.m.	Residents Reception	Springs Ballroom D-E
5:00 p.m. – 6:30 p.m.	<i>Journal of Pediatric Surgery</i> Reception (by invitation)	Springs Ballroom B-C
5:30 p.m. – 6:00 p.m.	New Member Rehearsal (by invitation)	Desert Ballroom 8-14
5:30 p.m. – 7:00 p.m.	Global Pediatric Surgery Reception Informal gathering for individuals interested in pediatric surgery efforts in low and middle-income countries	Directors Suite VII

Saturday, May 5

6:00 a.m. – 7:00 a.m.	Committee Meetings See page 61 for Ancillary Meeting Schedules	
6:00 a.m. – 4:00 p.m.	Registration Open	Desert Ballroom Foyer
6:00 a.m. – 4:00 p.m.	Speaker Ready Room Open	Springs Ballroom A
6:30 a.m. – 8:00 a.m.	Continental Breakfast	Desert Ballroom 1-7
6:30 a.m. – 10:00 a.m.	Poster Hall Open	Desert Ballroom 1-7
6:30 a.m. – 10:00 a.m.	Exhibit Hall Open	Desert Ballroom 1-7
7:00 a.m. – 8:00 a.m.	Business Meeting – all are welcome	Desert Ballroom 8-14
8:00 a.m. – 9:00 a.m.	Innovation Session	Desert Ballroom 8-14
8:00 a.m. – 10:00 a.m.	Companion Hospitality Suite Open	Aquifer 65, Lobby Bar
9:00 a.m. – 9:45 a.m.	Refreshment Break	Desert Ballroom 1-7
9:45 a.m. – 10:15 a.m.	Robert E. Gross Lecture Tracy C. Grikscheit, MD, Associate Professor of Surgery, Children's Hospital Los Angeles, University of Southern California, Keck School of Medicine	Desert Ballroom 8-14
10:00 a.m.	Exhibitor Dismantle	Desert Ballroom 1-7
10:00 a.m.	Poster Presenter Dismantle	Desert Ballroom 1-7
10:15 a.m. – 11:15 a.m.	Plenary Session II	Desert Ballroom 8-14
11:15 a.m. – 11:30 a.m.	Health Policy & Advocacy Committee Update Marion C. Henry, MD, MPH, Chair 2017 Brandeis Scholar Report Shawn D. St. Peter, MD	Desert Ballroom 8-1
11:30 a.m. – Noon	Journal of Pediatric Surgery Lecture Steven Stylianos, MD, Surgeon-in-Chief, Morgan Stanley Children's Hospital	Desert Ballroom 8-14
Noon – 12:30 p.m.	Box Lunch Pick Up	Desert Ballroom Foyer
12:30 p.m. – 1:00 p.m.	Travel Fellow Presentations Sohail Dogar, Aga Khan University, Karachi, Pakistan Oluwaseun Ladipo-Ajayi, University of Lagos College of Medicine, Lagos, Nigeria	Desert Ballroom 8-14

Schedule-at-a-Glance (cont.)

1:00 p.m. – 1:30 p.m.	APSA Foundation Jay Grosfeld, MD Scholar Presentations 2016 Scholars: Helen Hsieh, MD, Elisabeth T. Tracy, MD 2017 Scholars: Andrew J. Murphy, MD, Isam W. Nasr, MD	Desert Ballroom 8-14
1:30 p.m. – 1:45 p.m.	New Member Induction Ceremony	Desert Ballroom 8-14
2:00 p.m. – 3:00 p.m.	Scientific Session V: Quality	Desert Ballroom 8-14
3:00 p.m. – 4:00 p.m.	Scientific Session VI: Oncology	Desert Ballroom 8-14
4:00 p.m. – 6:00 p.m.	Pediatric Surgery NaT Reception (by invitation)	Springs Ballroom B-D
6:30 p.m. – 7:00 p.m.	President's Reception	Desert Ballroom Foyer
7:00 p.m. – 10:00 p.m.	President's Banquet	Desert Ballroom 8-14

Sunday, May 6

6:00 a.m. – 7:30 a.m.	Committee Meetings See page 61 for Ancillary Meeting Schedules	
6:30 a.m. - 7:30 a.m.	Continental Breakfast	Desert Ballroom Foyer
7:30 a.m. – 9:00 a.m.	COG Update: Hepatoblastoma and Hepatocellular Carcinoma; Solid Tumor Studies Update	Desert Ballroom 8-14
7:00 a.m. – 11:00 a.m.	Speaker Ready Room Open	Springs Ballroom A
7:00 a.m. – 11:00 a.m.	Registration Open	Desert Ballroom Foyer
9:00 a.m. – 11:00 a.m.	Town Hall Meeting	Desert Ballroom 8-14
11:00 a.m.	Meeting Concludes	



Ancillary Meeting by Group

Committee	Date/Time	Room
AAP Delivery of Surgical Care Committee	Saturday, May 5, 6:00 a.m. - 7:00 a.m.	Directors Suite V
AAP Publications Committee	Thursday, May 3, 6:00 a.m. - 7:00 a.m.	Directors Suite V
AAP SoSu EC	Sunday, May 6, 1:00 p.m. - 4:00 p.m.	Springs Ballroom B
ACS Pediatric Surgery Advisory Council	Friday, May 4, 3:30 p.m. - 5:30 p.m.	Griffin Room
Anniversary Celebration Committee	Thursday, May 3, 6:00 a.m. - 7:00 a.m.	Springs Ballroom E
APSA Foundation Board Meeting	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Directors Suite V
APSTPD - Program Directors	Wednesday, May 2, 2:30 p.m. - 6:30 p.m.	Springs Ballroom C-E
Baylor (BCM) Reunion	Friday, May 4, 5:30 p.m. - 7:00 p.m.	Directors Suite V
Benjy Brooks (registration required)	Friday, May 4, 1:30 p.m. - 3:30 p.m.	Santa Rosa (lower level)
Board of Governors	Wednesday, May 2, 7:00 a.m. - 2:00 p.m.	Directors Suite V
Cancer Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom L
Childhood Obesity Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom I
COG Research Collaborative Group	Sunday, May 6, 6:00 a.m. - 8:00 a.m.	Springs Ballroom B
Collaborative CDH Research	Friday, May 4, 3:30 p.m. - 5:30 p.m.	Directors Suite IV
Collaborative CDH Research	Saturday, May 5, 6:00 a.m. - 8:00 a.m.	Directors Suite IV
Consolidating Teaching Resources - Centralizing Patient Sheets	Wednesday, May 2, 6:30 p.m. - 7:30 p.m.	Directors Suite V
DHREAMS and CARE Studies	Saturday, May 5, 4:00 p.m. - 5:30 p.m.	Directors Suite V
Doctors Without Borders-Informational Meet and Greet (informal gathering open to all).	Thursday, May 3, 6:30 p.m.	Blue Star Lounge
Education Committee	Thursday, May 3, 6:30 a.m. - 7:30 a.m.	Springs Ballroom L
Ethics Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom J
Fetal Diagnosis and Treatment Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom B
Florida Association of Pediatric Surgeons	Thursday, May 3, 4:30 p.m. - 4:45 p.m.	Springs Ballroom B
Global Pediatric Surgery Committee	Friday, May 4, 4:00 p.m. - 5:30 p.m.	Directors Suite VII

Ancillary Meeting by Group (cont.)

Committee	Date/Time	Room
Global Surgery Networking Event (open to all attendees interested in global health issue)	Friday, May 4, 5:30 p.m. - 7:00 p.m.	Blue Star Lounge
Health Policy and Advocacy Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom C
Hirschsprung Disease Interest Group	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Directors Suite IV
Industry and Institutional Advisory Committee	Thursday, May 3, 6:30 a.m. - 7:30 a.m.	Springs Ballroom B
Informatics and Telemedicine Committee	Thursday, May 3, 6:30 a.m. - 7:30 a.m.	Springs Ballroom I
JPS Reception (by invitation)	Friday, May 4, 5:00 p.m. - 6:30 p.m.	Springs Ballroom B-C
Membership and Credentials Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom D
NaT Reception (by invitation)	Saturday, May 5, 4:00 p.m. - 6:00 p.m.	Springs Ballroom B-D
New Technology Committee	Thursday, May 3, 6:00 a.m. - 7:00 a.m.	Springs Ballroom K
Networking and Special Interest Focus Group <i>to reserve your spot contact Dr. Burke at riburke@chla.usc.edu</i>	Friday, May 4, 1:30 p.m. - 2:30 p.m.	Directors Suite VII
Outcomes and Evidence-based Practice Committee (OEBP)	Thursday, May 3, 6:00 a.m. - 7:00 a.m.	Springs Ballroom H
Pediatric Surgery Research Collaborative (PedSRC)	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Directors Suite VII
Practice Committee	Thursday, May 3, 6:00 a.m. - 7:00 a.m.	Springs Ballroom C
Professional Development Committee (PDC)	Thursday, May 3, 6:00 a.m. - 7:00 a.m.	Springs Ballroom J
Program Committee	Thursday, May 3, 6:00 a.m. - 7:00 a.m.	Directors Suite IV
Publications Committee	Wednesday, May 2, 6:30 p.m. - 10:00 p.m.	Directors Suite IV
Research Committee	Friday, May 4, 2:00 p.m. - 3:00 p.m.	Directors Suite IV
Residents Reception (open to all residents and students)	Friday, May 5, 4:30 p.m. - 5:30 p.m.	Springs Ballroom D-E
Surgical Critical Care Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom E
Surgical Quality and Safety Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom H
Trauma Committee	Thursday, May 3, 6:00 a.m. - 7:00 a.m.	Springs Ballroom D
Workforce Committee	Friday, May 4, 6:00 a.m. - 7:00 a.m.	Springs Ballroom K



Ancillary Meeting by Day

Committee	Time	Room
Wednesday, May 2		
Board of Governors	7:00 a.m. - 2:00 p.m.	Directors Suite V
APSTPD - Program Directors	2:30 p.m. - 6:30 p.m.	Springs Ballroom C-E
Consolidating Teaching Resources - Centralizing Patient Sheets	6:30 p.m. - 7:30 p.m.	Directors Suite V
Publications Committee	6:30 p.m. - 10:00 p.m.	Directors Suite IV
Thursday, May 3		
AAP Publications Committee	6:00 a.m. - 7:00 a.m.	Directors Suite V
Anniversary Celebration Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom E
New Technology Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom K
Outcomes and Evidence-based Practice Committee (OEBP)	6:00 a.m. - 7:00 a.m.	Springs Ballroom H
Professional Development Committee (PDC)	6:00 a.m. - 7:00 a.m.	Springs Ballroom J
Practice Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom C
Program Committee	6:00 a.m. - 7:00 a.m.	Directors Suite IV
Trauma Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom D
Education Committee	6:30 a.m. - 7:30 a.m.	Springs Ballroom L
Industry and Institutional Advisory Committee	6:30 a.m. - 7:30 a.m.	Springs Ballroom B
Informatics and Telemedicine Committee	6:30 a.m. - 7:30 a.m.	Springs Ballroom I
Florida Association of Pediatric Surgeons	4:30 p.m. - 4:45 p.m.	Springs Ballroom B
Doctors Without Borders - Informational Meet and Greet	6:30 p.m.	Blue Star Lounge

Ancillary Meeting by Day (cont.)

Committee	Time	Room
Friday, May 4		
APSA Foundation Board Meeting	6:00 a.m. - 7:00 a.m.	Directors Suite V
Cancer Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom L
Childhood Obesity Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom I
Fetal Diagnosis and Treatment Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom B
Health Policy and Advocacy Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom C
Hirschsprung Disease Interest Group	6:00 a.m. - 7:00 a.m.	Directors Suite IV
Membership and Credentials Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom D
Pediatric Surgery Research Collaborative (PedSRC)	6:00 a.m. - 7:00 a.m.	Directors Suite VII
Surgical Critical Care Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom E
Surgical Quality and Safety Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom H
Workforce Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom K
Networking and Special Interest Focus Group	1:30 p.m. - 2:30 p.m.	Directors Suite VII
Benjy Brooks	1:30 p.m. - 3:30 p.m.	Santa Rosa (lower level)
Research Committee	2:00 p.m. - 3:00 p.m.	Directors Suite IV
ACS Pediatric Surgery Advisory Council	3:30 p.m. - 5:30 p.m.	Griffin Room
Collaborative CDH Research	3:30 p.m. - 5:30 p.m.	Directors Suite IV
Global Pediatric Surgery Committee	4:00 p.m. - 5:30 p.m.	Directors Suite VII
Residents Reception	4:30 p.m. - 5:30 p.m.	Springs Ballroom D-E
JPS Reception	5:00 p.m. - 6:30 p.m.	Springs Ballroom B-C
Baylor (BCM) Reunion	5:30 p.m. - 7:00 p.m.	Directors Suite V
Global Surgery Networking Event <i>open to individuals interested in pediatric surgery efforts in low and middle-income countries</i>	5:30 p.m. - 7:00 p.m.	Blue Star Lounge
Ethics Committee	6:00 a.m. - 7:00 a.m.	Springs Ballroom J



Ancillary Meeting by Day (cont.)

Committee	Time	Room
Saturday, May 5		
AAP Delivery of Surgical Care Committee	6:00 a.m. - 7:00 a.m.	Directors Suite V
Collaborative CDH Research	6:00 a.m. - 8:00 a.m.	Directors Suite IV
DHREAMS and CARE Studies	4:00 p.m. - 5:30 p.m.	Directors Suite V
NaT Reception <i>(by invitation)</i>	4:00 p.m. - 6:00 p.m.	Springs Ballroom B-D
Sunday, May 6		
COG Research Collaborative Group	6:00 a.m. - 8:00 a.m.	Springs Ballroom B
AAP SoSu EC	1:00 p.m. - 4:00 p.m.	Springs Ballroom B



Education Overview

The APSA Annual Meeting is designed to provide comprehensive continuing education in the field of pediatric surgery. APSA strives to bring together the world's leading pediatric surgery authorities to present and discuss the most recent clinical and research efforts. This meeting covers the breadth of pediatric surgery and is intended to acquaint attendees with the latest research findings, clinical discoveries and trends that influence the day-to-day practice of pediatric surgery. The topics at these sessions have been selected by the Program and Education Committees and approved by the Board of Governors based on a member-driven needs analysis in order to offer material that is most relevant to their practices. The Plenary Sessions highlight the highest regarded clinical and basic science submitted to the annual meeting as determined by the Program Committee. The scientific sessions consist of basic research and practical clinical presentations and are organized in broad topics of similar interest in order to offer the attendee the opportunity to maximize their educational benefit. The hands-on courses are designed to provide simulation to the attendees in order to allow for experience that will translate to patient care. The poster sessions are intended to provide young investigators an opportunity to share preliminary research.

Accreditation Statement

The American Pediatric Surgical Association is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education (CME) for physicians. This live CME activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME).

APSA 2018 Annual Meeting

APSA designates this live activity for a maximum of 22 *AMA PRA Category 1 Credits™*. Physicians should claim only the credit commensurate with the extent of their participation in the activity.



The American Pediatric Surgical Association education credentials have been recognized and upgraded by the Accreditation Council for Continuing Medical Education from Accreditation to Accreditation with Commendation. The ACCME is the national accrediting board for all medical education organizations in the U.S. that administer courses and confer Continuing Medical Education credits to physicians and health care providers.

Disclosures

Disclaimer: These materials and all other materials provided in conjunction with CME activities are intended solely for purposes of supplementing CME programs for qualified health care professionals. Anyone using the materials assumes full responsibility and all risk for their appropriate use. APSA makes no warranties or representations whatsoever regarding the accuracy, completeness, currentness, noninfringement, merchantability or fitness for a particular purpose of the materials. In no event will APSA be liable to anyone for any decision made or action taken in reliance on the materials. In no event should the information in the materials be used as a substitute for professional care.

Policy on Faculty Disclosure

It is the policy of the ACCME and APSA that the planning committee and faculty disclose and resolve real or apparent conflicts of interest relating to the content of the educational activity, and also disclose discussions of unlabeled/unapproved uses of drugs or devices during their presentations.

Faculty Disclosures

In the case of faculty presentations the following faculty members have disclosed a financial relationship with an industry partner. The relationship was proven not to have an impact on the science presented at this annual meeting. All other faculty indicated that they have no financial relationships to disclose.

Christine Finck

Grant/Research Support: Biostage™ provided funding for the project. Other: Biostage™ provided synthetic scaffolds for the project

Adil H. Haider

Grant/Research Support: Henry M. Jackson Foundation for the Advancement of Military Medicine, Patient-Centered Outcomes Research Institute, Harvard Surgery Affinity Research Collaborative (ARC) Program Grant. Salary: Henry M. Jackson Foundation for the Advancement of Military Medicine. Stockholder/Ownership: Patient Doctor Technologies Inc. Other: Institute of Medicine's Military Trauma Care's Learning Health System and its Translation to the Civilian Sector Committee

Jeffrey D. Horbar

Employment at Vermont Oxford Network

Todd Jensen

Grant/Research Support: Biostage™ provided funding for the project. Other: Biostage™ provided synthetic scaffolds for the project

Kate A. Morrow

Employment at Vermont Oxford Network

John M. Racadio

Cincinnati Children's Hospital Medical Center Dept of Radiology has a Master Research Agreement with Philips Healthcare. None of the authors receive any payments or salary from Philips.

Ishna Sharma

Grant/Research Support: Biostage™ provided funding for the project. Other: Biostage™ provided synthetic scaffolds for the project

Roger F. Soll

Employment at Vermont Oxford Network

Heather Wanczyk

Grant/Research Support: Biostage™ provided funding for the project. Other: Biostage™ provided synthetic scaffolds for the project

Russell G. Witt

Grant/Research Support: The company Ultragenyx provided enzyme used in the study and research support



Disclosures (cont.)

Te-Lu Yap

Grant/Research Support: SingHealth
Foundation Research Grant 2015 (SHF/
FG591P/2015)

Jose M. Prince

Merck, Data Safety Monitoring Committee

Committee Disclosures

Disclosures were collected from all committee members with influence over the educational content of the annual meeting program. These committee members have reported the following financial relationships and it has been determined that no conflict of interest exists with any of these relationships. All other committee members indicated that they have no financial relationships to disclose.

Daniel J. Ostlie – Program Committee
JustRight Surgical, part owner

International Lecture



Friday, May 4, 2018 | 8:30 – 8:45 a.m.

Miliard Derbew, MD

President, College of Surgeons of East, Central and Southern Africa; Professor of Pediatric Surgery, Addis Ababa University, Ethiopia

Pediatric Surgery in Eastern Africa: Unmet Needs

Prof. Miliard Derbew is a professor of pediatric surgery at the College of Health Sciences, Addis Ababa University. He is also a principal investigator for Medical Education Partnership Initiative Junior Faculty project for Ethiopia, MEPI-JF. Since 2015, he has served as president of College of Surgeons of East Central and Southern Africa (COSECSA). He was the principal investigator of Medical Education Partnership (MEPI) project, a five year project which was a consortium of four medical schools in Ethiopia and five universities in the United States, focused on building institutional capacity.

Derbew has served as chief executive director (with a rank of vice president) in the College of Health Sciences, Addis Ababa University (2010- 2011) and was the dean of the School of Medicine from 2007- 2010. He has also served as president of the Surgical Society of Ethiopia and a vice president of COSECSA.

Derbew has published more than 50 peer reviewed scientific articles on reputable journals and has made more than 25 presentations at different international conferences.

He graduated from medical school and specialized in surgery from the School of Medicine, Addis Ababa University and served his fellowship in pediatrics surgery at Tel Aviv University and University of Toronto Sickkids Hospital. Derbew is a founding fellow of the COSECSA and fellow of the Royal College of Surgeons of England.



Jay and Margie Grosfeld Lecture



Friday, May 4, 2018 | 8:45 – 9:15 a.m.

Paul E. Farmer, MD, PhD

Kolokotronis University Professor and Chair, Chief, Division of Global Health Equity, Department of Global Health and Social Medicine, Harvard University Brigham and Women's Hospital; Co-Founder and Chief Strategist, Partners in Health, Boston, MA USA

Watering the Desert: Addressing Surgical Disparities in an Age of Austerity

Medical anthropologist and physician Paul Farmer, MD, PhD, has dedicated his life to improving health care for the world's poorest people. He is a founding director of Partners In Health (PIH), an international non-profit organization that since 1987 has provided direct health care services and undertaken research and advocacy activities on behalf of those who are sick and living in poverty. Farmer began his lifelong commitment to Haiti in 1983 while still a student, working with dispossessed farmers in Haiti's Central Plateau. Starting with a one-building clinic in the village of Cange, Partners In Health's project in Haiti has grown to a multi-service health complex that includes a primary school, an infirmary, a surgery wing, a training program for health outreach workers, a 104-bed hospital, a women's clinic and a pediatric care facility. Over the past twenty-five years, PIH has expanded operations to twelve sites throughout Haiti and ten additional countries around the globe. The work has become a model for health care for poor communities worldwide; Farmer and his colleagues in the U.S. and abroad have pioneered novel community-based treatment strategies that demonstrate the delivery of high-quality health care in resource-poor settings.

Farmer holds an MD and PhD from Harvard University, where he is the Kolokotronis University Professor and the chair of the Department of Global Health and Social Medicine at Harvard Medical School; he is also chief of the Division of Global Health Equity at Brigham and Women's Hospital, Boston. Additionally, Farmer serves as the United Nations Special Adviser to the Secretary-General on Community Based Medicine and Lessons from Haiti.

Farmer has written extensively on health, human rights, and the consequences of social inequality. His most recent books are *In the Company of the Poor: Conversations with Dr. Paul Farmer and Fr. Gustavo Gutierrez*, *Reimagining Global Health: An Introduction*, and *To Repair the World: Paul Farmer Speaks to the Next Generation*. Other titles include *Haiti After the Earthquake*, *Partner to the Poor: A Paul Farmer Reader*, *Pathologies of Power: Health, Human Rights, and the New War on the Poor*, *The Uses of Haiti*, *Infections and Inequalities: The Modern Plagues*, and *AIDS and Accusation: Haiti and the Geography of Blame*. Tracy Kidder's book *Mountains Beyond Mountains: The Quest of Dr. Paul Farmer, A Man Who Would Cure the World*, chronicles the development of Farmer's work in Haiti and beyond.

He is the recipient of numerous honors, including the Margaret Mead Award from the American Anthropological Association, the Outstanding International Physician (Nathan Davis) Award from the American Medical Association, a John D. and Catherine T. MacArthur Foundation Fellowship, and, with his PIH colleagues, the Hilton Humanitarian Prize. He is a member of the Institute of Medicine of the National Academy of Sciences and of the American Academy of Arts and Sciences.

Presidential Address



Friday, May 4, 2018 | 11:30 a.m. – 12:15 p.m.

Henri R. Ford, MD, MHA

Senior Vice President and Surgeon-in-Chief; Children's Hospital Los Angeles; Vice Chair and Professor of Surgery, Vice Dean of Medical Education, Keck School of Medicine of University of Southern California, Los Angeles, CA USA

APSA and the Quest for Significance: Addressing Health Disparities at Home and on the Global Scene

Henri R. Ford, MD, is vice president and chief of surgery at Children's Hospital Los Angeles (CHLA), vice dean of Medical Education, professor and vice chair for clinical affairs in the Department of Surgery and at the Keck School of Medicine of the University of Southern California. He is a member of the executive committee of the board of trustees of CHLA and a member of the board of directors of the Children's Hospital Los Angeles Medical Group. He is also a member of the Executive Leadership Team and the medical executive committee of CHLA. As surgeon-in-chief and vice president for Surgical and Perioperative Services, he oversees the entire perioperative services area at CHLA. Under his leadership, CHLA has developed a robust, state-of-the-art minimally invasive surgery program.

As a professor in the Department of Surgery at the Keck School of Medicine, he serves as an important role model for young physicians and medical students. As the vice dean for Medical Education at the Keck School, Ford advances the medical school's educational mission by promoting excellence in medical education as one of its highest priorities. Ford led a very successful accreditation visit for the MD program, which resulted in the maximum eight-year, full accreditation from the Liaison Committee on Medical Education (LCME), the best results achieved since a 10-year accreditation was granted in 1981. Ford's current priorities include strengthening research opportunities for medical students and developing new sources of funding for medical student scholarships.

Ford has demonstrated "...truly exceptional leadership..." in pediatric surgery and has conducted the definitive studies on pediatric trauma in the United States. His investigative studies have generated new insights into the pathogenesis of necrotizing enterocolitis, the most common and the most lethal disorder affecting the gastrointestinal tract of newborn infants. He is the author of more than 450 publications, book chapters, invited manuscripts, abstracts and presentations.

Ford serves on a variety of boards of directors, editorial boards and councils and has been active on many local and national professional and scientific committees. He is a member of numerous other professional and scientific societies and has received numerous prestigious honors and awards including the Arnold P. Gold Humanism in Medicine Award from the Association of American Medical Colleges.

Ford received his bachelor's degree in public and international affairs, cum laude, from Princeton University in 1980 and his MD from Harvard Medical School in 1984. He received his MHA (Master of Health Administration) degree from the School of Policy, Planning and Development of the University of Southern California in 2009. Ford did his internship (1984-85) and residency (1985-87; 1989-91) in general surgery at New York Hospital Cornell Medical College. He completed a research fellowship in immunology (1987-89) in the Department of Surgery at the University of Pittsburgh and a clinical fellowship (1991-93) in pediatric surgery at Children's Hospital of Pittsburgh.



Robert E. Gross Lecture



Saturday, May 5, 2018 | 9:45 – 10:15 a.m.

Tracy C. Grikscheit, MD

*Associate Professor of Surgery, Children's Hospital Los Angeles,
University of Southern California, Keck School of Medicine, Los
Angeles, CA USA*

Stem Cells for Babies and their Surgeons: the Future is Now

Tracy C. Grikscheit, MD, is a tenured associate professor of surgery at the University of Southern California, as well as an attending surgeon at Children's Hospital Los Angeles. She graduated from Harvard University with a bachelor's degree in biochemistry and later earned her MD from the Columbia College of Physicians.

Grikscheit completed her training in general surgery at Massachusetts General Hospital in Boston. During that time she worked with Joseph P. Vacanti in the Laboratory for Tissue Engineering and Organ Fabrication. Her research, centering on engineered solutions for congenital and acquired intestinal deficits, has been reported in numerous peer-review journals and national and international presentations. Her work was featured on the front page of the New York Times in 2012.

Grikscheit completed her surgical training with a pediatric surgery fellowship at Seattle Children's Hospital and Regional Medical Center before joining CHLA and is a clinical attending surgeon of pediatric surgery as well as a funded primary investigator at the Saban Research Institute, continuing her work in tissue engineering and the role of organ-specific and iPS stem cells in organ regeneration and replacement.

Journal of Pediatric Surgery Lecture



Saturday, May 5, 2018 | 11:30 a.m. – Noon

Steven Stylianos, MD

Surgeon-in-Chief, Morgan Stanley Children's Hospital, New York, NY USA

To Save a Child's Spleen: 50 Years from Toronto to ATOMAC

Steven Stylianos, MD, is the Rudolph N. Schullinger Professor of Surgery and Pediatrics and Chief of the Division of Pediatric Surgery at Columbia University. He serves as the Surgeon-in-Chief of the Morgan Stanley Children's Hospital. Previously, Stylianos served as the Chief of Pediatric Surgery and Associate Surgeon-in-Chief at the Cohen Children's Medical Center from 2011-2013 and at Miami Children's Hospital from 2005-2011.

A graduate of Rutgers University and the New York University School of Medicine, Stylianos completed his general surgical training at Columbia–Presbyterian Medical Center. He subsequently spent two years as the Trauma Fellow at the Kiwanis Pediatric Trauma Institute in Boston and then completed his formal pediatric surgery training at Boston Children's Hospital. Stylianos joined the faculty of Columbia University College of Physicians and Surgeons and the Children's Hospital of New York in 1992. He organized and directed the 50-member team of physicians and nurses who separated conjoined twins in 1993, 1995 and 2000. These conjoined twins separations attracted the attention of the national media, including "Dateline NBC", "CBS 48 Hours" and "Fox News".

Stylianos has served as APSA's Chair of the Trauma Committee (1997–2002) and authored the APSA position paper supporting all measures to reduce the toll of firearm violence in children. He also served as the Co-Principal Investigator of the U.S. Department of Health, Maternal and Child Health Bureau's grant to APSA "Partnership for Development and Dissemination of Outcomes Measures for Injured Children."

Currently, Stylianos is a site verification officer of the American College of Surgeons Committee on Trauma and recently served as a consultant on the Pediatric Surgery Board of the American Board of Surgery. He is also Editor-in-Chief of the new Journal of Pediatric Surgery Case Reports, Associate Editor of the Journal of Pediatric Surgery and served on the Executive Board as a founding member of the Pediatric Trauma Society. Stylianos was recently named to the Board of Governance of ColumbiaDoctors and named a Samberg Family Scholar in Children's Health. He recently received the prestigious American Pediatric Surgical Nurses Association's 2016 Champions Award and the American Trauma Society's 2016 NY State Trauma Medical Director of Distinction.



APSA 2018 Travel Fellows



Saturday, May 5 | 12:30 p.m. – 1:00 p.m.

Sohail Dogar, MD

Aga Khan University, Karachi, Pakistan

Pediatric Surgery and the Healthcare System in Pakistan

Dr. Sohail Dogar is a pediatric surgeon practicing at the Indus Hospital in Karachi, Pakistan, a charity hospital where treatment is totally free of cost. The hospital is situated in one of the most underserved areas of a city of 22 million and runs a colorectal program, safe circumcision program, vascular anomalies clinic, general pediatric surgical clinic and a pediatric cancer unit. Dogar's areas of interest are colorectal surgery, onco-surgery and laser surgery used for the treatment of vascular anomalies. He looks forward to the APSA Annual Meeting to improve his skills, learn about the latest pediatric surgical practice, with the goal of ultimately benefitting the poor and ailing children of his country.



Oluwaseun Ladipo-Ajayi, MD

University of Lagos College of Medicine, Lagos, Nigeria

Giving Respite from the Bite: Neonatal Care Challenges in a Developing Country

Dr. Oluwaseun Ladipo-Ajayi is a pediatric surgeon practicing in Nigeria, West Africa, where clinical practice conditions are often tedious and fraught with challenges notably due to the persistent dearth of the equipment and resources which make diagnosis and care seamless. Ladipo-Ajayi is interested in the mitigation of mortality from gastroschisis and hepatobiliary diseases, mainly biliary atresia. She is also passionate about the rights of children and committed to advocating for policies to ensure that children in Nigeria have access to heavily subsidized or free medical care, which would go a long way to reducing the country's neonatal and infant mortality rates. One of her main goals is to pioneer the establishment of a prenatal diagnosis and intervention facility in Nigeria.

APSA Past Meeting Lectures

Journal of Pediatric Surgery Lectures

2017

Diana L. Farmer, MD

Audacious Goals 2.0: The Global Initiative in Children's Surgery

2016

Michael W. Collins, PhD

Sport-Related Concussion: Moving in the Right Direction

2015

Robert W. Block, MD

All Adults Were Once Children

2014

Eric A. Rose, MD

Understanding Translational Research

2013

David B. Hoyt, MD

The American College of Surgeons Model for Quality Improvement

2012

Brad W. Warner, MD

Adaptation: Paradigm for an Academic Career and the Gut

2011

Professor Lewis Spitz

The History of Paediatric Surgery in the United Kingdom and the National Health Service

2010

Robert H. Bartlett, MD

ECMO: Gross, Beethoven, Krummel and Georgeson

2008

Thomas M. Krummel, MD

Inventing Our Future: Training the Next Generation of Surgeon Innovators

2007

Alan W. Flake, MD

Stem Cell Biology and Pediatric Surgery – Deciphering the Venn Diagram

2006

Pedro Rosselló, MD

The Unfinished Business of American Healthcare

2005

Alberto Peña, MD

Luck and Serendipity, the History of a Surgical Technique



APSA Past Meeting Lectures (cont.)

2004

R. Scott Jones, MD

The American College of Surgeons Initiatives for Safety and Quality Improvement

2003

Patricia K. Donahoe, MD

Sustained Inquiry and Perseverance in the Clinic and at the Bench

2002

Michael R. Harrison, MD

Fetal Surgery: Trials, Tribulations and Territory

2001

Joseph P. Vacanti, MD

The History and Current Status of Tissue Engineering

Robert E. Gross Lectures

2017

Stephen W. Bickler, MD, DTM&H

Out of Africa: Insights from a Prospective Pediatric Surgery Database

2016

Mary E. Fallat, MD

Redefining Ladd's Path

2015

Robert S. Langer, ScD

Biomaterials and Biotechnology: from the Discovery of the First Angiogenesis Inhibitors to the Development of Controlled Drug Delivery Systems and the Foundation of Tissue Engineering

2014

Diana L. Farmer, MD

Standing on the Shoulders of Giants: From Singapore to Stem Cell Therapy

2013

Jorge D. Reyes, MD

Intestinal Transplantation: an Unexpected Journey

2012

Daniel M. Green, MD

The Evolution of Treatment of Wilms' Tumor

2011

Judson G. Randolph, MD

Notes on the Early Development of Pediatric Surgery in the United States

APSA Past Meeting Lectures (cont.)

2010

John D. Birkmeyer, MD

Measuring and Improvement the Quality of Pediatric Surgery

2009

Stanley B. Prusiner, MD

Designer Prions and a Quest for Therapy

2008

Michael W.L. Gauderer, MD

Creativity and the Surgeon

2007

Francisco G. Cigarroa, MD

Leading an Academic Health Center in the 21st Century: A Pediatric Surgeon's Perspective

2006

Diana Bianchi, MD

Fetomaternal Cell Trafficking: A Story that Begins with Prenatal Diagnosis and May End with Stem Cell Therapy

2005

W. Hardy Hendren, MD

Looking Back 50 Years

2004

Giulio (Dan) D'Angio, MD

The Role of the Surgeon in the Past, Present and Future of Pediatric Oncology

2003

Lucien Leape, MD

Safe Health Care – Are We Up to It?

2002

Harold Shapiro, PhD

The Ethical Dimensions of Scientific Progress

2001

M. Judah Folkman, MD

Angiogenesis-Dependent Diseases

2000

J. Bruce Beckwith, MD

Pediatric Renal Tumors at the New Millennium: Myths, Misunderstandings, Controversies and Opportunities

1999

Samuel A. Wells, Jr., MD

(Title not available)



APSA Past Meeting Lectures (cont.)

1998

Richard M. Satava, MD

Medicine in the 21st Century

1997

Douglas W. Wilmore, MD

Will Organ Growth Replace Transplantation? Lessons from Patients with Short Bowel Syndrome

1996

Robert H. Bartlett, MD

Surgery, Science and Respiratory Failure

1995

David A. Williams, MD

The Role of Interleukin-II on the Pathophysiology of the Small Intestine

1994

W. French Anderson, PhD

Human Gene Therapy

1993

M. Judah Folkman, MD

Clinical Applications of Angiogenesis Research

1992

Warren Zapol, MD

Inhaled Nitric Oxide: A Selective Vaso-Dilator

1991

Joel Cooper, MD

History and Current Status of Lung Transplantation

1990

Richard Simmons, MD

Role of the Gut Flora in Surgery

Jay & Margie Grosfeld Lectures

2017

James A. O'Neill, Jr., MD

A Model for Humanitarian Outreach in Today's World

2016

Vinay Nadkarni, MD, MS

Resuscitating Resuscitation: Disruptive Innovations – Learning from the Past, Present and Toward a Brighter Future!

2015

Henri R. Ford, MD, MHA

Insights into the Pathogenesis of Necrotizing Enterocolitis: The Role of the Intestinal Microbiota

APSA Past Meeting Lectures (cont.)

2014

Gail E. Besner, MD

A Pain in the NEC: Research Challenges and Opportunities

2013

Jessica J. Kandel, MD

Serendipity, Translational Research, High Quality Care, and the Children's Hospital

2012

M. James Kaufman, PhD

Health Care Reform – The Impact on Children

2011

Anthony Atala, MD

Regenerative Medicine: New Approaches to Healthcare

2010

Christopher K. Breuer, MD

The Development and Translation of the Tissue Engineered Vascular Grafts

2009

Michael T. Longaker, MD, MBA

Regenerative Medicine: A Surgeon's Perspective

2008

Frederick J. Rescorla, MD

What's New in Pediatric Surgery

International Guest Lectures

2015

Paul K.H. Tam, MBBS, ChM

Hirschsprung's Disease: a Bridge for Science and Surgery

2014

Professor Jacques Marescaux

Next Step in Minimally Invasive Surgery: Hybrid Image-Guided Surgery

2013

Agostino Pierro, MD

Across the Ocean: Perspectives for Clinical Care, Training and Research

2012

Benno M. Ure, MD

Enthusiasm, Evidence and Ethics: the Triple E of Minimally Invasive Pediatric Surgery

2011

Professor Takeshi Miyano, MD

A Brief History of Pediatric Surgery and Healthcare Delivery Systems in Japan



APSA Past Meeting Lectures (cont.)

2010

Jan Alice Marcel Deprest, MD

Prenatal Management of the Fetus with Isolated CDH

2009

Marcelo Martinez Ferro, MD

New Approaches to Pectus and Other MIS in Argentina

2008

Tadashi Iwanaka, MD

Technical Innovation, Standardization and Skill Qualification of Pediatric Minimally Invasive Surgery in Japan

2007

Claire Nihoul-Fékété, MD

Is Regionalism of Complex Pediatric Malformations Desirable and Feasible? The Example of Disorders of Sexual Development

2005

Prof. Frans W.J. Hazebroek, MD, PhD

Is Continuation of Life Support Always the Best Option for the Surgical Neonate?

2004

David A. Lloyd, MD

Tomorrow's Surgeons: Who Cares for the Patient?

2003

Claire Nihoul-Fékété, MD

Modern Surgical Management of Congenital Hyperinsulinemic Hypoglycemia

2002

Takeshi Miyano, MD

Biliary Tree: A Gardener's 30-Year Experience

2001

Pedro Rosselló, MD

One Nation, with Liberty and Justice...and Healthcare for All

2000

Leela Kapila, MD

Are These the Children of a Lesser God?

1999

Bernardo Ochoa, MD

Pediatric Surgery in Latin America

1998

Sidney Cywes, MD

Some of the Little Things We Do – Something Old, Something New

APSA Past Meeting Lectures (cont.)

1997

Justin Kelly, MD

Bladder Exstrophy – Problems and Solutions

1996

Prem Puri, MD

Variant Hirschsprug's Disease

1995

Sir Lewis Spitz, MD, PhD

Esophageal Atresia – Past, Present and Future

1994

Sean J. Corkery, MCh

In Pursuit of the Testis

1993

Edward M. Kiely, MD

The Surgical Challenge of Neuroblastoma

1992

Yann Revillon, MD

Intestinal Transplantation in France

1991

Shemuel Nissan, MD

The History of Surgery and Medicine in the Holy Land from the 19th Century

1990

Jan C. Molenaar, MD

Congenital Diaphragmatic Hernia – What Defect?

Plenary Lectures

2016

Mary L. Brandt, MD

Sustaining a Career



APSA 2018 Annual Meeting Program in Detail

Program in Detail

Thursday, May 3 – EDUCATION DAY

6:00 a.m. – 7:30 a.m.	Committee Meetings See page 61 for Ancillary Meeting Schedules	
6:00 a.m. – 7:30 a.m.	Continental Breakfast	Desert Ballroom Foyer
6:30 a.m. – 2:00 p.m.	Poster Presenter Set-up	Desert Ballroom 1-7
6:30 a.m. – 5:00 p.m.	Registration Open	Desert Ballroom Foyer
6:30 a.m. – 5:00 p.m.	Speaker Ready Room Open	Springs Ballroom A

President's Welcome

7:30 a.m. – 7:45 a.m. Desert Ballroom 8-14

Henri R. Ford, MD, MHA

Education Session I: Endocrine

7:45 a.m. – 10:45 a.m. Desert Ballroom 8-14

APSA Education Committee

Moderator: Casey M. Calkins, MD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Describe important changes in thyroid nodule guidelines for children
- ▶ Describe work-up and management of thyroid nodules in children
- ▶ Recognize hypoparathyroidism as a complication of thyroid surgery
 - ▶ Describe techniques to protect the parathyroid glands
 - ▶ Describe treatment strategies for post-operative hypocalcemia
- ▶ Describe the work-up and treatment of thyroid disease in a child with possible Multiple Endocrine Neoplasm (MEN) syndrome
- ▶ Describe the indications and technique for doing central and lateral neck dissections in patients with thyroid cancer
- ▶ Describe the value of an institutional pediatric thyroid tumor board
- ▶ Describe contemporary management of a child with endocrine abnormalities of the pancreas

Overview of American Thyroid Association Guidelines

Role of the Pediatric Thyroid Tumor Board

Kurt F. Heiss, MD

Work-up of the Thyroid Nodule

David H. Rothstein, MD



Program in Detail (cont.)

Avoiding Complications: Preventing Hypocalcemia, Parathyroid Reimplantation, Long-term Follow-up

Monica E. Lopez, MD

Evolving Indications and Techniques for Central and Lateral Neck Dissection

Emily R. Christison-Lagay, MD

Evaluation and Prophylactic Treatment of Pediatric Medullary Thyroid Cancer

Diana L. Diesen, MD

Surgery for Congenital Hyperinsulinism

N. Scott Adzick, MD

8:00 a.m. – 10:00 a.m.	Companion Hospitality Suite Open (for registered companions)	Aquifer 65, Lobby Bar
9:00 a.m. – 2:00 p.m.	Exhibitor Set-up	Desert Ballroom 1-7
10:45 a.m. – 11:00 a.m.	Refreshment Break	Desert Ballroom Foyer

Systematic Reviews on Pilonidal Disease and Surgical Management of Undescended Testes

11:00 a.m. – Noon

Desert Ballroom 8-14

Outcomes and Evidence-based Practice Committee

Moderators: Adam B. Goldin, MD; Shawn D. St. Peter, MD

Systematic Review of Pilonidal Disease

LEARNING OBJECTIVES

By the end of the presentation, attendees will be familiar with the quality of the evidence available:

- ▶ To guide clinical decision-making in regard to the effectiveness of non-operative management and of minimally invasive procedures
- ▶ To guide clinical decision-making in regard to the effectiveness of operative management and the indications and contra-indications for various operative techniques and their potential associated complications
- ▶ In regard to the association between treatment options, patient satisfaction and quality-of-life

The “Effectiveness” of Non-operative Management in Pilonidal Disease

Julia E. Grabowski, MD

Various Operative Techniques: Indications and Contra-indications and Associated Complications

Tim Jancelewicz, MD

Program in Detail (cont.)

Thursday, May 3 (cont.)

Pilonidal Disease Management: What Treatments Have the Best Patient Satisfaction and Quality-of-life

Tolulope Oyetunji, MD

Systematic Review of Surgical Management of Undescended Testes

LEARNING OBJECTIVES

By the end of the presentation, attendees will be familiar with the quality of the evidence available:

- ▶ To guide clinical decision-making in regard to appropriate use and indications for pre-operative imaging
- ▶ To guide clinical decision-making in regard to the use of medical management in undescended testicle
- ▶ To guide clinical decision-making in regard to the appropriate timing of intervention and how timing is affected by the following clinical factors: laterality, palpable versus non-palpable testes, ascended/retractile testes, comorbid conditions, symptoms, and other associated findings
- ▶ To guide clinical decision-making in regard to the choice of operative technique
- ▶ In regard to describing the long-term outcomes after orchidopexy

When is Pre-operative Imaging Indicated and if so, Which Study is Most Appropriate?

Karen A. Diefenbach, MD

What is the Role of Medical Management in Undescended Testicle?

Karen A. Diefenbach, MD

What is the Appropriate Timing of Intervention and How is this Affected by the Following Clinical Factors: Laterality, Palpable v. Non-palpable Testes, Associated Findings, Comorbid Conditions, Symptoms and Ascending/retractile Testes?

Meghan A. Arnold, MD

What is the Evidence Supporting Each Type of Operative Intervention?

Robert L. Gates, MD

What are the Long-term Outcomes after Orchidopexy?

Julia S. Shelton, MD

Noon – 12:30 p.m.

Box Lunch Pick Up

Desert Ballroom Foyer



Program in Detail (cont.)

Case Debates and Controversies

12:30 p.m. – 2:00 p.m.

Desert Ballroom 8-14

Moderators: Carroll M. Harmon, MD, PhD; Todd A. Ponsky, MD

Education Session II: Pediatric Trauma

2:00 p.m. – 4:30 p.m.

Desert Ballroom 8-14

APSA Trauma Committee

Joint Session with APSNA

Moderators: John K. Petty, MD; Catherine Goodhue, MN, RN, CPNP-PC

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Understand the definition, etiology, and epidemiology of pediatric head injuries, including non-accidental trauma
- ▶ Understand the pathophysiological changes that occur in the brain after injury in patients with mild TBI and to correlate them with clinical symptoms
- ▶ Understand the clinical features, history and physical, of a patient with mTBI
- ▶ Identify and learn clinical guidelines regarding imaging of children presenting to the ED with a head injury (PECARN, CATCH, CHALICE)
- ▶ Learn evidence-based guidelines for acute management of mTBI regarding recommended criteria for discharge, observation, and admission
- ▶ Learn how to assess and manage post concussive syndrome and its outcomes
- ▶ Learn the utility of neurocognitive testing and cognitive rehab
- ▶ Educate about timing and process of return to activity (sports and school) after a concussion
- ▶ Recognize the characteristics of pediatric cervical spine injury that differ from those of adults
- ▶ Review imaging modalities for cervical spine with special consideration of radiation exposure
- ▶ Describe current treatment of BCVI in children
- ▶ Review trauma papers that impact pediatric trauma evaluation and management
 - Recognize the need for appropriate imaging and discuss the importance of limiting unnecessary testing in children
 - Identify the key decision points in directing surgical decision making for complex blunt trauma requiring non-operative interventions
 - Distinguish the signs of child maltreatment and discuss the design of appropriate algorithms to identify injuries arising from child abuse
 - Apply current medical treatment for venous thromboembolic prophylaxis and traumatic coagulopathic conditions
 - Evaluate complex pediatric thoracoabdominal trauma patients and design patient specific treatment plans to provide optimal care for injured children

Program in Detail (cont.)

Thursday, May 3 (cont.)

Traumatic Brain Injury

Mitchell R. Price, MD; Duane S. Duke, MD; Isam W. Nasr, MD

C-spine

Ramin Jamshidi, MD

Blunt Cerebrovascular Injury

Adam M. Vogel, MD

Discussion

Quick Shots/Papers that Should Change your Practice

Jose M. Prince, MD; Bindi Naik-Mathuria, MD; Robert T. Russell, MD; Catherine Goodhue, MN RN CPNP-PC

LEARNING OBJECTIVE

By the end of the presentation, attendees will be able to:

- ▶ Identify the hallmarks of pediatric trauma of the torso, including thoracic and abdominal trauma, requiring surgical management in injured children

Discussion

Mass Shooting in Las Vegas

Moderator: John K. Petty, MD

Gunshots, Invisible Wounds and the Pediatric Surgeon's Role in the Las Vegas Mass Casualty Incident

Cristina A. Metildi, MD; Nicholas F. Fiore, Jr., MD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Understand the timeline and triage system of the Las Vegas MCI, including the role of the Pediatric Surgeon
- ▶ Understand and anticipate the clinical "choke points" in the Las Vegas MCI
- ▶ Understand and anticipate the logistic "choke points" in the Las Vegas MCI
- ▶ Discuss the aftermath of a mass casualty incident, including crisis care, family support and psychological sequelae

Education Session III: Current Trends in Translational, Clinical and Outcomes Research

2:00 p.m. – 4:30 p.m.

Springs Ballroom F

Outcomes and Evidence-based Practice Committee

Moderators: Cynthia D. Downard MD, MMSc; Adam B. Goldin, MD



Program in Detail (cont.)

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Inform the APSA membership regarding current medical research techniques
- ▶ Help APSA members improve their comprehension of what questions each type of research is designed to answer
- ▶ Allow APSA members to critically appraise the current literature and allow research to inform their clinical decisions

Systematic Reviews – What are They and Why are They Important?

Robert J. Baird, MD; Robert L. Gates, MD

Survey Science – Nuisance or Useful?

Julia S. Shelton, MD; Adam B. Goldin, MD

Database Research – Big Problems, Big Solutions

Tolulope Oyetunji, MD; Marisa Bartz-Kurycki, MD

Research Collaboratives – How do They Fit into Pediatric Surgery?

Dave R. Lal, MD

Alternate Trial Structure – Are Randomized Controlled Trials a Thing of the Past?

Regan F. Williams, MD; Tinsley Anderson, MD

Quality and Safety Research – What’s Really Best for My Patients?

Akemi L. Kawaguchi, MD; Roshni A. Dasgupta, MD

Educational Resources Showcase

Moderators: Marjorie J. Arca, MD; Steven L. Lee, MD

The Professional Development Committee: APSA’s New Educational GPS

Craig W. Lillehei, MD

Maximizing the Full Potential of Pediatric Surgery NaT

David M. Powell, MD

Pediatric Surgery Self-assessment: PSSAP and its Many Forms

Charles L. Snyder, MD

3:00 p.m. – 5:30 p.m.	Exhibit Hall Open	Desert Ballroom 1-7
3:00 p.m. – 5:30 p.m.	Poster Hall Open	Desert Ballroom 1-7
4:15 p.m. – 5:15 p.m.	Wine and Cheese Reception in the Exhibit Hall	Desert Ballroom 1-7
4:30 p.m. – 6:30 p.m.	Stop the Bleed	Desert Ballroom 1-7 Booths – 110/112/114

Program in Detail (cont.)

Thursday, May 3 (cont.)

Concurrent Oral Poster Presentations I: Basic Science

4:45 p.m. – 6:30 p.m.

Desert Ballroom 8-14

Moderators: Troy A. Markel, MD; Shaun M. Kunisaki, MD, MSc

P1

SUCCESSFUL FIRST-IN-ANIMAL CHARACTERIZATION OF A NOVEL BIOSCAFFOLD TO SUPPORT AN ARTIFICIAL INTESTINE FOR THE MANAGEMENT OF SHORT BOWEL SYNDROME

Mitchell R. Ladd, MD, PhD¹, Carolyn Gosztyla, MD², Cait Costello, PhD³, Adam Werts, DVM, PhD¹, Blake Johnson, BS¹, Laura Martin, MD¹, Emily Banfield, MS¹, Hongpeng Jia, MD¹, Peng Lu, PhD¹, William Fulton, MS¹, Sanxia Wang, MS¹, Thomas Prindle, BS¹, Yukihiko Yamaguchi, PhD¹, Jungeun Sung, BS¹, Chhinder Sodhi, PhD¹, John March, PhD³, David J. Hackam, MD, PhD¹.

¹Johns Hopkins Hospital, Baltimore, MD, USA, ²Walter Reed, Bethesda, MD, USA, ³Cornell University, Ithaca, NY, USA.

P2

IN UTERO INJECTION OF NANOPARTICLE ENCAPSULATED PROTEIN PREVENTS PROTEIN-SPECIFIC AUTOIMMUNE DISEASE VIA CENTRAL TOLERANCE

John D. Stratigis, MD¹, Nicholas J. Ahn, MD¹, Kendall M. Lawrence, MD¹, Barbara E. Coons, MD¹, Haiying Li, BS¹, Camila G. Fachin, MD¹, Andre Dias, MD, PhD¹, Darrell J. Irvine, PhD², Stavros P. Loukogeorgakis, MD, PhD¹, Alan W. Flake, MD¹.

¹The Children's Hospital of Philadelphia, Philadelphia, PA, USA, ²MIT, Cambridge, MA, USA.

P3

A COMPARISON OF CLINICALLY RELEVANT SOURCES OF MESENCHYMAL STEM CELL-DERIVED EXOSOMES: BONE MARROW AND AMNIOTIC FLUID

Sarah A. Tracy, MD¹, Azra Ahmed, BS¹, John C. Tigges², Maria Ericsson, BS³, Anoop K. Pal, PhD⁴, David Zurakowski, PhD¹, Dario O. Fauza, MD, PhD¹.

¹Boston Children's Hospital, Boston, MA, USA, ²Beth Israel Deaconess Medical Center, Boston, MA, USA, ³Harvard Medical School, Boston, MA, USA, ⁴Izon Science Ltd, Cambridge, MA, USA.

P4

CURING DISEASE BEFORE BIRTH: IN UTERO GENE THERAPY FOR THE TREATMENT OF HEREDITARY TYROSINEMIA TYPE 1 IN A SMALL ANIMAL MODEL

Clara T. Nicolais, MD¹, Kari L. Allen, BS¹, Zeji Du, PhD¹, Rebekah M. Guthman, BS¹, Robert A. Kaiser, PhD², Brad A. Feltis, MD, PhD³, Raymond D. Hickey, PhD¹, Joseph B. Lillegard, MD, PhD⁴.

¹Mayo Clinic, Rochester, MN, USA, ²Midwest Fetal Care Center, Children's Hospitals and Clinics of Minnesota / Mayo Clinic, Minneapolis / Rochester, MN, USA, ³Midwest Fetal Care Center, Children's Hospitals and Clinics of Minnesota, Minneapolis, MN, USA, ⁴Midwest Fetal Care Center, Children's Hospitals and Clinics of Minnesota, Minneapolis / Rochester, MN, USA.



Program in Detail (cont.)

P5

INTESTINAL LENGTHENING VIA MULTIPLE IN-CONTINUITY SPRINGS

Genia Dubrovsky, MD¹, Nhan Huynh, MD¹, Anne-Laure Thomas, MS², Shant Shekherdian, MD, MPH¹, James CY Dunn, MD, PhD².

¹UCLA, Los Angeles, CA, USA, ²Stanford University, Stanford, CA, USA.

P6

INHIBITING H2S IN STEM CELLS REDUCES THEIR PROTECTIVE POWER DURING NEC THERAPY

Natalie Drucker, MD, Jan Te Winkel, MD, Troy Markel, MD.

Riley Hospital for Children, Indianapolis, IN, USA.

P7

HIGH-DOSE PLACENTAL MESENCHYMAL STROMAL CELLS PROVIDE NEURONAL PRESERVATION FOLLOWING IN UTERO TREATMENT OF OVINE MYELOMENINGOCELE

Melissa Vanover, MD, Sandra Kabagambe, MD, Christopher Pivetti, MS, Lee Lankford, MA, Priyadarsini Kumar, PhD, Y. Julia Chen, MD, Benjamin Keller, MD, James Becker, MD, Chelsey Lee, BS, Zachary Paxton, BS, Laura Galganski, MD, Laura Goodman, MD, MPH, Guy Jensen, MD, MPH, Aijun Wang, PhD, Diana Farmer, MD.

University of California, Davis, Sacramento, CA, USA.

P8

MESENCHYMAL STROMAL CELLS ISOLATED FROM PLACENTA OF FETUS WITH SPINA BIFIDA PROVIDE NEUROPROTECTION IN VITRO

Melissa Vanover, MD, Priyadarsini Kumar, PhD, Lee Lankford, MA, Y. Julia Chen, MD, Diana Farmer, MD, Aijun Wang, PhD.

University of California, Davis, Sacramento, CA, USA.

P9

POSTISCHEMIC IL6 THERAPY IMPROVES INTESTINAL PERFUSION AND LIMITS MUCOSAL INJURY

Jan Te Winkel, MD, Natalie Drucker, MD, Troy Markel, MD.

Riley Hospital for Children, Indianapolis, IN, USA.

P10

ACTIVATION OF PROTEIN PHOSPHATASE 2A INHIBITS HEPATOBLASTOMA TUMORIGENICITY

Laura L. Stafman, MD, Adele P. Williams, MD, Jamie M. Aye, MD, Jerry Stewart, BS, Elizabeth A. Beierle, MD.

University of Alabama at Birmingham, Birmingham, AL, USA.

Program in Detail (cont.)

Thursday, May 3 (cont.)

P11

HDAC INHIBITION ENHANCES ANTI-TUMOR EFFECTS OF NOVEL REXINOIDS

Adele P. Williams, MD, Laura L. Stafman, MD, Jamie M. Aye, MD, Venkatram Atigadda, PhD, Jerry Stewart, BA, Donald Muccio, PhD, Clinton Grubbs, PhD, Elizabeth A. Beierle, MD.

University of Alabama at Birmingham, Birmingham, AL, USA.

P12

NOTCH ACTIVATION IN ENDOTHELIAL CELLS BY THE S. AUREUS TOXIN HLA CIRCUMVENTS TRANSCRIPTION OF CANONICAL DOWNSTREAM TARGETS

Naina Bagrodia, MD¹, Ann Defnet, MD², Mildred Nelson, BS³, Jared Emolo, MD³, Lydia Wu⁴, Juliane Bubeck-Wardenburg, MD, PhD³, Sonia Hernandez, PhD³, Jessica Kandel, MD³.

¹University of Iowa Hospitals and Clinics, Iowa City, IA, USA, ²New York University, New York, NY, USA,

³University of Chicago Medicine, Chicago, IL, USA, ⁴University of Chicago, Chicago, IL, USA.

P13

FXR IS IMPORTANT FOR DECREASED HEPATIC STEATOSIS AFTER SLEEVE GASTRECTOMY IN DIET-INDUCED OBESE MICE

Monica D. Chow, MD¹, Andrew M. Wassef, BA¹, Bo Kong, PhD², Jianliang Shen, MS², Laura E. Armstrong, PhD², Justin D. Schumacher, PharmD², Dan Rizzolo, BS², Mingxing Huang, MD³, Min Zhang, MD⁴, Ragui W. Sadek, MD¹, Chen Liu, MD, PhD⁵, Grace L. Guo, MBBS, PhD², Yi-Horng Lee, MD¹.

¹Rutgers-Robert Wood Johnson Medical School, New Brunswick, NJ, USA, ²Department of Pharmacology and Toxicology, Ernest Mario School of Pharmacy, Rutgers University, Piscataway, NJ, USA, ³Fifth Affiliated Hospital of Sun-Yat Sen University, Zhuhai, China, ⁴Center of Children's Liver Disease, 302 Hospital of PLA, Beijing, China, ⁵Rutgers-New Jersey Medical School, Newark, NJ, USA.

P14

NITRIC OXIDE IS RESPONSIBLE FOR INTESTINAL DYSMOTILITY IN NECROTIZING ENTEROCOLITIS

Shogo Seo, MD, Hiromu Miyake, MD, Bo Li, PhD, Carol Lee, MSc, Jaques Belik, MD, Agostino Pierro, MD.

SickKids Hospital, Toronto, ON, Canada.

P15

NOVEL ENTEROID MODEL OF NECROTIZING ENTEROCOLITIS DEMONSTRATES CHANGES IN CLAUDIN 2

Guillermo J. Ares, MD¹, Christie Buonpane, MD², Carrie Yuan, BS³, Doug Wood, BS³, Catherine J. Hunter, MD².

¹University of Illinois at Chicago, Chicago, IL, USA, ²Ann & Robert H. Lurie Children's Hospital, Chicago, IL, USA, ³Northwestern University, Chicago, IL, USA.



Program in Detail (cont.)

P16

cGAS DOWNREGULATION IS ASSOCIATED WITH MURINE COLITIS AND HUMAN INFLAMMATORY BOWEL DISEASE

Vei Shaun Siow, MD¹, Elizabeth Novak, PhD², Garret Vincent, BS², Kellie Cunningham, MD¹, Kevin Mollen, MD².

¹University of Pittsburgh Medical Center, Pittsburgh, PA, USA, ²Children's Hospital of Pittsburgh of UPMC, Pittsburgh, PA, USA.

P17

DEVELOPMENT OF HUMAN ORGANOID MODELS FOR PEDIATRIC LIVER CANCER

James A. Saltsman, MD, MPH¹, William J. Hammond, MD, MS¹, Gadi Lalazar, MD², Nicole Croteau, MD¹, Michael P. La Quaglia, MD¹, Sanford M. Simon, PhD².

¹Memorial Sloan Kettering Cancer Center, New York, NY, USA, ²Rockefeller University, New York, NY, USA.

P18

GENE EXPRESSION VARIATION IN PRIMARY TUMORS AND METASTATIC LESIONS IN FIBROLAMELLAR HEPATOCELLULAR CARCINOMA

James A. Saltsman, MD, MPH¹, David Requena, MS², Gadi Lalazar, MD¹, William J. Hammond, MD, MS¹, Nicole J. Croteau, MD¹, Michael P. La Quaglia, MD¹, Sanford M. Simon, PhD¹.

¹Memorial Sloan Kettering Cancer Center, New York, NY, USA, ²Rockefeller University, New York, NY, USA.

P19

MORPHINE IMPAIRS TIGHT JUNCTION BARRIER FUNCTION IN-VITRO THROUGH PHOSPHORYLATION AND DISRUPTION OF OCCLUDIN

Lei Zhang, PhD, **Bradley J. Segura, MD, PHD.**

University of Minnesota Masonic Children's Hospital, Minneapolis, MN, USA.

P20

DIFFERENTIAL RESPONSE TO PROMININ-1 HEPATIC PROGENITOR CELLULAR ABLATION IN ADULT MICE COMPARED TO NEWBORN DURING CHOLESTATIC LIVER INJURY

Michael R. Fenlon, MD¹, Jiabo Xu, MS¹, Kinji Asahina, PhD², Kasper S. Wang, MD¹.

¹Children's Hospital Los Angeles, Los Angeles, CA, USA, ²University of Southern California, Los Angeles, CA, USA.

P21

THE ANGIOGENIC EFFECT OF GRANULOCYTE COLONY-STIMULATING FACTOR IN METASTATIC NEUROBLASTOMA

Wesley E. Barry, MD, Grace Asuelime, MA, Larry Wang, MD, PhD, Eugene S. Kim, MD.

USC; CHLA, Los Angeles, CA, USA.

Program in Detail (cont.)

Thursday, May 3 (cont.)

Concurrent Oral Poster Presentations II: Clinical Surgery

4:45 p.m. – 6:30 p.m.

Springs Ballroom F

Moderators: David H. Rothstein, MD; Casey M. Calkins, MD

P22

SCREENING LABORATORY TESTING IN ASYMPTOMATIC MINOR PEDIATRIC BLUNT TRAUMA LEADS TO UNNECESSARY NEEDLE STICKS

Faidah O. Badru, MD, MPH¹, Saurabh Saxena, MD², Hector Osei, MD², David Starr, MS³, Perry Xu, MS³, Robert Breeden, MS³, Jose Greenspon, MD¹, Colleen Fitzpatrick, MD⁴, Gustavo Villalona, MD⁴, Kaveer Chatoorgoon, MD⁴.

¹Cardinal Glennon Memorial Children's Hospital, St Louis University Hospital, St Louis, MO, USA,

²Cardinal Glennon Memorial Children's Hospital, St Louis, MO, USA, ³St Louis University School of

Medicine, St Louis, MO, USA, ⁴Cardinal Glennon Memorial Children's Hospital, St Louis University Hospital, St Louis, MO, USA.

P23

TWENTY YEARS OF PEDIATRIC GUNSHOT WOUNDS IN OUR COMMUNITY: HAVE WE MADE A DIFFERENCE?

Lilly Bayouth, MD, Katryne Lukens-Bull, MPH, Lori A. Gurien, MD, Joseph J. Tepas III, MD, Marie Crandall, MD.

University of Florida Health Shands Jacksonville, Jacksonville, FL, USA.

P24

ENTERAL NUTRITION IN NEONATES WITH CONGENITAL DIAPHRAGMATIC HERNIA ON VA ECMO: SAFE AND FEASIBLE

Lindsey B. Armstrong, MD, Katelyn Ariagno, RD, Nilesh M. Mehta, MD.

Boston Children's Hospital, Boston, MA, USA.

P25

TIMING FOR REPAIR OF CONGENITAL DIAPHRAGMATIC HERNIA IN INFANTS REQUIRING EXTRACORPOREAL MEMBRANE OXYGENATION

Ali Mokdad, MD, Faisal G. Qureshi, MD, MBA.

UTSW, Dallas, TX, USA.

P26

CLINICAL AND PATHOLOGIC CHARACTERISTICS OF PEDIATRIC GASTROINTESTINAL STROMAL TUMORS USING THE NATIONAL CANCER DATABASE

Christopher R. Reed, MD¹, Harold J. Leraas, MA², Brian Ezekian, MD¹, Uttara Nag, MD¹, Henry Rice, MD¹, Tamara Fitzgerald, MD, PhD¹, Elisabeth Tracy, MD¹.

¹Duke University Medical Center, Durham, NC, USA, ²Duke University School of Medicine, Durham, NC, USA.



Program in Detail (cont.)

P27

ILEAL POUCH-ANAL ANASTOMOSIS IN PEDIATRIC NSQIP: DOES A LAPAROSCOPIC APPROACH REDUCE COMPLICATIONS AND LENGTH OF STAY?

Nicholas P. McKenna, MD, Donald D. Potter, MD, Katherine A. Bews, BS, Amy E. Glasgow, MHA, Kellie L. Mathis, MD, Elizabeth H. Habermann, PhD.

Mayo Clinic, Rochester, MN, USA.

P28

CLINICAL OUTCOMES ASSOCIATED WITH PERITONEAL CONTAMINATION IN PERFORATED APPENDICITIS: A CASE FOR INTRAOPERATIVE SCORING

Ruth Ellen Jones, MD¹, James S. Davis, MD¹, Lorrie Burkhalter, MPH², Robert Foglia, MD¹.

¹University of Texas Southwestern Medical Center, Dallas, TX, USA, ²Children's Health, Dallas, TX, USA.

P29

CESAREAN SECTION WITH EXTRACORPOREAL MEMBRANE OXYGENATION STANDBY AS AN ALTERNATIVE TO EX UTERO INTRAPARTUM TREATMENT FOR HIGH RISK CONGENITAL DIAPHRAGMATIC HERNIA

Sarah A. Hilton, MD, MSHS¹, Scott Deeney, MD², Lindel C. Dewberry, MD¹, Maggie M. Hodges, MD, MPH¹, Jason Gien, MD², John Kinsella, MD², Ahmed I. Marwan, MD², Timothy M. Crombleholme, MD², Kenneth W. Liechty, MD².

¹University of Colorado, Aurora, CO, USA, ²Children's Hospital Colorado, Aurora, CO, USA.

P30

CLOSING GASTROSCHISIS: THE GOOD, BAD AND THE NOT-SO UGLY

Erin E. Perrone, MD¹, Jacob Olson, MD², Jamie Golden, MD³, Gail E. Besner, MD², Christopher Gayer, MD³, Saleem Islam, MD⁴, Gerald Gollin, MD⁵.

¹University of Michigan, C.S. Mott Children's Hospital, Ann Arbor, MI, USA, ²Nationwide Children's Hospital, Columbus, OH, USA, ³Children's Hospital of Los Angeles, Los Angeles, CA, USA, ⁴University of Florida, Gainesville, FL, USA, ⁵Rady's Children's Hospital, San Diego, CA, USA.

P31**

THE EFFICIENCY OF A FAMILY-CENTERED APPROACH TO PEDIATRIC INDUCTION OF ANESTHESIA

Natalie C. Luehmann, MD, Michelle E. Staubach, BA, Phillip J. Collier, MD, Richard E. Han, MD, Nathan M. Novotny, MD.

Beaumont Hospital, Royal Oak, MI, USA.

P32

A NOVEL NON-INVASIVE APPENDICITIS SCORE WITH A URINE BIOMARKER

Te-Lu Yap, MBBS¹, Jingdan Fan, BSc², Candy SC Choo, BA¹, Yong Chen, MBBS, MRCS, PhD¹, John C. Allen, MSc, PhD³, Meng Fatt Ho, PhD², Yee Low, MBBS¹, Anette S. Jacobsen, MB¹, Shireen A. Nah, MBBS, MRCS, MS¹.

¹KK Women's and Children's Hospital, Singapore, Singapore, ²National Dental Centre, Singapore, Singapore, ³Duke-NUS Medical School, Centre for Quantitative Medicine, Singapore, Singapore.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Thursday, May 3 (cont.)

P33

IMPACT OF DISEASE-SPECIFIC VOLUME AND HOSPITAL TRANSFER ON OUTCOMES IN GASTROSCHISIS

Charles R. Hong, MD¹, Brenna S. Fullerton, MD¹, Minsuk Han, MD¹, Kate A. Morrow, MS², Erika M. Edwards, PhD, MPH³, Roger F. Soll, MD³, Tom Jaksic, MD, PhD¹, Jeffrey D. Horbar, MD³, Biren P. Modi, MD, MPH¹.

¹Boston Children's Hospital and Harvard Medical School, Boston, MA, USA, ²Vermont Oxford Network, Burlington, VT, USA, ³University of Vermont and Vermont Oxford Network, Burlington, VT, USA.

P34

PROSPECTIVE LONG-TERM CLINICAL AND QUALITY OF LIFE OUTCOMES IN PEDIATRIC FECAL INCONTINENCE FOLLOWING BOWEL MANAGEMENT

Melody R.S. Threlkeld, MD¹, Christopher C. Cushing, PhD², Todd Jenkins, PhD¹, Monica Holder, RN¹, Misty Troutt, MS¹, Beth Rymeski, DO¹, Monir Hossain, PhD¹, Michael Helmuth, MD¹, Jason S. Frischer, MD¹.

¹Cincinnati Children's Colorectal Center for Children, Cincinnati, OH, USA, ²Clinical Child Psychology Program, University of Kansas, Lawrence, KS, USA.

P35

NON-OPERATIVE MANAGEMENT OF EXTRALOBAR PULMONARY SEQUESTRATIONS: A SAFE ALTERNATIVE TO RESECTION?

Victoria K. Robson, BA, Hester F. Shieh, MD, Jay M. Wilson, MD, Terry L. Buchmiller, MD.

Boston Children's Hospital, Boston, MA, USA.

P36

EARLY VS LATE POSTNATAL RESECTION IN CONGENITAL LUNG MALFORMATIONS

Candace C. Style, MD¹, Darrell L. Cass, MD², Patricio E. Lau, MD¹, Stephanie M. Cruz, MD¹, Mariatu A. Verla, MD¹, Timothy C. Lee, MD¹, Caraciolo J. Fernandes, MD¹, Sundeeep G. Keswani, MD¹, Oluyinka O. Olutoye, MD, PhD¹.

¹Baylor College of Medicine, Houston, TX, USA, ²Cleveland Clinic, Cleveland, OH, USA.

P37

LAPAROSCOPIC VERSUS OPEN INGUINAL HERNIA REPAIR IN NEONATES UNDER SPINAL ANESTHESIA

Katharine R. Bittner, MD¹, Briana Leung, MD¹, Ya Zhou, MD¹, Donald Schwartz, MD¹, Gregory Banever, MD², David Tashjian, MD², Kevin Moriarty, MD², Michael Tirabassi, MD².

¹Baystate Medical Center, Springfield, MA, USA, ²Baystate Children's Hospital, Springfield, MA, USA.

P38

DELAYED REDUCTION OF OMPHALOCELE WITH PROSTHESIS: AN APPROACH TO SINGLE-STAGED REPAIR OF GIANT DEFECTS

Alessandra Landmann, MD, **Katie C. Wiggins-Dohlvik, MD**, Kelly Simmons, PT, Alejandro Ruiz-Elizalde, MD. University of Oklahoma Health Sciences Center, Oklahoma City, OK, USA.



Program in Detail (cont.)

P39

A POPULATION-BASED ANALYSIS OF PEDIATRIC BREAST CANCER

Maggie L. Westfal, MD, MPH, David C. Chang, MPH, MBA, PhD, Cassandra M. Kelleher, MD.
Massachusetts General Hospital, Boston, MA, USA.

P40

SURGERY RESIDENTS AND FAMILY DYNAMICS: ARE OUR TRAINEES EQUIPPED TO HANDLE PATIENT CARE BEYOND THE DISEASE?

Victoria K. Pepper, MD¹, Arul S. Thirumoorthi, MD², Jacob K. Olson, MD³, Tabitha Crane, MD³, Amanda Munoz, MD¹, Rosemary Vannix, MSN¹, Donald Moores, MD¹, Joanne E. Baerg, MD¹, Barbara Couden Hernandez, PhD⁴, Edward P. Tagge, MD¹.

¹Loma Linda University Children's Hospital, Loma Linda, CA, USA, ²University of Michigan Medical Center, Ann Arbor, MI, USA, ³Loma Linda University Medical Center, Loma Linda, CA, USA, ⁴Loma Linda University School of Medicine, Loma Linda, CA, USA.

P41

OUTCOMES AND COST OF APPENDECTOMY AT RURAL HOSPITALS

Cynthia M. Tom, MD¹, Howard Jen, MD, MS³, Shant Shekherdimian, MD, MPH³, Daniel DeUgarte, MD, MS^{1,2,3}, Scott Friedlander, MPH^{1,2}, Rie Sakai-Bizmark, MD, PhD, MPH^{1,2}, Steven L. Lee, MD^{1,2,3}.

¹Harbor-UCLA Medical Center, Torrance, CA, USA, ²Los Angeles Biomedical Research Institute, Torrance, CA, USA, ³UCLA, Los Angeles, CA, USA

P42

DOES AN ENHANCED RECOVERY PATHWAY RESULT IN IMPROVED OUTCOMES FOLLOWING ILEO-POUCH ANAL ANASTOMOSIS IN CHILDREN WITH FAMILIAL ADENOMATOUS POLYPOSIS?

David T. Schindel, MD, Nora Bismar, BS.

University of Texas Southwestern Medical Center, Dallas, TX, USA.

Display-only Posters

These posters will be on display with the Oral Presentation Posters in the Exhibit Hall
May 3, 3:00 – 5:30 p.m. | May 4, 6:00 a.m. – 1:00 p.m. | May 5, 6:30 – 10:00 a.m.

P43

SHORT BOWEL MUCOSAL MORPHOLOGY, PROLIFERATION AND INFLAMMATION AT FIRST AND REPEAT STEP PROCEDURES

Annika Mutanen, MD, PhD¹, Meredith Barret, MD², Yongjia Feng, PhD², Jouko Lohi, MD, PhD³, Raja Rabah, MD², Daniel H. Teitelbaum, MD, PhD², Mikko M. Pakarinen, MD, PhD¹.

¹Children's Hospital, Helsinki University Central Hospital, Helsinki, Finland, ²Department of Surgery, Section of General Surgery, University of Michigan, Ann Arbor, MI, USA, ³Department of Pathology, HUSLAB, Helsinki University Central Hospital, University of Helsinki, Helsinki, Finland.

Program in Detail (cont.)

Thursday, May 3 (cont.)

P44

LOWER EXTREMITY AND PELVIC IMMOBILIZATION OF THE BLADDER AND ABDOMINAL CLOSURE IN CLOACAL EXSTROPHY: AN INSTITUTIONAL STUDY OF TWO MAINSTAY TECHNIQUES

Karl Benz, BA, Timothy Baumgartner, MD, John Jayman, BA, Mahir Maruf, MD, Matthew Kasprenski, MD, Daniel Friedlander, MD, Heather DiCarlo, MD, Paul Sponseller, MD, John Gearhart, MD.

Johns Hopkins, Baltimore, MD, USA.

P45

SAFESTART: MAKING THE SURGICAL TIMEOUT AN INTERACTIVE PATIENT- AND FAMILY-BASED EXPERIENCE FROM THE CLINIC THROUGH PREOP INTO THE OPERATING ROOM

Richard H. Pearl, MD¹, Joseph Esparaz, MD², Breanna Elger, BS², Robert Jennetten, MS³, Ryan T. Nierstedt, BS², Charles J. Aprahamian, MD⁴.

¹University of Illinois College of Medicine at Peoria/Children's Hospital of Illinois/JUMP Trading Simulation and Education Center, Peoria, IL, USA, ²University of Illinois College of Medicine at Peoria, Peoria, IL, USA, ³JUMP Trading Simulation and Education Center, Peoria, IL, USA, ⁴University of Illinois College of Medicine at Peoria/Children's Hospital of Illinois, Peoria, IL, USA.

P46

BLOOD TRANSFUSION IN THE BLADDER CLOSURE OF CLOACAL EXSTROPHY: AN INSTITUTIONAL STUDY

Karl Benz, BA, John Jayman, BA, Mahir Maruf, MD, Matthew Kasprenski, MD, John Gearhart, MD.

Johns Hopkins, Baltimore, MD, USA.

P47

SPONTANEOUS INTESTINAL PERFORATION: A MULTICENTER RETROSPECTIVE COMPARISON OF OUTCOMES BETWEEN PRIMARY PERITONEAL DRAIN VERSUS PRIMARY LAPAROTOMY WITH STOMA AND EVALUATION OF FACTORS ASSOCIATED WITH PRIMARY PERITONEAL DRAIN FAILURE

Samantha L. Ahle, MD¹, Saurabh Saxena, MD², Faidah Badru, MD, MPH², Salim Muñoz, MD², Rachelle Damle, MD, MPH², Hector Osei, MD², Amina Bathia, MD³, Kaveer Chatoorgoon, MD², Cindy Gingalewski, MD⁴, Jose Greenspon, MD², Nicholas Hamilton, MD⁴, Colleen Fitzpatrick, MD², David Stitelman, MD¹, Marya Strand, MD², Gustavo A. Villalona, MD².

¹Yale University School of Medicine/Yale-New Haven Hospital, New Haven, CT, USA, ²Saint Louis University/Cardinal Glennon Children's Medical Center, St. Louis, MO, USA, ³Children's Healthcare of Atlanta, Atlanta, GA, USA, ⁴Oregon Health and Science University, Portland, OR, USA.

P48

CORRECTION OF TRACHEOBRONCHOMALACIA MAY FACILITATE REMOVAL OF TRACHEOSTOMY

Wendy Jo Svetanoff, MD, Sigrid Bairdain, MD, Sukgi Choi, MD, Reza Rahbar, DMD, MD, Gary Visner, DO, Leah Frain, NP, Gallagher Dorothy, RN, Thomas Hamilton, MD, C Jason Smithers, MD, Russell Jennings, MD.

Boston Children's Hospital, Boston, MA, USA.



Program in Detail (cont.)

P49

DOWNREGULATION OF OCLUDIN PROTEIN IN NECROTIZING ENTEROCOLITIS IS ASSOCIATED WITH ALTERED EXPRESSION OF MICRORNA-21

Christie Buonpane, MD¹, Guillermo Ares, MD¹, John Sincavage, BS², Carrie Yuan, BS¹, Doug Wood, BS¹, Catherine Hunter, MD¹.

¹Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, IL, USA, ²Feinberg School of Medicine, Northwestern University, Chicago, IL, USA.

P50

PEDIATRIC DOG BITE MANAGEMENT OUTCOMES: INFECTIONS AND SCARS

Benjamin L. Drumright, BS¹, Breanna A. Borg, BS¹, Arlene A. Rozzelle, MD², Lydia J. Donoghue, MD², Christina M. Shanti, MD².

¹Wayne State University School of Medicine, Detroit, MI, USA, ²Children's Hospital of Michigan, Detroit, MI, USA.

P51

STERISTRIP VS SUBCUTICULAR CLOSURE IN PAEDIATRIC GROIN WOUNDS: A RANDOMIZED CLINICAL TRIAL

Oluwaseun A. Ladipo-Ajayi, MBChB¹, Taiwo A. Lawal, MBBS, MSc², Olukayode O. Ogundoyin, MBBS³, Tolulope A. Oyetunji, MD, MPH⁴.

¹Lagos University Teaching Hospital, Lagos, Nigeria, ²University College Hospital, Ibadan, Nigeria, ³University College Hospital, Ibadan, Nigeria, ⁴Children's Mercy Kansas City, Kansas City, KS, USA.

P52

THE KOTTMEIER PROCEDURE: A 38-YEAR FOLLOW UP IN A FEMALE PATIENT TREATED FOR ULTRA-LONG SEGMENT HIRSCHSPRUNG'S DISEASE

Benjamin T. Many, MD, Kaylene Barrera, MD, Francisca T. Velcek, MD.

SUNY Downstate, Brooklyn, NY, USA.

P53

WITHDRAWN

P54

WHO WAS THE FIRST WOMAN PEDIATRIC SURGEON IN THE UNITED STATES?

Megan T. Vu, MD¹, Elizabeth D. Anderson, BA¹, Kelly P. Schultz, BA¹, Marion C. Henry, MD, MPH², Sara Fallon, MD¹, Mary L. Brandt, MD¹.

¹Baylor College of Medicine, Houston, TX, USA, ²Naval Medical Center San Diego, San Diego, CA, USA.

P55

WILM'S TUMOR AND COMPLETE AORTOCAVAL LYMPH NODE DISSECTION: EFFICACY AND SAFETY

Katherine Dudley, BS¹, Jiri Bedrnicek, MD¹, Peter Abasolo, MD¹, Travis Kruse, MD¹, Elizabeth Lyden, MS², **Shahab Abdessalam, MD¹**.

¹Children's Hospital and Medical Center, Omaha, NE, USA, ²University of Nebraska Medical Center, Omaha, NE, USA.

Program in Detail (cont.)

Thursday, May 3 (cont.)

P56

ETHNIC MINORITIES TEND TO STAY IN THE HOSPITAL LONGER AFTER APPENDECTOMY FOR NON-COMPLICATED APPENDICITIS

Olivia Cheng, BS¹, Sathyaprasad Burjonrappa, MD, MS².

¹Stony Brook University, Stony Brook, NY, USA, ²Montefiore Medical Center, Bronx, NY, USA.

P57

LAPAROSCOPY VERSUS MINI-LAPAROTOMY PERITONEAL CATHETER INSERTION OF VENTRICULOPERITONEAL SHUNTS: A SINGLE-CENTRE COHORT ANALYSIS OF 210 CONSECUTIVE PEDIATRIC PATIENTS

Aodhnait S. Fahy, MD, PhD, Stephanie Tung, MD, Maria Lamberti-Pasculli, RN, James Drake, BSE, MBCh, MSc, Abhaya Kulkarni, MD, PhD, Justin T. Gerstle, MD.

The Hospital for Sick Children, Toronto, ON, Canada.

7:00 p.m. – 9:00 p.m.

Welcome Reception

JW Pavilion/The Grove

Friday, May 4

6:00 a.m. - 7:00 a.m.

Committee Meetings

See page 61 for Ancillary Meeting Schedule

6:00 a.m. - 7:00 a.m.

APSA Foundation Board Meeting

Directors Suite V

6:00 a.m. - 7:00 a.m.

Continental Breakfast

Desert Ballroom 1-7

6:00 a.m. - 1:00 p.m.

Exhibit Hall Open

Desert Ballroom 1-7

6:00 a.m. - 1:00 p.m.

Poster Hall Open

Desert Ballroom 1-7

6:00 a.m. - 1:30 p.m.

Registration Open

Desert Ballroom Foyer

6:00 a.m. - 1:30 p.m.

Speaker Ready Room Open

Springs Ballroom A

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Plenary Session I

7:00 a.m. - 8:30 a.m.

Desert Ballroom 8-14

Moderators: Ronald B. Hirschl, MD; Anne C. Fischer, MD, PhD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Have an improved understanding of the most recent clinical and basic science data in pediatric surgery
- ▶ Recognize advances in the clinical care of infants and children
- ▶ Describe contemporary translational research endeavors in pediatric surgery



Program in Detail (cont.)

1

GROWING LIVERS IN LYMPH NODES: EX VIVO GENE THERAPY AND ECTOPIC HEPATOCYTE TRANSPLANTATION FOR THE TREATMENT OF METABOLIC LIVER DISEASE IN A LARGE ANIMAL MODEL

Clara T. Nicolas, MD¹, Raymond D. Hickey, PhD¹, Kari L. Allen, BS¹, Zeji Du, PhD¹, Rebekah M. Guthman, BS¹, Robert A. Kaiser, PhD², Bruce Amiot, BS¹, Huailei Jiang, PhD¹, Brad A. Feltis, MD, PhD³, Timothy R. DeGrado, PhD¹, Scott L. Nyberg, MD, PhD¹, Eric Lagasse, PharmD, PhD⁴, Joseph B. Lillegard, MD, PhD².

¹Mayo Clinic, Rochester, MN, USA, ²Midwest Fetal Care Center, Children's Hospitals and Clinics of Minnesota / Mayo Clinic, Minneapolis / Rochester, MN, USA, ³Midwest Fetal Care Center, Children's Hospitals and Clinics of Minnesota, Minneapolis, MN, USA, ⁴McGowan Institute for Regenerative Medicine, University of Pittsburgh Medical Center, Pittsburgh, PA, USA.

2*

IMPROVED CONTEMPORARY OUTCOMES OF LIVER TRANSPLANTATION FOR PEDIATRIC HEPATIC MALIGNANCIES

Brian Ezekian, MD¹, Michael S. Mulvihill, MD¹, Brian F. Gilmore, MD¹, Harold J. Leraas, MHS, MA², Paul M. Schroder, MD, PhD¹, Sarah Jane Commander, MD¹, Stuart J. Knechtle, MD¹, Elisabeth T. Tracy, MD¹, Andrew S. Barbas, MD¹.

¹Duke University Medical Center, Durham, NC, USA, ²Duke University School of Medicine, Durham, NC, USA.

3*

LONG-TERM FOLLOW UP OF BLOOD PRESSURE IN BLUNT RENAL INJURY

Justin A. Sobrino, MD¹, Joseph Sujka, MD¹, Richard Sola Jr, MD¹, Douglas L. Blowey, MD¹, Kathleen D. Graziano, MD², David M. Notrica, MD², Shawn D. St.Peter, MD¹.

¹Children's Mercy Kansas City, Kansas City, MO, USA, ²Phoenix Children's Hospital, Phoenix, AZ, USA.

4

NEPHRON SPARING SURGERY AND OUTCOMES OF BILATERALLY-PREDISPOSED UNILATERAL WILMS TUMORS. A REPORT FROM THE CHILDREN'S ONCOLOGY GROUP STUDY AREN0534

Peter F. Ehrlich, MD¹, Murali M. Chintagumpala, MD², Yueh-Yun Chi, PhD³, Fredric A. Hoffer, MD⁴, Elizabeth J. Perlman, MD⁵, John A. Kalapurakal, MD⁶, Anne Warwick, MD⁷, Robert C. Shamberger, MD⁸, Geetika Khanna, MD⁹, Tom E. Hamilton, MD⁸, Ken Gow, MD⁴, Richard Glick, MD¹⁰, Arnold Paulino, MD¹¹, Eric Graitias, MD¹², Elizabeth A. Mullen, MD⁸, James I. Geller, MD¹³, Paul Grundy, MD¹⁴, Conrad V. Fernandez, MD¹⁵, Jeff S. Dome, MD¹⁶.

¹University of Michigan, Ann Arbor, MI, USA, ²Texas Children's Hospital, Houston, TX, USA, ³COG Data Center, Gainesville, FL, USA, ⁴University of Washington, Seattle, WA, USA, ⁵Lurie Children's Hospital, Chicago, IL, USA, ⁶Northwestern University, Chicago, IL, USA, ⁷Walter Reed, Washington, DC, USA, ⁸Boston Children's Hospital, Boston, MA, USA, ⁹Barnes Hospital, St. Louis, MO, USA, ¹⁰Cohen Children's Hospital, Hyde Park, NY, USA, ¹¹MD Anderson, Houston, TX, USA, ¹²Children's Oncology Group, Philadelphia, PA, USA, ¹³Cincinnati Children's Hospital, Cincinnati, OH, USA, ¹⁴Alberta Children's Hospital, Edmonton, AB, Canada, ¹⁵IWK Children's Hospital, Halifax, NS, Canada, ¹⁶Children's National Medical Center, Washington, DC, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Friday, May 4 (cont.)

5*

SURGERY ACCELERATES THE DEVELOPMENT OF PULMONARY METASTASES IN A MOUSE MODEL OF OSTEOSARCOMA AND IS ATTENUATED BY PERIOPERATIVE TREATMENT WITH GEFITINIB

Caroline Maloney, MD¹, Michelle Kallis, MD², Morris C. Edelman, MD¹, Marc Symons, PhD², Bettie M. Steinberg, PhD², Samuel Z. Soffer, MD¹.

¹Hofstra Northwell Cohen Children's Medical Center, Manhasset, NY, USA, ²Feinstein Institute for Medical Research, Manhasset, NY, USA.

6*

INTRA-AMNIOTIC INJECTION OF ALGINATE MICROPARTICLES LOADED WITH BASIC FIBROBLAST GROWTH FACTOR RESULTS IN PARTIAL SOFT TISSUE COVERAGE OF THE SPINAL DEFECT IN A RAT MYELOMENINGOCELE MODEL

James S. Farrelly, MD, MHS¹, Anthony Bianchi, MS², Gina Buzzelli, BS², Adele Ricciardi, MPhil, MS¹, Samantha Ahle, MD¹, Valerie Luks, BS¹, W. Mark Saltzman, PhD², David H. Stitelman, MD¹.

¹Yale University School of Medicine, New Haven, CT, USA, ²Yale University Department of Biomedical Engineering, New Haven, CT, USA.

7

TELEMEDICAL FOLLOW-UP IN PEDIATRIC SURGERY - A PROSPECTIVE RANDOMIZED TRIAL

Jan Goedeke, MD, Alexandra Ertl, MS, Daniela Zoeller, MSc, Stephan Rohleder, MD, **Oliver J. Muensterer, MD, PhD.**

University Medicine Mainz, Mainz, Germany.

8

HALOFUGINONE DOWN-REGULATES MYCN PROTEIN AND SUPPRESSES NEUROBLASTOMA TUMOR GROWTH

Jasmine Zeki, BS¹, Jeannine Coburn, PhD², Kimberly Ornell, BS², **Jamie Harris, MD³**, Hiroyuki Shimada, MD, PhD⁴, Naohiko Ikegaki, PhD¹, Bill Chiu, MD¹.

¹University of Illinois Chicago, Chicago, IL, USA, ²Worcester Polytechnic Institute, Worcester, MA, USA, ³Rush University Medical Center, Chicago, IL, USA, ⁴Children's Hospital Los Angeles, Los Angeles, CA, USA.

9*

THE EXTRA-UTERINE ENVIRONMENT FOR NEONATAL DEVELOPMENT SUPPORTS NORMAL INTESTINAL MATURATION AND DEVELOPMENT

Heron D. Baumgarten, MD, MPH, Avery Rossidis, MD, Christina Wright, BA, Kendall M. Lawrence, MD, Ali Mejaddam, MD, Patrick E. McGovern, MD, Aimee G. Kim, MD, Antoneta Radu, MSc, Haiying Li, BS, William Peranteau, MD, Marcus G. Davey, PhD, Robert O. Heuckeroth, MD, PhD, Alan W. Flake, MD.

Children's Hospital of Philadelphia, Philadelphia, PA, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

10

SURGICAL TREATMENT OF CONGENITAL HYPERINSULINISM: RESULTS FROM 467 PANCREATECTOMIES IN NEONATES AND CHILDREN

Scott Adzick, MD, Diva Deleon, MD, Lisa J. States, MD, Katherine Lord, MD, Tricia R. Bhatti, MD, Susan A. Becker, RN, Charles A. Stanley, MD.

Children's Hospital of Philadelphia, Philadelphia, PA, USA.

11*

"EARLY ON-ECMO" CDH REPAIR: COMPARATIVE EVALUATION OF SURVIVAL AND ECMO DURATION

Ian C. Glenn, MD¹, Sophia Abdulhai, MD¹, Pamela A. Lally, MD², Avraham Schlager, MD¹.

¹Akron Children's Hospital, Akron, OH, USA, ²The University of Texas McGovern Medical School, Department of Pediatric Surgery; Children's Memorial Hermann Hospital, Houston, TX, USA.

8:00 a.m. – 10:00 a.m. Companion Hospitality Suite Open Aquifer 65, Lobby Bar

International Lecture

8:30 a.m. – 8:45 a.m.

Desert Ballroom 8-14

Miliard Derbew, MD

President, College of Surgeons of East, Central and Southern Africa; Professor of Pediatric Surgery, Addis Ababa University, Ethiopia

Pediatric Surgery in Eastern Africa: Unmet Needs

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Describe the magnitude of the pediatric surgical problems in low- and middle-income countries
- ▶ Understand the advanced and unusual pathologies in Africa
- ▶ Explain how the shortage of health workers and infrastructure affects pediatric surgical patients
- ▶ Correlate how pediatric surgical patients are the primary victims of poverty

Jay and Margie Grosfeld Lecture

8:45 a.m. – 9:15 a.m.

Desert Ballroom 8-14

Paul E. Farmer, MD, PhD

Kolokotronis University Professor of Global Health and Social Medicine, Department of Global Health & Social Medicine, Harvard Medical School

Watering the Desert: Addressing Surgical Disparities in an Age of Austerity

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Friday, May 4 (cont.)

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Understand the burden of surgical disease in settings of poverty—focusing on Haiti, Rwanda, Sierra Leone and Liberia
- ▶ Describe disparities in access to safe surgical care both within and across countries
- ▶ Outline the solutions to addressing these disparities, focusing on what interventions are already underway and what is being proposed for the future

9:15 a.m. – 9:45 a.m.

Refreshment Break in the
Exhibit/Poster Hall

Desert Ballroom 1-7

Concurrent Scientific Session I: Necrotizing Enterocolitis, Short Gut, Congenital Diaphragmatic Hernia

9:45 a.m. – 11:15 a.m.

Desert Ballroom 8-14

Moderators: Sean E. McLean, MD; Christopher P. Gayer, MD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Gain an improved understanding in specific areas of clinical care and basic science pediatric surgical research
- ▶ Recognize the importance of ongoing improvements in general pediatric surgical, neonatal and trauma care
- ▶ Increase the attendees' knowledge base to be applied in the practice of pediatric surgery

12

LIPOCALIN-2 INCREASES INFLAMMATION AND DECREASES ADAPTATION IN SHORT BOWEL SYNDROME

Ailan Zhang, MD, PhD, Menghan Wang, MS, Hongpeng Jia, MD, PhD, William Fulton, MS, Chhinder Sodhi, PhD, David J. Hackam, MD, PhD, Samuel M. Alaish, MD.

Johns Hopkins University, Baltimore, MD, USA.

13

HUMAN MILK OLIGOSACCHARIDES PROMOTE INTESTINAL REGENERATION INDEPENDENTLY OF GUT MICROBIOTA DURING EXPERIMENTAL NECROTIZING ENTEROCOLITIS

Bo Li, PhD, Richard Y. Wu, PhD, Carol Lee, MSc, Adam Minich, BSc, Marissa Cadete, BSc, Hiromu Miyake, MD, Shogo Seo, MD, Steven R. Botts, MSc, Kathene C. Johnson-Henry, BSc, Philip M. Sherman, MD, Agostino Pierro, MD.

The Hospital for Sick Children, Toronto, ON, Canada.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

14*

DELETIONAL GENE EDITING FOLLOWING IN UTERO CRISPR/CAS9 DELIVERY

Heather A. Hartman, MD¹, Avery C. Rossidis, MD¹, Deepthi Alapati, MD², William Zacharias, MD, PhD³, John D. Stratigis, MD¹, Alexandra C. Chadwick, PhD³, Kiran Musunuru, MD, MPH, PhD³, Edward M. Morrissey, PhD³, William H. Peranteau, MD¹.

¹Children's Hospital of Philadelphia, Philadelphia, PA, USA, ²Alfred I. DuPont Hospital for Children, Wilmington, DE, USA, ³University of Pennsylvania, Philadelphia, PA, USA.

15

GENETIC ANALYSIS OF *DE NOVO* VARIANTS REVEAL SEX DIFFERENCES IN COMPLEX OR ISOLATED CONGENITAL DIAPHRAGMATIC HERNIA CASES AND INDICATES *MYRF* AS A NOVEL CANDIDATE GENE

Hongjian Qi, BA¹, Lan Yu, PhD¹, Xueya Zhou, PhD¹, Alexander Kitaygorodsky, BS¹, **Julia Wynn, MS¹**, Na Zhu, PhD¹, Gudrun Aspelund, MS, MD², Foong-Yen Lim, MD³, Timothy Crombleholme, MD⁴, Robert Cusick, MD⁵, Kenneth Azarow, MD⁶, Melissa Ellen Danko, MD⁷, Dai Chung, MD⁷, Brad Warner, MD⁸, George B. Mychaliska, MS, MD⁹, Douglas Potoka, MD¹⁰, Amy J. Wagner, MS¹¹, Mahmoud ElFiky, MD¹², Jay M. Wilson, MD¹³, Frances A. High, MD, PhD¹³, Mauro Longoni, MD¹⁴, Patricia Donahoe, MD¹⁴, Wendy K. Chung, MD, PhD¹, Yufeng Sheng, PhD¹.

¹CUMC, New York, NY, USA, ²CHONY, New York, NY, USA, ³Cincinnati Children's Hospital, Cincinnati, OH, USA, ⁴University of Colorado, Denver, CO, USA, ⁵Children's Hospital & Medical Center of Omaha, Omaha, NE, USA, ⁶OHSU, Portland, OR, USA, ⁷Vanderbilt Children's Hospital, Nashville, TN, USA, ⁸Washington University, St. Louis, MO, USA, ⁹University of Michigan, Ann Arbor, MI, USA, ¹⁰Children's Hospital of Pittsburgh, Pittsburgh, PA, USA, ¹¹Children's Hospital of Wisconsin, Milwaukee, WI, USA, ¹²Cairo University, Cairo, Egypt, ¹³Harvard Medical School, Boston, MA, USA, ¹⁴Boston Children's Hospital, Boston, MA, USA.

16

A LIPID MEDIATOR OF OMEGA-3 POLYUNSATURATED FATTY ACIDS REDUCES THE INTESTINAL INJURY AND INFLAMMATION ASSOCIATED WITH NECROTIZING ENTEROCOLITIS

Hiromu Miyake, MD, Shogo Seo, MD, Bo Li, PhD, Carol Lee, MSc, Agostino Pierro, MD.

The Hospital for Sick Children, Toronto, ON, Canada.

17

NEUROINFLAMMATION AND NECROTIZING ENTEROCOLITIS ASSOCIATED BRAIN DAMAGE

Lina Antounians, MSc, Bo Li, PhD, Nataliia Svergun, PhD, Shogo Seo, MD, Abidur Rahman, MBBS, Vincenzo D. Catania, MD, Elke Zani-Ruttenstock, MD, Agostino Pierro, MD, Augusto Zani, MD, PhD.

The Hospital for Sick Children, Toronto, ON, Canada.

18

NITRIC OXIDE FORMATION AND NEAR-INFRARED SPECTROSCOPY VALUES INCREASE, WHILE NEC INCIDENCE DECREASES WITH ARGININE AND CITRULLINE SUPPLEMENTATION IN A PREMATURE PIGLET MODEL

Patricio E. Lau, MD¹, Stephanie M. Cruz, MD¹, Jason L. Robinson, PhD², Candace C. Style, MD¹, Barbara Stoll, PhD², Ling Yu, PhD², Douglas G. Burrin, PhD¹, Olyuyinka O. Olutoye, MD, PhD¹.

¹Texas Children's Hospital, Houston, TX, USA, ²Baylor College of Medicine, Houston, TX, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Friday, May 4 (cont.)

19

CORRELATION OF PRE-OPERATIVE ABDOMINAL ULTRASOUND WITH OPERATIVE AND PATHOLOGIC FINDINGS IN NEONATES WITH NECROTIZING ENTEROCOLITIS

Erica M. Fallon, MD, Claudia Dziegielewski, MS-3, Samantha Gerrie, MD, Juliette Garel, MD, Alan Daneman, MD, Justin T. Gerstle, MD.

The Hospital for Sick Children, Toronto, ON, Canada.

20

MESENCHYMAL STROMAL CELL-DERIVED EXTRACELLULAR VESICLES IMPROVE PULMONARY ARTERY RESPONSIVENESS IN CONGENITAL DIAPHRAGMATIC HERNIA

Matthew T. Harting, MD, MS¹, Siqin Zhaorigetu, PhD¹, Di Jin, BS¹, Scott D. Olson, PhD¹, Lavannya M. Pandit, MD, MS², Robert M. Bryan, PhD², Charles S. Cox, MD¹, Kevin P. Lally, MD, MS¹.

¹McGovern Medical School at UTHealth, Houston, TX, USA, ²Baylor College of Medicine, Houston, TX, USA.

21

SWITCHING TO CENTRIFUGAL PUMPS DECREASES HEMOLYSIS RATES IN PEDIATRIC ECMO PATIENTS

Kevin N. Johnson, MD, Benjamin Carr, MD, Geoge B. Mychaliska, MD, Ronald B. Hirschl, MD, Samir K. Gadepalli, MD.

University of Michigan, Ann Arbor, MI, USA.

22*

CONGENITAL DIAPHRAGMATIC HERNIA REPAIR IN PATIENTS ON EXTRACORPOREAL MEMBRANE OXYGENATION: HOW EARLY CAN WE REPAIR?

Emily H. Steen, MD¹, Timothy C. Lee, MD², Oluyinka O. Olutoye, MD, PhD², Candace C. Style, MD², Mariatu C. Verla, MD, MPH¹, Caraciolo J. Fernandes, MD³, Swathi Balaji, PhD², Sundeep G. Keswani, MD².

¹Baylor College of Medicine, Department of Surgery, Houston, TX, USA, ²Texas Children's Hospital, Department of Pediatric Surgery, Houston, TX, USA, ³Texas Children's Hospital, Department of Neonatology, Houston, TX, USA.

Concurrent Scientific Session II: Trauma, Appendicitis, Hernia, General Pediatric Surgery

9:45 a.m. – 11:15 a.m.

Springs Ballroom F

Moderators: David A. Rodeberg, MD; Casey M. Calkins, MD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Gain an improved understanding in specific areas of clinical care and basic science pediatric surgical research

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

- ▶ Recognize the importance of ongoing improvements in general pediatric surgical, neonatal and trauma care
- ▶ Increase the attendees' knowledge base to be applied in the practice of pediatric surgery

23

HERNIA RECURRENCE FOLLOWING INGUINAL HERNIA REPAIR IN CHILDREN

Kathryn K. Taylor, BS¹, Kristin A. Ojomo, MD², Lindsey L. Wolf, MD, MPH², Wei Jiang, MS², Lindsey B. Armstrong, MD², Tracey P. Koehlmoos, PhD, MHA³, Brent R. Weil, MD⁴, Robert L. Ricca, MD³, Christopher B. Weldon, MD, PhD⁴, Adil H. Haider, MD, MPH², Samuel E. Rice-Townsend, MD⁴.

¹Harvard Medical School, Boston, MA, USA, ²Center for Surgery and Public Health, Brigham and Women's Hospital, Boston, MA, USA, ³Uniformed Services University of the Health Sciences, Bethesda, MD, USA, ⁴Boston Children's Hospital, Boston, MA, USA.

24**

PEDIATRIC TRAUMA CENTER VERIFICATION IMPROVES CLINICAL CARE AND REDUCES CHARGES IN CHILDREN WITH BLUNT SPLENIC INJURY

Matthew S. Alexander, MD, MHA, Ahmad Zeghal, MD, Julia Shelton, MD, MPH, Joel Shilyansky, MD.

University of Iowa Hospitals and Clinics, Iowa City, IA, USA.

25

MASS SHOOTINGS: ARE CHILDREN SAFER IN THE STREETS THAN IN THE HOME

Marc S. Levy, MD¹, Karen Safcsak, RN², Michael L. Cheatham, MD².

¹Arnold Palmer Hospital for Children, Orlando, FL, USA, ²Orlando Regional Medical Center, Orlando, FL, USA.

26

NEBULIZED ANALGESIA DURING LAPAROSCOPIC APPENDECTOMY (NALA), A RANDOMIZED TRIPLE-BLIND PLACEBO CONTROLLED TRIAL

Robert Baird, MDCM¹, Andrew Wei, MDCM², Yash Meghani, MD², Razaz Mujallid, MD², Sherif Emil, MDCM², Jean-Martin Laberge, MD², Pramod Puligandla, MD², Kenneth Shaw, MDCM², Dan Poenaru, MD², Pablo Ingelmo, MD².

¹BC Children's Hospital, Vancouver, BC, Canada, ²Montreal Children's Hospital, Montreal, QC, Canada.

27*

ORAL ANTIBIOTICS AT DISCHARGE ARE NOT ASSOCIATED WITH REDUCED COMPLICATIONS FOLLOWING APPENDECTOMY FOR COMPLICATED APPENDICITIS IN CHILDREN

Michael R. Arnold, MD, Angela M. Kao, MD, Brant T. Heniford, MD, Andrew M. Schulman, MD.

Carolinas Medical Center, Charlotte, NC, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Friday, May 4 (cont.)

28

CLINICAL OUTCOMES FOLLOWING IDENTIFICATION OF AN ENLARGED APPENDICEAL TIP ON ULTRASONOGRAPHY

Briana Leung, MD, Nikhil Madhuripan, MD, Katharine Bittner, MD, Gregory Banever, MD, David Tashjian, MD, Kevin P. Moriarty, MD, Michael Tirabassi, MD.

Baystate Medical Center, Springfield, MA, USA.

29

FERTILITY IN MALES AFTER CHILDHOOD, ADOLESCENT AND ADULT INGUINAL OPERATIONS

Saskia Silber, MS, Rudolf Seufert, MD, PhD, **Oliver J. Muensterer, MD, PhD.**

University Medicine Mainz, Mainz, Germany.

30

INCARCERATION RATE OF INGUINAL HERNIAS: AN AGE DISTRIBUTION CURVE

Sophia Abdulhai, MD, Karen Skerlong, BS, Todd A. Ponsky, MD.

Akron Children's Hospital, Akron, OH, USA.

31*

OUTCOMES OF CENTRAL VENOUS CATHETER REPAIR VERSUS REPLACEMENT AFTER CENTRAL VENOUS CATHETER FRACTURE

Tiffany Zens, MD, Peter Nichol, MD, PhD, Charles M. Leys, MD, MSCI, Adam Brinkman, MD.

University of Wisconsin, Madison, WI, USA.

32*

INDEX CASE VOLUMES OF RECENT APPLICANTS TO THE AMERICAN PEDIATRIC SURGICAL ASSOCIATION (APSA): AN APSA MEMBERSHIP AND CREDENTIALS COMMITTEE STUDY

Roxanne L. Massoumi, MD, **Genia Dubrovsky, MD**, Harry Applebaum, MD, Shant Shekherdimian, MD.

University of California, Los Angeles, Los Angeles, CA, USA.

33

PIT PICKING FOR ADOLESCENTS WITH PILONIDAL DISEASE

Hajar R. Delshad, MS, PA-C¹, Michele Dawson, MPH¹, Patrice Melvin, MPH², Susan K. Zotto, RN¹, David P. Mooney, MD, MPH¹.

¹Department of Surgery, Boston Children's Hospital, Boston, MA, USA, ²Center for Applied Pediatric Quality Analytics, Boston Children's Hospital, Boston, MA, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

Presidential Address

11:30 a.m. – 12:15 p.m.

Desert Ballroom 8-14

Henri R. Ford, MD, MHA

Senior Vice President and Surgeon-in-Chief, Children's Hospital Los Angeles; Vice Chair and Professor of Surgery, Vice Dean of Medical Education, Keck School of Medicine, University of Southern California

Concurrent Scientific Session III: Fetal, Transplant, Basic Science

12:15 p.m. – 1:30 p.m.

Desert Ballroom 8-14

Moderators: Pablo Laje, MD; Troy A. Markel, MD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Gain an improved understanding in specific areas of clinical care and basic science pediatric surgical research
- ▶ Recognize the importance of ongoing improvements in general pediatric surgical, neonatal and trauma care
- ▶ Increase the attendees' knowledge base to be applied in the practice of pediatric surgery

34*

SAFETY OF PROLONGED INTRA-AMNIOTIC CARBON DIOXIDE INSUFFLATION IN A FETAL SHEEP MODEL

Kendall M. Lawrence, MD, Avery C. Rossidis, MD, Heron D. Baumgarten, MD, Ali Y. Mejaddam, MD, Aimee G. Kim, MD, Grace Hwang, BA, Kathleen Young, BS, Emma Bradley, BS, Antoneta Radu, BA, William H. Peranteau, MD, Marcus G. Davey, PhD, Alan W. Flake, MD.

Children's Hospital of Philadelphia, Philadelphia, PA, USA.

35*

INCREASED OXYGENATOR RESISTANCE MIMICS INTRAUTERINE GROWTH RESTRICTION SECONDARY TO PLACENTAL INSUFFICIENCY IN THE EXTRAUTERINE ENVIRONMENT FOR NEONATAL DEVELOPMENT

Ali Y. Mejaddam, MD, Kendall M. Lawrence, MD, Avery C. Rossidis, MD, Patrick E. McGovern, MD, Heron D. Baumgarten, MD, Matthew A. Hornick, MD, Aimee G. Kim, MD, Grace L. Hwang, BS, Kathleen Young, BS, William H. Peranteau, MD, Marcus G. Davey, MD, Alan W. Flake, MD.

Children's Hospital of Philadelphia, Philadelphia, PA, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Friday, May 4 (cont.)

36

ORTHOTOPIC TISSUE-ENGINEERED STOMACH ENGRAFTMENT IN A MOUSE MODEL

Elisa Zambaiti, MD¹, Eleonora Rizzi¹, Federico Scottoni, MD¹, Simone Russo, MD¹, Sara Mantero, PhD², Alfonso Maria Tedeschi, MD¹, Simon Eaton, PhD¹, Alessandro Filippo Pellegata, PhD¹, Paolo De Coppi, PhD¹.

¹Institute of Child Health, London, United Kingdom, ²Politecnico di Milano, Milano, Italy.

37*

UNDERSTANDING THE MECHANISM OF ESOPHAGEAL REPAIR WITH A SYNTHETIC SCAFFOLD

Ishna Sharma, MD¹, Todd Jensen, MHS¹, Heather Wanczyk, MS¹, Christine Finck, MD².

¹University of Connecticut Health/Connecticut Children's Medical Center, Farmington, CT, USA,

²Connecticut Children's Medical Center, Hartford, CT, USA.

38*

PROLIFERATIVE AND MATURE CELL TYPES ARE DEMONSTRATED IN TISSUE-ENGINEERED LIVER DERIVED FROM HUMAN INDUCED PLURIPOTENT STEM CELLS IN A 3-MONTH MURINE MODEL

Anthony I. Squillaro, MD, MPH, Benjamin Peton, MS, Christopher R. Schlieve, MD, Candida Toribio, BS, Kathryn L. Fowler, MS, Laura-Marie Nucho, MS, MBA, Tracy C. Grikscheit, MD.

Children's Hospital Los Angeles, Los Angeles, CA, USA.

39*

LIVER TRANSPLANTATION IN CHILDREN UNDER 25KG: A COMPARISON OF SPLIT-LIVER VERSUS WHOLE-LIVER GRAFT RECIPIENTS

Stephanie Kim, MD, Gabriel Ramos-Gonzalez, MD, Heung Bae Kim, MD, Khashayar Vakili, MD.

Boston Children's Hospital, Brookline, MA, USA.

40*

DEPLETION OF FETAL HEMATOPOIETIC STEM CELLS IMPROVES ENGRAFTMENT AFTER TRANSPLANTATION

Russell G. Witt, MD, MAS, Bowen Wang, BS, Carlo Eikani, BS, Quoc Hung Nguyen, MD, Ryan Samuel, BS, Tippi C. MacKenzie, MD.

University of California, San Francisco, San Francisco, CA, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

41*

IN-HOSPITAL AND 90-DAY OUTCOMES AFTER TOTAL PANCREATECTOMY WITH ISLET AUTOTRANSPLANTATION FOR PEDIATRIC CHRONIC AND ACUTE RECURRENT PANCREATITIS

Meera Kotagal, MD, MPH¹, Joyce Slusher, MSN¹, Maisam Abu-El-Haija, MD¹, Syed Ahmad, MD², John Brunner, RN, BBA², Deborah A. Elder, MD¹, Kenneth R. Goldschneider, MD¹, Lindsey Hornung, MS¹, Tom K. Lin, MD¹, Stephen M. Ogg, RN¹, Joseph J. Palermo, MD, PhD¹, John B. Rose, MD¹, Stephen Sekoulopoulos¹, Alexandra Szabova, MD¹, Jaimie D. Nathan, MD¹.

¹Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA, ²University of Cincinnati Medical Center, Cincinnati, OH, USA.

42

INHIBITION OF TLR4 SIGNALING ATTENUATES TBI-INDUCED NEUROINFLAMMATION

Young Chun, MD¹, Jose C. Alonso-Escalante, MD², William B. Fulton, MS¹, Chhinder P. Sodhi, PhD¹, David J. Hackam, MD, PhD¹, Isam W. Nasr, MD¹.

¹Johns Hopkins, Baltimore, MD, USA, ²Allegheny General Hospital, Pittsburgh, PA, USA.

Concurrent Scientific Session IV: Anorectal Malformations, IBD, Thoracic

12:15 p.m. – 1:30 p.m.

Spring Ballroom F

Moderators: Andreas H. Meier, MD, MEd; Michael J. Goretsky, MD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Gain an improved understanding in specific areas of clinical care and basic science pediatric surgical research
- ▶ Recognize the importance of ongoing improvements in general pediatric surgical, neonatal and trauma care
- ▶ Increase the attendees' knowledge base to be applied in the practice of pediatric surgery

43

AVOIDING LONG-TERM COMPLICATIONS FROM COMPLEX CLOACAL REPAIR USING OPEN AND LAPAROSCOPIC STAGED RECONSTRUCTIONS OF THE INTESTINAL, URINARY, REPRODUCTIVE AND NEUROLOGICAL SYSTEMS

Erica M. Weidler, MEd, **Kathleen van Leeuwen, MD.**

Phoenix Children's Hospital, Phoenix, AZ, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Friday, May 4 (cont.)

44*

OUTCOMES FOLLOWING HEINEKE-MIKULICZ ANOPLASTY (HMA) FOR POSTOPERATIVE ANAL STRICTURES AND CONGENITAL ANAL STENOSIS AT THE SKIN LEVEL

Devin R. Halleran, MD, Alejandra Vilanova Sanchez, MD, Rebecca M. Rentea, MD, Laura Weaver, BA, Carlos Reck, MD, Marc Levitt, MD, Richard J. Wood, MD.

Nationwide Children's Hospital, Columbus, OH, USA.

45*

AN EVIDENCE-BASED PROTOCOL FOR CLOACAL MANAGEMENT: A PROPOSAL FOR A UNIFORM APPROACH FROM THE PRENATAL PERIOD TO ADULTHOOD, LITERATURE REVIEW AND TREATMENT OF MORE THAN 100 CASES

Alejandra Vilanova-Sanchez, MD, Devin R. Halleran, MD, Carlos A. Reck-Burneo, MD, Alessandra C. Gasior, DO, Ivo de Blaauw, MD, PhD, Robert E. Dyckes, Laura Weaver, Molly Fuchs, MD, Daniel Dajusta, MD, Christina B. Ching, MD, Kate McCracken, MD, Geri Hewitt, MD, Richard J. Wood, MD, Marc A. Levitt, MD.

Nationwide Children's Hospital, Columbus, OH, USA.

46*

MALONE APPENDICOSTOMY, NEOAPPENDICOSTOMY OR CECOSTOMY FOR ANTEGRADE ENEMA ACCESS AS PART OF A BOWEL MANAGEMENT PROGRAM

Devin R. Halleran, MD, Alejandra Vilanova-Sanchez, MD, Rebecca M. Rentea, MD, Mana Vriesman, MD, Tassiana Maloof, BS, Peter Lu, MD, Laura Weaver, BA, Karla KH Vaz, MD, Desale Yacob, MD, Carlo Di Lorenzo, MD, Marc A. Levitt, MD, Richard J. Wood, MD.

Nationwide Children's Hospital, Columbus, OH, USA.

47**

EVALUATION OF A WATER-SOLUBLE CONTRAST PROTOCOL FOR NON-OPERATIVE MANAGEMENT OF PEDIATRIC ADHESIVE SMALL BOWEL OBSTRUCTION

Allison F. Linden, MD, MPH¹, Manish T. Rajji, MD, MA¹, Jonathan E. Kohler, MD², Erica M. Carlisle, MD³, Carlos Pelayo, MD⁴, Kate Feinstein, MD¹, Jessica J. Kandel, MD¹, Grace Z. Mak, MD¹.

¹University of Chicago Comer Children's Hospital, Chicago, IL, USA, ²University of Wisconsin School of Medicine and Public Health, Madison, WI, USA, ³University of Iowa Children's Hospital, Iowa City, IA, USA, ⁴Children's Hospital Los Angeles, Keck School of Medicine, Los Angeles, CA, USA.

48*

NEURECTOMY FOR CHRONIC ABDOMINAL PAIN IN CHILDREN

Lindsey B. Armstrong, MD, David P. Mooney, MD, MPH.

Boston Children's Hospital, Boston, MA, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

49

THORACOSCOPIC REPAIR OF SIBSON'S HERNIA

Ruchi Amin, MD, Veronica F. Sullins, MD, Elizabeth Berdan, MD, Michael Mitchell, MD, Marjorie J. Arca, MD.

Children's Hospital of Wisconsin, Milwaukee, WI, USA.

50*

IS THE VACUUM BELL DEVICE A SAFE AND EFFECTIVE ALTERNATIVE TO SURGICAL TREATMENT OF PECTUS EXCAVATUM IN PEDIATRIC PATIENTS? A PRELIMINARY NORTH AMERICAN EXPERIENCE

Etienne St-Louis, MD¹, Jingru Miao, BSc¹, Robert Baird, MD², Marcos Bettolli, MD³, Sherif Emil, MD¹, Jean M. Laberge, MD¹.

¹McGill University Health Centre, Montreal, QC, Canada, ²British Columbia Children's Hospital, Vancouver, BC, Canada, ³Children's Hospital of Eastern Ontario, Ottawa, ON, Canada.

51*

THE RELATIONSHIP BETWEEN OPERATIVE VOLUME AND OUTCOMES IN ESOPHAGEAL ATRESIA

Amy E. Lawrence, MD¹, Peter C. Minneci, MD, MHSc¹, Katherine J. Deans, MD, MHSc¹, Lorraine Kelley-Quon, MD, MS², Jennifer N. Cooper, PhD¹.

¹Nationwide Children's Hospital, Columbus, OH, USA, ²Children's Hospital Los Angeles, Los Angeles, CA, USA.

1:30 p.m.

Leisure Time

Benjy Brooks Society Meeting and Luncheon

(pre-registration required)

1:30 p.m. – 3:30 p.m.

Santa Rosa (lower level)

Stop the Bleed

1:30 p.m. – 6:00 p.m.

Desert Ballroom 1-7
Booths – 110/112/114

Pediatric Ultrasound Course

(pre-registration required)

2:00 p.m. – 7:00 p.m.

Springs Ballroom G

Essentials of Surgical Critical Care Course

(pre-registration required)

2:00 p.m. – 7:00 p.m.

Springs Ballroom H-L

4:30 p.m. – 5:30 p.m.

Residents Reception
(open to all residents and students)

Springs Ballroom D-E

5:00 p.m. – 6:30 p.m.

Journal of Pediatric Surgery
Reception *(by invitation)*

Springs Ballroom B-C

5:30 p.m. – 6:00 p.m.

New Member Rehearsal *(by invitation)*

Desert Ballroom 8-14

Program in Detail (cont.)

Saturday, May 5 (cont.)

Saturday, May 5

6:00 a.m. – 7:00 a.m.	Committee Meetings See page 61 for Ancillary Meeting Schedules	
6:00 a.m. – 4:00 p.m.	Registration Open	Desert Ballroom Foyer
6:00 a.m. – 4:00 p.m.	Speaker Ready Room Open	Springs Ballroom A
6:30 a.m. – 8:00 a.m.	Continental Breakfast	Desert Ballroom 1-7
6:30 a.m. – 10:00 a.m.	Poster Hall Open	Desert Ballroom 1-7
6:30 a.m. – 10:00 a.m.	Exhibit Hall Open	Desert Ballroom 1-7

Business Meeting – all are welcome!

7:00 a.m. – 8:00 a.m. Desert Ballroom 8-14

Innovation Session

8:00 a.m. – 9:00 a.m. Desert Ballroom 8-14

Moderators: Elizabeth Fialkowski, MD; Andreas H. Meier, MD, MEd

All abstracts presented in this session are eligible for the Innovation Award.

i1

A NOVEL DRESSING FOR GASTROSTOMY BUTTONS IN CHILDREN

Young Mee Choi, MBBS, MPH¹, Fergus Moynihan, BS², Jeremy Parsons, BS², Alek Stefanov, BS², Steven Moulton, MD¹.

¹Children's Hospital Colorado, Aurora, CO, USA, ²University of Colorado Boulder, Boulder, CO, USA.

i2

AUGMENTED REALITY IN A HYBRID OR FOR PULMONARY NODULE LOCALIZATION AND THORACOSCOPIC RESECTION - FEASIBILITY OF A NOVEL TECHNIQUE

John M. Racadio, MD, Meera Kotagal, MD, Nicole A. Hilvert, RT(R)(VI), Andrew M. Racadio, BS, Daniel von Allmen, MD.

Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA.

i3

DYNAMIC ULTRASOUND EVALUATION IN PATIENTS WITH SUSPECTED SLIPPING RIB SYNDROME

Dane Van Tassel, MD, Craig E. Barnes, MD, Monique Riemann, RDMS, RVT, Lisa McMahon, MD.

Phoenix Children's Hospital, Phoenix, AZ, USA.

i4

INTESTINAL ELECTRICAL STIMULATION TO INCREASE THE RATE OF PERISTALSIS

Genia Dubrovsky, MD¹, Yi-Kai Lo, PhD¹, Po-Min Wang, MS¹, Ming-Dou Wu, PhD¹, Nhan Huynh, MD¹, Wentai Liu, PhD¹, James CY Dunn, MD, PhD².

¹UCLA, Los Angeles, CA, USA, ²Stanford University, Stanford, CA, USA.



Program in Detail (cont.)

i5

RANDOMIZED CONTROLLED TRIAL: INTRAOPERATIVE INTERCOSTAL NERVE CRYOABLATION DURING NUSS PROCEDURE REDUCES LENGTH OF STAY AND IN-HOSPITAL OPIOID USE

Jarrett Moyer, MD¹, Claire Graves, MD², Benjamin Padilla, MD¹.

¹University of California, San Francisco, San Francisco, CA, USA, ²Columbia University, New York, NY, USA.

i6

EXPERT OUTPATIENT BURN CARE IN THE HOME THROUGH MOBILE HEALTH TECHNOLOGY

Robert Cina, MD, Aaron P. Leshner, MD, Ryan R. Howard, RN, MSN, Benjamin J. Woodhouse, MSN, Sachin K. Patel, MSc, Frank A. Treiber, PhD.

Medical University of South Carolina, Charleston, SC, USA.

i7

PEDIATRIC ACUTE SURGICAL SUPPORT PASS - INITIAL ASSESSMENT OF THE MULTIMODAL COURSE FOR TEACHING THE INITIAL RESPONSE TO ACUTE PEDIATRIC SURGICAL EMERGENCIES TO MEDICAL PROFESSIONALS IN A DEVELOPING COUNTRY

Ai-Xuan Holterman, MD¹, Ginger Barton, RN², Girish Deshpande, MD², Thanh Dinh, MD³, Toufic Kharallah, RN², Sara Krzyzaniak, MD², Frederick Nguyen, BA¹, Chau Nguyen, MD⁴, Can Ta, MD⁵, Thao Tran, MD⁴.

¹University of Illinois College of Medicine at Chicago, Chicago, IL, USA, ²University of Illinois College of Medicine at Peoria, Peoria, IL, USA, ³Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Viet Nam, ⁴Children's Hospital 1, Ho Chi Minh City, Viet Nam, ⁵City Children's Hospital, Ho Chi Minh City, Viet Nam.

8:00 a.m. – 10:00 a.m.	Companion Hospitality Suite Open	Aquifer 65, Lobby Bar
9:00 a.m. – 9:45 a.m.	Refreshment Break in the Exhibit/Poster Hall	Desert Ballroom 1-7

Robert E. Gross Lecture

9:45 a.m. – 10:15 a.m.

Desert Ballroom 8-14

Tracy C. Grikscheit, MD

Associate Professor of Surgery, Children's Hospital Los Angeles, University of Southern California, Keck School of Medicine

Stem Cells for Babies and their Surgeons: the Future is Now

Program in Detail (cont.)

Saturday, May 5 (cont.)

LEARNING OBJECTIVES

At the conclusion of this session, attendees will be able to:

- ▶ Understand various types of stem/progenitor cells that are currently being prepared for human applications, including the benefits and risks associated with cell types and differentiation protocols
- ▶ Distinguish between trial types and the regulatory pathways that are required to prepare human cell therapies
- ▶ Understand ethical conundrums and approaches to resolving them in stem cell therapies

10:00 a.m.	Exhibitor Dismantle	Desert Ballroom 1-7
10:00 a.m.	Poster Dismantle	Desert Ballroom 1-7

Plenary Session II

10:15 a.m. – 11:15 a.m.

Desert Ballroom 8-14

Moderators: Daniel J. Ostlie, MD; Henri R. Ford, MA, MHA

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Have an improved understanding of the most recent clinical and basic science data in pediatric surgery
- ▶ Recognize advances in the clinical care of infants and children
- ▶ Describe contemporary translational research endeavors in pediatric surgery

52*

INTERVENTIONS FOR PATIENTS WITH HIRSCHSPRUNG DISEASE WITH OBSTRUCTIVE SYMPTOMS AFTER PULL-THROUGH: A REVIEW OF 62 CASES

Carlos A. Reck-Burneo, MD, **Alejandra Vilanova-Sanchez, MD**, Christopher McCullough, MD, Alessandra C. Gasior, MD, Laura Weaver, Tassiana Maloof, Erin Hoover, Jordon Jagers, Renae Gagnon, Richard J. Wood, MD, Marc A. Levitt, MD.

Nationwide Children's, Columbus, OH, USA.

53*

IN UTERO ENZYME REPLACEMENT THERAPY IMPROVES SURVIVAL AND NEUROLOGIC OUTCOMES IN MPS VII MICE

Russell G. Witt, MD, MAS, Carlo Eikani, BS, Bowen Wang, BS, Quoc Hung Nguyen, MD, Tippi C. MacKenzie, MD.

University of California, San Francisco, San Francisco, CA, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

54

MULTICENTER PRE-OPERATIVE ASSESSMENT OF PEDIATRIC OVARIAN MALIGNANCY

Arin L. Madenci, MD, MPH¹, Robert Vandewalle, MD², Bryan V. Dieffenbach, MD¹, Marc R. Laufer, MD¹, Theonia K. Boyd, MD¹, Stephan D. Voss, MD, PhD¹, A. Lindsay Frazier, MD¹, Deborah F. Billmire, MD², Frederick J. Rescorla, MD², Brent R. Weil, MD¹, Christopher B. Weldon, MD, PhD¹.

¹Boston Children's Hospital, Boston, MA, USA, ²Riley Hospital for Children, Indianapolis, IN, USA.

55

ULTRASOUND GUIDANCE IMPROVES SAFETY AND EFFICIENCY OF CENTRAL LINE PLACEMENTS

Cory N. Criss, MD¹, Niki Matusko, BS², Samir K. Gadepalli, MD, MBA¹, Marcus D. Jarboe, MD¹.

¹C.S. Mott Children's Hospital, Ann Arbor, MI, USA, ²Michigan Medicine, Ann Arbor, MI, USA.

56

A NOVEL PLATFORM FOR DETERMINING THE EFFECTS OF THE ENTERIC NERVOUS SYSTEM ON THE INTESTINAL EPITHELIUM

Mitchell R. Ladd, MD, PHD¹, Blake Johnson, BS¹, Carolyn Gosztyla, MD², Cait Costello, PhD³, Adam Werts, DVM, PhD¹, Laura Martin, MD¹, Emily Banfield, MS¹, Hongpeng Jia, MD¹, Peng Lu, PhD¹, William Fulton, MS¹, Sanxia Wang, MS¹, Thomas Prindle, BS¹, Yukihiro Yamaguchi, PhD¹, Jungeun Sung, BS¹, Chhinder Sodhi, PhD¹, John March, PhD⁴, Davi J. Hackam, MD, PhD¹.

¹Johns Hopkins Hospital, Baltimore, MD, USA, ²Walter Reed, Bethesda, MD, USA, ³Cornell University, Ithaca, NY, USA, ⁴Cornell University, Ithaca, MD, USA.

57*

OUTCOMES OF INFANTS WITH CONGENITAL DIAPHRAGMATIC HERNIA TREATED WITH VENOVENOUS VERSUS VENOARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION: A PROPENSITY SCORE APPROACH

Kelly Fairbairn, DO¹, Lishi Zhang, MS², Matthew T. Harting, MD³, Yanjun Chen, MS², Charles Stolar, MD⁴, Patrick Delaplain, MD², Peter Yu, MD⁵, Michael McMullan, MD⁶, Danh V. Nguyen, PhD², Yigit S. Guner, MD⁵.

¹Community Memorial Hospital, Ventura, CA, USA, ²University of California, Irvine, Irvine, CA, USA, ³University of Texas Health Science Center, Houston, TX, USA, ⁴Cottage Children's Medical Center, Santa Barbara, CA, USA, ⁵Children's Hospital of Orange County, Orange, CA, USA, ⁶Seattle Children's Hospital, Seattle, WA, USA.

58*

PROSTAGLANDIN E1 IMPROVES MARKERS OF PULMONARY HYPERTENSION IN CONGENITAL DIAPHRAGMATIC HERNIA

Kendall M. Lawrence, MD, Rachel K. Hopper, MD, Kelsey Berger, BS, Lisa M. Herkert, RN, MSN, Christine D. Franciscovich, RNC, Emily A. Partridge, MD, PhD, Lindsay Waqar, MPH, Brian D. Hanna, MDCM, PhD, William H. Peranetau, MD, Natalie E. Rintoul, MD, Holly L. Hedrick, MD.

Children's Hospital of Philadelphia, Philadelphia, PA, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Saturday, May 5 (cont.)

Health Policy & Advocacy Committee Update

11:15 a.m. – 11:30 a.m.

Desert Ballroom 8-14

Marion C.W. Henry, MD, MPH, Chair

2017 Brandeis Scholar Report

11:15 a.m. – 11:30 a.m.

Desert Ballroom 8-14

Shawn D. St. Peter, MD

***Journal of Pediatric Surgery* Lecture**

11:30 a.m. – Noon

Steven Stylianos, MD

Surgeon-in-Chief, Morgan Stanley Children's Hospital, New York, NY

To Save a Child's Spleen: 50 Years from Toronto to ATOMAC

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Understand the origin and history of non-operative treatment of children with blunt spleen injury
- ▶ Describe the evolution of clinical guidelines for the non-operative treatment of children with blunt spleen injury
- ▶ Apply basic science and clinical background in identifying the role of the spleen in human immune function

Noon – 12:30 p.m.

Box Lunch Pick Up

Desert Ballroom Foyer

Travel Fellow Presentations

12:30 p.m. – 1:00 p.m.

Desert Ballroom 8-14

Sohail Dogar, Aga Khan University, Karachi, Pakistan

Pediatric Surgery and the Healthcare System in Pakistan

Oluwaseun Ladipo-Ajayi, University of Lagos College of Medicine, Lagos, Nigeria

Giving Respite from the Bite: Neonatal Care Challenges in a Developing Country

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

APSA Foundation Jay Grosfeld, MD Grant Scholars Presentations

1:00 p.m. – 1:30 p.m.

Desert Ballroom 8-14

2016

Helen Hsieh, MD

Effect of Midazolam on the Developmental and Maturation of Hippocampal Neuronal Circuitry

Elisabeth T. Tracy, MD

Bleeding and Thrombosis in Infants and Children

2017

Andrew J. Murphy, MD

Genomic Analysis of Bilateral Wilms Tumors

Isam W. Nasr, MD

Prevention and Treatment of Traumatic Brain Injury by Inhibition of TLR4 Signaling in a Murine Model

New Member Induction Ceremony

1:30 – 1:45 p.m.

Desert Ballroom 8-14

Scientific Session V: Quality

2:00 p.m. – 3:00 p.m.

Desert Ballroom 8-14

Moderators: David A. Rodeberg, MD; David E. Skarda, MD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Gain an improved understanding in specific areas of clinical care and basic science pediatric surgical research
- ▶ Recognize the importance of ongoing improvements in general pediatric surgical, neonatal and trauma care
- ▶ Increase the attendees' knowledge base to be applied in the practice of pediatric surgery

59**

NON-OPERATIVE MANAGEMENT OF PERFORATED APPENDICITIS IS COST-EFFECTIVE IN PATIENTS PRESENTING WITH PROLONGED DAYS OF SYMPTOMS

Mubina Isani, MD, Jeremy Jackson, MD, Wesley E. Barry, MD, Michael Mallicote, MD, David Rosenberg, BS, Grace Asuelime, MS, Choo Phei Wee, MS, James E. Stein, MD, MS, Aaron R. Jensen, MD, MEd, Eugene S. Kim, MD.

Children's Hospital of Los Angeles, Los Angeles, CA, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Saturday, May 5 (cont.)

60*

LESSONS LEARNED FROM VALUE-BASED PEDIATRIC APPENDECTOMY CARE: A SHARED SAVINGS PILOT MODEL

Yangyang R. Yu, MD¹, Kathleen E. Carberry, RN, MPH², Hui Ren, BA², Charlene Barclay, RN, MBA², Binita Patel, MD¹, Jed G. Nuchtern, MD¹, Angelo P. Giardino, MD, PhD², Monica E. Lopez, MD¹.

¹Baylor College of Medicine, Houston, TX, USA, ²Texas Children's Hospital, Houston, TX, USA.

61**

REDUCING NARCOTIC USAGE IN POSTOPERATIVE APPENDECTOMY PATIENTS

Andrew Nordin, MD, Karen Diefenbach, MD, Jeff Christensen, MHA, Abigail Nelson, MSN, Gail Besner, MD, Brian Kenney, MD, MPH.

Nationwide Children's Hospital, Columbus, OH, USA.

62**

THINKING OUTSIDE THE (CHECK)BOX: EVALUATING SUSTAINABLE SURGICAL SAFETY CHECKLIST PERFORMANCE

Kathryn T. Anderson, MD, MPH¹, Marisa A. Bartz-Kurycki, MD¹, Maria Matuszczak, MD¹, Rhashedah A. Ekeoduru, MD¹, Jannette Clary, RN, BSN², Dorothy Serralles, MSN-Ed, RN², Akemi L. Kawaguchi, MD, MS¹, Kevin P. Lally, MD, MS¹, KuoJen Tsao, MD¹.

¹McGovern Medical School, University of Texas Health Sciences Center at Houston, Houston, TX, USA, ²Children's Memorial Hermann Hospital, Houston, TX, USA.

63**

ROOM FOR "QUALITY" IMPROVEMENT? VALIDATING NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM-PEDIATRIC APPENDECTOMY DATA

Kathryn T. Anderson, MD, MPH, Marisa A. Bartz-Kurycki, MD, Mary T. Austin, MD, MPH, Akemi L. Kawaguchi, MD, MS, Lillian S. Kao, MD, MS, Kevin P. Lally, MD, MS, KuoJen Tsao, MD.

University of Texas Health Sciences Center at Houston, Houston, TX, USA.

64**

SIMPLE PREOPERATIVE RADIATION SAFETY INTERVENTIONS SIGNIFICANTLY LOWER RADIATION DOSES DURING CENTRAL VENOUS LINE PLACEMENT IN CHILDREN

Beatrix Hyemin Choi, BA, Kamalou Yaya, MD, Vinay Prabhu, MD, Nancy Fefferman, MD, Beverly Mitchell, RN, Keith A. Kuenzler, MD, Howard B. Ginsburg, MD, Jason C. Fisher, MD, Sandra Tomita, MD.

NYU School of Medicine, New York, NY, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.



Program in Detail (cont.)

65

MAKING THE DIAGNOSIS OF MIDGUT VOLVULUS: LIMITED ABDOMINAL ULTRASOUND HAS CHANGED OUR CLINICAL PRACTICE

Kevin Wong, DO, Dane Van Tassel, MD, Deepa Biyyam, MD, Monique Riemann, RDMS, RVT, Justin Lee, MD, Craig Egan, MD, Dianna Bardo, MD, Mostafa Youssfi, MD.

Phoenix Children's Hospital, Phoenix, AZ, USA.

Scientific Session VI: Oncology

3:00 p.m. – 4:00 p.m.

Desert Ballroom 8-14

Moderators: Samuel Z. Soffer, MD; Eugene S. Kim, MD

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Gain an improved understanding in specific areas of clinical care and basic science pediatric surgical research
- ▶ Recognize the importance of ongoing improvements in general pediatric surgical, neonatal and trauma care
- ▶ Increase the attendees' knowledge base to be applied in the practice of pediatric surgery

66*

PROCEDURAL BURDEN EXPERIENCED BY CHILDREN WITH CANCER DURING THEIR TERMINAL ADMISSION

Kristine S. Corkum, MD, Timothy B. Lautz, MD, Ferdynand Hebal, MD, Erin E. Rowell, MD.

Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, IL, USA.

67*

LYMPH NODE RATIO PREDICTS RECURRENCE IN PEDIATRIC PAPILLARY THYROID CANCER

Jill Rubinstein, MD, PhD¹, Kayleigh Herrick-Reynolds, MD², Raffaella Morotti, MD³, Manju Prasad, MD¹, Robert Udelsman, MD, MBA⁴, Glenda G. Callender, MD¹, Catherine Dinauer, MD³, Emily Christison-Lagay, MD³.

¹Yale-New Haven Hospital, New Haven, CT, USA, ²Yale School of Medicine, New Haven, CT, USA, ³Yale-New Haven Children's Hospital, New Haven, CT, USA, ⁴Miami Cancer Institute, Miami, FL, USA.

68*

COMPARISON OF POST-OPERATIVE COMPLICATION RATES IN CHILDREN UNDERGOING HEPATECTOMY OR NEPHRECTOMY BETWEEN KID, NSQIP AND PHIS DATABASES

Kristine S. Corkum, MD, Lauren M. Baumann, MD, Timothy B. Lautz, MD.

Ann and Robert H. Lurie Children's Hospital of Chicago, Chicago, IL, USA.

Abstracts marked with single asterisk are eligible for Folkman Award. Abstracts marked with double asterisks are eligible for the Quality Award.

Program in Detail (cont.)

Saturday, May 5 (cont.)

69

NEUTROPENIA AT THE TIME OF SUBCUTANEOUS PORT INSERTION IS NOT A RISK FACTOR FOR EARLY INFECTIOUS COMPLICATIONS IN PEDIATRIC ONCOLOGY PATIENTS

Lisa Taylor VanHouwelingen, MD¹, John M. Lu, BSc², Laura V. Veras, MD³, Jessica Staszak, MD³, Lynn Wynn, MSN⁴, William Wu, MS⁴, Jianrong Wu, PhD⁴, Andrew J. Murphy, MD⁴, Ankush Gosain, MD, PhD³, Andrew M. Davidoff, MD⁴, Ching-Hon Pui, MD⁴, Israel Fernandez-Pineda, MD⁴.

¹McMaster Children's Hospital, Hamilton, ON, Canada, ²University of Tennessee, Memphis, TN, USA, ³Le Bonheur Children's Hospital, Memphis, TN, USA, ⁴St. Jude Children's Research Hospital, Memphis, TN, USA.

70*

R1 RESECTION IN PATIENTS WITH STAGE 3 NEUROBLASTOMA IS ASSOCIATED WITH THE ABSENCE OF NEURAXIAL IMAGE-DEFINED RISK FACTORS

Nicole J. Croteau, MD, James A. Saltsman, MD, MPH, Shakeel Modak, MD, Brian Kushner, MD, Ellen Basu, MD, Stephen Roberts, MD, Anita P. Price, MD, Michael P. La Quaglia, MD.

Memorial Sloan Kettering Cancer Center, New York, NY, USA.

71*

C-KIT DIRECTED IMMUNOTOXINS IMPROVE ALLOGENEIC ENGRAFTMENT AFTER FETAL HEMATOPOIETIC STEM CELL TRANSPLANTATION

Patrick E. McGovern, MD, John D. Stratigis, MD, Jeremy M. Tuttle, BA, John S. Riley, BA, Nicholas Ahn, MD, Alan W. Flake, MD, William H. Peranteau, MD.

The Children's Hospital of Philadelphia, Philadelphia, PA, USA.

72*

CHARACTERISTICS AND OUTCOMES IN PEDIATRIC NON-CENTRAL NERVOUS SYSTEM RHABDROID TUMORS: A REPORT FROM THE NATIONAL CANCER DATABASE

Vei Shaun Siow, MD¹, Xilin Chen, MPH¹, Kenneth Gow, MD², Marcus Malek, MD³.

¹University of Pittsburgh Medical Center, Pittsburgh, PA, USA, ²Seattle Children's Hospital, Seattle, WA, USA, ³Children's Hospital of Pittsburgh of UPMC, Pittsburgh, PA, USA.

4:00 p.m. – 6:00 p.m.	Pediatric Surgery NaT Reception (<i>by invitation</i>)	Springs Ballroom B-D
6:30 p.m. – 7:00 p.m.	President's Reception	Desert Ballroom Foyer
7:00 p.m. – 10:00 p.m.	President's Banquet	Desert Ballroom 8-14

Sunday, May 6

6:00 a.m. – 7:30 a.m.	Committee Meetings See page 61 for Ancillary Meeting Schedules	
6:30 a.m. - 7:30 a.m.	Continental Breakfast	Desert Ballroom Foyer
7:00 a.m. – 11:00 a.m.	Registration Open	Desert Ballroom Foyer



Program in Detail (cont.)

Children's Oncology Group (COG) Update

7:30 a.m. – 9:00 a.m.

Desert Ballroom 8-14

Moderators: Rebecka L. Meyers, MD; Roshni A. Dasgupta, MD

Focus on Hepatoblastoma and Hepatocellular Carcinoma

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Understand the surgical lessons learned from the recently closed COG liver tumor study AHEP-0731
- ▶ Describe the new international CHIC Hepatoblastoma staging system
- ▶ Become familiar with revised international PRETEXT definitions
- ▶ Describe the surgical guidelines and questions being asked on the new Pediatric Hepatic malignancy International Therapeutic Trial (PHITT/AHEP-1531)

Surgical Lessons Learned from AHEP0731 and Children's Hepatic Tumor International Collaboration (CHIC)

Rebecka L. Meyers, MD

International Consensus PRETEXT Groups and Annotation Factors

Gregory M. Tiao, MD

PHITT/AHEP-1531 Hepatoblastoma Surgical Guidelines and Study Questions

Sanjeev A. Vasudevan, MD

PHITT/AHEP-1531 Hepatocellular Carcinoma Surgical Guidelines and Study Questions

Eugene S. Kim, MD

COG Solid Tumor Studies Update

LEARNING OBJECTIVES

By the end of the presentation, attendees will be able to:

- ▶ Restate the primary results and study characteristics of open and recently closed COG solid tumor multicenter trials
- ▶ Be familiar with information available on the COG surgeon's website

Neuroblastoma

Mary Beth Madonna, MD

Wilms Tumor

Richard D. Glick, MD

Sarcoma and Bone

Todd E. Heaton, MD

Program in Detail (cont.)

Saturday, May 5 (cont.)

Rare Tumors and Late Effects (Germ, ACC, Late Effects)

Reto M. Baertschiger, MD, PhD

COG Surgeons Website (www.childrensoncologygroup.org)

Timothy B. Lautz, MD

Town Hall Meeting

9:00 a.m. – 11:00 a.m.

Desert Ballroom 8-14

Annual Meeting concludes.



Poster Session I

Poster Session I: Basic Science

Thursday, May 3, 4:30 – 6:15 p.m.

P1

SUCCESSFUL FIRST-IN-ANIMAL CHARACTERIZATION OF A NOVEL BIOSCAFFOLD TO SUPPORT AN ARTIFICIAL INTESTINE FOR THE MANAGEMENT OF SHORT BOWEL SYNDROME

Mitchell R. Ladd, MD, PHD¹, Carolyn Gosztyla, MD², Cait Costello, PhD³, Adam Werts, DVM, PhD¹, Blake Johnson, BS¹, Laura Martin, MD¹, Emily Banfield, MS¹, Hongpeng Jia, MD¹, Peng Lu, PhD¹, William Fulton, MS¹, Sanxia Wang, MS¹, Thomas Prindle, BS¹, Yukihiro Yamaguchi, PhD¹, Jungeun Sung, BS¹, Chhinder Sodhi, PhD¹, John March, PhD³, David J. Hackam, MD, PhD¹.

¹Johns Hopkins Hospital, Baltimore, MD, USA, ²Walter Reed, Bethesda, MD, USA, ³Cornell University, Ithaca, NY, USA.



Tweet it! Poster P1: Novel Bioscaffold for Artificial Intestine Formation

@mrladd #eAPSA2018

Purpose: The purpose of this study is to characterize a novel bioscaffold for the generation of an artificial intestine with similarities to the native gut, based upon our earlier observation that poly(glycerol sebacate) (PGS) derived bioscaffolds have anatomic features (villi, mechanical properties) that mimic the native intestine.

Methods: PGS scaffolds were laser fabricated to create villi that mimic the height and width of native intestinal villi (350 x 150 μ m). Scaffolds cut to 8mm diameter sizes were seeded with murine intestinal stem cells labeled with a fluorescent report to allow detection in animal models. After culture for seven days, both seeded and unseeded scaffolds were implanted in the abdomen of mice for 2 (n=6) and 4 (n=7) weeks for evaluation of degradation, surface topography by electron microscopy (EM) and histology.

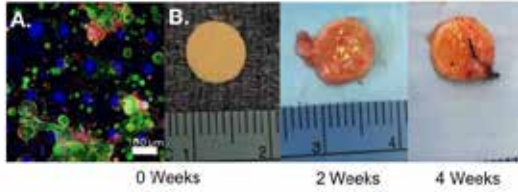
Results: After 7 days in culture, intestinal stem cells attach and begin to cover villi of scaffolds. At 2 and 4 weeks, bioscaffold size was unchanged grossly and by surface area measurements. Excitingly, the scaffolds were surrounded with tissue with signs of incorporation and blood vessel formation. EM revealed that the scaffold villus projections were persistent at 2 and 4 weeks approximately maintaining their initial height and that there were significant quantities of tissue adherent, as would be needed to withstand luminal contents. Histology showed inflammatory tissue and early signs of angiogenesis.

Conclusion: This novel bioscaffold supports the growth of intestinal stem cells *in vitro* and has favorable *in vivo* degradation with maintenance of the villus projections at early time points, while supporting vasculogenesis after implantation into the abdomen. We have thus engineered a bioscaffold with similar mechanical properties to the native small intestine which advances our capability for the on-demand manufacture of an artificial intestine.

Poster Session I (cont.)

Figure 1. **A.** Confocal image of GFP intestinal stem cells seeded on intestinal scaffold; patterned blue staining is top-down view of scaffold villi. **B.** Gross images of scaffolds on day of surgery, 2, and 4 weeks after implantation. **C.** EM images of scaffold villi at 0, 2, and 4 weeks.

Green=Intestinal Stem Cells
 Red=phalloidin
 Blue=DAPI





Poster Session I (cont.)

P2

IN UTERO INJECTION OF NANOPARTICLE ENCAPSULATED PROTEIN PREVENTS PROTEIN-SPECIFIC AUTOIMMUNE DISEASE VIA CENTRAL TOLERANCE

John D. Stratigis, MD¹, Nicholas J. Ahn, MD¹, Kendall M. Lawrence, MD¹, Barbara E. Coons, MD¹, Haiying Li, BS¹, Camila G. Fachin, MD¹, Andre Dias, MD, PhD¹, Darrell J. Irvine, PhD², Stavros P. Loukogeorgakis, MD, PhD¹, Alan W. Flake, MD¹.

¹The Children's Hospital of Philadelphia, Philadelphia, PA, USA, ²MIT, Cambridge, MA, USA.



Tweet it! Poster P2: #InUteroTolerance Preventing Autoimmune Diseases In Utero
@JohnStratigis #eAPSA2018

Purpose: This study aims to show that prenatal antigen presentation can abrogate autoimmune disease. We demonstrate this by preventing the autoimmune disease Experimental Autoimmune Encephalopathy (EAE) with nanoparticles encapsulating the peptide Myelin Oligodendrocyte Glycoprotein (35-55) (MOG).

Methods: In utero E14 injections of MOG-loaded nanoparticles (nMOG) were performed in C57BL/6 mice. Post-natal nMOG boosters were injected subcutaneously at 2/4/6/8 weeks of age. Disease was induced with MOG and Complete Freund's Adjuvant (CFA) injections at 8 weeks. Intraperitoneal pertussis toxin (PT) was given the day of MOG/CFA and 48 hours later. Positive controls received MOG/CFA and PT. Negative controls received plain CFA and PT. Mice were monitored using the 5-point EAE scoring system for 4 weeks after MOG/CFA injection. Spines and brains were harvested 2 weeks after MOG/CFA injection. Spine and brain mononuclear cells were analyzed on FACSria™.

Results: Mice that received nMOG prenatally and nMOG boosters (Group A) developed disease less frequently than mice that received post-natal nMOG along with boosters (Group B) or positive controls (52.0% vs 87.5% vs 90.0% $p < 0.005$). Mice that received prenatal nMOG only without boosters (Group C) did as poorly as positive controls (85.72% vs 90.0%). Spinal cord and brain analysis of Group A mice showed fewer CD45 cells compared to positive controls but not negative controls (133.2 ± 52.0 vs 6062.5 ± 1166.9 vs 79.8 ± 15.0 $p < 0.0001$.) The same is seen with CD4⁺ Tetramer⁺ cells (0.7 ± 0.3 vs 379.1 ± 156.6 vs 2.9 ± 1.0 $p < 0.0001$) demonstrating central tolerance.

Conclusions: The decreased frequency of EAE and paucity of CD4⁺ Tetramer⁺ cells in the spine shows that autoimmune disease can be prevented by prenatal tolerance induction. Prenatal administration of nanoparticle encapsulated peptide induces central tolerance, and continuous postnatal exposure maintains it. These results provide proof in principle that antigen-induced autoimmune disease can be prevented by a novel strategy based on prenatal tolerance induction.

Poster Session I (cont.)

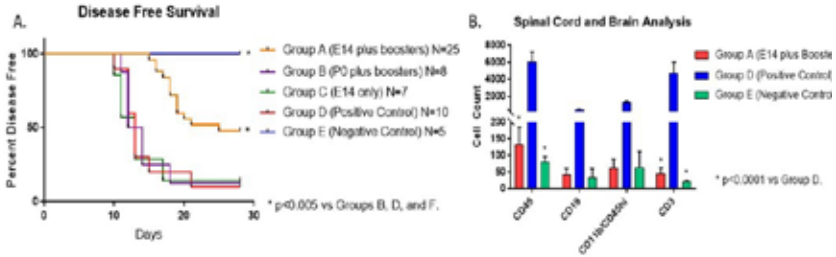


Figure 1 – A) Disease free survival Kaplan-Meier plot and B) Lineage analysis of mononuclear cells found in the spinal cord and brain



Poster Session I (cont.)

P3

A COMPARISON OF CLINICALLY RELEVANT SOURCES OF MESENCHYMAL STEM CELL-DERIVED EXOSOMES: BONE MARROW AND AMNIOTIC FLUID

Sarah A. Tracy, MD¹, Azra Ahmed, BS¹, John C. Tigges, ASCP², Maria Ericsson, BS³, Anoop K. Pal, PhD⁴, David Zurakowski, PhD¹, Dario O. Fauza, MD, PhD¹.

¹Boston Children's Hospital, Boston, MA, USA, ²Beth Israel Deaconess Medical Center, Boston, MA, USA, ³Harvard Medical School, Boston, MA, USA, ⁴Izon Science Ltd, Cambridge, MA, USA.

Purpose: Exosomes may constitute a more practical alternative to live cells in certain applications of stem cell-based therapies. While exosomes cannot replicate all the biological activities of their cell sources, their effects and purportedly greater amenability to regulatory approval justify their use in select translational efforts. Here, we sought to compare exosomes derived from two mesenchymal stem cell (MSC) sources clinically relevant to perinatal and pediatric surgical diseases.

Methods: Human MSCs banked after isolation from either bone marrow (bmMSCs) or amniotic fluid (afMSCs), with phenotype confirmed by flow cytometry, were submitted to 24-hour serum starvation. Exosome isolation was then performed by reagent-enhanced centrifugation. Characterization included flow cytometry using magnetic beads and three widely employed MSC tetraspanin markers - CD9, CD63, and CD81. Morphological analysis was by transmission electron microscopy, with sample sub-sets labeled with anti-CD63. Particle concentrations and size distributions were determined by a tunable resistive pulse sensor after removal of aggregate and larger particles by size-exclusion chromatography. Statistical comparisons were by Poisson regression modeling for analyzing count data ($P < 0.05$).

Results: Exosomes could be consistently isolated from either MSC source, with comparable expressions of CD9 (96% vs. 94%), CD63 (88% vs. 66%) and CD81 (71% vs. 63%) for bmMSC and afMSC, respectively. Appropriate size and morphology of vesicles isolated from both sources was confirmed by electron microscopy. Total exosome yield (particles/mL) adjusted for number of cells was significantly higher from afMSCs than bmMSCs by an estimated 25% ($P < 0.001$). Larger exosome diameters were predictive of higher concentrations for bmMSCs and afMSCs (both $P < 0.001$).

Conclusions: While bone marrow and amniotic fluid mesenchymal stem cells are comparable sources of exosomes in size distribution, morphology and expression of typical surface markers, particle yield is higher from amniotic fluid cells. The amniotic fluid appears to be a preferable source of exosomes for eventual clinical applications.

Poster Session I (cont.)

P4

CURING DISEASE BEFORE BIRTH: IN UTERO GENE THERAPY FOR THE TREATMENT OF HEREDITARY TYROSINEMIA TYPE 1 IN A SMALL ANIMAL MODEL

Clara T. Nicolas, MD¹, Kari L. Allen, BS¹, Zeji Du, PhD¹, Rebekah M. Guthman, BS¹, Robert A. Kaiser, PhD,² Brad A. Feltis, MD, PhD³, Raymond D. Hickey, PhD¹, Joseph B. Lillegard, MD, PhD⁴.

¹Mayo Clinic, Rochester, MN, USA, ²Midwest Fetal Care Center, Children's Hospitals and Clinics of Minnesota / Mayo Clinic, Minneapolis / Rochester, MN, USA, ³Midwest Fetal Care Center, Children's Hospitals and Clinics of Minnesota, Minneapolis, MN, USA, ⁴Midwest Fetal Care Center, Children's Hospitals and Clinics of Minnesota, Minneapolis / Rochester, MN, USA.

Purpose: *In vivo* gene therapy can successfully rescue a porcine model of hereditary tyrosinemia type 1 (HT1). The aim of this study was to take the *in vivo* approach one step further: to cure a murine model of HT1 through *in utero* gene therapy, as well as to evaluate lentiviral vector biodistribution and integration profile in this setting.

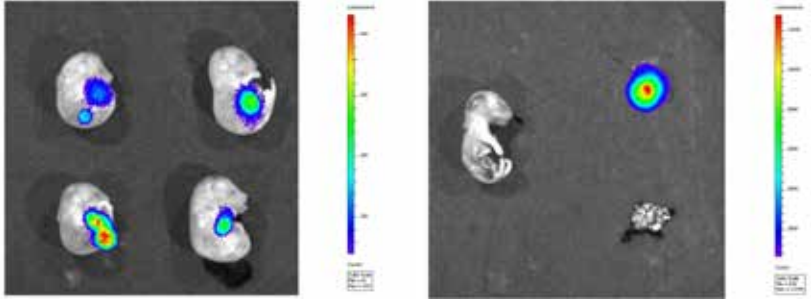
Methods: We performed direct fetal intrahepatic injections of a lentiviral vector carrying the luciferase gene under control of the CMV promoter in wild-type mice. Injections were performed at day 15 of gestation and 3×10^8 TU/fetus. Mothers and fetuses were imaged with the Xenogen IVIS-200 3-5 days after injection. Injections were repeated in *Fah*^{-/-} mice with a lentiviral vector carrying the human *FAH* gene under control of the hepatocyte-specific alpha1-antitrypsin promoter. Correction of the metabolic disease was followed through histological analysis and through the animals' ability to thrive off the protective drug NTBC/nitisinone. Direct fetal intrahepatic injections of a lentiviral vector carrying the green fluorescent protein (GFP) gene under control of the SFFV promoter were then performed in a sow at day 63 of gestation and 1×10^8 - 1×10^9 TU/fetus. Here, biodistribution was evaluated through PCR analysis.

Results: Luciferase expression in mothers was limited to the uterus, and in pups luciferase was preferentially expressed in the liver. Three treated *Fah*^{-/-} pups have demonstrated maintenance of healthy NTBC-independent growth curves, suggesting effective treatment of the metabolic disorder, with histological confirmation of FAH-positivity in hepatocytes and complete liver repopulation with corrected cells within three months. Preliminary real-time PCR analysis performed on fetal and maternal pig tissues demonstrated no evidence of lentiviral vector integration in maternal tissues.

Conclusions: *In utero* gene transfers have the potential to correct the metabolic deficiency in FAH-deficient mice, with preferential lentiviral integration and expression in fetal liver over other fetal and maternal tissues in both mice and pigs.



Poster Session I (cont.)



Poster Session I (cont.)

P5

INTESTINAL LENGTHENING VIA MULTIPLE IN-CONTINUITY SPRINGS

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Purpose: Short-gut syndrome is a debilitating condition with significant morbidity and mortality, but few effective treatments. One area of active research is distraction enterogenesis, or the use of force to stretch and grow new intestine. Springs can be used to lengthen intestine in mice, rats and pigs. The purpose of this study is to determine whether multiple springs in series can safely maximize the amount of lengthening achieved.

Methods: Juvenile mini-Yucatan pigs (n=6) underwent laparotomy. Three nitinol springs inside dissolvable gelatin capsules were placed within the jejunum of each pig via an enterostomy. A 20 French catheter was temporarily passed, and sutures were used to plicate and narrow the intestinal lumen to the size of the catheter around each of the three springs (Figure). Compressed springs were used in the experimental group (n=3), while uncompressed springs were used in the control group (n=3). The intestine was examined three weeks later and independent t-tests were used for analysis.

Results: All pigs tolerated liquid diets post-operatively and showed continued weight gain. There was no dilation or obstruction of the intestine proximal to the points of plication. Segments of intestine that contained compressed springs had a 60% increase in length from 2.5 cm to 3.9 ± 0.2 cm per spring, compared to segments containing control springs that showed no change ($p < 0.001$). Histologic review showed an increase in muscularis propria thickness in lengthened segments compared to normal intestine ($400 \mu\text{m}$ compared to $210 \mu\text{m}$, $p < 0.001$) and an increase in crypt depth ($420 \mu\text{m}$ compared to $200 \mu\text{m}$, $p < 0.001$).

Conclusions: Intestinal plication can be safely used to secure multiple springs in series to achieve intestinal lengthening without compromising GI function. Using several springs at once allows for a greater amount of total lengthening. This is a promising model that has potential applications in the treatment of patients with short-gut syndrome.



Poster Session I (cont.)

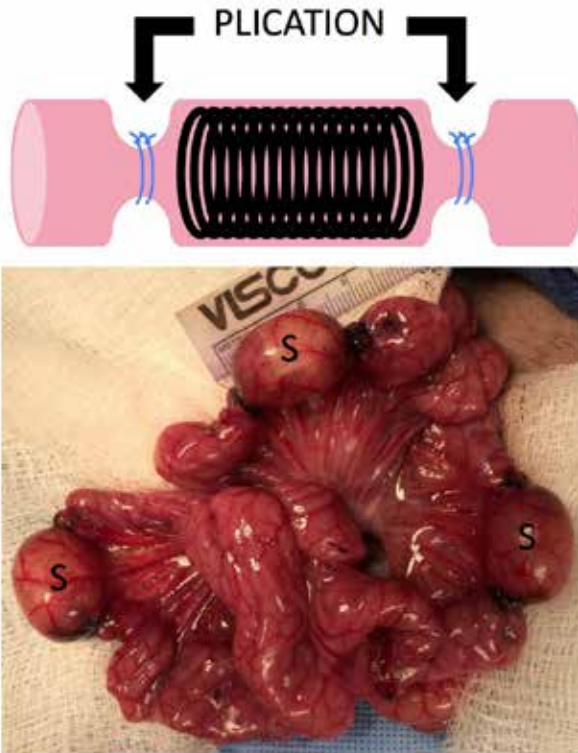


FIGURE. Segment of jejunum with 3 gelatin capsules containing nitinol springs. Sutures were used to create the intestinal plication at both ends of the capsules and to evaluate for bowel lengthening at reoperation. (S = spring)

Poster Session I (cont.)

P6

INHIBITING H₂S IN STEM CELLS REDUCES THEIR PROTECTIVE POWER DURING NEC THERAPY

Natalie Drucker, MD, Jan Te Winkel, MD, Troy Markel, MD.

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Purpose: Umbilical mesenchymal stromal cells (USC) have been shown to reduce illness in animal models of necrotizing enterocolitis (NEC). We hypothesized that this protection was mediated via the paracrine release of hydrogen sulfide (H₂S) from cells via the enzyme cystathionine- γ -synthase (CBS).

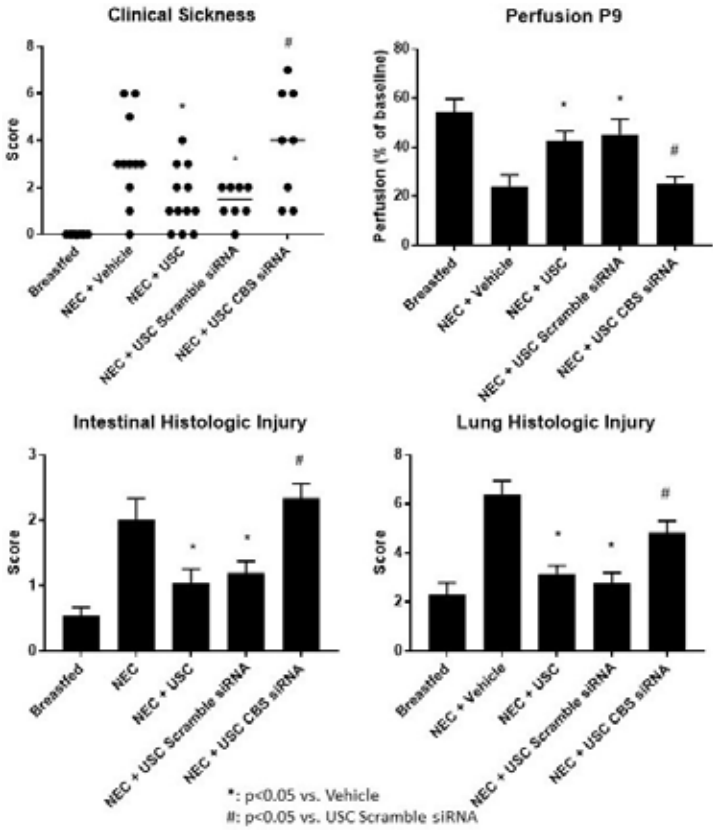
Methods: NEC was induced in 5-day-old mouse pups with formula feeding and intermittent hypoxic and hypothermic stress. CBS was transiently knocked down in human USC with siRNA by an established protocol and was confirmed by RT-PCR. Experimental groups (n=8/group) consisted of either PBS vehicle (10ul intraperitoneal injection) or 80,000 cells/g of one of the following cell types: (1) USC, (2) USC with negative siRNA control (Scramble), or (3) USC with CBS siRNA. Pups were monitored with clinical status and intestinal perfusion by Laser Doppler Imaging (LDI). After sacrifice on day 9, intestinal and lung histologic injury were scored. Data were compared with Mann-Whitney U-tests and p<0.05 was considered significant.

Results: No differences in intestinal perfusion or histologic injury were noted between the Scramble siRNA negative control group and the non-transfected USC group. Median sickness score in the CBS siRNA group was four (95% C.I. 1.25-6) compared to 2 (95% C.I. 1-2, p=0.0389) in the Scramble siRNA group. Compared to baseline, intestinal perfusion was also worse at 25% (SEM 2.84%) in the CBS siRNA group and 45% (SEM 6.20%, p=0.0104) in the Scramble siRNA group. Histologic injury in both intestine and lung was also significantly worse in the CBS siRNA group compared to the Scramble siRNA group.

Conclusion: Inhibition of CBS, a known producer of hydrogen sulfide gas within USCs, reduces the beneficial effects of these cells during NEC therapy. It is likely that USC work at least in part through the paracrine release of hydrogen sulfide during NEC therapy.



Poster Session I (cont.)



Poster Session I (cont.)

P7

HIGH-DOSE PLACENTAL MESENCHYMAL STROMAL CELLS PROVIDE NEURONAL PRESERVATION FOLLOWING IN UTERO TREATMENT OF OVINE MYELOMENINGOCELE

Melissa Vanover, MD, Sandra Kabagambe, MD, Christopher Pivetti, MS, Lee Lankford, MA, Priyadarsini Kumar, PhD, Y. Julia Chen, MD, Benjamin Keller, MD, James Becker, MD, Chelsey Lee, BS, Zachary Paxton, BS, Laura Galganski, MD, Laura Goodman, MD, MPH, Guy Jensen, MD, MPH, Aijun Wang, PhD, Diana Farmer, MD.

University of California, Davis, Sacramento, CA, USA.



Tweet it! Poster P7: Placental stem cells preserve spinal cord neurons after fetal repair of spina bifida in lambs @UCDavis_Surgery #eAPSA2018

Purpose: *In utero* application of placental mesenchymal stromal cells (PMSCs) seeded onto clinical-grade small intestine submucosa extracellular matrix (ECM) has been shown to improve motor function in an ovine model of myelomeningocele (MMC). We sought to determine whether neuronal preservation was improved with a higher seeding density of PMSCs.

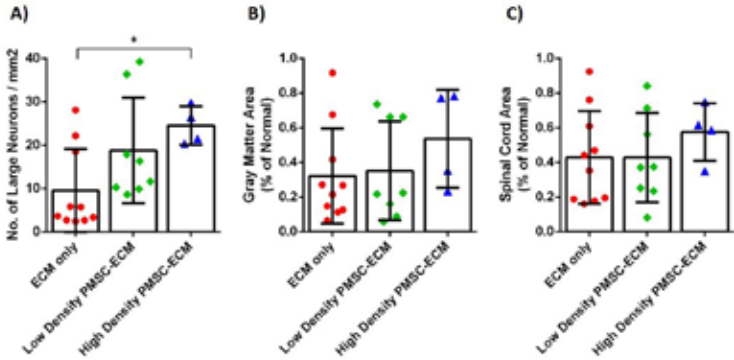
Methods: MMC defects were surgically created in 22 fetuses at mean gestational age (GA) 77 days. Repair treatments, performed at mean GA 101 days, were randomized into the following groups: ECM only (n=10), low density PMSC-ECM (42K cells/cm²) (n=8), or high density PMSC-ECM (300K cells/cm²) (n=4). Fetuses were delivered at mean GA 146 days. Serial cross-sections of the lumbar spinal cord were analyzed by measuring height, width and area, which were then normalized to control animals. Large neurons (LN), defined as cells within the gray matter with a diameter of 30-70 μ m, were manually counted and the density calculated per mm² gray matter. Treatment groups were compared using the Kruskal-Wallis test and post-hoc analysis.

Results: LN density was significantly increased in the high density PMSC-ECM group compared to the ECM-only group (24.5 LN/mm² vs. 9.5 LN/mm², p<0.05, Figure 1A). There was no significant difference between the ECM-only group and the low density PMSC-ECM group nor between the low and high density PMSC-ECM groups. Though not significant, the high density PMSC-ECM had greater preservation of both gray matter and total spinal cord cross-sectional area (Figure 1B, C).



Poster Session I (cont.)

Figure 1. Histological analyses of the MMC spinal cord lesion. Serial cross-sectional tissue slices of each animal's spinal cord were analyzed for lambs in the ECM only (n=10), low-density (42K/cm²) PMSC-ECM (n=8), and high density (300K/cm²) PMSC-ECM (n=4) treatment groups. (A) Large neuron density was significantly higher for lambs treated with high density PMSC-ECM when compared to lambs treated with ECM only. (B, C) Though not significant, there was increased normalized cross-sectional area of both gray matter and total spinal cord tissue in animals treated with high density PMSC-ECM.



Conclusions: Fetal repair of myelomeningocele augmented with high dose placental mesenchymal stromal cells resulted in increased large neuron density. Further studies are underway to determine the optimal cellular seeding density to maximize motor function and tissue preservation.

Poster Session I (cont.)

P8

MESENCHYMAL STROMAL CELLS ISOLATED FROM PLACENTA OF FETUS WITH SPINA BIFIDA PROVIDE NEUROPROTECTION IN VITRO

Melissa Vanover, MD, Priyadarsini Kumar, PhD, Lee Lankford, MA, Y. Julia Chen, MD, Diana Farmer, MD, Aijun Wang, PhD.

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Tweet it! Poster P8: Placental stem cells protect neurons, suggesting potential for autologous applications @UCDavis_Surgery #eAPSA2018

Purpose: Placental mesenchymal stromal cells (PMSCs) are being investigated as an adjunct to prenatal treatment of myelomeningocele. To assess the potential for autologous applications, we isolated and characterized PMSCs from early gestational placenta of a fetus with prenatally diagnosed spina bifida (SB-PMSCs).

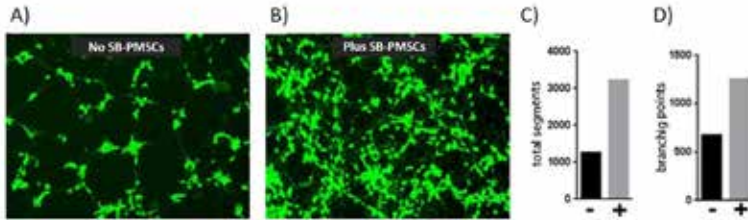
Methods: SB-PMSCs were isolated from chorionic villi of one second trimester placenta by explant culture. SB-PMSCs were characterized by flow cytometry for mesenchymal stromal cell (MSC) specific surface markers and assessed for multipotency by inducing osteogenic, chondrogenic and adipogenic differentiation *in vitro*. Secretion of brain-derived neurotrophic factor (BDNF), hepatocyte growth factor (HGF) and vascular endothelial growth factor (VEGF) were determined by enzyme-linked immunosorbent assays (ELISA). Neuroprotective capability was determined by indirect co-culture with staurosporine (apoptosis inducing agent)-treated human neuroblastoma SH-SY5Y cells using an established protocol. SB-PMSCs seeded on small intestine submucosa-derived extracellular matrix (SIS-ECM) were placed in hanging millicell inserts and then positioned over the apoptotic SH-SY5Y cells. SIS-ECM alone was used as a control. After 72 hours in co-culture, SH-SY5Y cells were stained with CalceinAM, imaged and analyzed for total number of neuronal segments and branch points using WimNeuron Image Analysis software.

Results: Isolated cells were positive for MSC markers CD29, CD44, CD73, CD90 and CD105, and negative for endothelial and hematopoietic markers CD31, CD34 and CD45. Similar to PMSCs isolated from healthy donors, SB-PMSCs displayed trilineage differentiation capability and secreted BDNF, HGF and VEGF. Increases in total number of segments and branch points were seen for SH-SY5Y cells after indirect co-culture with SB-PMSCs, indicating neuroprotection by a paracrine mechanism.



Poster Session I (cont.)

Figure 1. Neuroprotective capability of SB-PMSCs. After treatment with apoptosis-inducing staurosporine, SH-SY5Y cells were co-cultured with and without SB-PMSCs. When compared to vehicle alone (A), co-culture with SB-PMSCs resulted in increased number of cells (B), total segments (C), and branch points (D).



Conclusions: Placental mesenchymal stromal cells can be isolated from second trimester placental tissue of fetuses with spina bifida, suggesting the potential for autologous applications. Neuroprotective capability of these cells is exerted via paracrine activity *in vitro*. Studies are planned to determine their therapeutic ability *in vivo* and precise mechanisms of action.

Poster Session I (cont.)

P9

POSTISCHEMIC IL6 THERAPY IMPROVES INTESTINAL PERFUSION AND LIMITS MUCOSAL INJURY

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Purpose: Novel therapies are needed to decrease morbidity and mortality of intestinal ischemia. Interleukin-6 (IL6) has been shown to promote intestinal hyperplasia, but its protective effects during intestinal ischemia are unknown. We hypothesized that administration of IL6 following intestinal ischemia would improve mesenteric perfusion and mucosal injury.

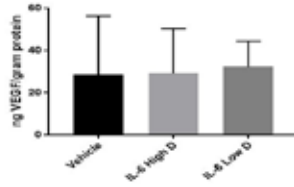
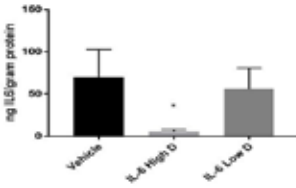
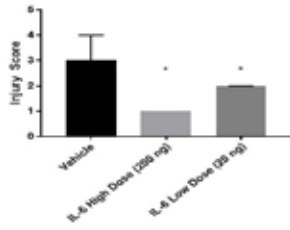
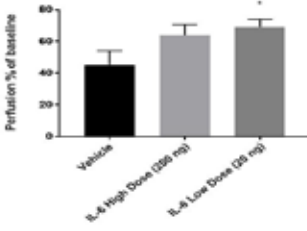
Methods: Adult C57Bl6J mice were anesthetized and a laparotomy performed. Intestinal ischemia was induced for 60 mins by temporarily occluding the superior mesenteric artery. At the end of ischemia, treatments were administered via intraperitoneal injection before closure; Vehicle: 250 μ L phosphate-buffered-saline (PBS), IL6 high-dose (200 ng), or IL6 low-dose (20 ng). Animals were allowed to recover for 24 hours, then reanesthetized and their mesenteric perfusion reassessed. Perfusion was expressed as percentage of baseline. Following perfusion analysis, animals were sacrificed, and intestines were explanted, preserved in 4% paraformaldehyde, paraffin embedded, sectioned, stained with H&E and graded. Separate frozen samples were homogenized and assessed for IL6 and VEGF by multiplex assay. Data were assessed for normalcy and compared using student's t test or Mann-Whitney. P-values <0.05 were significant.

Results: IL6 increased mesenteric perfusion in low dose groups only (PBS: 45.37 \pm 8.786%; IL6-high: 64% \pm 6.564%; IL6-low: 69.11 \pm 4.932%, p <0.05), while it improved post-ischemic mucosal injury scores in both treatment groups (PBS=3 (IQR=2.25); IL6-high=1.0 (IQR=0); IL6-low=2 (IQR=1.0), p <0.05). No differences in perfusion or histology were seen when high and low dose groups were directly compared to one another. Intestinal IL6 levels were significantly lower in IL6-high dose compared to vehicle (PBS=19.89 ng/gram protein (IQR=101.62), IL6-high=3.5ng/gram protein(IQR=20.2), IL6-low=11.15 ng/gram protein(IQR=8.52), p<0.05). No differences were seen in VEGF values.

Conclusion: IL6 may serve as a novel therapy to improve mesenteric perfusion and intestinal mucosal injury following ischemia. Further studies are needed to elucidate the downstream mechanisms prior to widespread clinical use.



Poster Session I (cont.)



Poster Session I (cont.)

P10

ACTIVATION OF PROTEIN PHOSPHATASE 2A INHIBITS HEPATOBLASTOMA TUMORIGENICITY

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Purpose: Hepatoblastoma is the most common primary liver tumor of childhood and carries a dismal prognosis for those with recurrent or relapsed disease. Treatment has not changed significantly in the past 20 years. The tumor suppressor, protein phosphatase 2A (PP2A), has been demonstrated to be downregulated in multiple cancers and overexpression of PP2A in hepatoblastoma sensitizes hepatoblastoma cells to chemotherapy. FTY720 is a small molecule that activates PP2A. We hypothesized that increasing activity of PP2A with FTY720 would inhibit tumorigenesis in hepatoblastoma cells and sensitize them to chemotherapy.

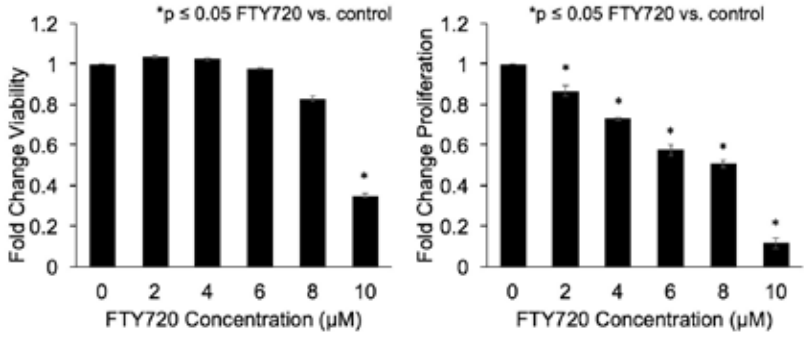
Methods: HuH6 hepatoblastoma cells were utilized. PP2A and c-myc expression were determined by immunoblotting. FTY720-induced PP2A activation was assessed using the PP2A Immunoprecipitation Phosphatase Assay Kit (Millipore). Cell viability and proliferation were determined using alamarBlue® and CellTiter 96®, respectively. A monolayer wounding assay was performed to assess motility. Synergy between FTY720 and doxorubicin or cisplatin was determined using Chou and Talalay isobolograms, with combination index <1 indicating synergy. Student's t-test statistic was used with $p < 0.05$ significant.

Results: FTY720 increased PP2A activity in a dose-dependent manner (50% increase, FTY720 versus control, $p < 0.001$). FTY720 treatment decreased cell viability and proliferation (Figure). FTY720 treatment decreased the expression of c-myc proto-oncogene. Cells treated with FTY720 exhibited decreased motility with 71% of scratch area remaining free of cells at 24 hours in FTY720-treated cells versus 49% in controls ($p = 0.003$). FTY720 exerted a synergistic effect with doxorubicin or cisplatin on cell viability with combination indices of 0.58 and 0.16 or 0.59 and 0.33, respectively.

Conclusions: PP2A activation with FTY720 decreased cell viability, proliferation, and motility, potentially due to decreased c-myc expression. Combining FTY720 with the standard hepatoblastoma chemotherapeutic agents, doxorubicin or cisplatin, decreased viability in a synergistic manner. FTY720 warrants further exploration as a novel therapy for hepatoblastoma.



Poster Session I (cont.)



Poster Session I (cont.)

P11

HDAC INHIBITION ENHANCES ANTI-TUMOR EFFECTS OF NOVEL REXINOIDS

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Purpose: Retinoic acid is currently standard therapy for high-risk neuroblastoma (NB), but nearly 50% of children treated with retinoic acid will have disease recurrence. We have previously demonstrated that two newly developed rexinoid compounds (UAB116 and 7Me-UAB30) decrease cell viability in NB cell lines. Histone deacetylase inhibitors (HDACi) have been demonstrated to enhance the cytotoxicity of chemotherapeutics in NB, leading us to hypothesize that the combination of rexinoids with HDACi would result in decreased NB tumorigenesis.

Methods: Four long-term passaged NB cell lines were used; two *MYCN* amplified (SK-N-AS, SH-EP) and two non-amplified [SK-N-BE(2), WAC2]. Cells were treated with UAB116 and 7Me-UAB30 alone or with the HDACi, suberanilohydroxamic acid (SAHA). Cell viability was assessed with alamarBlue assays. Cell proliferation and apoptosis were examined with CellTiter assay and immunoblotting, respectively. The method of Chou-Talalay was utilized to determine drug combination effect, with a combination index (CI) <1 indicating synergy. Data were reported as mean \pm SEM, compared with Student's t-test or ANOVA as appropriate, with $p \leq 0.05$ considered significant.

Results: Treatment with 50 μ M UAB116 decreased cell proliferation by an average of 72%, and 25 μ M treatment of 7Me-UAB30 decreased cell proliferation by 82%. These decreases were statistically significant in all four cell lines ($p < 0.001$). Western blotting detected increased PARP cleavage following treatment, indicating apoptosis. The addition of SAHA had a synergistic effect in the SK-N-AS (CI = 0.89 and 0.65 for UAB116 and 7Me-UAB30, respectively), SK-N-BE(2) (CI = 0.55 for 7Me-UAB30) and SH-EP (CI = 0.75 for UAB116) cell lines.

Conclusion: Treatment with novel rexinoids UAB116 and 7Me-UAB30 decreased NB cell proliferation and increased apoptosis. The addition of an HDACi had a synergistic effect, warranting further investigation into the mechanisms involved with the combination of HDACi and rexinoids, and their potential for clinical therapeutic applications.



Poster Session I (cont.)

P12

NOTCH ACTIVATION IN ENDOTHELIAL CELLS BY THE S. AUREUS TOXIN HLA CIRCUMVENTS TRANSCRIPTION OF CANONICAL DOWNSTREAM TARGETS

Naina Bagrodia, MD¹, Ann Defnet, MD², Mildred Nelson, BS³, Jared Emolo, MD³, Lydia Wu⁴, Juliane Bubeck-Wardenburg, MD, PhD³, Sonia Hernandez, PhD³, Jessica Kandel, MD³.

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Purpose: The principal cytotoxic agent released by *Staphylococcus aureus*, alpha-hemolysin (Hla), is the first identified endogenous activator of Notch proteins, critical regulators of developmental and pathologic angiogenesis. Notch signaling is exquisitely context- and tissue-dependent. We therefore asked whether Hla would induce upregulation of canonical Notch target genes in endothelial cells *in vitro*.

Methods: Human umbilical vein endothelial cells (HUVEC) were cultured in serum-free EBM-2 media, to avoid serum-induced transcription factor upregulation. The Notch activator ethylene diamine triacetic acid (EDTA) was used as a positive control. HUVEC were stimulated for 10 minutes with 0.01 ug/mL recombinant Hla, Hla-H35L (genetically inactivated Hla), 5mM EDTA, or Hank's solution (HBSS), and probed after 8h. To verify that Hla caused binding and activation of Notch-specific DNA-binding sites, HUVEC were transfected with an 11-CSL Notch reporter luciferase construct. Next, HUVEC were analyzed by immunocytochemistry (ICC) using a specific antibody for cleaved-Notch1 (active form of the Notch receptor). HUVEC mRNA was isolated and real-time quantitative PCR (QPCR) for Notch target genes Hes1, Hey1, Hey2, and Dll4 was performed using Taqman probes, with results normalized to beta-actin.

Results: Luciferase assays demonstrated that 0.01 Hla ug/mL increased Notch activation by 1.75±0.5-fold as compared to HBSS controls (p<0.05) and EDTA (5.4±1.4-fold activation relative to HBSS, p<0.01). Hla-H35L had no effect. ICC confirmed these findings. However, Hla elicited no target gene expression changes compared to HBSS controls by QPCR (p=ns). In contrast, EDTA caused a 7-12 fold induction of these transcripts compared to HBSS controls (p<0.001).

Conclusion: Strikingly, Notch activation by Hla circumvents canonical Notch downstream targets Hes1, Hey1, Hey2 and Dll4 in HUVEC, consistent with models indicating complex effects of Notch signaling in vascular cells. Given the key regulatory role of Notch in angiogenesis, particularly during conditions of pathobiologic stress, such as exposure to microbial toxins, further studies are warranted.

Poster Session I (cont.)

P13

FXR IS IMPORTANT FOR DECREASED HEPATIC STEATOSIS AFTER SLEEVE GASTRECTOMY IN DIET-INDUCED OBESE MICE

Monica D. Chow, MD¹, Andrew M. Wassef, BA¹, Bo Kong, PhD², Jianliang Shen, MS², Laura E. Armstrong, PhD², Justin D. Schumacher, PharmD², Dan Rizzolo, BS², Mingxing Huang, MD³, Min Zhang, MD⁴, Ragui W. Sadek, MD¹, Chen Liu, MD, PhD⁵, Grace L. Guo, MBBS, PhD², Yi-Horng Lee, MD¹.

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Purpose: The prevalence of obesity in the adolescent and pediatric population is 17% in the United States. Nonalcoholic fatty liver disease (NAFLD) is associated strongly with obesity and is a common cause of chronic liver disease in adolescents. Sleeve gastrectomy (SGx) leads to many weight-independent improvements of obesity-related comorbidities. Studies have suggested that SGx decreases hepatic steatosis in patients with NAFLD, but the mechanism is unclear. Farnesoid X receptor (FXR) plays a critical role in hepatic lipid metabolism and may therefore be crucially involved in correcting NAFLD.

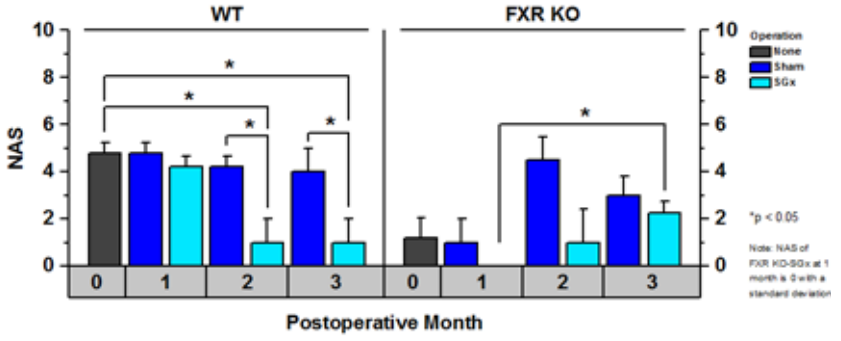
Methods: Wild type (WT) and FXR whole-body knock out (KO) mice were fed a high fat diet for 3 months prior to undergoing either a SGx or sham operation. Weights were recorded weekly. Liver was collected, weighed, and stained with hematoxylin and eosin preoperatively and 1, 2 and 3 months after surgery. NAFLD activity scores (NAS) were determined by a pathologist. Mann-Whitney U Test or Kruskal-Wallis ANOVA was used to analyze the data. Significance was taken at $p < 0.05$.

Results: WT-SGx mice had a statistically significant decrease in liver to body weight ratios and NAS compared to WT-sham mice at months 2 and 3. NAS was decreased in FXR KO-SGx mice compared with FXR KO-sham mice at 1, 2 and 3 months, respectively. NAS also trended up in FXR KO-SGx mice from 1 to 3 months with a statistically significant increase at month 3 compared with month 1. Despite regaining their preoperative weight 6 weeks after surgery, WT-SGx mice demonstrated a sustained decrease in NAS.

Conclusions: FXR appears to play a crucial role in the weight-independent improvement in liver steatosis after SGx in diet-induced obese mice and, therefore, may be essential for reversing NAFLD. However, further studies still need to be completed to elucidate a mechanism.



Poster Session I (cont.)



Poster Session I (cont.)

P14

NITRIC OXIDE IS RESPONSIBLE FOR INTESTINAL DYSMOTILITY IN NECROTIZING ENTEROCOLITIS

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Purpose: Necrotizing enterocolitis (NEC) is the most common life-threatening gastrointestinal disease in the premature infant and its etiology remains unclear. Nitric oxide (NO) is a major inhibitory neurotransmitter involved in the regulation of intestinal motility. NO plays an important role in the pathogenesis of NEC development. Intestinal dysmotility is a common clinical feature of NEC but its causative factors are unknown. Hypothesizing that NEC-induced upregulation of NO generation, the aim of this study was to investigate its potential role in reducing intestinal motility.

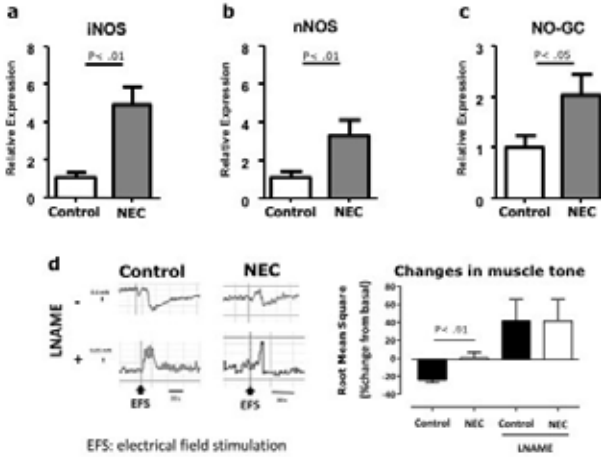
Methods: Nineteen neonatal mice (C57BL/6) were randomized into two groups: NEC [n=10] and control [n=9]. NEC was induced by hypoxia, gavage feeding of hyperosmolar formula and lipopolysaccharide between postnatal days 5-9. The ileum was harvested on postnatal day 9. Gene expression of iNOS, nNOS and NO-sensitive guanylyl cyclase (NO-GC) which is the receptor of NO were analyzed by qPCR. Relaxation of the ileum was measured using isometric force studies. Data were compared using t-test.

Results: iNOS and nNOS expressions were increased in NEC compared to control ($p < 0.01$ and $p < 0.01$ respectively) (Fig. a, b). NO-GC expression was also increased in NEC compared to control ($p < 0.05$) (Fig. c). Neurogenic muscle relaxation induced by electrical field stimulation (EFS) was not observed in NEC, whereas the relaxation was clearly observed in control ($P < 0.01$) (Fig. d). EFS-induced Intestinal muscle relaxation was significantly reduced in NEC-derived tissue, However, this group difference disappeared when stimulation was obtained following incubation with the nonspecific NO synthase blocker, L-NAME (Fig. d).

Conclusions: Inflammation-associated upregulation of nitric oxide synthases impairs intestinal muscle contraction and relaxation via nitric oxide in necrotizing enterocolitis. These findings provide further insight into the mechanism accounting for intestinal dysmotility in necrotizing enterocolitis.



Poster Session I (cont.)



Poster Session I (cont.)

P15

NOVEL ENTEROID MODEL OF NECROTIZING ENTEROCOLITIS DEMONSTRATES CHANGES IN CLAUDIN 2

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¹University of Illinois at Chicago, Chicago, IL, USA, ²Ann & Robert H. Lurie Children's Hospital, Chicago, IL, USA, ³Northwestern University, Chicago, IL, USA.

Purpose: Necrotizing enterocolitis (NEC) is the most devastating neonatal intestinal disorder. Despite the use of multiple animal models, its complex pathophysiology remains poorly understood. Enteroids are three-dimensional epithelial organoids derived from intestinal stem cells (ISC). These novel structures resemble the gut microenvironment better than single cell tissue cultures and may be a novel model for NEC. Tight junction (TJ) proteins, such as Claudin 2 (C2), are essential regulators of intestinal barrier function. We hypothesize that C2, a pore-forming TJ protein, will be overexpressed in a neonatal human enteroid model of NEC.

Methods: Human intestinal fragments were obtained from neonates undergoing bowel resection with or without NEC. ISC were harvested by isolation of intestinal crypts and incubation in Matrigel with ISC media with or without lipopolysaccharide (LPS) to induce experimental NEC. Rat intestines were collected from pups subjected to hypoxia and fed clean formula (control) vs bacteria-containing formula (NEC). C2 was analyzed by immunofluorescence mean fluorescent intensity (MFI) and quantitative PCR. Data was analyzed with student's T-test.

Results: C2 gene expression was upregulated in rats with experimental NEC vs control ($p=0.001$), with an associated increase in C2 MFI (706 ± 21 vs 514 ± 23 , $p<0.001$). Similarly, enteroids exposed to LPS had upregulated C2 gene expression ($p=0.023$) and increased fluorescence vs control ($p<0.0001$). These results were compared against humans with NEC, which had increased C2 immunofluorescence vs controls ($p<0.0001$). Furthermore, C2 changed in localization pattern from cell membrane to an intracellular speculated pattern for rats, humans, and enteroids.

Conclusions: Neonatal human enteroids are emerging as a novel model of NEC. Our results showed increased gene expression of C2 in a known rat model of NEC and in the enteroid model. Immunofluorescent microscopy revealed a change in cellular localization of C2 in human and experimental NEC. Further research using enteroid models may reveal therapeutic targets against NEC.



Poster Session I (cont.)

P16

cGAS DOWNREGULATION IS ASSOCIATED WITH MURINE COLITIS AND HUMAN INFLAMMATORY BOWEL DISEASE

Vei Shaun Siow, MD¹, Elizabeth Novak, PhD², Garret Vincent, BS², Kellie Cunningham, MD¹, Kevin Mollen, MD².

¹University of Pittsburgh Medical Center, Pittsburgh, PA, USA, ²Children's Hospital of Pittsburgh of UPMC, Pittsburgh, PA, USA.

Purpose: Cyclic GMP-AMP synthase (cGAS) has been shown to activate the innate immune system in response to cytoplasmic DNA via the production of cyclic GMP-AMP (cGAMP). This leads to the activation of the adaptor protein STING. However, a functioning cGAS-cGAMP-STING pathway has not been established in intestinal epithelial cells (IECs) and thus its role in intestinal inflammation has yet to be elucidated. We hypothesized that cGAS dysregulation plays a key role in mediating intestinal inflammation in the setting of inflammatory bowel disease (IBD).

Methods: Intestinal tissue was obtained from patients with active IBD (n=10) and from control subjects (n=5) according to University and IRB protocol. WT and cGAS^{-/-} mice (n=10 in each group) were subjected to 2% Dextran Sulfate Sodium (DSS) for seven days. RNA from colonic tissue was isolated, cDNA synthesized, and qPCR used to determine cytokine expression. Primary IECs and enteroids were isolated from murine and human tissues, cultured, and used in *ex vivo* experiments.

Results: We demonstrate that primary IECs and enteroids from humans and murine intestines express both cGAS and STING. cGAS^{-/-} mice undergoing DSS exhibited dramatically worse colitis when compared to their WT counterparts as measured by weight loss, disease activity index, colon lengths and histologic changes. Levels of proinflammatory cytokines such as TNF α and IL-6 were found to be significantly increased in cGAS^{-/-} mice. Finally, we demonstrate for the first time that human patients with active IBD have decreased levels of cGAS expression within the intestinal epithelium as compared to healthy controls.

Conclusions: We demonstrate for the first time that an intact cGAS-cGAMP-STING pathway is present within the intestinal epithelium. Our studies indicate that cGAS expression is downregulated during human IBD and murine colitis which may contribute significantly to the pathogenesis of IBD. Further studies are needed to elucidate the factors that activate cGAS during intestinal inflammation.

Poster Session I (cont.)

P17

DEVELOPMENT OF HUMAN ORGANOID MODELS FOR PEDIATRIC LIVER CANCER

James A. Saltsman, MD, MPH¹, William J. Hammond, MD, MS¹, Gadi Lalazar, MD², Nicole Croteau, MD¹, Michael P. La Quaglia, MD¹, Sanford M. Simon, PhD².

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Purpose: Pediatric liver cancer research is hampered by the small number of *in vitro* disease models. Organoids have emerged as robust models for several diseases, including cancer. This study describes the development of human organoid models for hepatoblastoma and fibrolamellar hepatocellular carcinoma (FLHCC).

Methods: With IRB approval, tumor and normal liver tissue were obtained from patients with hepatoblastoma and FLHCC undergoing surgical resection. Tumor and normal liver cells were isolated from tissue using mechanical homogenization and collagenase digestion, and mixed in a 3D basement membrane matrix. Initial culture medium contained Wnt pathway agonists which were removed to promote hepatocyte differentiation once organoids were established. Analysis was performed on undifferentiated organoids, and organoids in differentiation media for 7 and 10 days. Viral transduction was performed in normal liver organoids to induce expression of chimeric PRKACA-DNAJB1, the putative oncogene in FLHCC. Transduction of organoids was confirmed with PCR. Protein expression was evaluated by Western blots and immunofluorescence.

Results: Tumor and normal liver samples were collected from 8 patients with FLHCC and 4 patients with hepatoblastoma (1 pure fetal, 2 mixed fetal/embryonal, 1 mixed epithelial/mesenchymal). Organoids were successfully derived from normal liver (Figure 1A), and tumor (Figure 1B) in all patients with hepatoblastoma. Normal liver organoids were derived from all 8 FLHCC samples, however no tumor organoids were successfully derived from tumor tissue. To establish an FLHCC tumor organoid model, normal liver organoids from FLHCC patients were transduced with the FLHCC oncogene, chimeric PRKACA-DNAJB1. Transduced organoids expressed the chimeric protein (figure 1B) and showed other characteristic features associated with FLHCC.

Conclusions: Organoid models for pediatric liver cancer can be derived directly from tissue samples (hepatoblastoma) or through oncogene transduction into established normal liver organoids (FLHCC). These models hold significant promise for drug testing and improving understanding of the basic biology of these tumors.



Poster Session I (cont.)

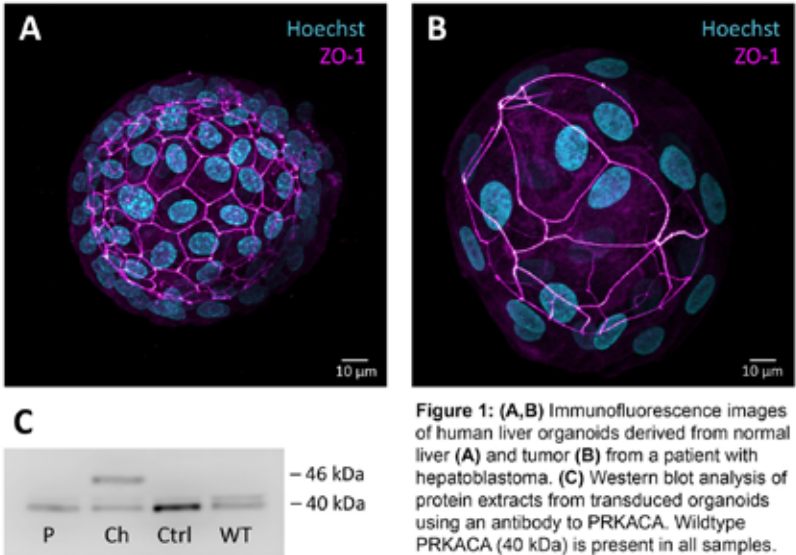


Figure 1: (A,B) Immunofluorescence images of human liver organoids derived from normal liver **(A)** and tumor **(B)** from a patient with hepatoblastoma. **(C)** Western blot analysis of protein extracts from transduced organoids using an antibody to PRKACA. Wildtype PRKACA (40 kDa) is present in all samples. The higher molecular weight band (46 kDa) represents the chimeric PRKACA-DNAJB1 oncogene. (P = PRKACA transduction, Ch = chimera transduction, Ctrl = control transduction, WT = not transduced)

SCHEDULE & PROGRAM

Poster Session I (cont.)

P18

GENE EXPRESSION VARIATION IN PRIMARY TUMORS AND METASTATIC LESIONS IN FIBROLAMELLAR HEPATOCELLULAR CARCINOMA

James A. Saltsman, MD, MPH¹, David Requena, MS², Gadi Lalazar, MD¹, William J. Hammond, MD, MS¹, Nicole J. Croteau, MD¹, Michael P. La Quaglia, MD¹, Sanford M. Simon, PhD¹.

¹Memorial Sloan Kettering Cancer Center, New York, NY, USA, ²Rockefeller University, New York, NY, USA.

Purpose: Fibrolamellar hepatocellular carcinoma (FLHCC) is a rare liver malignancy that arises in children and young adults without a history of liver disease. Approximately 50% of patients present with metastatic disease at diagnosis, for which there is no effective therapy. We aimed to characterize gene expression variations unique to metastatic lesions with the goal of identifying novel targets for therapy.

Methods: With IRB approval, primary tumors, metastatic lesions and normal liver tissue were obtained from patients with FLHCC undergoing surgical resection. Tissue was frozen at the time of surgery to preserve RNA integrity. RNA isolated and integrity was confirmed prior to library preparation. Total RNA libraries were prepared for sequencing using a ribosomal RNA depletion technique. Next-generation sequencing was performed on the Illumina platform. Reads were aligned to the hg38 reference genome and counted using the STAR aligner. Differential expression analysis was performed using the DESeq2 software package. Threshold for differential expression was set at a false discovery rate (FDR) <0.05. A t-distributed stochastic neighbor embedding (tSNE) plot was created to evaluate global gene expression variation.

Results: Forty-five samples from 12 unique patients were analyzed. Thirteen samples were normal liver, 10 were primary tumors, and 22 were metastatic lesions. tSNE revealed global gene expression differences between normal liver and tumor samples, but not between primary and metastatic lesions (Figure 1A). Despite global similarity, 354 genes were found to be significantly differentially expressed between primary tumors and metastases. Differentially expressed genes included coding genes with known roles in other malignancies such as HOXC6 and GDF2, as well as many non-coding transcripts including LINK-A (Figure 1B).

Conclusions: While there is global similarity between primary and metastatic lesions in FLHCC, numerous gene expression differences exist at the single-gene level that represent potential targets for therapy in metastatic FLHCC.



Poster Session I (cont.)

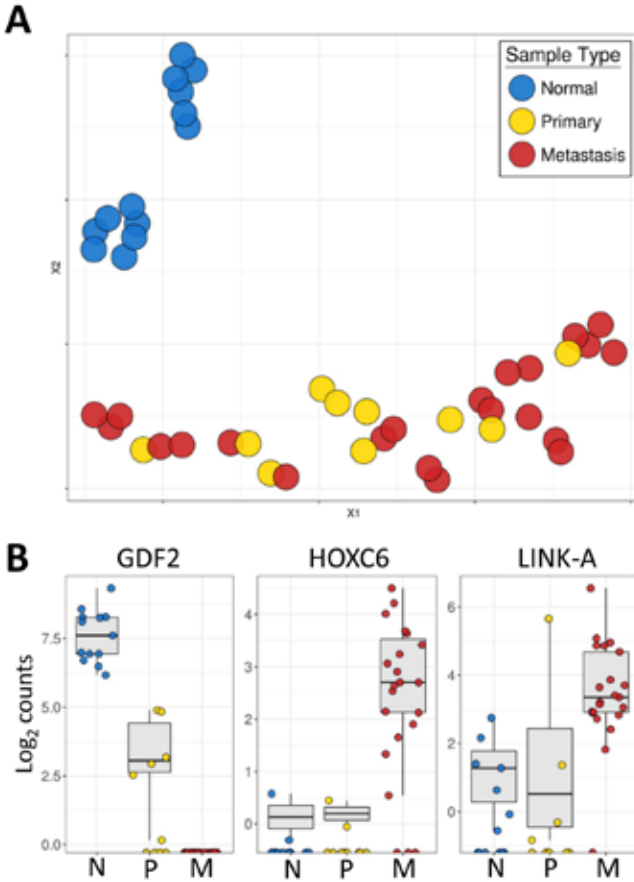


Figure 1: Gene expression plots of normal liver (N), primary tumors (P), and metastatic lesions (M) in FLHCC. **(A)** tSNE plot **(B)** Gene expression plots for individual genes.

SCHEDULE & PROGRAM

Poster Session I (cont.)

P19

MORPHINE IMPAIRS TIGHT JUNCTION BARRIER FUNCTION IN-VITRO THROUGH PHOSPHORYLATION AND DISRUPTION OF OCCLUDIN

Lei Zhang, PhD, **Bradley J. Segura, MD, PHD.**

University of Minnesota Masonic Children's Hospital, Minneapolis, MN, USA.

Purpose: Opioids are a mainstay of clinical management in pediatric surgical patients. Our previous studies suggest that morphine affects gut barrier function through the involvement of the enteric nervous system. We hypothesized that morphine alters the tight junction complex proteins Occludin and Zona Occludens (ZO-1) and sought to further characterize the mechanism of morphine signaling in an in-vitro model of barrier function.

Methods: HEK293 cells stably expressing the mu-opioid receptor were cultured under standard conditions. Confluent cells were treated with 1 microM morphine at various time intervals (0-24 hours). Immunofluorescence studies were performed using antibodies to Occludin and ZO-1, two important tight junction complex proteins. Western blot analysis was completed to assess phosphorylation of Occludin Tyrosine, Serine, and Threonine residues. Morphological assessment and Electric Cell-substrate Impedance Sensing (ECIS) on cultured cells were conducted to monitor disruption in barrier function in-vitro.

Results: Western blot results reveal that morphine treatment induced Tyrosine phosphorylation of Occludin in a time-dependent manner that was complete within 24 hours. This effect was blocked by the opioid antagonist Naloxone. Coincidentally, immunofluorescence studies show that morphine treatment caused dissociation of Occludin and ZO-1 co-localization, consistent with the similarly disrupted morphology and aggregation of previously confluent cultured cells. ECIS studies demonstrate a trend towards decreasing resistance—further evidence of barrier function impairment.

Conclusions: In an in-vitro model, morphine disrupts epithelial cell function and barrier formation. This holds significant implications for clinical management of pain in the pediatric patient. Further studies are warranted to apply these findings to the characterization of the effects of opioids upon enteric nervous system signaling and intestinal health and disease in children.



Poster Session I (cont.)

P20

DIFFERENTIAL RESPONSE TO *PROMININ-1* HEPATIC PROGENITOR CELLULAR ABLATION IN ADULT MICE COMPARED TO NEWBORN DURING CHOLESTATIC LIVER INJURY

Michael R. Fenlon, MD¹, Jiabo Xu, MS¹, Kinji Asahina, PhD², Kasper S. Wang, MD¹.

¹Children's Hospital Los Angeles, Los Angeles, CA, USA, ²University of Southern California, Los Angeles, CA, USA.

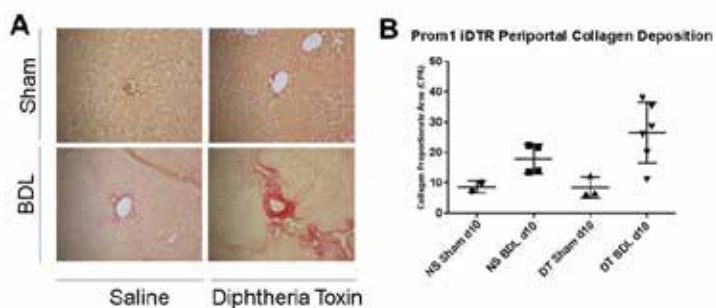
Purpose: In spite of successful surgical drainage, Biliary Atresia (BA) typically progresses to cirrhosis. We previously demonstrated that Prominin-1 (Prom1) positive(pos) hepatic progenitor cells (HPC), which exhibit 65-fold higher regenerative capacity in the newborn compared to the adult mouse, and proliferate within regions of fibrosis in BA. Knockout of Prom1 decreases biliary fibrosis in the murine model of BA induced by Rhesus rotavirus. Hypothesis: Selective ablation of adult Prom1 pos HPCs results in altered fibrosis following cholestatic liver injury caused by bile duct ligation (BDL).

Methods: *Prom1*^{pos} cell-specific expression of *Diphtheria Toxin Receptor* (iDTR) was induced with tamoxifen in 6-8 week old *Prom1*^{Cre-ert2};*iDtr*^{sl} mice. Selective ablation of *Prom1*^{pos} HPC was achieved with Diphtheria toxin (DT) administration (vs saline control) one week prior to BDL (vs sham). At 5 and 10 days (d) postop, livers were collected for analysis (n = 13 and 15, respectively).

Results: BDL-saline mice exhibited more intrahepatic fibrosis measured by collagen proportionate area (CPA) compared to sham-saline (18.0±2.4 vs 8.7±1.4 respectively, p=0.03). In contrast to *Prom1* knockout in the newborn mouse pups with BA, *Prom1*^{pos} HPC ablation in the BDL-DT group led to an increasing CPA compared to the BDL-saline group at 5d (25.8±2.6 vs 18.1±2.9, p=0.10) and 10d (26.6±4.0 vs 18.0±2.4 p= 0.15). Fibrosis by Sirius Red staining in BDL-DT group was similar at 10d compared to 5d (26.6±4.0 vs 25.8±2.6, p=0.88). BDL-DT groups demonstrated a trend toward increased expression of the profibrotic gene *Vimentin* compared to BDL-saline (6.9±1.9 vs 2.6±1.3, p=0.15).

Conclusions: Whereas null mutation of *Prom1* leads to decreased fibrosis in the newborn pup with BA, ablation of *Prom1*⁺ HPCs in the adult mouse undergoing BDL increases fibrogenesis. Understanding this differential age-related response to targeting *Prom1*^{pos} HPC may provide further insight into the progressive biliary fibrosis associated with BA.

Poster Session I (cont.)



Hepatic Fibrosis Worsened with *Prom1*⁺ HPC Ablation: A. Sinus red imaging of *Prom1*⁺cre; iDTR (double heterozygous) with or without DT ablation 10 days after Bile Duct Ligation (BDL) or sham laparotomy. Periportal areas show increased fibrosis after BDL, particularly with DT treatment. 20x magnification, n=15. B. Quantification of Periportal Collagen Proportionate Area.



Poster Session I (cont.)

P21

THE ANGIOGENIC EFFECT OF GRANULOCYTE COLONY-STIMULATING FACTOR IN METASTATIC NEUROBLASTOMA

Wesley E. Barry, MD, Grace Asuelime, MA, Larry Wang, MD, PhD, Eugene S. Kim, MD.
USC; CHLA, Los Angeles, CA, USA.



Tweet it! Poster P21: G-CSF increases expression of proangiogenic proteins in neuroblastoma. #neuroblastoma #surgtweeting #eAPSA2018 @webthethird

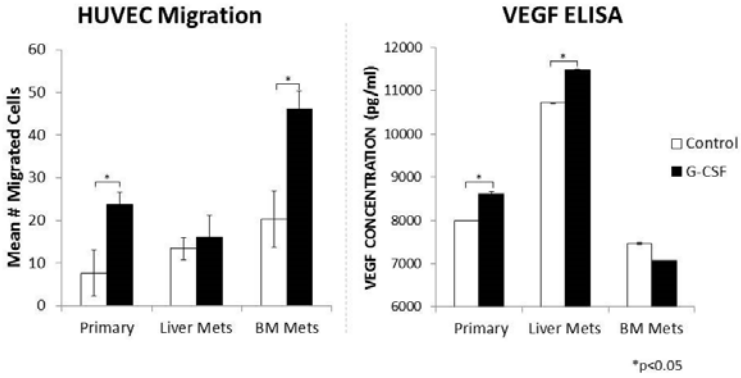
Purpose: Granulocyte colony-stimulating factor (G-CSF) is a hematopoietic cytokine frequently administered to patients with high-risk neuroblastoma (NB) to ameliorate chemotherapy-induced neutropenia. However, G-CSF has previously been shown to induce angiogenesis through vascular endothelial growth factor (VEGF) expression in multiple cancer types. We hypothesize that G-CSF leads to increased VEGF-mediated angiogenesis in metastatic NB.

Methods: The human NB cell line CHLA-255 was orthotopically implanted in NSG mice to generate cell lines from harvested primary tumor and liver and bone marrow (BM) metastasis. Human umbilical vein endothelial cell (HUVEC) migration assays and VEGF ELISA were performed using conditioned media from the cultured cell lines (primary tumor cells, liver metastatic cells, BM metastatic cells) with and without G-CSF. In vivo, 1 million human NB cells (CHLA-255) were orthotopically implanted in NSG mice. The primary tumor was resected on post-injection day 7, and mice received vehicle or G-CSF for 2 weeks. At the completion of treatment, serum from all mice was collected and examined using a human angiogenesis protein array. Statistical analysis was performed using Student's t-tests.

Results: In vitro, endothelial cell migration was significantly increased in the primary tumor cell and BM metastatic cell groups following treatment with G-CSF ($p < 0.05$). By ELISA, G-CSF significantly increased VEGF protein expression in primary tumor and liver metastatic cells but not in BM metastatic cells (Figure). Protein array analysis of the mouse serum demonstrated a significant increase in the expression of other proangiogenic proteins, such as IGFBP-1, FGF-1, and thrombospondin, following treatment with G-CSF ($p < 0.05$).

Conclusions: G-CSF appears to increase the angiogenic potential of metastatic NB through both VEGF-dependent and independent pathways. Further studies are needed to elucidate the role of pro-angiogenic pathways stimulated by G-CSF to elucidate the safety of its use in patients with high-risk NB.

Poster Session I (cont.)





Poster Session II

Poster Session II: Clinical

Thursday, May 3, 4:30 – 6:15 p.m.

P22

SCREENING LABORATORY TESTING IN ASYMPTOMATIC MINOR PEDIATRIC BLUNT TRAUMA LEADS TO UNNECESSARY NEEDLE STICKS

Faidah O. Badru, MD, MPH¹, Saurabh Saxena, MD², Hector Osei, MD², David Starr, MS³, Perry Xu, MS³, Robert Breeden, MS³, Jose Greenspon, MD¹, Colleen Fitzpatrick, MD⁴, Gustavo Villalona, MD⁴, Kaveer Chatoorgoon, MD⁴.

¹Cardinal Glennon Memorial Children's Hospital, St Louis University Hospital, St Louis, MO, USA, ²Cardinal Glennon Memorial Children's Hospital, St Louis, MO, USA, ³St Louis University School of Medicine, St Louis, MO, USA, ⁴Cardinal Glennon Memorial Children's Hospital, St Louis University Hospital, St Louis, MO, USA.



Tweet it! Poster P22: Routine trauma laboratory testing in minor trauma is unnecessary @faidahbadru #eAPSA2018

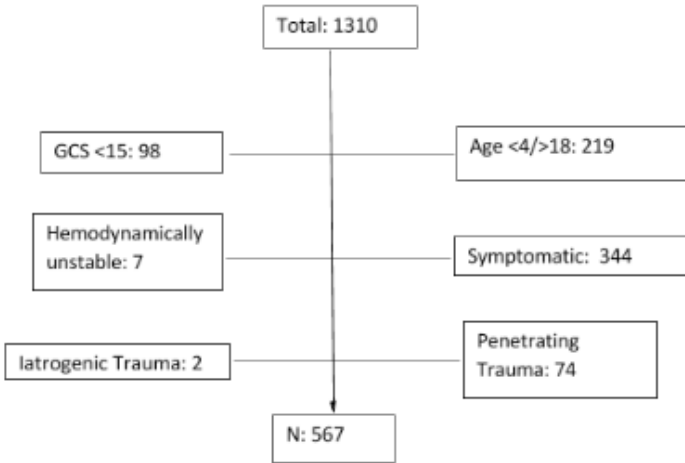
Purpose: Screening bloodwork after minor injuries is common in pediatric trauma. The risks of missed injuries versus the diagnostic necessity in an asymptomatic patient remains an ongoing debate. We evaluated the clinical utility of screening bloodwork in carefully selected asymptomatic children after minor trauma.

Methods: Patients admitted to a Level 1 pediatric center with 'minor trauma' or 'trauma consult' designation for blunt trauma between 2010 and 2015 were retrospectively reviewed. Exclusion criteria were: age <4 or > 18 years, Glasgow Coma Score (GCS) <15, penetrating trauma, workup for non-accidental trauma, hemodynamic instability, abdominal findings (pain, distension, bruising, presence of seatbelt sign, tenderness or hematuria), and any patient that required a higher level of intervention (i.e. intubation). Variables abstracted included demographic data, blood work, interventions, disposition and return to emergency room with missed injuries. Routine laboratory tests performed at our institution are complete blood count (CBC), complete metabolic panel (CMP), amylase, lipase and coagulation profile. Pearson's Chi square analysis was performed on categorical data and Students' T-test on continuous data.

Result: A total of 1,310 patients were treated for minor trauma over the study period. Of these, 567 (43%) met inclusion criteria. Average age was 12.7 years and 63% were male. Fifty-nine percent were discharged home from the emergency room. Ninety-five percent had laboratory testing done, 60% of which had at least one positive laboratory test value. The most common abnormal values were leukocytosis (30%) and hypochloremia (25%). Forty percent of the patients had an intervention, but none were prompted by abnormal blood work. Of the 5% who did not undergo any laboratory testing, there were no missed injuries.

Conclusion: When appropriately selected, screening laboratory testing in asymptomatic minor pediatric blunt trauma patients leads to unnecessary needle sticks without significant diagnostic advantage.

Poster Session II (cont.)





Poster Session II (cont.)

P23

TWENTY YEARS OF PEDIATRIC GUNSHOT WOUNDS IN OUR COMMUNITY: HAVE WE MADE A DIFFERENCE?

Lilly Bayouth, MD, Katryne Lukens-Bull, MPH, Lori A. Gurien, MD, Joseph J. Tepas III, MD, Marie Crandall, MD.

University of Florida Health Shands Jacksonville, Jacksonville, FL, USA.

Purpose: Pediatric gunshot wounds (GSWs) are a public health concern of significant incidence and mortality, despite the emergence of local firearm safety programs and crime prevention initiatives. We evaluate 20 years of pediatric GSW injury demographics seen at our institution and construct a risk map model, triangulating areas of high pediatric GSW incidence with risk factors and outcomes.

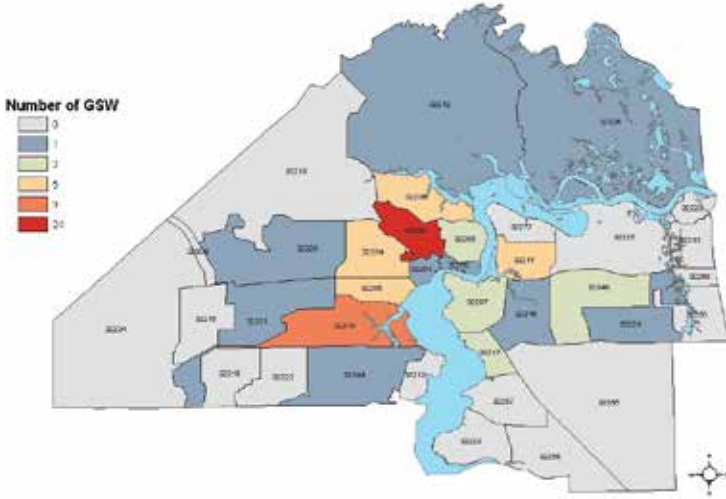
Methods: Children, 0-18 years, suffering a GSW between 1996-2016 (n=898), were identified using this Level 1 trauma center's trauma registry. Demographic, socioeconomic and institutional variables were retrospectively reviewed. Hospital charges were normalized to 2016 values prior to analysis. Multi-variable logistic regression models identified predictors of mortality. Geographic information system (GIS) mapping of incident location and residence identified hot spots of higher GSW incidence.

Results: The cohort, predominantly male (86.4%), had a mean age of 15.6±3.4 years. Mean Injury Severity Score (ISS) was 9.51±10.26. The majority (52.9%) required procedural and/or operative intervention. GSWs were most frequently from assault (81.5%) and unintentional injury (12.8%). Despite normalizing for inflation and controlling for injury demographics, hospital charges showed significant annual increase. Annual incidence of GSWs showed marked variation without longitudinal trend (p=0.89). GIS mapping revealed significant clustering of GSWs in known lower socioeconomic areas; yearly and total GSWs was highest in one particular zip code (Figure 1). The only significant predictor of mortality (n=18) was ISS (OR 1.19, 95% CI 1.15-1.22, p < 0.001).

Conclusions : We conclude the impoverished areas of this community have higher incidence of pediatric gunshot wounds, unchanged over 20 years, despite firearm safety programs and crime suppression efforts. Gun violence carries significant morbidity/mortality and rising financial burden. Alternative community-based firearm injury prevention efforts, aimed at neighborhood capacity building, economic strengthening and recognition of guns as a disease vector are needed.

Poster Session II (cont.)

Number of Children/Youth (0-18 yrs) Received by Trauma for Gun Shot Wounds (GSW) by zip code, 2008





Poster Session II (cont.)

P24

ENTERAL NUTRITION IN NEONATES WITH CONGENITAL DIAPHRAGMATIC HERNIA ON VA ECMO: SAFE AND FEASIBLE

Lindsey B. Armstrong, MD, Katelyn Ariagno, RD, Nilesh M. Mehta, MD.

Boston Children's Hospital, Boston, MA, USA.

Purpose: Nutrient delivery, preferably enteral, is essential for recovery and growth in critically ill neonates with congenital diaphragmatic hernia (CDH) on ECMO and has not been previously described. We examined macronutrient delivery during the first week of ECMO therapy in this cohort.

Methods: Details of nutrient delivery in neonates with CDH who survived greater than 24 hours after ECMO cannulation from 2012-2015 in a single pediatric intensive care unit (PICU) were examined.

Results: We analyzed data from 23 consecutive eligible patients, 65% male, with median (IQR) ECMO duration of 13 (9, 22) days, ICU length of stay 45 (31, 77) days, and 28-day mortality 7%. Weight for age z-score declined from 0.05 at admission to -1.39 at 30 days ($P=0.003$). Median (IQR) time from admission to parenteral nutrition (PN) initiation was 1 (1, 2) day. Time to surgery was 3 (1, 13) days and time from surgery to enteral nutrition (EN) initiation was 10 (3, 15) days. Five patients received no EN during their PICU stay. Of the 18 patients receiving EN, 14 (78%) were fed via the stomach and 4 (22%) post pyloric. Four patients received formula (20-22kcal) while the majority received breast milk. By day 7 of ECMO, patients were receiving 94% goal calories and 90% goal protein via EN and PN. Presence of umbilical artery catheter (UAC) or use of vasoactive infusions was not associated with failure of EN delivery. There were no cases of necrotizing enterocolitis. Lower mortality and shorter ECMO duration were seen in the group receiving EN (Table). Ninety-day mortality for those not receiving EN was 100%.

Conclusions: Neonates with CDH on ECMO required early PN to meet caloric and protein goals. EN was safely delivered to 80% of this cohort and was not impeded by the presence of UAC or use of vasoactive infusions.

Factors associated with receiving enteral nutrition during the first week of pediatric ECMO therapy			
Variables	Patients receiving EN	Patients receiving no EN	P-value*
N	18	5	
Left CDH	12 (67%)	3 (60%)	0.792
ECMO days	12 (8.8, 20.5)	22 (15.5, 35.5)	0.011*
UAC indwelling	5 (28%)	4 (80%)	0.060
Vasoactive infusions	12 (67%)	3 (60%)	0.792
28-day mortality	0 (0%)	2 (40%)	0.029*
90-day mortality	3 (17%)	5 (100%)	0.003*
ICU LOS (days)	69 (38.8, 120)	22 (16.5, 37)	0.048*
Hospital LOS (days)	111 (60.5, 148)	30 (16.5, 38)	0.006*

Poster Session II (cont.)

P25

TIMING FOR REPAIR OF CONGENITAL DIAPHRAGMATIC HERNIA IN INFANTS REQUIRING EXTRACORPOREAL MEMBRANE OXYGENATION

Ali Mokdad, MD, Faisal G. Qureshi, MD, MBA.

UTSW, Dallas, TX, USA.

Purpose: Infants with congenital diaphragmatic hernia (CDH) requiring extracorporeal membrane oxygenation (ECMO) have a high mortality. Among those, hernia repair improves survival but the timing of the repair is controversial and poorly studied. We evaluated the relation between survival and timing of hernia repair among infants with CDH on ECMO.

Methods: Using the Texas hospital inpatient discharge data between 2006 and 2015, we identified infants with CDH who received ECMO. We included infants who underwent a repair as well as those who did not. We excluded infants undergoing CDH repair prior to initiation of ECMO. Timing to CDH repair was measured from the time of initiation of ECMO. We used the Kaplan-Meier method to evaluate the timing of repair. A logistic regression model was used to evaluate the association between survival at the time of discharge and the timing of CDH repair.

Results: A total of 162 infants were included; 121 (75%) underwent CDH repair; 41 (25%) were not repaired. Over the study period, infants were more likely to undergo CDH repair in recent years (2014-2015: 80% vs 2006-2007: 52%, $P = 0.01$). The median time to hernia repair was 8 days (95% CI, 7 to 11 days). Overall mortality was 62%. Mortality was 50% for infants who underwent repair and 100% for those who did not ($P < 0.01$). Among infants undergoing CDH repair, earlier repair was associated with better survival (OR = 1.07; 95% CI, 1.00 to 1.14). The relation between survival and timing of repair was largely linear (Figure 1).

Conclusion: For infants with CDH requiring ECMO, an early repair was associated with improved survival. Our findings merit further evaluation in a randomized clinical trial setting.



Poster Session II (cont.)

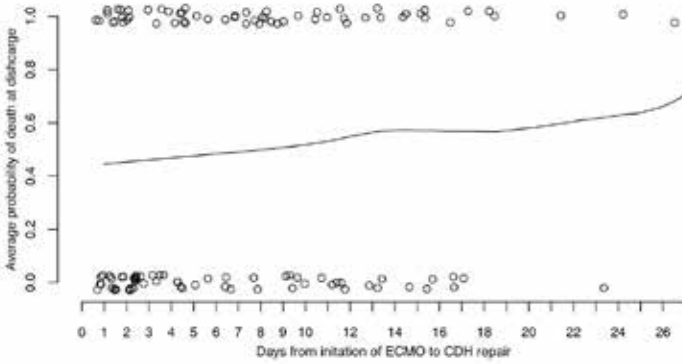


Figure 1. Average probability of death as a function of time from initiation of ECMO to CDH repair. Each circle is an infant who required ECMO and underwent CDH repair (after initiation of ECMO). The line is a smoothed average probability of death at discharge.

Poster Session II (cont.)

P26

CLINICAL AND PATHOLOGIC CHARACTERISTICS OF PEDIATRIC GASTROINTESTINAL STROMAL TUMORS USING THE NATIONAL CANCER DATABASE

Christopher R. Reed, MD¹, Harold J. Leraas, MA², Brian Ezekian, MD¹, Uttara Nag, MD¹, Henry Rice, MD¹, Tamara Fitzgerald, MD, PhD¹, Elisabeth Tracy, MD¹.

¹Duke University Medical Center, Durham, NC, USA, ²Duke University School of Medicine, Durham, NC, USA.

Purpose: Evidence for a discrete “pediatric-type” gastrointestinal stromal tumor (GIST) that is genetically and biochemically distinct from that classically described among adults is accumulating. Due to the rarity of this entity, no large descriptive studies of GIST in children exist. We aimed to compare clinical outcomes and pathology of GIST in children versus those among adults.

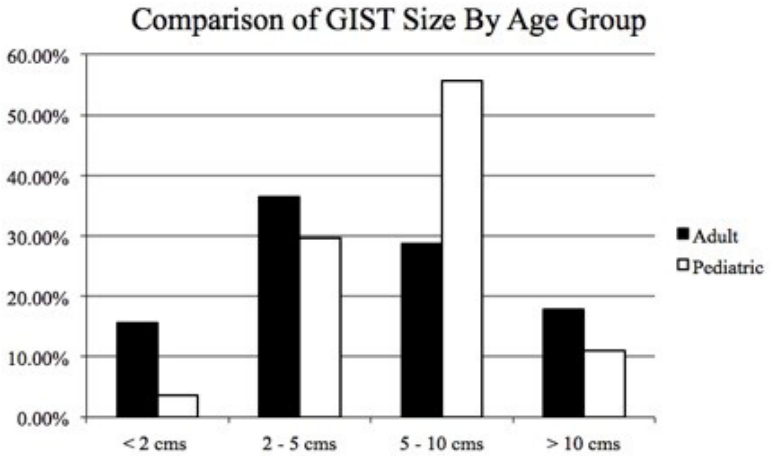
Methods: The National Cancer Database (NCDB) was used to capture tumor and patient-specific variables among all children (age ≤ 21) and adults with pathologically-proven GIST from 2005-2015. Demographics, survival, nodal status, size and location of primary tumor, and use of chemo- and radiation therapies were captured and compared using descriptive statistics.

Results: A total of 72 pediatric patients and 21,661 adults with GIST were identified between 2005 and 2015. Pediatric patients were more likely to be female (62.5 vs 49.5%, $p = 0.028$) and have node positivity (18.8 vs 7.6%, $p = 0.019$). Among those patients with adequate follow-up, 5- and 10-year survival was higher among children (90.6 vs 56.2% and 55.6 vs 8.2%, $p < 0.001$). Tumor size and histologic grade, 30-day mortality, use of preoperative chemotherapy, and primary tumor location were all similar between children and adults, with most tumors affecting the stomach and small intestine among adults and children.

Conclusions: Using a large national database to compile cases from 10 years of data, we have found that clinical and pathologic behaviors of “pediatric-type” GIST differ from those among adults with respect to gender, node positivity, and 5- and 10-year survival. As recurrence data are not available, further study is needed to determine differences in disease-free survival and to investigate whether the conventional TNM criteria developed for adults is appropriate for children.



Poster Session II (cont.)



Poster Session II (cont.)

P27

ILEAL POUCH-ANAL ANASTOMOSIS IN PEDIATRIC NSQIP: DOES A LAPAROSCOPIC APPROACH REDUCE COMPLICATIONS AND LENGTH OF STAY?

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Tweet it! Poster P27: Results from a multicenter analysis of lap IPAA #NSQIP #MIS #eAPSA2018 @NPMcKenna

Purpose: To determine if a laparoscopic approach reduces complications and length of stay after total proctocolectomy with ileal pouch-anal anastomosis (IPAA) in pediatric patients using a multi-center prospective database.

Methods: The American College of Surgeons Pediatric National Surgical Quality Improvement Project multi-center database from 2012-2015 was used to identify patients with a diagnosis of chronic ulcerative colitis (CUC) or familial adenomatous polyposis (FAP) undergoing IPAA. Major complications included deep and organ space surgical site infection, unplanned intubation, sepsis, blood transfusion, progressive renal insufficiency, venous thromboembolism, and unplanned reoperation. Minor complications were superficial surgical site infection and urinary tract infection. Prolonged length of stay (LOS) was defined as an initial hospitalization longer than the 75th percentile. Univariate and multivariable analyses were performed with significance set at $p < 0.05$.

Results: 195 (108 female) patients underwent IPAA at a median age of 14 years (IQR: 11-16) for CUC (N=99) or FAP (N=96). Two-thirds of cases (N=132) were performed laparoscopically. There were a total of 63 major complications in 43 patients and 12 minor complications in 12 patients. A laparoscopic approach was not associated with an increased risk of major complications but lower odds of minor complications were observed ($p=0.02$). A reduced LOS was seen in laparoscopic versus open surgery (median LOS 6 vs 8 days, $p < 0.01$). Further, open IPAA was independently associated with prolonged LOS in the FAP cohort (OR 4.0, 95% CI 1.1-14.0), while a similar effect did not reach significance in the CUC cohort (OR 2.2, 95% CI 0.8-6.4).

Conclusion: A laparoscopic approach was not associated with increased major complications following total proctocolectomy with ileal pouch-anal anastomosis in a multi-center database of pediatric patients, but was associated with lower odds of minor complications and shorter lengths of stay. The laparoscopic approach should continue to be preferred in the pediatric population.



Poster Session II (cont.)

Multivariable Analysis of Risk Factors for Major Complications and Prolonged Length of Stay

Variable	Major Complication, OR (95% CI)	Prolonged LOS in entire cohort, OR (95% CI)	Prolonged LOS in CUC cohort, OR (95% CI)	Prolonged LOS in FAP cohort, OR (95% CI)
Open Surgery (vs laparoscopic)	-----	2.1 (1.0-4.7)	2.2 (0.8-6.4)	4.0 (1.1-14.0)
Major Complication Prior to Discharge	-----	9.1 (3.7-22.6)	6.7 (2.2-20.2)	21.1 (5.3-85.0)
Minor Complication Prior to Discharge	-----	5.0 (0.6-41.8)	2.5 (0.1-42.2)	-----
Steroid AND Immunosuppressant Use (vs none)	4.1 (0.8-22.0)	-----	-----	-----
Steroid OR Immunosuppressant Use (vs none)	-----	-----	3.5 (1.2-10.3)	-----
Type III/IV wound (vs Type I/II)	2.7 (1.1-6.6)	2.3 (0.9-5.9)	-----	-----
WBC > 13.5 (vs ≤13.5)	4.2 (0.9-19.1)	1.3 (0.2-6.7)	-----	-----
Black/African American (vs non-Hispanic white)	-----	4.4 (1.5-13.4)	18.1 (2.6-128.5)	-----
History of asthma	-----	-----	-----	7.3 (1.5-35.0)

Each model was built with variables found significant on univariate analysis or deemed clinically relevant (limited variables seen here secondary to space constraints)

Poster Session II (cont.)

P28

CLINICAL OUTCOMES ASSOCIATED WITH PERITONEAL CONTAMINATION IN PERFORATED APPENDICITIS: A CASE FOR INTRAOPERATIVE SCORING

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Purpose: Pediatric perforated appendicitis encompasses a disease spectrum, ranging from localized peritoneal contamination to contamination in all four quadrants. Presently, clinical outcomes and reimbursement for perforated appendicitis do not take into account severity of illness. The purpose of this study is to develop a classification system for disease severity based on extent of peritoneal contamination. We hypothesized that more extensive contamination noted at operation leads to higher hospital resource utilization and complication rates. A severity scoring system may provide insight into deficiencies in current coding and reimbursement practices (ICD-10 and CPT).

Methods: With IRB approval, the health record at our children's hospital was queried for patients who underwent laparoscopic appendectomy for perforated appendicitis between 2012-2014. Operative reports were reviewed to determine extent of peritoneal contamination, outcomes, and charges. Group A were children with purulence in the right lower quadrant only, and Group B were those with contamination in two or more quadrants. Outcomes assessed included length of stay (LOS), postoperative intra-abdominal abscess, complications and unplanned hospital visits after discharge. Descriptive and comparative analysis was performed with statistical significance was set at $p \leq 0.05$.

Results: There were 150 patients, 49 (33%) in Group A and 101 (67%) in Group B. (Table 1) Children in Group B had significantly longer LOS, higher rates of postoperative intra-abdominal abscess, complications, charges, and unplanned hospital visits. Number of patients readmitted were not significantly different between groups.

Conclusion: The extent of peritoneal contamination in perforated appendicitis correlates strongly with clinical outcomes and resource utilization. The present national coding policies (ICD-10 and CPT) do not differentiate extent of intra-abdominal contamination. Implementation of this scoring system may facilitate discrimination of illness severity, identification of best practices, modification of national codes, and improved reimbursement for both hospital and professional services.



Poster Session II (cont.)

Table 1. The degree of peritoneal contamination and clinical outcomes.

Outcome	A	B	p-value
Intraoperative severity classification, n (%)	49 (33%)	101 (67%)	
Length of stay (days, mean \pm SD)	4.5 \pm 2.6	6.3 \pm 4.7	0.0125
Postoperative intra-abdominal abscess, n (%)	4 (8%)	24 (24%)	0.0250
Any complication, n (%)	8 (16%)	41 (41%)	0.0030
Unplanned hospital visits, n (%)	9 (18%)	36 (36%)	0.0368
Readmissions, n (%)	5 (10%)	11 (11%)	1.0000
Total charges (dollars, mean \pm SD)	49,843 \pm 27,276	73,829 \pm 66,298	0.0017

Poster Session II (cont.)

P29

CESAREAN SECTION WITH EXTRACORPOREAL MEMBRANE OXYGENATION STANDBY AS AN ALTERNATIVE TO EX UTERO INTRAPARTUM TREATMENT FOR HIGH RISK CONGENITAL DIAPHRAGMATIC HERNIA

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Purpose: The mortality of patients with severe congenital diaphragmatic hernia (CDH) remains high despite attempts at early intervention including ex utero intrapartum treatment (EXIT) to extracorporeal membrane oxygenation. We hypothesized that scheduled caesarean section (c-section) with extracorporeal membrane oxygenation (ECMO) standby for selected high risk patients could be used in place of EXIT procedure with improved outcomes and avoid the associated maternal morbidity.

Methods: We retrospectively reviewed outcomes of CDH patients from 2008 to 2016. The need for scheduled c-section with ECMO standby was determined prenatally based on predicted lung volume (PPLV) <15 or observed to expected lung to head ratio (O/E) <25. The same multidisciplinary CDH team attended each c-section including cases that were delivered early for maternal or fetal distress.

Results: 8 patients were identified during the study period to undergo c-section with ECMO standby. Mean gestational age was 37 weeks and mean birth weight was 2.8kg. Mean PPLV was 14%. There were no complications related specifically to prematurity including necrotizing enterocolitis or intracranial hemorrhage. 6 of the 8 patients were placed on ECMO immediately after delivery and the remaining 2 were placed on ECMO within 24 hours of life. Mortality in this group was 50%, improved compared to published literature on the most severe CDH patients. There were no maternal complications.

Conclusions: Scheduled c-section with ECMO standby is an alternative to EXIT to ECMO for patients with prenatally diagnosed severe CDH. This avoids potential maternal complications from EXIT procedure and may contribute to improved survival in this patient population. Using established guidelines we identified patients with 100% accuracy of needing early ECMO with 75% needing it immediately after birth. This allows all necessary resources and personnel to be available to assist in these challenging cases.



Poster Session II (cont.)

P30

CLOSING GASTROSCHISIS: THE GOOD, BAD AND THE NOT-SO UGLY

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Tweet it! Poster P30: #ClosingGastro @perrone_erin #eAPSA2018

Purpose: The diagnosis of “closing” or “closed gastroschisis” is made when bowel is incarcerated within a closed or nearly closed ring of fascia, usually with associated bowel atresia. It has been described as having a high morbidity and mortality. We sought to better define this rare entity.

Methods: A review of closing/closed gastroschisis cases (n=53) at six children's hospitals between 2000 and 2016 was completed.

Results: Prenatal ultrasounds showed dilated bowel in 74% of cases, but no definitive prenatal diagnoses of closing/closed gastroschisis were made. The mean age at delivery was 34.8 weeks. 89% of infants survived; 4 died prior to NICU discharge and 3 of these were classified as “early deaths”. Among the surviving babies, 39 had intestinal atresias that were repaired at a median of 49 days (range 1-115): 6 underwent early repair (<14 days), 20 underwent fascial closure with delayed atresia repair (≥14 days), and 13 underwent immediate fascial closure and stoma followed by delayed atresia repair. We developed a new classification system for closing/closed gastroschisis: Type A (15%): bowel significantly narrowed at the ring but without atresia; Type B (51%): intestinal atresia with a mass of viable external bowel; Type C (26%): closing ring with non-viable external bowel +/- atresia; and Type D (8%): completely closed defect with either a nubbin of exposed tissue or no external bowel. Follow up data is supplied in the table for each defect.

Conclusions: Unless the external bowel in a closing gastroschisis is clearly necrotic it should be reduced and evaluated later. Survival was found to be much better than previously reported. If criteria for prenatal diagnosis can be defined, this could allow for selected fetal intervention or earlier delivery that might avoid type C and D variants with massive intestinal loss and increased morbidity.

Poster Session II (cont.)

Follow up data					
	Total (n=53)	A (n=8)	B (n=27)	C (n=14)	D (n=4)
Survival (%)	47 (89)3 early deaths	7 (88)	25 (93)2 early deaths	12 (86)	3 (75)1 early death
Length of Bowel (mean, cm)	69	Normal	78	54	37
NICU LOS*(mean, days)	127 (20-544)	43 (20-104)	137 (45-544)	171 (20-328)	96 (46-182)
Long term results:					
Cholestasis at follow up (%)**	6/49 (12)	1/8 (13)	2/25 (8)	3/13 (23)	0/3 (0)
Sent home on TPN (%)**	28/49 (57)	1/8 (13)	12/25 (48)	12/13 (92)	3/3 (100)
On TPN at last fol- low up (%)**	17/49 (35)	1/8 (13)	7/25 (28)	8/13 (62)	1/3 (33)
# central lines (median, range)**	1 (0-11)	0.5 (0-9)	1 (0-11)	2.5 (0-5)	3 (1-3)
# post NICU hospitalizations (median, range)**	4 (0-49)	1 (0-39)	4 (0-49)	7 (0-39)	16 (5-24)



Poster Session II (cont.)

P31**

THE EFFICIENCY OF A FAMILY-CENTERED APPROACH TO PEDIATRIC INDUCTION OF ANESTHESIA

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Tweet it! Poster P31: Family member presence during induction of pediatric anesthesia @natcjay #eAPSA2018

Purpose: We initiated a pediatric surgical program where a family member accompanies the child during induction of anesthesia. During this period, we measured program satisfaction and effect on time spent in the pre-operative area and operating room.

Methods: Families with children undergoing surgery at a tertiary care hospital between June 2016 and September 2017 were included. Time between arrival and departure in the pre-operative area (pre-operative time) and between arrival in the OR and time of incision (induction time) was collected and compared between the program participants and non-participants. Satisfaction surveys were given to all participating family members and staff. Statistical analysis was performed using an unpaired t-test and Wilcoxon Rank-Sum test with significance at $p < 0.05$.

Results: Of the 1567 patients undergoing surgery within the time period, 118 participated in the program and 1449 did not. Both the mean pre-operative and induction times were shorter in the participant group (82.5 vs 94.4 minutes, $p=0.0091$, and 14.3 vs 17.7 minutes, $p<0.0001$, respectively). Both parents (97%) and staff (77.5%) rated the program as "beneficial" or "very beneficial" (1=not beneficial, 5=very beneficial) to the patient. The median response among the parent groups was "very beneficial", whereas the median response among the staff group was "beneficial" ($p=0.0007$). Parents also answered that it "greatly reduced" (1=not reduced at all, 5=greatly reduced) their anxiety (74.4%) and their child's anxiety (76.7%). No program associated adverse events occurred.

Conclusions: Opponents of programs involving the presence of a family member during induction of pediatric anesthesia suggest that their presence slows care and is disruptive. We found that our program was felt to be beneficial by hospital staff, even more so by parental participants, and also decreased perceived parent and child anxiety. The program participants also experienced decreased overall time in the preoperative area and time to induction in the operating room.

Poster Session II (cont.)

P32

A NOVEL NON-INVASIVE APPENDICITIS SCORE WITH A URINE BIOMARKER

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Purpose: Current diagnostic scores for appendicitis are all based on haematological markers which mandate venepuncture for patients. We evaluate the performance of a new score incorporating a urine biomarker, Leucine rich alpha-2-glycoprotein (LRG), for the diagnosis of pediatric appendicitis.

Methods: From January to August 2017, we prospectively enrolled children aged 4-16 years old admitted to our wards suspected of appendicitis. Urine samples for LRG analysis were obtained from patients on admission and pre-operatively. Urinary LRG levels were quantified by enzyme-linked immunosorbent assay (ELISA) after correction for patients' hydration status. The diagnosis of appendicitis was based on operative histology. Logistic regression was used in statistical analysis.

Result: A total of 148 patients were recruited of which 42(28.4%) were confirmed to have appendicitis. Our Appendicitis Urinary Biomarker (AUB) score incorporated 4 variables (3 clinical, 1 urinary biomarker) into the following linear predictor:

$y = -2.6691 + 1.604 \times \text{constant pain} + 0.943 \times \text{Right iliac fossa tenderness} + 1.540 \times \text{Pain on hop/cough/percussion} + 0.00384 \times \text{LRG/Creatinine (mg/mmol)}$

(For each clinical variable, its presence = 1 and absence = 0)

The predicted probability of appendicitis, $p = \exp\{y\} / (1 + \exp\{y\})$

Area under the **ROC** curve for AUB was **0.823** versus **0.783** for Pediatric Appendicitis Score (PAS) on the same cohort of patients. Using a cut-off of $p = 0.15$, **sensitivity** for the AUB was **97.6%**, **negative predictive value 97.6%**, positive predictive value 38.3%, negative likelihood ratio 0.06 and specificity 37.7%. At this cut-off, the AUB correctly identified 40 non-appendicitis patients with only one false negative.

Conclusion: The AUB is the first non-invasive appendicitis score combining clinical features with a urinary biomarker. Its performance as a negative predictor for appendicitis appears to be superior to PAS which requires blood sampling. However, its utility will require validation in a larger cohort of patients.



Poster Session II (cont.)

P33

IMPACT OF DISEASE-SPECIFIC VOLUME AND HOSPITAL TRANSFER ON OUTCOMES IN GASTROSCHISIS

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Purpose: Given conflicting findings in prior reports, this study aims to assess the impact of disease-specific surgical volume and early hospital transfer on gastroschisis outcomes in a prospectively collected cohort.

Methods: Data were collected prospectively on newborns with gastroschisis, birthweight ≥ 1500 g, born 2009-2015, and admitted to 159 participating US centers separated into terciles based on number of annual gastroschisis repairs. Infants transferred after gastroschisis repair were excluded. Multivariate analysis for association between center volume or transfer status and mortality, sepsis and length of stay was performed.

Results: There were 4,663 infants included: 307 from 53 low (L), 1,201 from 55 medium (M), and 3,155 from 51 high (H) volume centers. Median (IQR) gastroschisis repairs performed annually were 1 (1,2), 4 (2,5), and 9 (6,13) at low, medium and high volume centers, respectively. Infants at high volume centers had higher rates of intestinal atresia (4.9% L, 3.7% M, 5.7% H; $P=0.04$) and outborn status (8.5% L, 14.1% M, 29.8% H; $P<0.0001$). High volume centers had lower Cesarean section rates (69.7% L, 57.2% M, 48.5% H; $P<0.0001$). Outborn infants ($N=1,134$) had higher rates of gastrostomy/jejunostomy placement (7.9% vs. 5.3%, $P<0.001$) and lower rates of Cesarean section birth (46.2% vs. 54.1%, $P<0.0001$). Mortality was universally low (2.0% L, 2.4% M, and 1.7% H). Mortality was 2.0% and 1.9% for outborn and inborn infants, respectively. On multivariate analysis, mortality, rate of sepsis and length of stay did not differ by center volume; outborn status correlated with longer length of stay ($P=0.001$), not mortality or sepsis (Table).

Poster Session II (cont.)

Factors associated with mortality, sepsis, and length of stay in gastroschisis						
	Mortality (Odds Ratio)	95% Confidence Interval	Sepsis (Odds Ratio)	95% Confidence Interval	Length of Stay (Poisson Regression; B)	95% Confidence Interval
High volume center	0.71	(0.46-1.10)	0.98	(0.75-1.27)	0.05	(-0.02, 0.11)
Outborn	1.02	(0.60-1.72)	1.03	(0.75-1.42)	0.10	(0.04, 0.16)*
Male	1.18	(0.83-1.68)	1.10	(0.90-1.35)	-0.06	(-0.05, 0.03)
Gestational age <37 weeks	1.97	(1.11-3.51)*	1.25	(0.96-1.63)	0.07	(0.03, 0.12)*
Birth weight <2500 grams	1.18	(0.75-1.88)	1.21	(0.96-1.51)	0.14	(0.10, 0.18)*
Cesarean section	0.68	(0.44-1.06)	0.81	(0.66-0.99)	-0.02	(-0.05, 0.03)
Atresia	0.30	(0.09-1.06)	0.96	(0.68-1.35)	0.26	(0.16, 0.36)*
Other congenital anomaly	10.87	(6.51-18.12)*	1.36	(0.70-2.54)	0.15	(0.01, 0.28)*
Bowel resection	3.03	(1.72-5.33)*	3.73	(2.92-4.77)*	0.87	(0.80, 0.94)*

Conclusions: Infant characteristics and practice patterns vary by center based on gastroschisis surgical volume. On multivariate analysis, center volume and patient transfer status did not correlate with mortality. Further investigation to identify subsets of gastroschisis infants who would benefit from delivery at or early transfer to higher volume centers is warranted



Poster Session II (cont.)

P34

PROSPECTIVE LONG-TERM CLINICAL AND QUALITY OF LIFE OUTCOMES IN PEDIATRIC FECAL INCONTINENCE FOLLOWING BOWEL MANAGEMENT

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Purpose: Fecal incontinence (FI) has significant effects on pediatric psychosocial development and caregiver stress. The long-term success of a bowel management program (BMP) has yet to be described with objective clinical and quality of life measures. We report a prospective observational study evaluating the FI severity and FI quality of life (QOL) scores one year after completion of BMP.

Methods: With IRB approval (2011-3239), we enrolled 342 parents of children aged 3 to 12 years attending bowel management. BMP consists of either enemas or laxatives with serial abdominal films to titrate the appropriate daily therapy. Study measures were given at baseline, 2 weeks, 3 months, and 1 year. Measures included CINCY-FIS, a psychometrically validated FI QOL score, and our FI severity score. Statistical analysis was completed with SAS 9.4.

Results: The majority of participants were male (61%), Caucasian (74%), and used enemas (55%). Median age was 6.6 years. Underlying causes of FI included: anorectal malformations (ARM) (44%), idiopathic constipation (IC) (29%), spina bifida (SB) (16%), Hirschsprung disease (HD) (11%), and other (0.6%). At least three study visits were completed by 74% of participants. There was a significant improvement over time with the CINCY-FIS score ($p < 0.01$) and clinical symptoms of incontinence ($p < 0.01$) (Fig.1). Improvement in FI was associated with improvements in QOL ($p < 0.01$). Change in QOL score differed by diagnosis ($p < 0.01$). QOL At 1 year was significantly lower for HD than IC and ARM (each $p < 0.01$) and IC was greater than SB ($p = 0.02$). Diagnosis type was significantly associated with clinical symptoms of incontinence. Compared to ARM, HD had lower odds of improvement (OR=0.56, $p = 0.02$), whereas IC ($p = 0.30$) and SB ($p = 0.65$) were similar to ARM.

Conclusions: Significant improvement in quality of life is associated with improved incontinence after bowel management. Success with BMP is sustainable over one year. Outcomes improve over time and differ between diagnoses.

Poster Session II (cont.)

Fecal Incontinence Severity and Quality of Life After Bowel Management

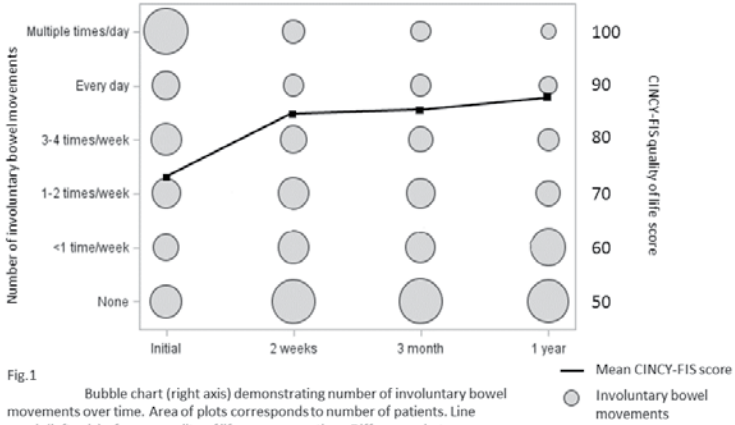


Fig.1

Bubble chart (right axis) demonstrating number of involuntary bowel movements over time. Area of plots corresponds to number of patients. Line graph (left axis) of mean quality of life scores over time. Differences between initial and 1 year were statistically significant ($p < 0.01$) for fecal incontinence severity and quality of life scores.



Poster Session II (cont.)

P35

NON-OPERATIVE MANAGEMENT OF EXTRALOBAR PULMONARY SEQUESTRATIONS: A SAFE ALTERNATIVE TO RESECTION?

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Purpose: This retrospective cohort study compares the natural history of patients with extralobar sequestrations (ELS) that do not undergo intervention with those that are resected in order to assess the safety of non-operative management.

Methods: 126 patients with pulmonary sequestrations or congenital pulmonary airway malformations (CPAM) born between 1999-2016 were identified. 49 had ELS on postnatal imaging, with 2 patients excluded for associated congenital diaphragmatic hernia. Demographic and clinical data were retrospectively reviewed, with phone follow-up for non-operative ELS patients with no clinical records for >1 year. Statistical analysis was by Fisher's exact test (two-tailed $P < 0.05$).

Results: 40% (19/47) were managed non-operatively and 60% (28/47) underwent resection based on surgeon preference. Patients managed non-operatively were less likely to have an intrathoracic ELS: 47% (9/19) vs. 75% (21/28), $p = 0.07$. No patients developed high-output cardiac failure or pulmonary hemorrhage. No symptoms were attributed directly to the ELS; however, 2 patients had pneumonia in different locations than the ELS and 3 premature infants required ventilator support after birth. Follow-up of non-operative patients was mean 3.5 years (range 2 weeks to 10 years), during which time 1 lesion increased in size, 7 were stable and 10 were smaller on serial imaging (CT and/or ultrasound). There was 100% concordance between CT imaging and intraoperative findings. 50% (14/28) of resected lesions had foci of non-aerated CPAM on final pathology. No specimens had evidence of inflammation, infection or malignancy.

Conclusions: In our cohort of ELS patients, the ELS was asymptomatic on presentation. In those observed, no symptoms were attributable to the ELS on long-term follow-up. In those undergoing surgical resection, no concerning pathology findings were observed, even if they had a component of associated non-aerated CPAM. Although further longitudinal study is required, this study supports non-operative management of ELS as a safe, and potentially preferred, option.

Poster Session II (cont.)

P36

EARLY VS LATE POSTNATAL RESECTION IN CONGENITAL LUNG MALFORMATIONS

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Purpose: The timing of elective resection for children with congenital lung malformations (CLM) is controversial with some suggesting that delayed surgery is associated with fewer complications. In this study, we examined post-surgical outcomes for a consecutive series of children treated with elective operations for congenital lung malformations.

Methods: Following IRB approval (H-40176), a retrospective review was performed of a prospectively collected dataset of all fetuses evaluated for a CLM between July 2001 and July 2016. Prenatal findings, operative treatment and postnatal outcomes were collected. Children having elective operations (admitted same day as surgery) were divided in two groups based on age at time of surgery. Data were analyzed using descriptive statistics, chi-square analysis and Student's t-test; a p-value < 0.05 was considered significant.

Results: Of 220 fetuses, 143 had operations and follow-up at our center. Six had open fetal lobectomy, 17 had EXIT-to-resection, 16 had urgent thoracotomy and 110 with asymptomatic lesions had elective resection. Of these 110, the median fetal CVR was 0.8 [0.1 - 2.2], mean gestational age of diagnosis was 25.1±3.1 weeks, and median age at operation was 4(1-60) months (58% had resection at <4 months). Overall complication rate, including air-leak syndromes and pleural effusion, was 15%. Chest tubes were placed in 75% of patients for a mean duration of 2.5 ± 1.3 days. When comparing those having resection at ≥ 4 months to those < 4 months, there were no significant differences in chest tube duration or length-of-stay (p=0.98 and 0.52, respectively). No patient with surgery at <4 months was readmitted or developed a pleural effusion postoperatively. Overall cohort survival was 100%

Conclusions: Fetuses with an asymptomatic CLM have excellent outcomes following elective resection. Early elective resection is not associated with increased risk and may provide advantages including better compensatory growth from non-resected lung.



Poster Session II (cont.)

Table 1. Comparison of Early vs Late Resection			
	Resection < 4 months (n=64)	Resection ≥ 4 months (n=46)	p-value
Age at Operation	2.9 (0.8)	9.1 (8.7)	<0.001
Chest Tube Placement	82.5% (n=47)	80.0% (n=36)	0.53
30 Day Readmission	0	7.0% (n=3)	0.02
Complications	11.1% (n=7)	17% (n=9)	0.07
Airleak	7.9% (n=5)	8.7% (n=4)	0.78
Pleural effusion	0	6.5% (n=3)	0.04
Conversion to Open	3.2% (n=2)	0	0.22
Other (chlyothorax, sepsis)	0	4.7% (n=2)	0.33
Mean Length of Stay (SD)	3.5 (3.4)	3.5 (2.1)	0.52

Poster Session II (cont.)

P37

LAPAROSCOPIC VERSUS OPEN INGUINAL HERNIA REPAIR IN NEONATES UNDER SPINAL ANESTHESIA

Katharine R. Bittner, MD¹, Briana Leung, MD¹, Ya Zhou, MD¹, Donald Schwartz, MD¹, Gregory Banever, MD², David Tashjian, MD², Kevin Moriarty, MD², Michael Tirabassi, MD².

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Purpose: Demonstrate the feasibility and safety of performing laparoscopic neonatal inguinal hernia repair under spinal anesthesia.

Methods: After obtaining IRB approval, a retrospective cohort study was performed. All charts were reviewed for patients that had inguinal hernia repair performed in the first 6 months of life under spinal anesthesia. Cases were reviewed from 1/1/2012 through 6/1/2017. Outcomes included operative time, need for additional procedures and adverse events such as apnea, bradycardia, infection and hernia recurrence.

Results: Sixty-nine patients met inclusion criteria (13 laparoscopic, 56 open). Patient characteristics were similar across the laparoscopic (LG) and open (OG) groups: 92.3% and 85.7% were born prematurely, and 61.5% and 57.1% had a respiratory comorbidity, respectively. Mean operative time was shorter in LG, with an average of 34 minutes versus 48 minutes for OG. On multivariate analysis, the difference between operative times was significant ($p=0.020$). 23.1% of patients in LG had a preoperative diagnosis of bilateral inguinal hernia, compared to 8.9% of OG. Bilateral repairs were performed more often in LG, where 69.2% of patients underwent bilateral repair compared to 10.7% in OG. 46.2% in the LG and 3.6% in OG had a contralateral hernia discovered and repaired at time of initial operation. There were no wound infections or hernia recurrences in either group. 7.7% of LG and 1.9% of OG had at least one episode of apnea. None in LG and 5.6% of those in OG had at least one episode of bradycardia postoperatively. Seven patients in the open group underwent a second, contralateral hernia repair following their initial operation.

Conclusions: Laparoscopic inguinal hernia repair appears to have comparable outcomes to open hernia repair when performed under spinal anesthetic and may be a more efficient approach to addressing subclinical contralateral hernias, possibly avoiding another operation in up to 12.5% of patients in the open group.



Poster Session II (cont.)

Demographic and Clinical Characteristics		
	Laparoscopic (n=13)	Open (n=56)
% Premature	92.3 %	85.7%
Mean age at surgery, months	2.5 +/- 0.9	2.6 +/- 0.8
Mean weight at surgery, grams	3128 +/- 696	3078 +/- 866
Preoperative diagnosis of bilateral inguinal hernia	23.1%	8.9%
Bilateral repair performed	69.2%	10.7%
Contralateral hernia discovered during initial repair	46.2%	3.6%
Additional procedures performed at time of initial repair	61.5%	51.8%
Total operative time in minutes (min-max)	34 (23-49)	48 (19-149)

Poster Session II (cont.)

P38

DELAYED REDUCTION OF OMPHALOCELE WITH PROSTHESIS: AN APPROACH TO SINGLE-STAGED REPAIR OF GIANT DEFECTS

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Background: Defined in the literature as defects larger than five centimeters or containing the liver within the hernia sac, giant omphalocele occurs in approximately 1 in 5000 live births. Small defects can be closed primarily; however, large defects often result in abdominal volume mismatch precluding immediate reduction. Coupled with associated birth defects and prematurity, giant omphaloceles can be a difficult problem to manage. The purpose of this study is to describe a novel technique of gentle reduction to allow for a single-staged surgical closure at one-year of age through remodeling of the abdominal wall.

Method: With IRB approval, patients with prenatal diagnosis of giant omphalocele were identified. A treatment plan was developed with the parents and coordinated with physical therapy. Patients were fitted for a custom orthosis with inserts for compression. Serial gentle compression continued until complete reduction into the abdominal cavity. The infants were wrapped in an elastic dressing until definitive surgical closure. At operation, the fascial defect was closed primarily and an umbilicoplasty was performed for cosmesis.

Results: Three patients have undergone serial compression with delayed primary fascial closure. Patients were seen at birth by pediatric surgery, with an average defect size of 7 cm. Custom orthotic device fitting was coordinated with physical therapy, and serial compression was continued by the parents at home. Once contents were reduced, definitive surgery was scheduled. At operation, all underwent tension-free primary approximation of the fascia. They were admitted for pain control and resumed infant diet the following morning. Average length of stay was two days, and on follow-up all are asymptomatic.

Conclusions: Gentle reduction of omphalocele with prosthesis-aided compression is a novel method to allow for single-staged closure of giant defects. Our preliminary findings suggest that this approach facilitates a primary fascial closure and cosmetically acceptable outcomes.



Poster Session II (cont.)



Poster Session II (cont.)

P39

A POPULATION-BASED ANALYSIS OF PEDIATRIC BREAST CANCER

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Tweet it! Poster P39: Pediatric Breast Cancer: A 10-year update on a rare pediatric malignancy @mw1211 #eAPSA2018

Purpose: To evaluate trends in demographics and outcomes of pediatric breast cancer from 1973-2014 in a United States population-based cohort.

Methods: The Surveillance, Epidemiology and End Results (SEER) database was utilized to identify all pediatric patients (19 years old and younger) with malignant breast tumors diagnosed between 1973 and 2014. Analysis was performed using Stata Statistical Software version 13.1 (StataCorp LP, College Station, TX). Univariate survival analysis was completed using the log-rank test. Kaplan-Meier analysis was performed to investigate five-year and ten-year survival rates across several variables. Correlations between categorical variables were made using the X^2 test.

Results: A total of 135 patients with breast malignancies were identified. The majority (85.19%) were 15-19 years old at the time of diagnosis, with a median age of 17 years old. Evaluation of race showed that the majority was white (67.91%). Carcinoma was the most prevalent histologic type (48.51%), followed by fibroepithelial tumors (35.07%), and sarcoma (14.18%). Fibroepithelial tumors were twice as common in non-whites compared to whites ($p < 0.05$). Analysis of histology by stage revealed that 100% of fibroepithelial tumors were early stage disease ($P < 0.0001$). Nearly half (46.67%) of the tumors tested were ER/PR negative, over twice as many when compared to the published adult estimate of 20%. Survival analysis did not reveal any survival differences between age groups, race, histologic subtypes, stage, grade, or hormone status.

Conclusion: Breast cancer remains a rare malignancy among pediatric patients. Although non-white patients were found to have the majority of non-carcinomatous tumors with less advanced disease, this did not confer a survival advantage. In addition, this data suggests that adolescents may have higher rates of ER/PR negative breast cancer than adults.



Poster Session II (cont.)

P40

SURGERY RESIDENTS AND FAMILY DYNAMICS: ARE OUR TRAINEES EQUIPPED TO HANDLE PATIENT CARE BEYOND THE DISEASE?

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Tweet it! Poster P40: Poster P40: Be involved in discussion of #Psychosocial #Family #Dynamics faced by #Surgery #Residents #Stress #PediatricSurgery @EdwardPedSurg #eAPSA2018

Introduction: With increasing interest in family-centered care, surgical trainees are expected to demonstrate knowledge beyond the biologic aspects of diseases. However, it is unclear if residents are equipped with the knowledge required to handle the psychosocial factors of pediatric patients. Previous direct observations of surgery residents revealed that they often seemed ill at ease with complex family interactions. In anticipation of developing a family dynamics curriculum, our aim was to evaluate the baseline knowledge of family dynamics among surgical residents.

Methods: Over a 6-month period, a family therapist accompanied the surgery team on rounds to gather ethnographic data regarding salient family-resident issues. In addition, surgery residents (n=16) were given an anonymous questionnaire regarding their comfort with psychosocial aspects of patient care and their facility in handling various family behaviors. Using a Likert scale, the survey assessed their familiarity with family adjustment phases and family developmental stages, relational triangles, ambiguous loss, the ABCX model of family stress, and the SPIKES model for breaking bad news. Finally, in an open-ended question, they were asked what they felt least prepared to handle when working with patients' families.

Results: Most trainees lacked knowledge regarding family stress models (100%), the SPIKES model (88%), relational triangles (78%), ambiguous loss (75%), family adjustment phases (50%), and family developmental stages (40%). Almost half of residents felt unsure or unprepared for dealing with most family behaviors except anxiety or sadness (Table 1). Finally, residents uniformly felt the least prepared to break bad news to families.

Poster Session II (cont.)

	Not at all	Not very	Unsure	Somewhat	Very
Anxious		19%		75%	6%
Sad		19%	12%	63%	6%
Controlling		25%	19%	56%	
Demanding		13%	31%	50%	6%
Helpless	25%	13%	12%	44%	6%
Angry		38%	12%	50%	
Apathetic	12%	25%	19%	44%	
Non-compliant		37%	25%	38%	
Manipulative	19%	13%	31%	31%	6%

Conclusion: Surgery residents feel ill-prepared to handle the family dynamic issues that they face daily. A cross-disciplinary family dynamic curriculum with a modest amount of family theory and clearly delineated interactive tools could potentially alleviate resident concern, improve patient care and promote professional development.



Poster Session II (cont.)

P41

OUTCOMES AND COST OF APPENDECTOMY AT RURAL HOSPITALS

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Background: Rural Hospitals play a critical role in the nation's safety net by providing critical access to patients living in remote areas. Despite policy efforts to support rural hospitals, little is known about the quality of care provided. Our aim was to determine outcomes and charges of appendectomy performed at rural hospitals.

Methods: We used the Kids' Inpatient Database (KID) to compare outcomes of appendectomies between urban and rural hospitals. The study included patient discharges for children under age 18 who received an appendectomy (weighted n = 299,149) in KID 2003, 2006, 2009 and 2012. Survey weighted bivariate and multivariable regression analyses were performed with primary outcomes including rates of perforation, negative appendectomy, laparoscopy, morbidity, length of stay (LOS) and charges.

Results: Univariate analysis (table) showed rural hospitals had lower rates of laparoscopy and perforated appendicitis with higher rates of negative appendectomy and morbidity. Multivariable analysis confirmed rural hospitals were more likely to have a negative appendectomy (OR=1.55, 95% CI 1.45-1.66, p<0.01), but less likely to have perforated appendicitis (OR=0.87, 95% CI 0.84-0.90, p=0.06). Rural hospitals were less likely to use laparoscopy (OR=0.49, 95% CI 0.47-0.50, p<0.01) and had increased post-operative morbidity (OR=1.27, 95% CI 1.18-1.38, p<0.01). Rural hospitals had shorter LOS (OR=0.91, 95% CI 0.90-0.92, p=0.01) and slightly higher overall cost (log dollar 1.02, 95% CI 1.01-1.02, p<0.01).

Conclusions: Rural hospitals care for fewer patients with advanced appendicitis. Despite this lower disease severity, appendectomies performed at rural hospitals are associated with higher negative appendectomy rate, lower laparoscopy use, higher morbidity and higher cost. Additional studies are needed to identify factors that drive this disparity in order to improve the quality of surgical care in rural settings.

Table 1: Univariate Analysis

	Urban(N=258,484)	Rural(N=40,665)	p-value
Mean Age (years)	11.9	11.3	<0.01
Female	39.7%	40.2%	<0.01
Laparoscopy	59.6%	42.5%	<0.01
Non-perforated, Acute	68.2%	69.5%	<0.01
Perforated Appendicitis	28.6%	25.0%	<0.01
Negative Appendectomy	3.2%	5.4%	<0.01
Negative Appendectomy	3.2%	5.4%	<0.01
Complications	3.3%	4.2%	<0.01

Poster Session II (cont.)

Length of Stay (days)	2.84	2.44	<0.01
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P42

DOES AN ENHANCED RECOVERY PATHWAY RESULT IN IMPROVED OUTCOMES FOLLOWING ILEO-POUCH ANAL ANASTOMOSIS IN CHILDREN WITH FAMILIAL ADENOMATOUS POLYPOSIS?

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Purpose: The intent of Enhanced Recovery after Colorectal Surgery (ERAS) pathways is to achieve an optimum outcome in patients undergoing colorectal surgery. The purpose of this study is to evaluate the effect of an ERAS pathway on children with Familial Adenomatous Polyposis (FAP) who underwent an ileo pouch anal anastomosis (IPAA).

Methods: After IRB approval, a review from 2007-2017 was performed. The study population was separated into groups before (NEG) and after (EG) the implementation of an ERAS pathway. The ERAS pathway includes preoperative counseling, minimal bowel prep, minimally invasive incisions, intravenous antibiotics, early removal of a nasogastric tube, patient controlled anesthesia, early forced mobilization and avoidance of a protective stoma when feasible. Data collected includes patient demographics and outcomes. A statistical significance was set at <0.05 using GraphPad® San Diego, CA.

Results: Twenty-six children ages 5-18 yrs were identified (NEG, n=11; EG, n=15). All children from both groups underwent a laparoscopic procedure. Of EG, 14/15 (93%) underwent a one-stage procedure without a protective stoma. Time to discharge following the procedure was reduced in the EG group (5.1 +/- 0.4 days) vs NEG group (8.8 +/- 2.1 days) (p=0.1). ER return visits were less in the EG group (p<0.05) as was need for readmission (p<.05). Complications included ileoanal stricture requiring dilatation (NEG, n=3; EG, n=1); pouchitis (NEG, n=2) and bowel obstruction (NEG; n=1).

Conclusions: An ERAS pathway appears to improve outcome parameters following ileo pouch anal procedures in pediatric patients with FAP without additional risk of complications. Larger multi-institutional studies are likely to identify further refinements in such pathways which may be of additional benefit to these populations.



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P43

SHORT BOWEL MUCOSAL MORPHOLOGY, PROLIFERATION AND INFLAMMATION AT FIRST AND REPEAT STEP PROCEDURES

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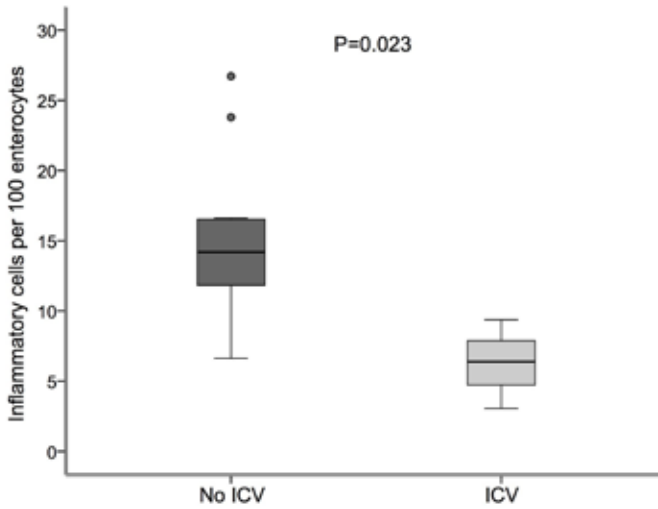
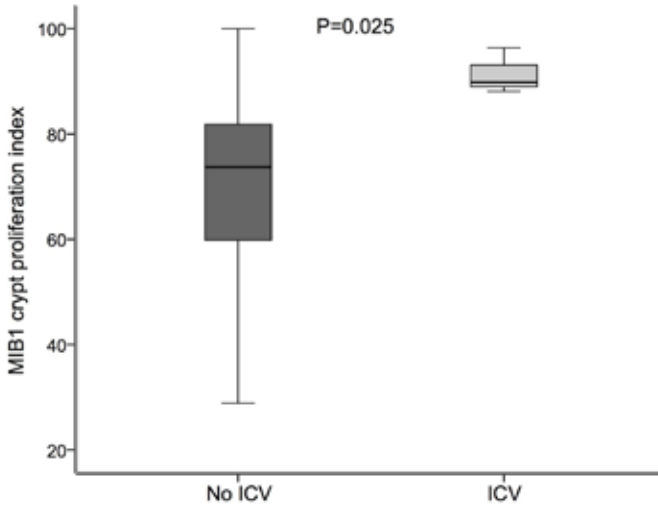
Purpose: Although serial transverse enteroplasty (STEP) improves function of dilated short bowel, a significant proportion of patients require repeat surgery. To address underlying reasons for unsuccessful STEP, we compared small intestinal mucosal characteristics between initial and repeat STEP procedures in children with short bowel syndrome (SBS).

Methods: Fifteen SBS children, who underwent 13 first and 7 repeat STEP procedures with full thickness small bowel samples at median age 1.5 years (IQR 0.7-3.7) were included. The specimens were analyzed histologically for mucosal morphology, inflammation and muscular thickness. Mucosal proliferation and apoptosis was analyzed with MIB1 and TUNEL immunohistochemistry.

Results: Median small bowel length increased 42% by initial STEP and 13% by repeat STEP ($P=0.05$), while enteral caloric intake increased from 6% to 36% ($P=0.07$) during 14 (12-42) months between the procedures. Abnormal mucosal inflammation was frequently observed both at initial (69%) and additional STEP (86%, $P=0.52$) surgery. Villus height, crypt depth, enterocyte proliferation and apoptosis as well as muscular thickness were comparable at first and repeat STEP ($P>0.05$ for all). Patients who required repeat STEP tended to be younger ($P=0.057$) with less apoptotic crypt cells ($P=0.031$) at first STEP. Absence of ileocecal valve associated with increased intraepithelial leukocyte count and reduced crypt cell proliferation index ($P<0.05$ for both, Figure).

Conclusions: No adaptive mucosal hyperplasia or muscular alterations occurred between first and repeat STEP. Persistent inflammation and lacking mucosal growth may contribute to continuing bowel dysfunction in SBS children, who require repeat STEP procedure, especially after removal of the ileocecal valve.

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P44

LOWER EXTREMITY AND PELVIC IMMOBILIZATION OF THE BLADDER AND ABDOMINAL CLOSURE IN CLOACAL EXSTROPHY: AN INSTITUTIONAL STUDY OF TWO MAINSTAY TECHNIQUES

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Purpose: Successful bladder closure in cloacal exstrophy (CE) is best accomplished through a multi-disciplinary team and attention to pre- and post-operative technique. This is the first study from a high volume exstrophy center comparing outcomes and complications of primary and reoperative bladder closures between patients immobilized with spica cast or with external fixation(EF) and skin traction.

Methods: The authors reviewed an institutionally approved and daily updated database of 1311 patients with exstrophy-epispadias complex and identified patients with cloacal exstrophy born after 1975 who had undergone primary or reoperative bladder closures. Demographic, operative and outcomes data were compared between patients with spica cast only, spica with EF or EF with skin traction.

Results: Out of a 140 patients with cloacal exstrophy or CE variant, a total of 67 patients with 95 bladder closures met inclusion criteria. Median follow-up time was 8.8 years (range 1.5-29.1). There were 67 primary closures and 28 reoperative closures, with 37 performed at the authors' institution and 58 from outside hospitals. Pelvic osteotomy was undertaken in 67 (70.5%) of total closures and in 36 (97.3%) of closures at the authors' institution. Post-operative immobilization was achieved with spica cast alone in 46 closures, EF and skin traction in 43 and spica cast and EF in 5 closures. For all closures, there were 33 failures (71.7%) amongst those immobilized with spica cast alone versus 4 failures (9.5%) for those immobilized with EF and skin traction ($p < 0.005$). When restricted to closures performed with osteotomy, the failure rates were 50.0% and 9.5% respectively ($p < 0.005$). There was minimal differences in complication rates between spica and EF groups (8.7% versus 23.3%, $p = .059$).

Conclusions: Failure of cloacal exstrophy closure can occur with any form of pelvic and lower extremity immobilization. This study, however, provides evidence that EF with skin traction is a secure technique for post-operative management.

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P45

SAFESTART: MAKING THE SURGICAL TIMEOUT AN INTERACTIVE PATIENT- AND FAMILY-BASED EXPERIENCE FROM THE CLINIC THROUGH PREOP INTO THE OPERATING ROOM

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Purpose: Our objective was to assess the efficacy of *SafeStart* in creating a comprehensive and engaging surgical consent process to improve patient safety and quality of care.

Methods: 100 pediatric general surgery outpatients were enrolled from October 2016 through March 2017 in this IRB-approved prospective study utilizing the mobile-based *SafeStart* technology. In the pre-operative office visit, comprehensive patient and surgery information was entered in the *SafeStart* program as well as facial identification photos and annotated photos of the intended surgical site. For flexibility, a variety of mobile devices can be used with the program. Independently, the parents reviewed and verified the information through a web-based portal. Next, upon arrival at the hospital, the pre-operative nurse completed an independent review of the *SafeStart* information before the patient proceeded to the OR; this information was verified by the parent. In the OR, *SafeStart* was used during the Surgical Safety Checklist process to verify the photo documentation and the correct surgical site. Postoperatively, a printed record of the *SafeStart* surgical safety process was provided to parents. Parent assessments of the surgical safety process were collected in pre- and post-operative surveys with a 100% response rate. Standard paper consent forms were used and compared as a control to the *SafeStart* process.

Results: Only 31% of parents had knowledge of the surgical safety process prior to utilization of *SafeStart*. Results were ranked on a 5-point Likert scale shown in Table 1.

Conclusions: Parents overwhelmingly said that *SafeStart* made them feel more involved and believed they were helping make their child's care safer. They were actively participating in a process that was created to prevent harm. Further, they thought it would help reduce errors, and virtually all families would highly recommend its use. We concur.



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Table 1: Pre-operative and Post-operative Parent Survey Response Averages		
Pre-operative	Actual	Target
I want a checklist to be used in my child's procedure.	4.7	5.0
I want proof a checklist is being used.	4.3	5.0
Post-operative	Actual	Target
I felt involved in the surgical safety process	4.8	5.0
SafeStart made me feel my child was safer.	4.5	5.0
I feel I had proof I was helping prevent harm.	4.5	5.0
I would not be satisfied with the standard consent form signature.	4.1	5.0
I felt I helped reduce errors.	4.6	5.0
I would recommend SafeStart for my care or my family member's care.	4.7	5.0

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P46

BLOOD TRANSFUSION IN THE BLADDER CLOSURE OF CLOACAL EXSTROPHY: AN INSTITUTIONAL STUDY

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Purpose: The bladder closure in cloacal exstrophy (CE) patients is an extensive surgery that requires a potentially more complicated re-closure if the first closure fails. In the first report of its kind, the authors investigated factors that contribute to risk of receiving an intraoperative transfusion or post-operative transfusion (72 hours) in the bladder closure of CE.

Methods: A prospectively maintained, daily updated IRB approved database of 1311 exstrophy-epispadias complex patients was reviewed for CE patients undergoing bladder closure at the authors' institution from 1975 to 2017. Descriptive data was analyzed to identify potential factors associated with blood transfusions.

Results: Of the 140 CE patients, 48 bladder closures were conducted at the authors' institution. Forty-three had complete peri-operative transfusion information. Of these, 29 underwent a primary closure, and 14 underwent a repeat closure. In the primary and repeat closure groups, 9 (31.0%) and 4 (28.6%) patients were transfused, respectively. In the primary closure group, a similar proportion of patients in the transfused and untransfused group underwent a delayed closure (88.9% vs 95%, $p=0.532$). Similarly, transfused patients had comparable rates of pelvic osteotomy as those not transfused (88.9% vs 95%, $p=0.435$). In our cohort transfused patients had a lower, but not statistically significant rate of osteotomy prior to the bladder closure (62.5% vs 84.2%, $p=0.319$). Operative time was significantly higher in transfused patients (557.5 vs 424.6 minutes, $p=0.042$). In both groups, neither sex nor race affected transfusion rates. No transfusion reactions were observed.

Conclusions: In both the primary bladder closure group and the repeat bladder closure group, the rates of peri-operative transfusion for CE patients was nearly one-third. Only operative time was significantly associated with higher transfusion rates in the primary closure group. Further studies will be necessary to determine factors that may be predictive of receiving a blood transfusion.



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P47

SPONTANEOUS INTESTINAL PERFORATION: A MULTICENTER RETROSPECTIVE COMPARISON OF OUTCOMES BETWEEN PRIMARY PERITONEAL DRAIN VERSUS PRIMARY LAPAROTOMY WITH STOMA AND EVALUATION OF FACTORS ASSOCIATED WITH PRIMARY PERITONEAL DRAIN FAILURE

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Purpose: Compare outcomes between infants with spontaneous intestinal perforation (SIP) treated with primary peritoneal drain versus primary laparotomy, and to further identify predictors for drain failure.

Methods: After IRB approval was obtained, a multicenter retrospective review was performed between 2012-2016. Patients with perinatal intestinal perforation were included. We excluded patients with birth weight >1500 g, necrotizing enterocolitis signs on imaging, abdominal wall erythema or death <48hrs from diagnosis. We compared demographics and outcomes post-intervention of drain versus stoma.

Results: We identified 78 patients treated for SIP (drain n=41 vs. laparotomy n=37). There were no differences in maternal characteristics. Drain patients were more premature (24.9 vs 25.8 weeks, p=0.02), had lower birth weight (<750 g vs >750 g, p=0.008) and had higher rates of severe intraventricular hemorrhage (n=15 vs n=1, p<0.001). There were no significant differences in vital signs, labs or pressor requirements from diagnosis up to 48 hours after intervention. No significant differences were found in complications, need for rescue laparotomy, time to full feeds, length of stay (LOS) or mortality between the groups; however, the primary laparotomy group had more procedures [2.2 (0.7) vs 1.4 (0.5), p<0.001]. There were 12 (29%) primary drain failures, and laparotomy was ultimately needed. These patients had longer gestational age (25.7 vs 24.6 weeks, p=0.008) and higher birth weight (>750g, p=0.008). Additionally, they had longer time to full feeds and longer LOS, but no change in mortality.

Conclusions: Spontaneous intestinal perforation treated with primary drain is successful in the majority of patients with no significant changes in outcomes when compared to laparotomy with stoma. Primary drain failure is more common in neonates with longer gestational age and higher birth weight.

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CORRECTION OF TRACHEOBRONCHOMALACIA MAY FACILITATE REMOVAL OF TRACHEOSTOMY

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Purpose: The goal of this study is to assess the effectiveness of surgical correction of tracheobronchomalacia (TBM) at weaning mechanical ventilator support, thus facilitating tracheostomy removal.

Methods: A retrospective review identified patients who were referred for the correction of TBM after placement of a tracheostomy from January 2011- July 2017. (IRB# P00004344). Outcome measures included tracheostomy removal, need for ventilator support and additional planned reconstructive airway procedures.

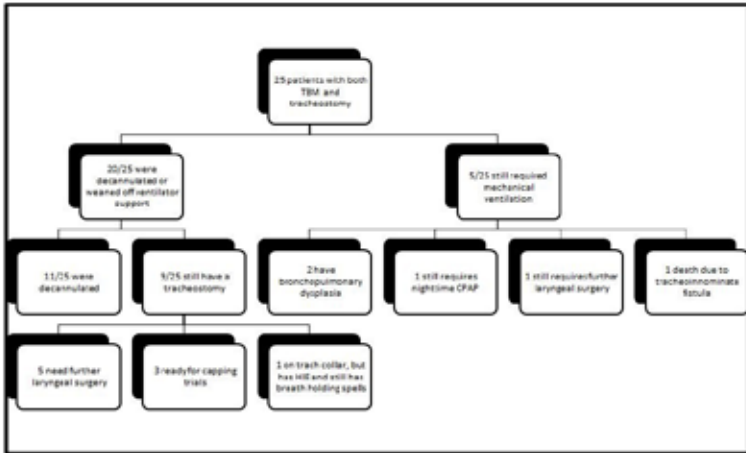
Results: Twenty-five patients were identified as having both significant TBM and a tracheostomy prior to our evaluation (Figure 1). Following TBM repair, 11/25 (44%) successfully underwent tracheostomy removal and another 9/25 (36%) were weaned off mechanical ventilation, but still had tracheostomies. Of these 9 patients, 5 will require laryngotracheal reconstruction (LTR) prior to tracheostomy removal, and 3 are ready for capping trials. Two patients were noted to have bilateral vocal cord paresis; however, one patient has been decannulated, and one is ready for a capping trial. Five patients (5/25, 20%) were able to be weaned, but still required mechanical ventilation; two have existing bronchopulmonary dysplasia. Seven patients (7/25, 28%) required both posterior and anterior tracheopexies to correct their TBM; of these patients, 3/7 (43%) had successful tracheostomy removals and another 3/7 (43%) were able to wean off mechanical ventilation. One death occurred due to a tracheo-innominate artery fistula related to the tracheostomy.

Conclusions: Correction of TBM has greatly facilitated weaning off mechanical ventilator support and subsequent tracheostomy removal. While other factors, such as a need for LTR, may also need to be addressed prior to tracheostomy removal, airway evaluation and correction of TBM should be strongly considered in patients that have tracheostomies for tracheobronchomalacia.



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Figure 1: Results after Correction of Tracheobronchomalacia. Of the 25 patients requiring a tracheostomy pre-operative with TBM, 20 were able to fully wean off of ventilator support or be successfully decannulated. There was one death due to a trachea-innominate artery fistula.



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P49

DOWNREGULATION OF OCCLUDIN PROTEIN IN NECROTIZING ENTEROCOLITIS IS ASSOCIATED WITH ALTERED EXPRESSION OF MICRORNA-21

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Purpose: Necrotizing enterocolitis (NEC) is a devastating intestinal disease of neonates. NEC is associated with increased intestinal permeability and decreased tight junction proteins (i.e. occludin). MicroRNAs (miRNAs) are small non-coding RNAs that negatively regulate gene expression. Aberrant expression of miRNAs is found in the intestinal epithelium of patients with inflammatory bowel disease; however, no studies have examined the role of miRNAs in NEC. We hypothesize that decreased occludin is regulated by miRNA expression in the intestinal epithelium during NEC.

Methods: To test our hypothesis, we analyzed patterns of three occludin-regulating miRNAs (miR-21, miR-122 and miR-874). An in-vitro NEC model of Caco-2 cells (human intestinal cell line) + lipopolysaccharide (LPS) + tumor necrosis factor alpha (TNF α) was studied over a seven-day time course. Serial transepithelial resistance (TEER) and permeability to FITC-dextran were measured to assess tight junction function. Additionally, we examined human intestinal NEC vs control samples for similar patterns (N=9). Changes in miRNA, mRNA and protein were analyzed by RT-PCR, western blot and immunofluorescence. Data was analyzed with Student's t-test or ANOVA.

Results: A sustained decrease in TEER of 50% was identified in experimental NEC by 24 hours (p=0.003) as well as an increase in FITC at day seven (p<0.001). Significant changes of miR-122 or 874 were not identified. Increased expression of miR-21 (p=0.005) in experimental NEC was associated with decreased occludin mRNA and protein expression (p=0.004) after three days. Similarly, human intestinal NEC samples expressed higher levels of miR-21 than the controls. This finding was accompanied by a decrease in occludin mRNA (p=0.006) and occludin protein expression (p=0.008).

Conclusions: An increase of intestinal cell permeability is found in NEC compared with controls. This increase is associated with downregulation of occludin RNA and protein. These changes are preceded by increased miR-21 expression.



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P50

PEDIATRIC DOG BITE MANAGEMENT OUTCOMES: INFECTIONS AND SCARS

Benjamin L. Drumright, BS¹, Breanna A. Borg, BS¹, Arlene A. Rozzelle, MD², Lydia J. Donoghue, MD², Christina M. Shanti, MD².

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Introduction: There is little consensus on the proper management of dog bite victims. Many dog bite studies have been conducted, but few have examined long-term patient outcomes. This study evaluated two outcomes: infection and need for additional scar treatment.

Methods: A retrospective analysis was conducted at a Level I Pediatric Trauma Center of dog bite cases from January 2013 to May 2016. During this period, 680 patients presented, and 144 patients followed up at the outpatient clinic. Patients were included if they received definitive repair and had long-term follow-up for reasons other than rabies vaccination. Forty-six patients remained, and results were analyzed using Fisher's exact test.

Results: Of the 46 patients, 18 were repaired in the operating room, 24 in the emergency department and 4 in both locations. Of patients repaired in the operating room, 2/18 (11%) developed infection and 12/18 (67%) developed scars that required further treatment. Of patients repaired in the emergency department, 10 were repaired by surgeons and 14 by emergency physicians. After repair by a surgeon, 1/10 (10%) patients developed infection and 6/10 (60%) developed scars that required further treatment. After repair by an emergency physician, 8/14 (57%) patients developed infection and 7/14 (50%) developed scars that required further treatment. Repair personnel and infection were significantly related ($p=0.007$), with 8/12 (67%) infections following repair by emergency physicians.

Conclusion: Presence of infection was significantly related to bedside repair by emergency physicians. The data are suggestive of differences in repair technique between emergency and surgical personnel. Standardizing technique could reduce complications and morbidity associated with repairing dog bites and other contaminated wounds. Need for additional scar treatment was not significantly dependent on personnel or location of repair. There may be stratification based on wound severity, but a classification system for dog bite wounds must be established before objective commentary.

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	Bedside			Operating Room	Combination
	All	Surgery	Emergency		
Repair (N = 46)	n = 24	n = 10	n = 14	n = 18	n = 4
Scar Treatment	13	6	7	12	1
Infection	9	1	8	2	1
Scar Treatment + Infection	8	1	7	2	0



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P51

STERISTRIP VS SUBCUTICULAR CLOSURE IN PAEDIATRIC GROIN WOUNDS: A RANDOMIZED CLINICAL TRIAL

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Purpose: A technique that offers the best chance of an optimal result is the most appropriate to be employed for wound closure. Standard suturing techniques have been proven to be effective but may be accompanied with local inflammatory responses. We set out to compare the cosmetic and wound complication rates associated with clean paediatric groin wounds closed using Steri-Strip™ (a tissue adhesive) or subcuticular suturing.

Methods: A prospective randomized study. Children with unilateral and bilateral clean groin wounds following herniotomy, ligation of patent processus vaginalis and groin exploration were randomized into subcuticular suture closure and Steri-Strip™ groups. Parental consent and child assent was obtained after institutional ethical clearance. Follow up was five days, 2nd, 4th and 8th weeks postoperatively. Wounds assessment were scored based on parents' satisfaction using the Visual Analogue Scale (VAS) at clinic visits and a single plastic surgeon assessed pictures of the scars using the Hollandier Wound Evaluation Scale (HWES). The level of statistical significance was set as $p < 0.05$

Results: Seventy-five wounds were assessed, 35 in the Steri-Strips™ and 40 in the suturing group. Sixty-eight (90.7%) procedures were done by senior residents and seven (9.3%) by consultants. There was no statistical significance between the surgeon's status and the complications that ensued ($p = 0.596$). The overhead cost for Steri-Strip™ group was also lesser (\$0.15 vs \$3.24), as each wound was closed with either a single suture or half a pack of Steri-Strip™

Conclusions: We conclude that skin closure of clean paediatric groin wounds with Steri-Strips™ gives comparative cosmetic outcome compared with subcuticular suturing.

Table showing the Mean VAS/HWES Scores and P values

Mean Scores	5th day	2nd Week	4th Week	8th Week
VAS				
Subcuticular suturing	8.2±1.2	9.3±0.9	9.8±0.5	9.9±0.2
Steri-Strips	7.9 ±1.3	8.9±1.0	9.5±0.7	9.8±0.5
p value	0.320	0.080	0.070	0.080
HWES				
Subcuticular suturing	3.5±1.6	3.7±1.3	4.0±0.7	5.0±0
Steri-Strips	3.8±1.5	2.7±1.8	3.5±0.6	3.0±0
p value	0.600	0.100	0.290	

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P52

THE KOTTMEIER PROCEDURE: A 38-YEAR FOLLOW UP IN A FEMALE PATIENT TREATED FOR ULTRA-LONG SEGMENT HIRSCHSPRUNG'S DISEASE

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Purpose: Management of ultra-long segment Hirschsprung's disease remains a challenge to the pediatric surgeon. A long-term follow-up of a female patient with ultra-long segment aganglionosis and severe fluid and electrolyte losses treated with the Kottmeier Procedure is reported here.

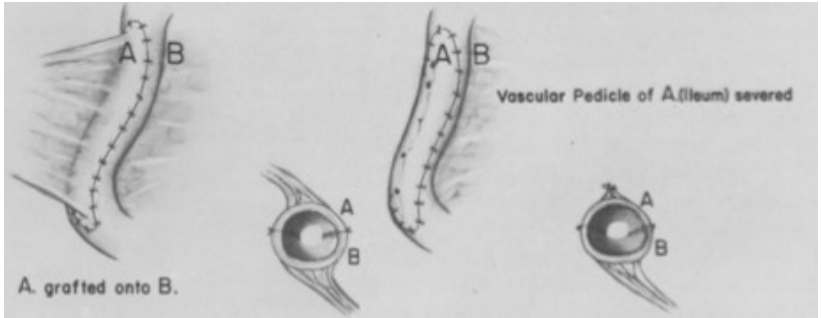
Methods: In 1979, Kottmeier et al. performed a novel procedure based on the persistent absorptive capacity of aganglionic segments of ileum in a 7-month-old female with ultra-long segment Hirschsprung's disease including the distal ileum. The Kottmeier Procedure involved a side-to-side anastomoses between the aganglionic terminal ileum to the more proximal ganglionic ileum creating an ileal pouch of approximately 18cm in length. (Kottmeier, 1981; APSA, 1980). This side-to-side anastomoses necessitated the creation of dual vascular pedicles which would interfere any eventual pull-through procedure. At 23 months of age, the aganglionic segment was devascularized uneventfully. Six weeks later, the child underwent an uneventful Martin-Duhamel ileo-ileal-rectal pull through.

Results: Within one week of the aganglionic-ganglionic ileal side-to-side anastomoses, the intestinal osmolality rose from less than 280 milliosmoles to over 450 milliosmoles. Transit time did not change appreciably. The child's stools became solid. Within 1.5 years, the child progressed from below the 3rd percentile on the growth curve to the 55th percentile; her height rose from the 10th to the 25th percentile. Thirty-eight years later, the patient is totally asymptomatic with normal bowel function. Of note, an older male sibling with Hirschsprung's disease died from enterocolitis in infancy; a younger sibling was subsequently diagnosed to have long-segment colonic aganglionosis treated successfully with an endorectal pull-through.

Conclusion: The Kottmeier Procedure should be considered in patients with ultra-long segment Hirschsprung's disease, an otherwise devastating condition.



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P54

WHO WAS THE FIRST WOMAN PEDIATRIC SURGEON IN THE UNITED STATES?

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Purpose: Historical literature on pediatric surgery has not clearly identified the first woman to practice pediatric surgery. Our purpose was to identify the first fellowship-trained female pediatric surgeon in the United States.

Methods: We conducted an extensive review of the history of pediatric surgeons in North America focusing on female surgeons. In addition to a literature review and interviews with surgeons with historical knowledge, archivists and historians from the American Pediatric Surgical Association, the American Academy of Pediatrics Section on Surgery, the American Board of Surgery and the American College of Surgeons served as resources for this research.

Results: Rowena Spencer, Benjy Brooks, Louise Schnaufer, Jessie Ternberg, Elizabeth Coryllos, Blanca Smith, Kathryn Anderson and Ann Kosloske were the key female pioneers in pediatric surgery. Although each of these women made major contributions to pediatric surgery, Rowena Spencer deserves the designation of first female pediatric surgeon in the United States by being the first of these women to complete fellowship training in 1949.

Conclusions: Based on available information, Rowena Spencer was the first woman trained in pediatric surgery in North America. Although other women may have preceded her in general surgery with a focus on the surgical care of children, Dr. Spencer deserves the designation of first female pediatric surgeon in the United States.



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P55

WILM'S TUMOR AND COMPLETE AORTOCAVAL LYMPH NODE DISSECTION: EFFICACY AND SAFETY

Katherine Dudley, BS¹, Jiri Bedrnicek, MD¹, Peter Abasolo, MD¹, Travis Kruse, MD¹, Elizabeth Lyden, MS², **Shahab Abdessalam, MD¹**.

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Tweet it! Poster P55: Remove the surgeon subjectivity from Wilm's tumor operations and make standard an aortocaval lymph node dissection
#eAPSA2018

Purpose: Per Children's Oncology Group protocol, operative treatment for Wilm's tumor (WT) includes nephrectomy with lymph node sampling (LNS). There is no absolute number of lymph nodes currently recommended for sampling. An aortocaval lymph node dissection (ACLND) entails the removal of all of the draining lymph nodes (LN) of the kidney. The purpose of this study was to investigate the accuracy of subjective LN assessment by radiologists and surgeons and evaluate the morbidity associated with ACLNDs.

Methods: A prospectively gathered database was reviewed for all WT patients from 2007-2017 at a single institution operated on by a single surgeon. At the time of the operation, lymph nodes were judged to be "positive" or "negative" for metastatic disease by gross assessment, followed by an ACLND. In addition, all patients' CTs were reviewed by a single radiologist to determine if radiographically lymph nodes were "positive" or "negative". Using the pathology assessment of lymph node involvement as the gold standard, statistics were calculated against the surgeon assessment and radiology assessment.

Results: 39 patients with WT were treated over the 10 year period, of which 35 received ACLNDs. Median follow-up time was 5.5 years. For patients in the adjuvant chemotherapy (AC) (n=26) group, the PPV for radiology was 0.46 and 0.5 for surgeon. Three patients died during the study period (OAS = 92%) as a result of disease progression outside the abdomen, and all three were stage IV. Average post-operative length of stay was 4.3 days. No lymphatic leak was identified in the entire study population.

Conclusions: The subjective interpretations of lymph node involvement by radiology and surgery compared to pathology were not perfect, demonstrating that lymph node sampling may not lead to accurate staging for Wilm's tumor. The morbidities associated with aortocaval lymph node dissection were not encountered in this study, indicating that it can be performed safely.

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Comparison of pathology versus surgeon and radiology assessment of lymph node status			
radiology versus pathology interpretation of lymph nodes in adjuvant chemotherapy group			PPV: 0.46 (95%CI: 0.20, 0.74), NPV: 1.00 (95%CI: 0.68, 1.00), kappa coefficient: 0.44 (95% CI: 0.15, 0.73)
	positive	negative	total
positive	6	7	13
negative	0	11	11
total	6	18	24
surgeon versus pathology interpretation of lymph nodes in adjuvant chemotherapy group			PPV: 0.5 (95% CI: 0.20, 0.80), NPV: 0.94 (95% CI: 0.68, 1.00), kappa coefficient: 0.47 (95% CI: .13, .81)
	positive	negative	total
positive	5	5	10
negative	1	15	16
total	6	20	26



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P56

ETHNIC MINORITIES TEND TO STAY IN THE HOSPITAL LONGER AFTER APPENDECTOMY FOR NON-COMPLICATED APPENDICITIS

Olivia Cheng, BS¹, Sathyaprasad Burjonrappa, MD, MS².

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Purpose: There is an increasing trend favoring early discharge after laparoscopic appendectomies leading to decreased patient costs, increased hospital profits and decreased risk of hospital acquired infections. The purpose of this study is to investigate the effect of race on hospital stay after laparoscopic appendectomies.

Methods: This is a single-center retrospective chart review of 248 pediatric patients (<18 years old) who underwent appendectomies for acute appendicitis from January 2015 to April 2017. Of these, 63 were excluded due to perforated appendicitis, non-operative management, interval appendectomies or other diagnoses or surgeries other than laparoscopic appendectomy. The 185 patients were divided into two groups: minority (Black or Hispanic) and non-minority groups. Same-day discharge was defined as discharge less than 24 hours of surgical admission. Length of hospital stay, preoperative and postoperative factors and total costs were compared and analyzed between the two groups and statistically evaluated using Fisher two-test for categorical data and student t-test for continuous variables.

Results: Out of the 185 patients, 42.2% (n=78) were of a minority ethnicity (Black or Hispanic) and 57.8% (n=107) were not. A greater ratio of children in minority groups stayed more than one day compared to those in other ethnic groups (51.3% vs 32.7%; $p < 0.02$). In our experience, average costs were higher for patients who stayed longer than 24 hours (\$29200 vs \$33700; $p < 0.001$). This is reflected in the larger costs of minority groups when patients stay longer than 24 hours (\$28100 vs \$34200; $p < 0.01$). However, pre-operative and post-operative factors did not differ significantly between the two groups (Table).

Conclusions: We conclude that minority groups tend to stay longer in the hospital post-laparoscopic appendectomies, and those that stay more than one day have significantly higher costs despite similar pre- and post-operative factors as non-minority groups.

Table: Comparison of pre-operative and post-operative factors between minority and non-minority ethn

Patient Factor	Minority Group (n=78)	Other Ethnic Group (n= 107)	P-value
Same-day discharge	49%	67%	0.015
Average Number of Imaging Studies	1.218	1.224	1
ED Revisit Rate	6.4%	8.4%	0.8
Readmission Rate	2.6%	2.8%	1
Misdiagnosis of Appendicitis	2.6%	1.9%	1
Complication Rate	0%	0.9%	1

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P57

LAPAROSCOPY VERSUS MINI-LAPAROTOMY PERITONEAL CATHETER INSERTION OF VENTRICULOPERITONEAL SHUNTS: A SINGLE-CENTRE COHORT ANALYSIS OF 210 CONSECUTIVE PEDIATRIC PATIENTS

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Purpose: Ventriculoperitoneal (VP) shunts are the mainstay of treatment of hydrocephalus. Open mini-laparotomy is the traditional operative approach for peritoneal catheter insertion. There has been no direct comparison of laparoscopic versus open primary VP shunt insertion in the pediatric population. We hypothesized that laparoscopic VP shunt may have lower distal (peritoneal) revision rates.

Methods: A prospectively maintained, externally validated database of pediatric patients who underwent shunt creation between 2012 and 2016 was reviewed for primary shunt placement in an open or laparoscopic technique. Patients received laparoscopic or open shunt insertion based on neurosurgeon preference. Comparisons of outcomes including overall revisions, distal revisions, infection and operative time and hospital stay between open and laparoscopic groups was undertaken. Statistics are reported as Student's t-test or chi-squared analysis with $p < 0.05$ judged significant.

Results: 210 patients underwent initial VP shunt placement - 41 laparoscopically and 169 open (Table 1). Mean age at was lower in the open group. Operative time was longer for laparoscopic insertions; there was no significant difference in perioperative complications or length of stay. There was no significant difference between overall revisions in the laparoscopic group (41%) versus the open group (41%), $p = 0.54$. There was significantly more frequent distal revisions in the laparoscopic group (22%) versus the open group (8%), $p = 0.04$. There was no difference in shunt infections or perioperative complications.

Conclusion: Within the first direct comparison study of laparoscopic versus open placement of initial VP shunts in pediatric patients, we report that there was not a statistically higher shunt infection rate in the laparoscopic group; interestingly, there was an unexpectedly higher rate of distal revisions for those placed laparoscopically. With practice evolving towards laparoscopic placement of the peritoneal portion of VP shunts, it is important to elucidate whether there may be a subset of patients who would benefit from this technique.



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Table 1. Comparison of demographics, etiology and outcomes for laparoscopic versus open VP shunt insertions

	Laparoscopic n=41	Open n=169	
Demographics			
Age - Mean (months) +- SD	45 +/- 59	29 +/- 51	p=0.04
Gender	M=23 (56%), F=18 (44%)	M=98 (57%), F=71 (43%)	p=0.83
Etiology			
Tumor	14	42	
Post-IVH secondary to immaturity	10	29	
Post-Trauma	0	3	
Post-infectious	2	20	
Aqueductal stenosis	2	14	
Communicating congenital hydrocephalus	2	9	
Myelomeningocele/Encephalocele	3	15	
Other	4	11	
Intracranial cyst	3	9	
Spontaneous ICH/IVH/SAM	1	17	
Perioperative complications			
Wound infection	0	1	P=0.62
Bacterial Meningitis	1	3	P=0.96
Hyponatremia	1	1	P=0.54
Sepsis	0	1	P= 0.8
Cardiac arrest	0	1	p=0.62
DVT/PE	0	5	p=0.33
Ascites	0	0	-
CSF Leak	0	1	p=0.62
Hemorrhage	0	4	p=0.79
Bowel injury	0	0	-
Outcomes			
Overall revisions	17 (41%)	69 (41%)	p=0.94
All distal revisions	9 (22%)	13 (7%)	P=0.004
Distal with proximal revision	6 (15%)	9 (5%)	p=0.06
Distal only revisions	3 (7%)	6 (3%)	P=0.28
Shunt infections	6 (15%)	16 (10%)	P=0.33
Operative time Mean (mins) +/- SD	79 (+/- 39)	62 (+/- 25)	p=0.001
Length of stay after shunt placement			
Mean (days) (+/- SD)	10 (+/- 16)	11 (+/- 23)	p=0.4

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Table 1. Comparison of patients who underwent laparoscopic or open VP shunt placement			
	Laparoscopic n=41	Open n=169	
Age - Mean (months) +/- SD	45 +/- 59	29 +/- 51	p=0.04
Gender	M=23 (56%), F=18 (44%)	M=98 (57%), F=71 (43%)	p=0.83
Operative time Mean (mins) +/- SD	79 (+/- 39)	62 (+/-25)	p=0.001
Length of stay after shunt placement Mean (days) (+/- SD)	10 (+/- 16)	11 (+/- 23)	p=0.4
Shunt infections	6 (15%)	16 (10%)	p=0.33
Overall revisions (proximal and distal)	17 (41%)	69 (41%)	p=0.94
All distal revisions	9 (22%)	13 (7%)	P=0.004
Distal with proximal revisions	6 (15%)	9 (5%)	p=0.06
Distal only revisions	3 (7%)	6 (3%)	p=0.28



Plenary Session I

1

GROWING LIVERS IN LYMPH NODES: EX VIVO GENE THERAPY AND ECTOPIC HEPATOCYTE TRANSPLANTATION FOR THE TREATMENT OF METABOLIC LIVER DISEASE IN A LARGE ANIMAL MODEL

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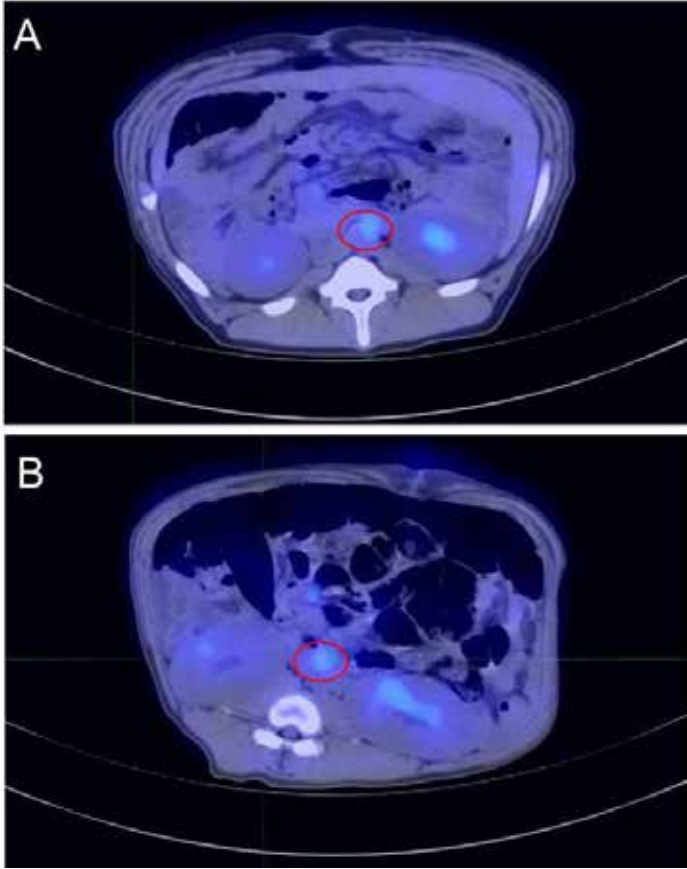
Purpose: Hereditary tyrosinemia type 1 (HT1) is an autosomic recessive metabolic disorder caused by a deficiency in the fumarylacetoacetate hydrolase (FAH) enzyme. *Ex vivo* gene therapy and hepatocyte transplantation via portal vein infusion can successfully rescue a porcine model of HT1. The aim of this study was to treat and cure this model through *ex vivo* gene delivery via ectopic transplantation of hepatocytes into mesenteric lymph nodes.

Methods: We performed laparoscopic partial hepatectomies on FAH-deficient pigs at five weeks of age, and isolated primary hepatocytes *ex vivo*. Hepatocytes were transduced in suspension with lentiviral vectors expressing the human *FAH* and the sodium-iodide symporter (*NIS*) genes. The *NIS* reporter is a non-invasive method to monitor hepatocyte expansion using nuclear imaging. Animals received autologous hepatocyte transplantation by direct injection of hepatocytes into mesenteric lymph nodes. Engraftment and expansion of *ex vivo* corrected autologous hepatocytes were followed through biochemical and histological analysis, SPECT-CT imaging, and through the animal's ability to thrive off the protective drug NTBC/nitisinone.

Results: Animals were injected with six-hundred million cells, with no complications. After transplantation, animals were cycled on/off NTBC to stimulate expansion of FAH-positive hepatocytes. SPECT-CT scanning at thirty days post-transplantation showed multiple *NIS*-positive lymph nodes at the root of the mesentery, demonstrating successful engraftment of *ex vivo* transduced hepatocytes. Lymph node biopsies were performed in two pigs at four months post-transplantation, with FAH-positive hepatocytes found in 4/4 lymph nodes. At five months post-transplantation, liver function tests and tyrosine levels show complete normalization in three pigs, which are currently maintaining NTBC-independent growth curves suggesting effective treatment of the metabolic disorder.

Conclusion: In this study we show that lymph nodes can be used as a safe, ectopic site for hepatocyte transplantation after *ex vivo* gene therapy. Engraftment and expansion of these cells in the lymph nodes may be sufficient for improvement and cure of metabolic disease.

Plenary Session I (cont.)





Plenary Session I (cont.)

2*

IMPROVED CONTEMPORARY OUTCOMES OF LIVER TRANSPLANTATION FOR PEDIATRIC HEPATIC MALIGNANCIES

Brian Ezekian, MD¹, Michael S. Mulvihill, MD¹, Brian F. Gilmore, MD¹, Harold J. Leraas, MHS, MA², Paul M. Schroder, MD, PhD¹, Sarah Jane Commander, MD¹, Stuart J. Knechtle, MD¹, Elisabeth T. Tracy, MD¹, Andrew S. Barbas, MD¹.

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Purpose: For advanced pediatric hepatoblastoma (HB) and hepatocellular carcinoma (HCC), liver transplantation (LT) may provide the only means for complete tumor extirpation and thus the only possibility for cure. However, the role of LT is debated and the existing literature is limited. We hypothesized that contemporary outcomes of LT are improving due to advances in perioperative management and increased organ availability.

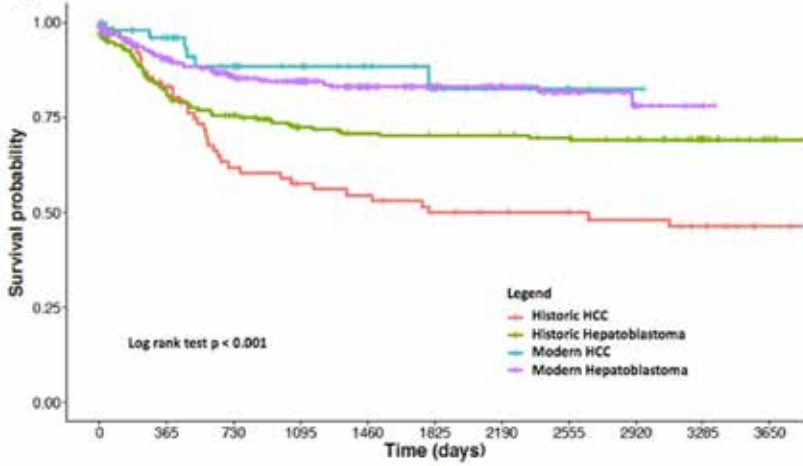
Methods: The United Network of Organ Sharing (UNOS) database was queried for patients age <21 years that underwent LT for a primary diagnosis of HB or HCC. Subjects were divided into contemporary (transplant after December 31, 2007) and historic (transplant before December 31, 2007) cohorts. Baseline characteristics were compiled and examined. Survival was estimated using the Kaplan-Meier method and compared using the log-rank test.

Results: Overall, 557 pediatric patients with HB and 134 with HCC underwent LT. Divergences were noted in recipient age (HB 2.7 vs. HCC 11.7 years), waitlist time (HB 50.4 vs. HCC 113.8 days), prior abdominal surgery (HB 44.2% vs. HCC 23.4%), donor age (HB 12.7 vs. HCC 20.8 years), living donation (HB 20.4% vs. HCC 12.1%), and length of hospital stay (HB 23.1 vs. HCC 18.3 days), which were significantly different between groups (all $p < 0.05$). HB and HCC were associated with 1-, 5-, and 10-year overall survival rates of 86.7%, 77.5%, and 75.6%, and 88.3%, 61.2%, and 57.0%, respectively. In the contemporary era, patients with HB and HCC had considerably improved 1- and 5-year survival rates of 90.0% and 83.7%, and 94.7% and 80.8%, respectively (Figure).

Conclusion: Outcomes of LT for pediatric HB and HCC have dramatically improved in the contemporary era, with both now associated with comparable 5-year overall survival exceeding 80%. These data suggest that early transplant evaluation is appropriate and that broader usage of LT may be warranted to further improve outcomes.

Plenary Session I (cont.)

Figure. Temporal Trends in Survival of Liver Transplantation for Pediatric Hepatoblastoma and Hepatocellular Carcinoma





Plenary Session I (cont.)

3*

LONG-TERM FOLLOW UP OF BLOOD PRESSURE IN BLUNT RENAL INJURY

Justin A. Sobrino, MD¹, Joseph Sujka, MD¹, Richard Sola Jr, MD¹, Douglas L. Blowey, MD¹, Kathleen D. Graziano, MD², David M. Notrica, MD², Shawn D. St.Peter, MD¹.

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Purpose: The development of hypertension (HTN) after renal trauma has been described in retrospective series but has never been studied prospectively.

Methods: We performed a 2 center, prospective cohort study enrolling patients less than 18 years old sustaining blunt renal injury. Renal injuries were graded according to the American Association for the Surgery of Trauma scale. Exclusion criteria were penetrating trauma and known bleeding disorders. Demographics and details of clinical course were recorded. Blood pressures (BP) were measured approximately every six months for three years and were obtained by letter or phone call to the family or PCP. BPs were classified according to the 2017 American Academy of Pediatrics guidelines on HTN, which consist of normal BP, elevated BP, stage 1 HTN, and stage 2 HTN. Median values are reported with interquartile ranges (IQR).

Results: From 2009 to 2017, 129 patients were enrolled with 105 (hospital 1 n = 57, hospital 2 n = 49) patients being eligible for 3-year follow up. Forty-two (40%) had a BP value recorded at 3 years or later. There were 89 (69%) males, and a median age of 13.0 years (IQR 8.7, 14.8). The most common mechanism of injury was falls (26%, n=34). Major associated injuries were present in 45% (n=57) of cases. 5% (n=7) of cases required operative intervention for the renal injury. The median time to final follow up was 39.1 months (IQR 36.1, 48.4). At three year follow up, 10 (24%) patients screened positive abnormal BP: 6 as elevated BP, 3 as stage 1 HTN, and 1 as stage 2 HTN.

Conclusions: Patients with blunt renal injury are at risk of developing hypertension after their injury. Future studies focusing on standardization of long-term follow up in order to identify and manage early onset hypertension are needed.

Plenary Session I (cont.)

4

NEPHRON SPARING SURGERY AND OUTCOMES OF BILATERALLY-PREDISPOSED UNILATERAL WILMS TUMORS. A REPORT FROM THE CHILDREN'S ONCOLOGY GROUP STUDY AREN0534

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Purpose: A primary aim of Children's Oncology Group (COG) study AREN0534 was to facilitate partial nephrectomy in 25% of children with bilaterally-predisposed unilateral tumors (WAGR, multifocal tumors and overgrowth syndromes). The purpose of this prospective study was to achieve an excellent EFS and OS, while preserving renal tissue through pre-operative chemotherapy, completing definitive surgery by 12 weeks from diagnosis, and modifying post-operative chemotherapy based on histologic response.

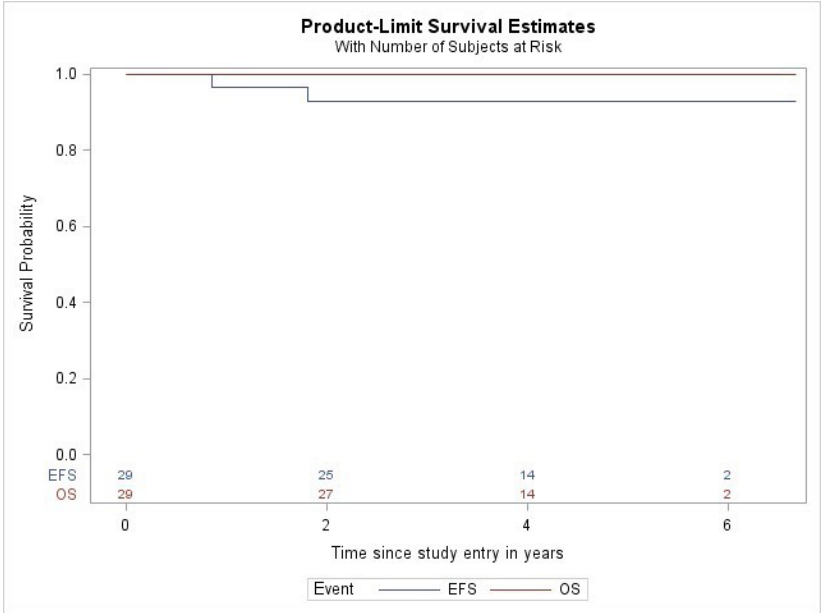
Methods: Imaging studies of patients identified with a predisposition syndrome by the treating institution were centrally reviewed through the biology and classification study AREN03B2 for eligibility prior to enrollment on AREN 0534. Patients were treated with induction chemotherapy determined by localized or metastatic disease on imaging (and histology if a biopsy had been undertaken). Surgery was based on radiographic response at 6 or 12 weeks. Further chemotherapy was determined by histology. Stage III or IV disease patients received radiotherapy.

Results: 29/31 patients were evaluable. 4-year EFS and OS were 92.9% (95%CI: 80.1% - 100%) and 100% (fig1). Nine patients had Beckwith-Wiedeman, 7 hemihypertrophy, 9 multifocal tumors, 2 WAGR, 1 Denys-Drash and 1 solitary kidney. Twenty-four were treated with 2-drug and five with 3-drug induction chemotherapy. Using RECIST criteria, radiographic response was complete response in 2, partial response in 17, and stable disease in 10. After induction chemotherapy, 18/29 (62.0%) either had complete resolution (n=2) or underwent a partial nephrectomy (n=16) the rest had total nephrectomy (n=11). After surgery/chemotherapy 19 patients were stage I, 4 stage II and 6 stage III. All patients (28/29) but one had favorable histology. Two patients relapsed (one tumor bed, one abdomen) and none had disease progression during induction.



Plenary Session I (cont.)

Conclusions: A standardized approach of preoperative chemotherapy, surgical resection within 12 weeks and histology-based post-operative chemotherapy results in an excellent EFS/OS and substantial preservation of renal parenchyma.



Plenary Session I (cont.)

5*

SURGERY ACCELERATES THE DEVELOPMENT OF PULMONARY METASTASES IN A MOUSE MODEL OF OSTEOSARCOMA AND IS ATTENUATED BY PERIOPERATIVE TREATMENT WITH GEFITINIB

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Purpose: Surgical resection of the primary tumor is often the first step in the treatment of solid cancers. However surgery itself may *promote* the growth of remote metastases, an effect referred to as surgery-accelerated metastasis. The development of pulmonary metastasis is the most common cause of mortality in patients with osteosarcoma (OS). We have demonstrated that macrophages promote OS invasion which can be blocked by modulating macrophage activity with the drug gefitinib. Furthermore, gefitinib reduced metastatic burden in a mouse model of OS. We examined the effect of surgery on the development of metastases and the impact of perioperative gefitinib in a mouse model of OS.

Methods: Mouse OS cells (K7M2) were implanted into the tibia of BALB/c mice (n=49). One week post-implantation mice were randomized to 5 groups (n=9-10/group): Group 1: control mice, no surgery; Group 2: Non-amputated mice treated with gefitinib; Group 3: resection of primary tumor via amputation; Group 4: Amputation of tumor-bearing limb plus gefitinib impregnated chow 2 days prior to amputation and continuing 7 days after surgery; Group 5: sham surgery with amputation of the contralateral limb. The lungs were harvested 3 weeks after amputation and the numbers of gross pulmonary metastases were counted.

Results: Mice that underwent amputation of the primary tumor had increased pulmonary metastases after 3 weeks when compared to control and sham-operated animals (20.8 vs 10.9 nodules; p<0.05, Fig 1). Perioperative administration of gefitinib decreased the effects of primary tumor removal on the development of pulmonary metastases (20.8 vs. 5.5 nodules; p<0.01, Fig 1). Surgical stress, represented by amputation of the contralateral limb, had no effect on metastasis.

Conclusions: Surgical removal of the primary tumor accelerates the growth of pulmonary metastases in a mouse model of osteosarcoma. Perioperative gefitinib treatment attenuates this effect. Neoadjuvant treatment with gefitinib may limit metastatic progression of osteosarcoma and improve survival.



Plenary Session I (cont.)

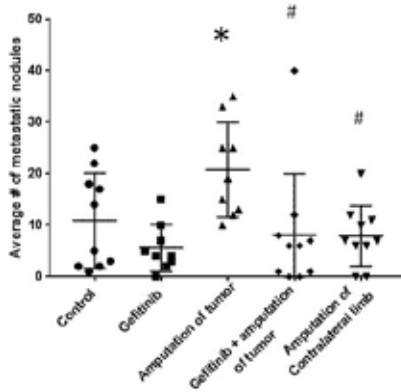


Figure 1. Amputation of the tumor-bearing limb increases the number of gross pulmonary metastases in a mouse model of OS, attenuated by perioperative gefitinib treatment. Data expressed as mean \pm SD (n=9-10/group); compared by one-way ANOVA. *p<0.05 vs. control; #p<0.05 vs. amputation of tumor.

Plenary Session I (cont.)

6*

INTRA-AMNIOTIC INJECTION OF ALGINATE MICROPARTICLES LOADED WITH BASIC FIBROBLAST GROWTH FACTOR RESULTS IN PARTIAL SOFT TISSUE COVERAGE OF THE SPINAL DEFECT IN A RAT MYELOMENINGOCELE MODEL

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Purpose: We sought to develop a minimally invasive intra-amniotic therapy for prenatal treatment of myelomeningocele (MMC) using an established rat model.

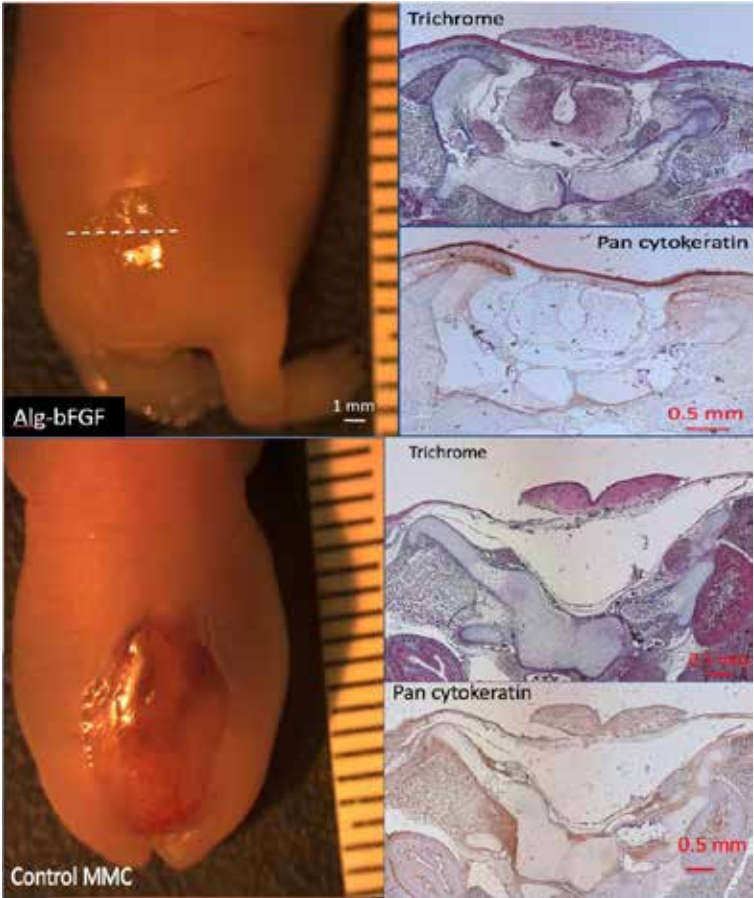
Methods: Time-dated Sprague-Dawley dams were gavage-fed retinoic acid on gestational day E10 to induce MMC. Intra-amniotic injections were performed on day E17.5 via laparotomy of the dams and directly visualized micropipette injection. The experimental group was treated with alginate microparticles loaded with basic fibroblast growth factor (Alg-bFGF). Control groups were treated with phosphate-buffered saline (PBS), free bFGF, blank alginate (Alg-Blank), alginate with fluorescently tagged albumin (Alg-Alb), or were left uninjected. All groups were sacrificed at E21, and each MMC defect was examined under a dissection stereomicroscope. Histology sections of MMC defects were stained with trichrome and AE1/AE3 pancytokeratin immunohistochemical stain and analyzed by light microscopy.

Results: All dams that underwent laparotomy and IA injections were alive at the time of sacrifice (N = 22). 150 of 239 fetuses (62.8%) that received IA injections at E17.5 were viable at E21. Fluorescence analysis proved that unmodified alginate microparticles bound specifically to the MMC defect. 18 of 61 (30%) fetuses treated with Alg-bFGF showed evidence of partial soft tissue coverage compared to 0 of 24 (0%) non-injected controls (P=0.0021) and 0 of 13 (0%) fetuses treated with PBS (P=0.0297). The gross appearance of tissue coverage was supported by histological analysis (Fig 1). 2 of 18 (11%) Alg-Alb, 3 of 19 (16%) Alg-Blank, and 4 of 24 (17%) free bFGF specimens appeared to have partial coverage of the defect but with different histological features.

Conclusions: We conclude that intra-amniotic injection of alginate microparticles loaded with bFGF resulted in significant soft tissue coverage of the MMC defect compared to PBS and un-injected controls. Blank alginate particles, alginate particles loaded with albumin, and free bFGF might also encourage soft tissue growth over the MMC defect.



Plenary Session I (cont.)



SCHEDULE & PROGRAM

Plenary Session I (cont.)

7

TELEMEDICAL FOLLOW-UP IN PEDIATRIC SURGERY - A PROSPECTIVE RANDOMIZED TRIAL

Jan Goedeke, MD, Alexandra Ertl, MS, Daniela Zoeller, MSc, Stephan Rohleder, MD, **Oliver J. Muensterer, MD, PhD.**

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Purpose: Telemedicine may be an alternative to direct ambulatory patient contact. We have designed a prospective study to evaluate the feasibility, safety and quality of telemedical follow up of pediatric surgical patients.

Methods: Ethics board approval was obtained. Pediatric surgical patients discharged after inpatient pediatric surgical treatment were randomized to telemedical or conventional (ambulatory) follow-up. All caregivers filled out a survey on quality/satisfaction/time required/costs spent on the patient-physician interaction. Information received concerning "current health status of the child", "further treatment plan", and "recommendations" were recorded on a 1-10 Likert-scale. A score of >8 was defined as "high". Participating surgeons were queried on quality of transmission of the history and physical findings. Results were statistically compared.

Results: Meeting power analysis requirements, 112 patients were randomized to each study arm. Pertinent findings were not adequately visible in only 1 of the 112 telemedical patients (abscess, clinical finding "fluctuence"), requiring ambulatory physical follow up. In all other patients, pediatric surgeons were confident of high-quality telemedical assessment. No pertinent findings were missed. Overall quality of the follow up was rated "high" by the caregivers more often with telemedical compared to ambulatory interaction (78% versus 48%, $p<0.001$), although some form of initial technical difficulty or problem was reported in 23% of cases. Most telemedical appointments required less than 30 minutes, while caregivers in the ambulatory arm spent a median of 2 hours for the interaction ($p<0,001$). Between 0.5 and 1 ton of CO₂ emissions were cumulatively saved by telemedical follow-up in our study.

Conclusions: This study shows that telemedical follow-up for pediatric surgical indications is at least as good as ambulatory follow-up in terms of feasibility, quality and accuracy. Parents were more satisfied with telemedical compared to conventional follow-up. Time and cost invested was lower for the telemedical interaction, as was the environmental footprint.



Plenary Session I (cont.)

8

HALOFUGINONE DOWN-REGULATES MYCN PROTEIN AND SUPPRESSES NEUROBLASTOMA TUMOR GROWTH

Jasmine Zeki, BS¹, Jeannine Coburn, PhD², Kimberly Ornell, BS², **Jamie Harris, MD³**, Hiroyuki Shimada, MD, PhD⁴, Naohiko Ikegaki, PhD¹, Bill Chiu, MD¹.

¹University of Illinois Chicago, Chicago, IL, USA, ²Worcester Polytechnic Institute, Worcester, MA, USA, ³Rush University Medical Center, Chicago, IL, USA, ⁴Children's Hospital Los Angeles, Los Angeles, CA, USA.

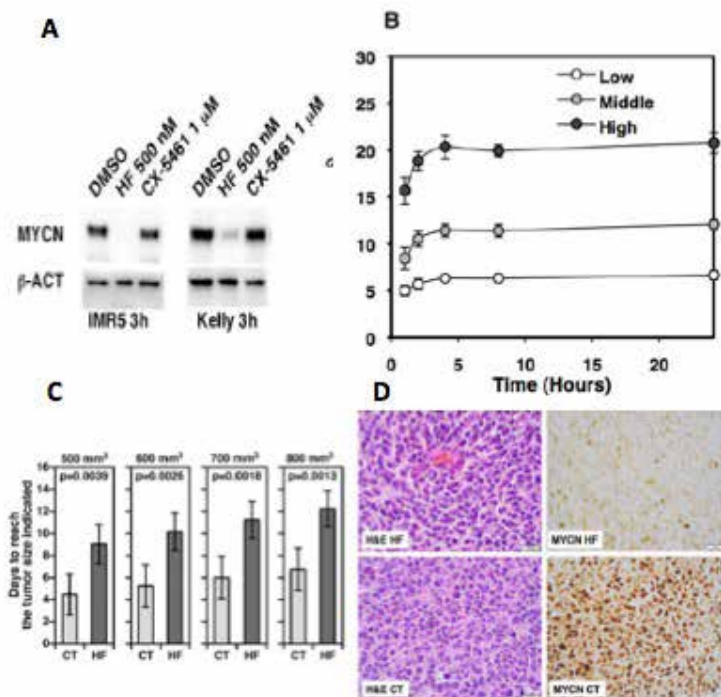
Purpose: *MYCN* oncogene amplification has been recognized as the strongest indicator of aggressive tumor behavior in neuroblastoma. Halofuginone (HF), an FDA-approved drug for scleroderma and a small molecule inhibitor of Glutamyl-prolyl-tRNA synthetase, can down-regulate *MYCN* protein in neuroblastoma cells. We hypothesized that treatment of neuroblastoma cells with HF would result in destabilization of *MYCN* protein and improve survival of neuroblastoma patients.

Methods: *MYCN* amplified neuroblastoma KELLY cells were treated with HF, and expression of *MYCN* after 3, 24, 48 hours was determined by Western blot. HF 6±0.7µg, 13±0.4µg, and 25±1.3µg, were loaded onto silk films; drug amount released from film was recorded. Orthotopic KELLY neuroblastoma tumors were created in mouse adrenal gland. Tumor growth was monitored using ultrasound until volume reached >50mm³ before HF-loaded films were implanted. Endpoint was tumor size >1000mm³. Histologic evaluation of tumors was performed.

Results: In vitro, HF inhibited growth of KELLY neuroblastoma cells at submicromolar concentrations in 48 hours. The half maximal inhibitory concentration for KELLY cells to HF was 0.18µM. HF at 500 nM down-regulated *MYCN* protein in <3 hours on Western blot analysis. Release profiles of HF-loaded films demonstrated rapid release of HF within 5 hours with constant levels after. In vivo, HF showed significant growth suppressive effect on the treated xenografts (12.2±1.6 days) compared to control treatment (CT) (6.8±1.9 days) for tumors to reach 800mm³ (p=0.0013). Immunohistochemistry demonstrated marked reduction of *MYCN* expression in HF-treated tumors, which lasted for over two weeks upon a single HF administration (25µg).

Conclusions: Halofuginone down-regulated of *MYCN* protein, which led to significantly slower tumor growth. Targeted halofuginone treatment could be used in the treatment of neuroblastoma tumors with overexpression of *MYCN*.

Plenary Session I (cont.)



A. Western blot showing decreased MYCN expression in HF treated cells B. In vitro release profile of silk HF film C. Slower tumor growth in vivo after treatment with HF film D. Decreased expression of MYCN in HF treated tumors compared to control



Plenary Session I (cont.)

9*

THE EXTRA-UTERINE ENVIRONMENT FOR NEONATAL DEVELOPMENT SUPPORTS NORMAL INTESTINAL MATURATION AND DEVELOPMENT

Heron D. Baumgarten, MD, MPH, Avery Rossidis, MD, Christina Wright, BA, Kendall M. Lawrence, MD, Ali Mejaddam, MD, Patrick E. McGovern, MD, Aimee G. Kim, MD, Antoneta Radu, MSc, Haiying Li, BS, William Peranteau, MD, Marcus G. Davey, PhD, Robert O. Heuckeroth, MD, PhD, Alan W. Flake, MD.

Children's Hospital of Philadelphia, Philadelphia, PA, USA.

Purpose: Extreme prematurity is the leading cause of infant morbidity and mortality in the developed world, and ten percent of premature infants develop necrotizing enterocolitis (NEC). We have previously described the Extra-Uterine Environment for Neonatal Development (EXTEND) that incorporates a pumpless oxygenator circuit and maintenance of the fetus within a fluid environment. The goal of this therapy is to avoid the iatrogenic complications of prematurity, such as NEC. Here we present a comprehensive evaluation of intestinal development in extreme premature lambs supported by EXTEND, with specific emphasis on the known pathology associated with NEC.

Methods: Specimens were collected from eight preterm lambs who were supported on EXTEND for 2 to 4 weeks. Control tissue was collected from age-matched fetuses, allowed to develop in-utero. Fixed terminal ileum was analyzed for villous height and crypt depth. Staining for enteric nervous system components, intestinal fatty acid binding protein (I-FABP), mucin, and caspase-3 expression was performed. Fresh small bowel was assessed for contractile properties, and fresh frozen terminal ileum was used to measure protein concentrations of EGFR by Western blot.

Results: There were no significant differences in villous height, crypt depth, number of mucin-containing goblet cells, nor neuronal cell bodies between experimental and control fetuses. There were also no significant differences in caspase-3 or EGFR expression between the two groups. I-FABP staining showed the expected migration of maturing epithelial cells with increasing gestational age. Contractile power and frequency of both experimental and control bowel increased along the same linear progression with gestational age.

Conclusion: Intestinal development of preterm lambs supported within EXTEND appears normal. Specifically, we have shown that markers of maturation, contractility, enteric nervous system development, and barrier function are equivalent to age-matched controls. The classic morphologic changes and cellular expression profiles associated with NEC are not seen.

Plenary Session I (cont.)

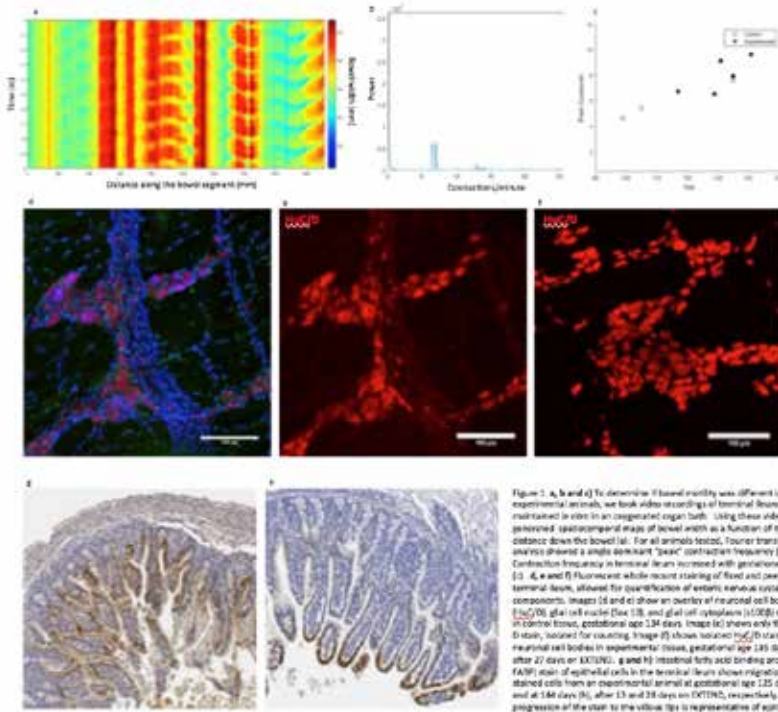


Figure 1. **a, b** and **d**) To determine if basal motility was different in our experimental animals, we took video recordings of terminal ileum maintained *in vitro* in an oxygenated organ bath. Using these videos, we performed spatiotemporal maps of basal motility as a function of time and distance down the bowel (**a**). For all animals tested, Fourier transform analysis showed a single dominant "peak" contraction frequency (**b**). Contraction frequency in terminal ileum increased with gestational age (**c**). **d, e** and **f**) Fluorescent whole mount staining of fixed and opened terminal ileum, allowed for quantification of enteric nervous system components. Images **d** and **e**) show an overview of neuronal cell body (F-actin) (red) and nuclei (DAPI) (blue), and glial cell cytoplasm (GFAP) staining in control ileum, gestational age 134 days. Image **f**) shows only the GFAP stain, isolated for quantifying. Image **g**) shows isolated GFAP stain of neuronal cell bodies in experimental ileum, gestational age 145 days, after 27 days on KLTNO. **g** and **h**) Histological hematoxylin and eosin (H&E) stain of epithelial cells in the terminal ileum shows migration of stained cells from an experimental animal at gestational age 125 days (**g**) and at 144 days (**h**), after 13 and 28 days on KLTNO, respectively. The progression of the stain to the villous tips is representative of epithelial maturation.



Plenary Session I (cont.)

10

SURGICAL TREATMENT OF CONGENITAL HYPERINSULINISM: RESULTS FROM 467 PANCREATECTOMIES IN NEONATES AND CHILDREN

Scott Adzick, MD, Diva Deleon, MD, Lisa J. States, MD, Katherine Lord, MD, Tricia R. Bhatti, MD, Susan A. Becker, RN, Charles A. Stanley, MD.

Children's Hospital of Philadelphia, Philadelphia, PA, USA.

Purpose: Congenital Hyperinsulinism (HI) causes severe hypoglycemia in neonates and infants. Recessive mutations of the beta cell K-ATP channel genes cause diffuse HI, whereas loss of heterozygosity together with inheritance of a paternal mutation cause focal adenomatous HI. We reviewed our experience with pancreatectomy to treat focal and diffuse HI.

Methods: From 12/1998 to 9/2017, 467 patients with HI underwent pancreatectomy: 240 for focal disease, 211 for diffuse disease, and 16 for Localized Islet Nuclear Enlargement (LINE). The focal HI patients (ages 1 week to 14 months; median age = 7 weeks) were treated with partial pancreatectomy. Since 2004, the focal lesion was found using preoperative 18-fluoroDOPA PET/CT scan and multiple pancreatic biopsies with frozen section analysis, followed by partial pancreatectomy. Patients with diffuse disease who failed medical management underwent biopsies to confirm the diagnosis then near-total (98%) pancreatectomy.

Results: The vast majority of pancreatectomies for focal HI were <50% (range 2% - 98%). 55% of patients had involvement of the pancreatic head or neck with the focal lesion. Thirty-nine lesions required pancreatic head resection with Roux-en-Y pancreaticojejunostomy (including 2 Whipple procedures) to preserve the normal body and tail. Lesions of the body or tail were treated with local resection or distal pancreatectomy. Intraoperative ultrasound was useful for delineating the course of the pancreatic duct. 97% of patients had a complete response to surgery and are cured. For diffuse disease patients, near-total pancreatectomy resulted in 31% having well-controlled blood sugars, 20% requiring insulin, and 49% requiring treatment for hypoglycemia. The incidence of diabetes has increased with long-term followup.

Conclusion: Our approach to patients with focal HI can distinguish focal from diffuse disease, localize focal lesions, and permit partial pancreatectomy with cure in almost all patients. Surgery does not cure diffuse disease but can help prevent hypoglycemia and brain damage.

Plenary Session I (cont.)

11*

“EARLY ON-ECMO” CDH REPAIR: COMPARATIVE EVALUATION OF SURVIVAL AND ECMO DURATION

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Purpose: “Early on-ECMO” (extracorporeal membrane oxygenation) repair of congenital diaphragmatic hernia (CDH) entails repair within 48-72 hours of ECMO cannulation in order to optimize pulmonary physiology, improve ECMO survival and shorten ECMO duration. Prior studies evaluating these potential benefits are conflicting. The CDH Study Group (CDHSG) registry was utilized to compare ECMO survival and duration between patients managed with early on-ECMO repair and those left unrepaired during ECMO.

Methods: Following IRB approval, the CDHSG database was queried for CDH patients born 1995-2016 requiring ECMO who either underwent diaphragm repair within the first 72 hours of cannulation or remained unrepaired on ECMO (including those decannulated/died without CDH repair). Only initial ECMO runs were included. Demographics and mortality risk factors were collected. Survival to decannulation was compared for the early repair group and those not repaired on ECMO. Duration of the ECMO course was also compared. Patients who died on ECMO or on the day of decannulation were excluded for this analysis. Statistical calculations utilized the Student's t, Wilcoxon Rank-Sum, Chi-square and Fisher's Exact tests.

Results: A total of 248 patients underwent early repair, and 922 were left unrepaired on ECMO. The early repair group had higher rates of cardiac defects and thoracic liver location and lower odds of hernia sac presence. Nonetheless, on-ECMO mortality for the early repair group was 12.9% compared to 21.6% in the unrepaired group ($p = 0.002$). In contrast, the early repair group had a longer mean ECMO duration compared to the unrepaired group (270.2 vs. 227.3 hours, $p = 0.001$).

Conclusion: Although early ECMO repair does not appear to shorten ECMO duration, it results in increased survival to decannulation as compared to those left unrepaired. This potentially suggests a physiologic benefit leading to increased ECMO survival in patients undergoing on-ECMO diaphragmatic repair over those designated to undergo post-ECMO repair.



Scientific Session I

12

LIPOCALIN-2 INCREASES INFLAMMATION AND DECREASES ADAPTATION IN SHORT BOWEL SYNDROME

Ailan Zhang, MD, PhD, Menghan Wang, MS, Hongpeng Jia, MD, PhD, William Fulton, MS, Chhinder Sodhi, PhD, David J. Hackam, MD, PhD, Samuel M. Alaish, MD.

Johns Hopkins University, Baltimore, MD, USA.

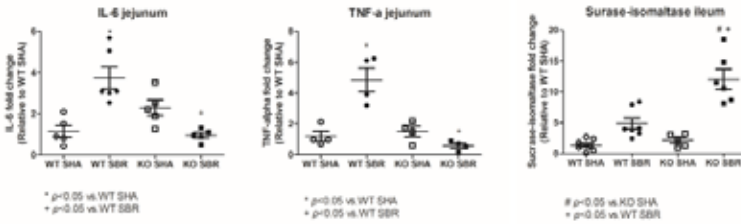
Purpose: Short bowel syndrome (SBS) is a major, life-threatening condition affecting pediatric patients. Strategies are required to enhance adaptation or limit complications. Lipocalin-2 (LCN2) plays a key role in proinflammatory conditions, such as type 2 diabetes mellitus and nonalcoholic steatohepatitis, and was also found to be increased in our model of SBS after massive small bowel resection (SBR). In this study, we hypothesize that LCN2 expression leads to inflammation in SBS which is detrimental to adaptation.

Methods: Under an ACUC-approved protocol, we performed a 75% SBR on both C57Bl/6J [n=6] and LCN2^{-/-} (C57Bl/6J background) [n=6] mice, which mimics the resection seen in SBS patients. Sham-operated C57Bl/6J [n=6] and LCN2^{-/-} [n=6] mice served as controls. One week later, after establishment of SBS, the mice underwent euthanasia, and intestinal tissue was collected for analysis for inflammatory cytokines, enterocyte proliferation and apoptosis, and carbohydrate enzyme expression. Statistical analysis was performed using ANOVA with $p < 0.05$ considered significant. Results: One week following 75% SBR, the proinflammatory marker expression of both IL-6 and TNF- α were significantly decreased in the intestine of LCN2^{-/-} mice as compared to their wild-type littermates, $*p < 0.05$. In addition, the proliferation markers, Ki-67 and PCNA, were significantly increased in the intestine of LCN2^{-/-} mice as was the apoptosis marker, PUMA, when compared to their wild-type littermates, $*p < 0.05$. Most strikingly, the expression of the carbohydrate enzyme sucrase-isomaltase was significantly increased in the intestine of LCN2^{-/-} mice as compared to their wild-type littermates, $*p < 0.05$, implying the functional consequences of LCN2 to absorption.

Conclusion: The presence of LCN2 leads to increased intestinal inflammation, decreased proliferation, decreased apoptosis and decreased enzymatic expression following 75% SBR in a mouse model of SBS. These findings suggest that LCN2 is detrimental to intestinal adaptation in SBS and may represent a novel target for future therapy to enhance adaptation and enteral tolerance in SBS patients.

Scientific Session I (cont.)

75% Small Bowel Resection in LCN2 KO mice vs. WT littermates



Key:

- WT SHA = wild-type mice with sham resection and anastomosis
- WT SBR = wild-type mice with 75% small bowel resection and anastomosis
- KO SHA = LCN2^{-/-} mice with sham resection and anastomosis
- KO SBR = LCN2^{-/-} mice with 75% resection and anastomosis



Scientific Session I (cont.)

13

HUMAN MILK OLIGOSACCHARIDES PROMOTE INTESTINAL REGENERATION INDEPENDENTLY OF GUT MICROBIOTA DURING EXPERIMENTAL NECROTIZING ENTEROCOLITIS

Bo Li, PhD, Richard Y. Wu, PhD, Carol Lee, MSc, Adam Minich, BSc, Marissa Cadete, BSc, Hiromu Miyake, MD, Shogo Seo, MD, Steven R. Botts, MSc, Kathene C. Johnson-Henry, BSc, Philip M. Sherman, MD, Agostino Pierro, MD.

The Hospital for Sick Children, Toronto, ON, Canada.

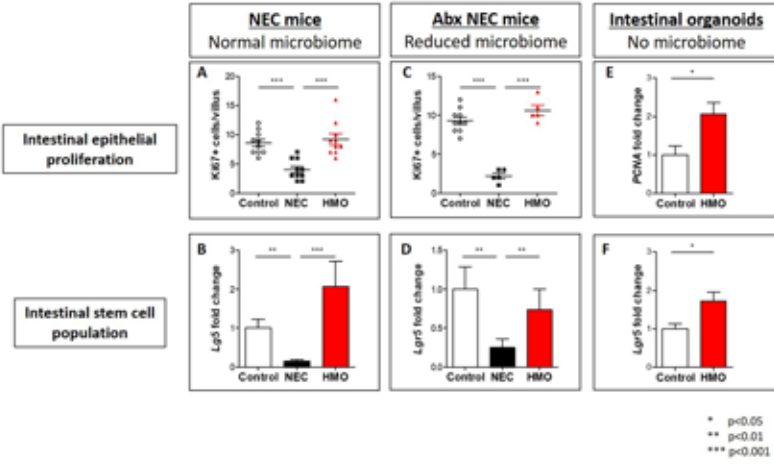
Purpose: Human milk oligosaccharides (HMOs) are a component of breast milk and have been implicated in the restoration of intestinal microbiota equilibrium through their prebiotic properties. It has been previously demonstrated that HMOs attenuate intestinal injury in murine models of experimental necrotizing enterocolitis (NEC). This study investigates whether the effects of HMOs on preventing NEC intestinal damage are due to changes in gut microbiota.

Methods: NEC was induced in 5-day old neonatal mice using hypoxia, oral lipopolysaccharide (4mg/kg), and gavage feeding of hyperosmolar formula (20 mg/ml, 50 μ l/g body weight three times a day). In the treatment group, hyperosmolar formula was supplemented with HMOs. Breastfed pups served as controls. Mucosal injury was scored blindly, epithelial proliferation was measured using immunofluorescence staining of Ki67, and intestinal stem cells (ISC) were quantified by qPCR (*Lgr5*). To establish a model of reduced gut microbiota in neonatal pups, an antibiotic cocktail (Abx) was added to drinking water during the gestational and postnatal period and the progression of NEC was assessed. Mouse small intestinal organoids, devoid of gut microbiota, were cultured and directly exposed to medium containing HMOs (20 mg/ml). Intestinal epithelium proliferation (*PCNA*) and ISC (*Lgr5*) were assessed by qPCR.

Results: In the presence of either normal or reduced gut microbiota (Figure A-D), HMOs attenuated NEC-induced intestinal injury (NEC $p < 0.01$, Abx NEC $p < 0.01$ by ANOVA) by rescuing intestinal epithelial proliferation (Ki67) and ISC expression (*Lgr5*). Similarly, in intestinal organoids devoid of gut microbiota, HMOs increased intestinal proliferation (Figure E) and ISC expression (Figure F).

Conclusions: These results demonstrate that HMOs promote epithelial proliferation, rescue intestinal stem cells, and prevent the development of NEC independently of gut microbiota. This study suggests that HMOs administration is a potential strategy for preventing NEC in at-risk preterm infants.

Scientific Session I (cont.)





Scientific Session I (cont.)

14*

DELETIONAL GENE EDITING FOLLOWING IN UTERO CRISPR/CAS9 DELIVERY

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Tweet it! Abstract 14: CRISPRCas9 in utero for the mTmG mouse model
#CRISPRinutero #eAPSA2018

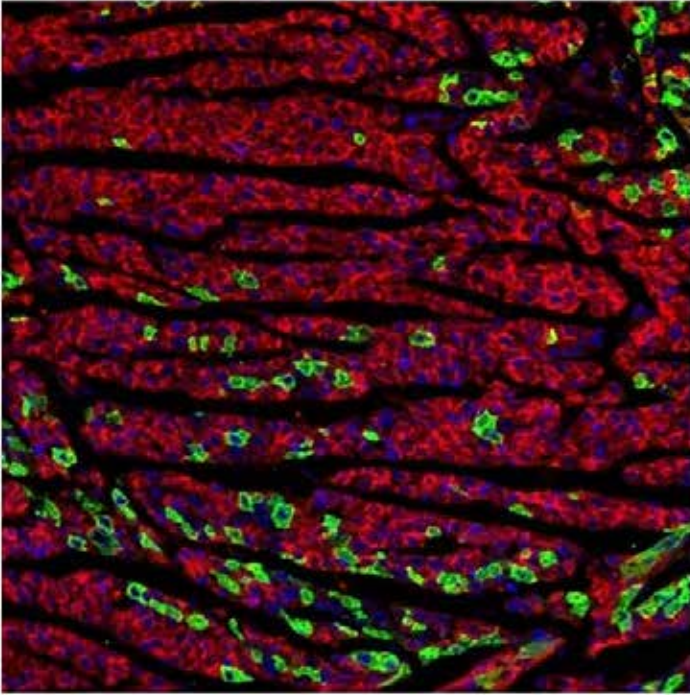
Purpose: The advent of powerful new gene editing technologies including CRISPR/Cas9 presents an unprecedented opportunity for therapeutic gene correction. The ability to apply these technologies in utero offers the potential to take advantage of the unique properties of the developing fetus, as well as correct congenital genetic disorders before disease onset. The mTmG mouse model constitutively expresses a red fluorescent transgene that converts to green fluorescent protein (GFP) expression following Cre recombinase exposure. In this study, we evaluate CRISPR/Cas9 gene editing in the mTmG mouse model following intravenous in utero delivery.

Methods: Viral vectors carrying SpCas9 constructs with gRNAs targeting the loxP sequences surrounding the mT gene were intravenously injected via the vitelline vein into E16.5 mTmG fetuses (n=7). Positive control injections were performed using viral vectors carrying Cre recombinase (n=10). Pups were harvested on day of life 0 (P0) and 7 (P7) for analysis by PCR, flow cytometry, and confocal microscopy. T-tests were performed with statistical significance established at p<0.05.

Results: PCR at all timepoints demonstrated the expected band indicative of successful deletion in the liver and heart in experimental and control animals. At P0, cytometry identified 47.2±7.00% hepatocyte editing and 0.276±0.291% cardiomyocyte editing in SpCas9 injected fetuses (n=4). Greater editing was seen by P7 (n=3) in SpCas9 treated livers (87.4±1.28%), while cardiomyocyte editing remained relatively stable (0.194±0.225%). Fetuses injected with Cre recombinase demonstrated similar overall cytometry results, except at P0, when hepatocyte editing was initially higher (p<0.01); but by P7, this difference was no longer significant (p=0.28). Confocal microscopy confirmed GFP expression on individual cell membranes consistent with cytometry results.

Conclusions: As proof-of-concept, we have demonstrated successful gene editing following intravenous in utero delivery of CRISPR/Cas9 constructs in the mTmG mouse model. These findings provide the basis for future application of this technology for the treatment of congenital disorders in utero.

Scientific Session I (cont.)



P7 heart from fetus injected intravenously on E16.5 with Ad-SpCas9.



Scientific Session I (cont.)

15

GENETIC ANALYSIS OF *DE NOVO* VARIANTS REVEAL SEX DIFFERENCES IN COMPLEX OR ISOLATED CONGENITAL DIAPHRAGMATIC HERNIA CASES AND INDICATES *MYRF* AS A NOVEL CANDIDATE GENE

Hongjian Qi, BA¹, Lan Yu, PhD¹, Xueya Zhou, PhD¹, Alexander Kitaygorodsky, BS¹, **Julia Wynn, MS¹**, Na Zhu, PhD¹, Gudrun Aspelund, MS, MD², Foong-Yen Lim, MD³, Timothy Crombleholme, MD⁴, Robert Cusick, MD⁵, Kenneth Azarow, MD⁶, Melissa Ellen Danko, MD⁷, Dai Chung, MD⁷, Brad Warner, MD⁸, George B. Mychaliska, MS, MD⁹, Douglas Potoka, MD¹⁰, Amy J. Wagner, MS¹¹, Mahmoud ElFiky, MD¹², Jay M. Wilson, MD¹³, Frances A. High, MD, PhD¹³, Mauro Longoni, MD¹⁴, Patricia Donahoe, MD¹⁴, Wendy K. Chung, MD, PhD¹, Yufeng Sheng, PhD¹.

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Tweet it! Abstract 15: Genetic analysis of 357 CDH cases reveals *de novo* variants in complex or isolated cases; indicates *MYRF* as a novel candidate gene @GudrunAsp #eAPSA2018

Purpose: Congenital diaphragmatic hernia (CDH) is a common and lethal birth defect. Previous studies using exome sequencing of protein coding gene regions support a significant contribution of coding *de novo* variants in isolated CDH and complex CDH cases with additional anomalies.

Methods: To further investigate the genetic architecture of CDH, we performed exome or genome sequencing of coding and non-coding gene regions in 357 proband-parents trios, including 148 complex and 209 isolated cases.

Results: Complex and isolated cases both have a significant burden of deleterious *de novo* coding variants (1.7~fold, $p=1.2 \times 10^{-5}$ for complex, 1.5~fold, $p=9.0 \times 10^{-5}$ for isolated). Notably, in isolated CDH, almost all of the burden is carried by females (2.1~fold, $p=0.004$ for likely gene damaging (LGD) and 1.8~fold, $p=0.0008$ for deleterious missense (D-mis) variants); whereas in complex CDH, the burden is similar for males and females. Furthermore, LGD variants are mainly concentrated in evolutionarily conserved genes (3.3~fold, $P=1.1 \times 10^{-3}$). Additionally, damaging *de novo* variants in complex cases are mostly enriched in genes highly expressed in developing diaphragm (4.7~fold, $p=7.0 \times 10^{-7}$ for LGD, 2.4~fold, $P=2.3 \times 10^{-4}$ for D-mis) but distributed among genes with a broad range of expression levels in isolated cases. We identified four *de novo* variants in *MYRF* (p -value= 2×10^{-10}) in CDH patients with associated congenital heart disease and genitourinary anomalies. This gene has not previously been associated with CDH. Also, two *de novo* variants were identified in a known CDH candidate gene *WT1* in two cases.

Scientific Session I (cont.)

Conclusion: Our study suggests for the first time that for isolated CDH males and females have a different genetic liability. We identified distinct gene expression patterns in early development for genes implicated in isolated versus complex CDH. We describe a new genetic syndrome associated with CDH, congenital heart disease, and genitourinary malformations due to *de novo* variants in *MYRF*.



Scientific Session I (cont.)

16

A LIPID MEDIATOR OF OMEGA-3 POLYUNSATURATED FATTY ACIDS REDUCES THE INTESTINAL INJURY AND INFLAMMATION ASSOCIATED WITH NECROTIZING ENTEROCOLITIS

Hironu Miyake, MD, Shogo Seo, MD, Bo Li, PhD, Carol Lee, MSc, Agostino Pierro, MD.
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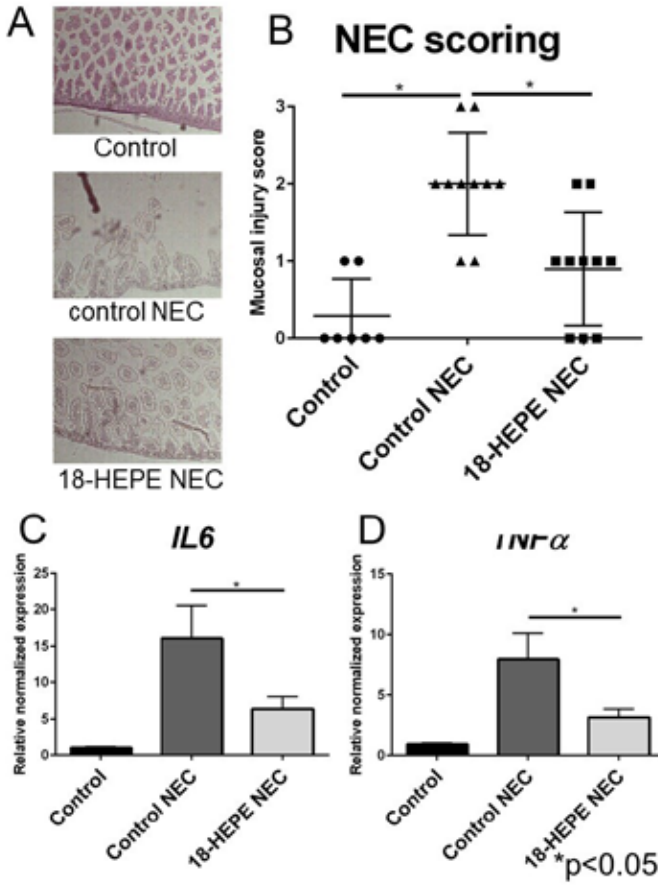
Purpose: It has been reported that maternal diet enriched in omega-3 polyunsaturated fatty acids (PUFAs) attenuates intestinal mucosal injury and inflammation in offspring exposed to experimental necrotizing enterocolitis (NEC). In addition, transgenic mice which produce omega-3 PUFAs are protected from NEC development and metabolites of the omega-3 PUFA eicosapentaenoic acid (EPA) are increased in the ileum. One of EPA metabolites, 18-HEPE, is progenitor of E-series resolvins, which are anti-inflammatory lipid mediators. The aim of this study is to investigate whether exogenous administration of 18-HEPE can reduce NEC severity.

Methods: Following ethical approval (#32238), we investigated NEC in C57BL/6 mice. On postnatal day 5 (P5), pups were randomly assigned to the following 3 groups. (i) Breastfed control (n=7) (ii) NEC with intraperitoneal PBS injection (control NEC group: n=10); (iii) NEC with daily intraperitoneal injection of 18-HEPE (18-HEPE NEC group: n=10). NEC was induced from P5 to P9 by hypoxia and gavage administration of lipopolysaccharide and formula. On P9, the pups were sacrificed and the ileum was evaluated for severity of mucosal injury (hematoxylin/eosin staining) and inflammation (qPCR for IL6 and TNF α mRNA expression).

Results: Significant mucosal injury was present in NEC. However, this was reduced by the administration of 18-HEPE (Figure A, B). Similarly, the incidence of NEC was 80% in control NEC compared to 20% in 18-HEPE NEC (p<0.05). Expression of IL6 and TNF α was significantly lower in 18-HEPE NEC compared to control NEC, suggesting less inflammation after administration of 18-HEPE (Figure C, D).

Conclusions: Administration of 18-HEPE led to minimal mucosal injury during NEC induction, reduction of NEC incidence and attenuation of inflammation in the intestine. These results indicate that lipid mediators derived from omega-3 PUFAs play an important role in protecting the intestine from NEC injury.

Scientific Session I (cont.)





Scientific Session I (cont.)

17

NEUROINFLAMMATION AND NECROTIZING ENTEROCOLITIS ASSOCIATED BRAIN DAMAGE

Lina Antounians, MSc, Bo Li, PhD, Nataliia Svergun, PhD, Shogo Seo, MD, Abidur Rahman, MBBS, Vincenzo D. Catania, MD, Elke Zani-Ruttenstock, MD, Agostino Pierro, MD, Augusto Zani, MD, PhD.

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Purpose: The pathogenesis of neurodevelopmental delay in neonates with necrotizing enterocolitis (NEC) remains poorly understood. We have recently reported that experimental NEC acts through the gut-brain axis and induces severe changes in brain size and morphology, specifically having a detrimental effect on neuronal progenitor cells. The aim of the present study was to investigate the inflammation that occurs in the brain during NEC.

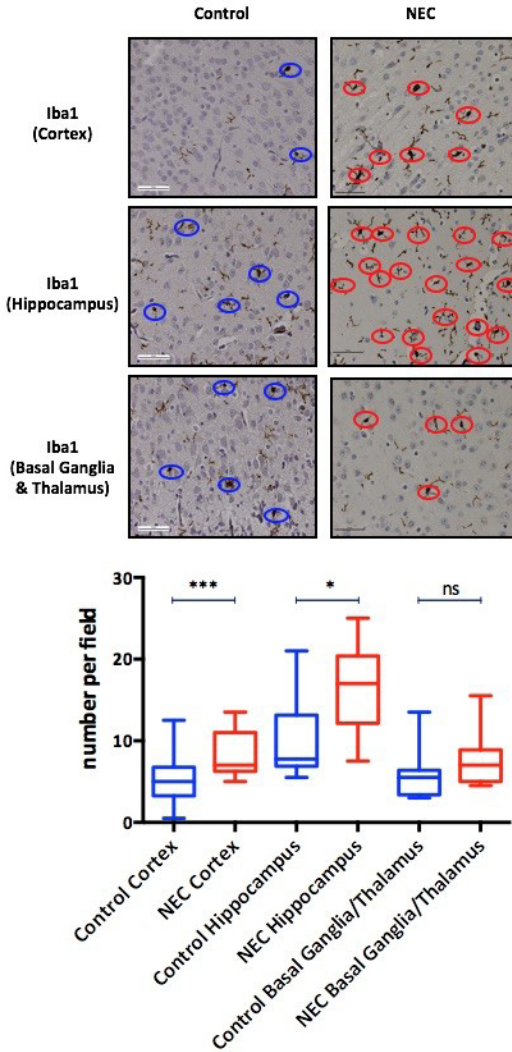
Methods: NEC was induced in 5-day old neonatal mice using hypoxia, gavage feeding with hyperosmolar formula and oral lipopolysaccharide (4mg/kg) (protocol n.32238). Breastfed pups served as control. On P9, both NEC and control mice were sacrificed and the whole brain was harvested and analyzed for levels of apoptosis (cleaved caspase-3) and inflammatory cytokines (TNF α and IL-6). The number of reactive inflammatory cells was investigated in the two groups by blindly counting the number of Iba1+ microglia and GFAP+ astrocytes per field.

Results: Compared to control, the brain of NEC pups had increased level of inflammatory cytokines (IL6: $p < 0.0001$; TNF α : $p < 0.0001$), and apoptosis ($p < 0.001$) levels. Compared to control, pups with NEC had activated microglia in the hippocampus ($p = 0.014$) and in the cortex ($p = 0.009$), whereas there was no difference between the groups in the basal ganglia and thalamus ($p = 0.1$) (Figure). Moreover, the brain of NEC pups showed signs of astrogliosis in the cortex, as evidenced by the increased number of astrocytes compared to control ($p < 0.0001$).

Conclusions: This study shows for the first time that experimental NEC induces severe neuroinflammation by activation of microglia and astrocytes in specific regions of the brain that control cognitive function. Both microgliosis (early inflammatory activation) and reactive astrocytosis (late inflammatory activation) may have a cytotoxic effect and contribute to progressive neuronal loss during acute brain inflammation. Further studies are needed to identify the key factors to target in the attempt to prevent NEC associated brain damage in babies.

Scientific Session I (cont.)

Figure. Number of microglial cells (Iba1+)





Scientific Session I (cont.)

18

NITRIC OXIDE FORMATION AND NEAR-INFRARED SPECTROSCOPY VALUES INCREASE, WHILE NEC INCIDENCE DECREASES WITH ARGININE AND CITRULLINE SUPPLEMENTATION IN A PREMATURE PIGLET MODEL

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Purpose: Bowel ischemia is a component of the pathogenesis of necrotizing enterocolitis (NEC). We hypothesized that supplementation with nitric oxide (NO) precursors will decrease the rate of NEC by increasing the rate of NO production and bowel perfusion as measured by abdominal near-infrared spectroscopy (A-NIRS).

Methods: Premature newborn piglets received parenteral nutrition for 48 hours, followed by 48 hours of enteral feeds. At 12 hours, piglets were randomized into citrulline, arginine and saline continuous infusion groups. Six hours prior to initiation of feeds, arginine, citrulline and nitrate tracers were administered intravenously to quantify citrulline-arginine-NO kinetics. A-NIRS were measured continuously throughout the experiment. Presence of NEC was assessed by necropsy.

Results: A total of 29 piglets were analyzed. The rate of NO formation by citrulline and arginine was higher than controls during periods of parenteral and enteral nutrition ($p=0.033$ and $p<0.001$) (Figure 1A). A-NIRS values in the first 3 hours were similar among groups ($p=0.83$), but an increase in A-NIRS was noted after infusion of NO precursors (Figure 1B). With enteral feeds, A-NIRS in the citrulline group remained elevated while others declined. NEC developed in 38% of piglets ($n=3/8$) in the control group, 36% ($n=4/11$) in arginine and 0% in citrulline groups.

Conclusions: As anticipated, citrulline and arginine infusion produced higher rates of NO formation compared to controls piglets. A-NIRS levels increased after infusion of NO precursors and remain elevated in the citrulline group following enteral feeds. Citrulline was more efficient in decreasing NEC than arginine. Citrulline supplementation may have potential to decrease NEC in neonates at risk.

Scientific Session I (cont.)

Figure 14

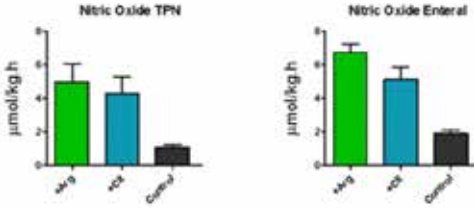
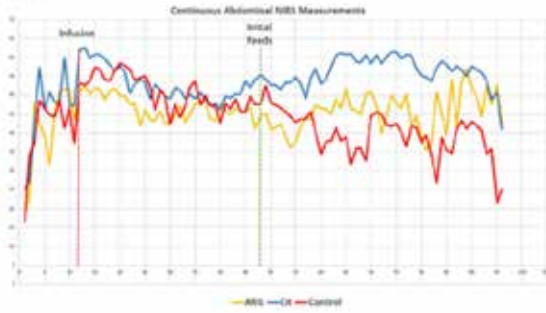


Figure 15





Scientific Session I (cont.)

19

CORRELATION OF PRE-OPERATIVE ABDOMINAL ULTRASOUND WITH OPERATIVE AND PATHOLOGIC FINDINGS IN NEONATES WITH NECROTIZING ENTEROCOLITIS

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Purpose: The purpose of this study was to evaluate abdominal ultrasonography (AUS) features and correlate them with operative and pathologic findings in neonates with suspected necrotizing enterocolitis (NEC).

Methods: A retrospective review of neonates treated for NEC at our institution from October 2003 to June 2017 was performed (REB#1000055522). AUS was done 0-2 days prior to surgical intervention [laparotomy or peritoneal drain (PD)]. Patient demographics, cardiopulmonary status, findings at surgical intervention, and mortality were evaluated.

Results: Of 99 patients, 51 (51.5%) were male, 85 (85.9%) were born premature (median 29 weeks GA), and 61/99 (61.6%) had BW <1500g (median 1297g). 8% had significant cardiac disease. All 99 patients underwent an AUS pre-operatively (or prior to PD). AUS findings of NEC included free gas in 30/99 (30.3%), focal fluid collection in 19/99 (19.2%), free fluid with echoes in 78/99 (78.8%), and absent perfusion in 41/99 (41.4%). 10/99 (10.1%) had PD, of which 50% had feculent drainage upon insertion. Of 89 patients who underwent laparotomy, 84/89 (94.4%) had intestinal necrosis, perforation and/or NEC totalis. 5/89 (5.6%) had no findings of NEC. Necrosis was found in 86.5%, 83.3%, and 89.6% of patients with absent perfusion, portal venous gas, and bowel wall thinning, respectively, on AUS. At laparotomy, 74/89 (83.1%) underwent intestinal resection. Of these, 72/74 (97.3%) had necrosis and/or perforation on pathology. Overall mortality was 27%. Among the patients with PD, mortality was 70%.

Conclusions: Radiologic features of NEC on pre-operative AUS appear to correlate closely with surgical findings of NEC. AUS may be useful in the management of NEC and could aid in treatment decisions, especially when clinical findings and/or plain radiographs are inconclusive.

Scientific Session I (cont.)

20

MESENCHYMAL STROMAL CELL-DERIVED EXTRACELLULAR VESICLES IMPROVE PULMONARY ARTERY RESPONSIVENESS IN CONGENITAL DIAPHRAGMATIC HERNIA

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Purpose: Pathologic pulmonary vasculature precipitates pathophysiologic pulmonary circulation and impaired oxygenation/ventilation in congenital diaphragmatic hernia (CDH). Extracellular vesicles may alter the vasculature allowing a more physiologic response. Our objective was to evaluate the effect of mesenchymal stromal cell extracellular vesicles (MSCEv) on pulmonary artery endothelial cell vasoactive mediators and pulmonary artery (PA) vasoreactivity.

Methods: Human pulmonary artery endothelial cells (HPAECs) were treated with nitrofen (0.1 mg/ml), with/without MSCEv (1e10/ml x 24 hours), and expression of endothelin-1 (ET-1) and endothelial nitric oxide synthase (eNOS) were assessed via immunoblotting. Newborn rodents with or without CDH (nitrofen model, Sprague-Dawley) were treated with intravascular MSCEv or vehicle control, PAs were isolated, and PA contractility was assessed via wire myography. The contractile (KCL and ET-1) and relaxation (fasudil) responses were evaluated, results shown as mean±SEM, and statistical analysis performed using student's t test.

Results: Alterations of the major vasoactive mediators (ET-1, 55% increased, p<0.05; e-NOS, 60% decreased, p<0.01) were identified in nitrofen-treated HPAECs compared to HPAECs. MSCEv treatment significantly reversed the alterations of the major vasoactive mediators in nitrofen-treated HPAECs, reducing the over-expression of ET-1 by 51% (p<0.05) and increasing the under-expression of eNOS by 55% (p<0.05). CDH PA (n=20 PAs/group) contraction was impaired with KCL (108.6±1.4% vs 112.0±1.4%, p=0.092) and significantly impaired with ET-1 (121.7±3.0% vs 131.2±1.8%, p=0.007). CDH PA (n=20 PAs/group) relaxation was significantly impaired with fasudil (32.2±1.9% vs 42.1±2.2%, p<0.001). After MSCEv treatment, CDH PA (n=6 PAs/group) contraction was improved (125.9±3.4% vs 116.4±3.5, p=0.078) and relaxation unchanged (32.5±3.2% vs 29.4±3.1%, p=0.496).

Conclusions: Nitrofen exposure alters endothelial expression of ET-1 and eNOS *in vitro* and decreases PA vasoreactivity. Exposure to MSCEv restores the physiologic expression of ET-1 and eNOS, possibly through anti-inflammatory or LOX-1 avenues, with improvement in PA contractile response. Ongoing investigation will focus on the mechanism and therapeutic efficacy of MSCEv in CDH-associated pulmonary hypertension.



Scientific Session I (cont.)

21

SWITCHING TO CENTRIFUGAL PUMPS DECREASES HEMOLYSIS RATES IN PEDIATRIC ECMO PATIENTS

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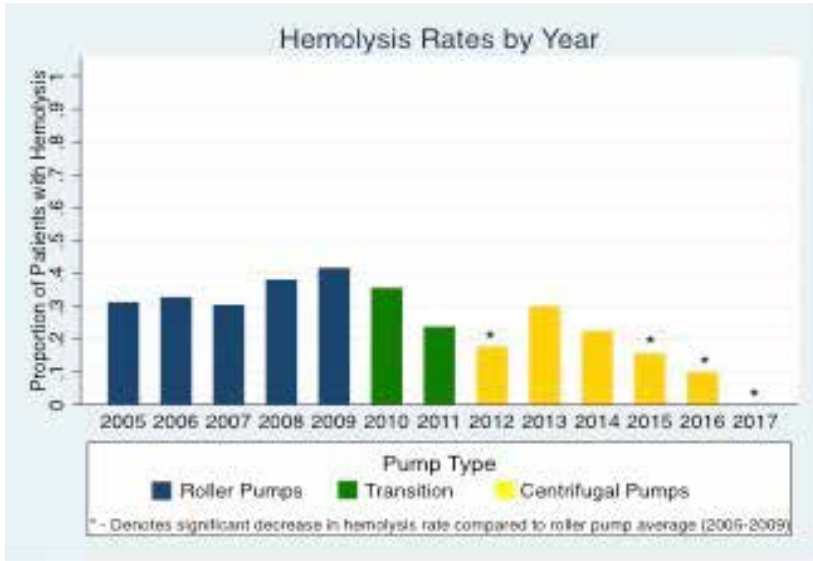
Purpose: Recent advances in ECLS technology have led to the adoption of centrifugal pumps for the majority of patients worldwide. Despite several advantages of centrifugal pumps, they remain controversial because a number of studies have shown increased rates of hemolysis. We investigated our complications and outcomes during the transition from roller to centrifugal pumps to determine whether this change was beneficial or detrimental to our patients.

Methods: A retrospective analysis of all pediatric ECMO patients (age 0-17 years) at a single center between 2005 and 2017 was undertaken. Hemolysis was defined as a plasma free hemoglobin >50 mg/dL. Multivariable logistic regression was performed correcting for age, gender, support type (cardiac, respiratory, eCPR), mode of support (VA versus VV), pump type, and number of hours on ECLS to determine risk factors for hemolysis and analyze outcomes among patients with hemolysis. Significant findings were those with $p < 0.05$.

Results: A total of 590 patients were identified during the study period. Multivariable logistic regression for risk factors for hemolysis showed roller pumps (OR 2.47, CI 1.60-3.66) and increasing number of hours on ECMO (OR 1.002 per hour, CI 1.001-1.003) to be significant factors. When analyzing hemolysis rates by year, rates of hemolysis significantly improved following conversion from roller to centrifugal pumps, with significantly lower rates of hemolysis in 2012, 2015, 2016, and 2017 when compared to the historical average with roller pumps from 2005-2009 (34.7%). Additionally, hemolysis was associated with an increased risk of death (OR 3.12, CI 2.07-4.69) when correcting for other factors.

Conclusion: We conclude that contrary to many studies, these data demonstrate decreasing rates of hemolysis with centrifugal pumps compared to roller pumps. Since hemolysis was also associated with increased risk of death, these data support the switch from roller to centrifugal pumps at ECMO centers.

Scientific Session I (cont.)





Scientific Session I (cont.)

22*

CONGENITAL DIAPHRAGMATIC HERNIA REPAIR IN PATIENTS ON EXTRACORPOREAL MEMBRANE OXYGENATION: HOW EARLY CAN WE REPAIR?

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Purpose: We have previously reported that early repair (<72hr) on ECMO was associated with lower complication rates and decreased duration of ECMO. Our anecdotal evidence suggests that repair in the first 24 hours post-cannulation is beneficial. The aim of this study is to compare the outcomes of CDH repair on ECMO at <24 hours to repair between 24-72 hours after cannulation.

Methods: A retrospective review of the inborn infants with CDH placed on ECMO (2004-2017) was performed comparing patients repaired before 24 hours and between 24-72 hours post cannulation. The two groups were assessed for severity stratification data (fetal lung volumes, percent liver-up, APGAR score) and outcome data. Data presented as mean \pm -SD; p-value by students t-test.

Results: 32 patients underwent early (<72h) repair on ECMO with an overall survival of 63.63%. Patients repaired at <24 hours (n=14) had an increased average survival of 71.42%, compared to repair at 24-72 hours (n=18; survival 61.1%; p=NS). Patients repaired <24hour had a shorter hospital stay (115.4 vs 175.5 days; p=NS); ventilator days (29.2 vs 57.3; p=NS) and ECMO duration (217.7 vs 254.6 hours; p=NS). Interestingly, the group of patients repaired at <24hours had significantly smaller lung volumes, higher liver-up percentages, and lower APGAR scores compared to those repaired at 24-72 hours.

Conclusions: These data suggest that patients who were repaired at less than 24 hours had improved outcomes, despite the fact that they were predicted to have a worse outcome by standard severity stratification parameters. However, this difference did not reach statistical significance due to small sample size. Nonetheless, the data suggest that repair at <24 hours of CDH patients on ECMO may confer a previously unrecognized outcome advantage.

Scientific Session II

23

HERNIA RECURRENCE FOLLOWING INGUINAL HERNIA REPAIR IN CHILDREN

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Purpose: Reported rates of hernia recurrence following inguinal hernia repair (IHR) vary from 0.3%–10.9%, and the timing and risk factors for recurrence are not clearly defined. We aimed to describe the incidence, timing and predictors of inguinal hernia recurrence in children.

Methods: We used the TRICARE claims database, a national cohort of >3 million child dependents of active and retired members of the U.S. Armed Forces, to perform a retrospective cohort study of children <12y who underwent IHR between 2005–2014. Our primary outcome was hernia recurrence, defined by ICD9-CM diagnosis codes. We calculated incidence rates for the overall population and stratified by age, conducted a time to event analysis to assess time from initial repair to hernia recurrence, and performed multivariable logistic regression to determine associated factors.

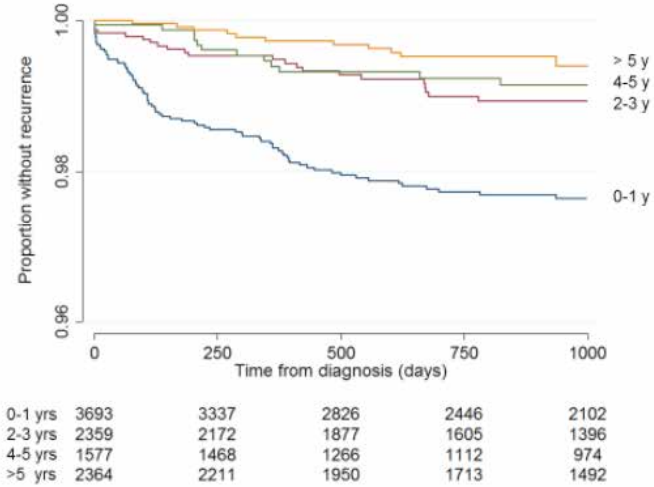
Results: 9993 children met inclusion criteria. Age at the time of IHR was ≤1y in 3693 (37%), 2–3y in 2359 (23%), 4–5y in 1577 (16%), and 5–12y in 2364 children (24%). Median follow-up time was 3.5y (IQR:1.6–6.1). Hernia recurrence occurred in 137 cases (1.4%), with an overall incidence of 3.46 per 1000 person-years. Over half of the recurrences occurred in children 0–1y at initial repair (60%), and the majority occurred within the 1st year following repair (median 209 days [IQR:79–486]). In multivariable analysis, children 0–1y had 2.53 times greater odds of recurrence compared to those >5y, and children with multiple comorbidities had 5.45 times greater odds compared to those with no comorbidities. Prematurity, surgical specialty or approach (open vs. laparoscopic) were not predictors of recurrence.

Conclusions: From a nationally representative sample of pediatric patients who underwent IHR, we found an incidence of recurrence of 3.46 per 1000 person-years. The majority of recurrences occurred within a year of initial operation. Children ≤1y and those with multiple comorbidities were at increased risk for hernia recurrence.



Scientific Session II (cont.)

Figure. Kaplan-Meier curve depicting time to hernia recurrence from initial hernia repair, stratified by age



Scientific Session II (cont.)

24**

PEDIATRIC TRAUMA CENTER VERIFICATION IMPROVES CLINICAL CARE AND REDUCES CHARGES IN CHILDREN WITH BLUNT SPLENIC INJURY

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Purpose: Our hospital was verified as a Pediatric Trauma Center (PTC) by the American College of Surgeons (ACS) Committee on Trauma in February of 2009. The purpose of this study is to evaluate the clinical and financial impact of this designation on children presenting with blunt splenic injury.

Methods: Children younger than 18 years of age with blunt splenic injury from July 2004 through June 2017 were extracted from the hospital trauma registry. February of 2009 distinguished the “pre-PTC” patients from “post-PTC” patients. Cohorts were also sub-categorized as “isolated injury” and “multisystem injury”. Clinical quality and financial characteristics of each child in the study were collected and groups were statistically compared by student T test and chi-square tests.

Results: A total of 126 patients were treated for blunt splenic injury between July 2004 and June 2017, 56 prior to PTC designation and 70 following PTC designation. Splenic procedure rates decreased (19.6% vs 7.1%; $p = 0.05$), average blood products administered decreased (7.2 vs 2.4; $p = 0.08$), and average hospital charges were substantially lower (\$121,935 vs \$72,700; $p = 0.05$). The quality and financial metrics for children with isolated splenic injuries did not change after PTC verification. However, children with multisystem injuries had significant reductions in splenic procedure rates (24.4% vs 8.3%; $p < 0.05$), blood product administration (9.8 vs 3.6; $p = 0.09$), and hospital charges (\$156,180 vs \$97,391; $p = 0.05$).

Conclusions: PTC designation improved in-hospital care of pediatric blunt splenic injuries by reducing operative rates and blood transfusions and was complimented by significantly lower hospital charges. Multisystem injury children benefit the most from structured communication and collaboration between adult and pediatric surgeons facilitated by PTC designation.



Scientific Session II (cont.)

25

MASS SHOOTINGS: ARE CHILDREN SAFER IN THE STREETS THAN IN THE HOME

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Tweet it! Abstract 25: Children account for 42% of fatalities and 48% of injuries in domestic mass shootings; rates are 10% and 2%, in public mass shootings. @MarcLev95759662 #eAPSA2018

Purpose: Domestic mass shootings, due to intimate partner violence, are more common than public mass shootings despite the latter's dominance in the media. We sought to compare the rates of pediatric injury and death (<18 years) in domestic and public mass shootings.

Method: Domestic and public mass shootings in the United States from 2009 to 2016 were compiled using the Federal Bureau of Investigation Active Shooter Incidents; Everytown Research, and Mother Jones open-source online databases. Mass shooting is defined as four or more fatalities in a single incident. Domestic mass shooting is defined as one that occurs in the home where the shooter is either a family member or a past or present intimate partner of a member of the household. Home invasion and drug-related domestic shootings were excluded. Public mass shooting is defined as one that occurs in a public place where the shooter is unknown to the victim. The number of mass shootings per year resulting in pediatric injury or death were compared between the domestic and public groups. Categorical data were analyzed using Fisher's Exact test and are reported as percentage. Significance was defined as $p < 0.05$.

Results: During the eight-year study period there were 71 domestic and 31 public mass shootings resulting in 330 and 278 fatalities, respectively. Of these, 58 (82%) domestic and 6 (19%) public mass shooting incidents resulted in the death of at least one child ($p < 0.001$). There was a significantly higher rate of pediatric death (42% vs. 10%; $p < 0.001$) and injury (48% vs. 2% $p < 0.001$) in domestic compared to public mass shootings.

Conclusion: The pediatric fatality rate in domestic mass shootings as a result of intimate partner gun violence is significant and alarming. It represents a public health issue that requires greater vigilance and protection of children at-risk.

Scientific Session II (cont.)

26

NEBULIZED ANALGESIA DURING LAPAROSCOPIC APPENDECTOMY (NALA), A RANDOMIZED TRIPLE-BLIND PLACEBO CONTROLLED TRIAL

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Purpose: Post-operative pain remains a considerable concern for patients and families and may decrease enthusiasm for surgical care when non-operative options are available. Intra-peritoneal administration of nebulized anesthetic has been described as safe and effective in adults. We assessed whether nebulized ropivacaine reduces morphine consumption and pain after laparoscopic appendectomy for uncomplicated appendicitis in children.

Methods: With IRB approval (14-120PED), consenting patients (aged 7-18) diagnosed with uncomplicated appendicitis were randomized to ropivacaine (intervention arm) or saline nebulization (placebo arm) at the onset of laparoscopy. Surgeons, patients and data collectors remained blind to arm allocation until final analysis. Non-consenting individuals were treated with standard care and invited to provide clinical data (baseline arm). The primary outcome was in-patient morphine utilization; secondary outcomes included pain scores at multiple time-points, markers of recovery, operative times and surgeon satisfaction. Data was collected with Redcap, and analyzed using standard hypothesis testing. Approval for off-label use of ropivacaine was provided by the federal regulatory body. The trial was registered (NCT02624089).

Results: Study enrollment was 116 patients over a 1-year period: Intervention (n=43) Placebo (n=39) Baseline (n=34). No significant differences were noted between groups. No difference was noted in overall in-patient morphine consumption between randomized groups (0.31 vs. 0.35mg/kg, p=0.42), nor between ropivacaine and baseline (0.31 vs. 0.277mg/kg, p=0.62). No differences were noted in time to unassisted walking, length of stay and outpatient pain scores between groups. No adverse events were reported that related to the nebulization. Although operative times were comparable between all groups, 63% of surgeon respondents felt nebulization obscured visualization.

Conclusions: Nebulized ropivacaine did not reduce post-operative morphine consumption nor pain scores after laparoscopic appendectomy for simple appendicitis in children. Given that it decreases visualization and likely increases costs, nebulized administration of intra-peritoneal analgesia does not appear warranted in this context.



Scientific Session II (cont.)

27*

ORAL ANTIBIOTICS AT DISCHARGE ARE NOT ASSOCIATED WITH REDUCED COMPLICATIONS FOLLOWING APPENDECTOMY FOR COMPLICATED APPENDICITIS IN CHILDREN

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Purpose: The aim of this study was to assess the effect of discharge antibiotics on outcomes following appendectomy for complicated appendicitis in children.

Methods: The ACS NSQIP Pediatric targeted appendectomy database from 2015 was queried for children undergoing appendectomy for complicated appendicitis. Patients were divided into two groups based on discharge antibiotics: yes vs. no. 30-day outcomes, including organ space infection (OSI), percutaneous drain placement, postoperative ED visits, and readmission were compared between groups.

Results: During the study period, 2346 patients underwent appendectomy for complicated appendicitis. 1394 (59.4%) were discharged with oral antibiotics and 952 (40.6%) were discharged without antibiotics. There was no difference in gender (59.8% male), age (10.0, SD 4.0 years), race, ethnicity, diabetes, or other comorbidities between groups ($p > 0.05$). OSI rate was 7.5% and was higher in the antibiotic group compared to the no antibiotic group (9.5% vs. 4.5%; $p < 0.0001$). Percutaneous drainage rate was 12.3% and higher in the antibiotic group (14.3% vs. 9.5%; $p = 0.0005$). Controlling for confounding variables, discharge antibiotics were no longer a significant risk factor for percutaneous drainage (OR 1.4, 95%CI 0.99-1.98). Preoperative CT (OR 1.42, 95%CI 1.03-1.95), postoperative fever (OR 2.33, 95%CI 1.51-3.57), and time from operation to discharge (OR 1.24, 95%CI 1.19-1.30) remained statically significant. These risk factors were used to identify a high risk group of patients that might benefit from prolonged antibiotic therapy. 91 patients were identified for subset analysis. The OSI rate was 29.7% with no significant difference between groups (29.3% vs. 30.3%; $p = 0.92$). The percutaneous drainage rate was 45.1%, also with no significant difference between groups (43.1% vs. 48.5%; $p = 0.62$). Readmission and postoperative ED visits were not different between groups ($p > 0.05$).

Conclusions: The majority of children with complicated appendicitis are discharged with oral antibiotics after appendectomy. However, oral antibiotics given at discharge do not appear to prevent postoperative intervention, ED visits or readmission.

Scientific Session II (cont.)

28

CLINICAL OUTCOMES FOLLOWING IDENTIFICATION OF AN ENLARGED APPENDICEAL TIP ON ULTRASONOGRAPHY

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Purpose: With recent improvements in ultrasonography, subtler variations in the anatomy of the appendix can be appreciated. We intend to determine whether radiographic findings of tip appendicitis truly correlate with a pathologic diagnosis of appendicitis.

Methods: After obtaining IRB approval, our radiology database was mined for reports with a diagnosis of tip appendicitis between January 2013 and June 2017. The criteria for this diagnosis were enlarged tip >6mm with majority of the appendix of normal caliber, and findings including free or periappendiceal fluid, wall thickening, hyperemic vascularity, appendicoliths and non-compressibility. Retrospective chart review was performed to determine demographic and clinical data and clinical outcomes. For patients managed operatively, pathology results were reviewed for evidence of acute appendicitis. Patients managed nonoperatively and those with negative pathology were considered to not have appendicitis. Multivariate analysis was used to determine any independent risk factors for a diagnosis of appendicitis in this group, with a p-value <0.05 considered significant.

Results: 34 patients met inclusion criteria, 20 boys and 14 girls between the ages of 2 and 17. 29 patients (85.3%) with tip appendicitis on ultrasonography ultimately did not have appendicitis. 9 patients underwent appendectomy; 5 (55.6%) of whom had pathologic evidence of appendicitis. One patient had a ruptured appendix. For patients with a negative appendectomy, no other pathology was identified. 9 patients had CT scans performed to clarify their ultrasound findings; all of which were negative, and these patients were discharged home without treatment. None of the patients managed nonoperatively required a return ED visit or readmission. No significant independent risk factors were associated with a pathologic diagnosis of appendicitis.

Conclusion: We conclude that ultrasound findings of tip appendicitis may not accurately correlate with a final diagnosis of acute appendicitis. Clinical judgment should ultimately dictate appropriate initial management, follow-up tests and imaging.



Scientific Session II (cont.)

29

FERTILITY IN MALES AFTER CHILDHOOD, ADOLESCENT AND ADULT INGUINAL OPERATIONS

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Purpose: Inguinal hernia repair and orchidopexy are among the most common operations in boys. The impact on future fertility has not been conclusively defined. This study evaluates later fertility and sperm quality after previous inguinal surgical interventions.

Methods: Ethics board approval for this retrospective cohort study was obtained. We analysed the spermograms of men with a desire to conceive children from 2014 until 2016. History of previous inguinal surgery (inguinal hernia repair, orchidopexy, varicocele ligation) was recorded and correlated with sperm quality. Abnormal sperm counts were defined according to WHO criteria. Using T-test and Chi-square, the relationship between previous inguinal surgery and an abnormal spermogram was tested at a significance level of $p < 0.05$. In a subgroup analysis, possible other influential factors (age, BMI, chronic medication, tobacco use, physical activity) were tested as well.

Results: A total of 333 patients were included. Overall, 12.6% of the subjects had undergone previous inguinal surgery. Of these, 17 (43%) were inguinal hernia repairs, 8 (20%) orchidopexies, and 6 (15%) varicocele ligations, while 9 (22%) could not give an exact history of their previous procedure. Overall, abnormal spermograms were found in 60% ($n=24$) of those with previous inguinal surgery versus 48% in controls ($p=0.16$). There was also no difference in subgroup analysis regarding age at operation or type of operation. Patients taking chronic medications, however, were at higher risk for having an abnormal spermogram ($p=0.008$).

Conclusions: Previous inguinal surgery does not seem to impact negatively on quality of sperm later in life. This is a reassuring finding for pediatric surgeons who perform these types of interventions on a daily basis. The study is somewhat limited by subgroup cohort size. Therefore, a larger study is needed to universally confirm these findings.

Scientific Session II (cont.)

30

INCARCERATION RATE OF INGUINAL HERNIAS: AN AGE DISTRIBUTION CURVE

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Introduction: While the literature clearly describes a high risk of inguinal hernia incarceration in premature infants and recommends early repair, it is unknown how the risk of incarceration changes with age and how urgently older children should be operated on. This study will identify the rate of inguinal hernia incarceration by age.

Methods: A retrospective study using the Pediatric Health Information Systems (PHIS) database was performed. Patients between 0-17 years with inguinal hernias were identified using ICD codes from January 2004-December 2016. Recurrent inguinal hernias and duplicate visits were excluded. Patients with inguinal hernia incarcerations who presented to the ED or hospital were then identified. Patients were divided into age groups and premature patients below the age of 1 were identified. Data were analyzed using descriptive statistics, odds ratio and Chi² test.

Results: A total of 172,772 patients were identified, of which 3,366 were incarcerated. Incarceration rates peaked at 3 weeks for both premature (15%) and non-premature infants (10%). Incarceration rate trends were similar for premature and non-premature infants and decreased until 3 months of age, at which time it was between 2% to 3% until age 2 years. After age 2, the incarceration risk ranged between 0.3% to 1.52% (see graph). Incarceration rates were statistically significant between 0-3 months of age and < 1 to 5 years (all $p < 0.05$).

Conclusion: The peak incarceration rate of premature and non-premature infants occurs at 3 weeks and drops significantly to 2 to 3% at 3 months of age. The incarceration rate after age 2 is between 0.3 to 1.52%. This shows that inguinal hernia incarceration risk is very low after 3 months of age, and the surgeon may consider waiting to repair the hernia.



Scientific Session II (cont.)

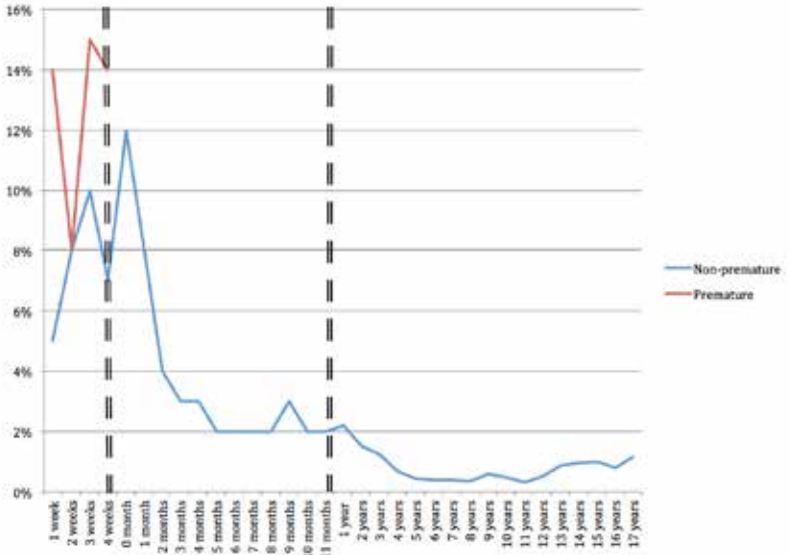


Figure: Incarceration rates by age (1 week to 17 years)

Scientific Session II (cont.)

31*

OUTCOMES OF CENTRAL VENOUS CATHETER REPAIR VERSUS REPLACEMENT AFTER CENTRAL VENOUS CATHETER FRACTURE

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Purpose: Central venous catheter (CVC) fracture is a common complication that places children at increased risk for CVC infection and need for replacement. The aim of this study is to examine risk factors for CVC fracture and compare outcomes of children undergoing CVC repair versus replacement.

Methods: A retrospective chart review was conducted from 2000-2016 for children ≤ 17 yrs old with tunneled CVCs. Children with CVC fractures were compared to those with intact CVCs to identify risk factors for fracture. Children with fractured CVCs were then divided into treatment groups based on whether the CVC was repaired or replaced and outcomes were compared between groups.

Results: In the 236 children with tunneled CVCs, the rate of CVC fracture was 29.2%. Fractured CVCs were more common in children with double lumen CVC ($p=0.040$) and those whose indication for CVC placement was total parenteral nutrition administration ($p=0.007$). There was no difference in fracture rate based on age, gender, race, catheter brand, or catheter size ($p>0.328$). Given children often underwent multiple repairs or replacements, a total of 98 CVC repairs and 41 replacements were analyzed. There was no increased incidence of bacteremia in children who underwent repair versus replacement (9.2% vs. 14.6% $p=0.345$). There were no differences in bacteremia rates based on a child's immunosuppression status ($p=0.439$), indication for CVC ($p=0.902$) or number of lumens ($p=0.539$). A clinical trend towards longer catheter integrity was seen in those children with replacement vs. repair (182.0 ± 156.2 days vs. 102.8 ± 147.4 days, $p=0.073$), although these findings were not statistically significant.

Conclusions: CVC fracture is a frequent complication in children with tunneled CVCs. CVC repair offers similar durability with equivalent incidence of bacteremia without subjecting the child to the intraoperative and anesthetic risks of CVC replacement.



Scientific Session II (cont.)



Scientific Session II (cont.)

32*

INDEX CASE VOLUMES OF RECENT APPLICANTS TO THE AMERICAN PEDIATRIC SURGICAL ASSOCIATION (APSA): AN APSA MEMBERSHIP AND CREDENTIALS COMMITTEE STUDY

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Purpose: There has been an increase in the number of pediatric surgery fellowship programs without a concomitant rise in the national birth rate. Between the years 2008 and 2016, the number of accredited programs increased 34%, from 35 to 47. This study seeks to assess the effects of the increased number of pediatric surgeons on individual surgeon case volume.

Methods: Case logs from APSA membership applications from 2008 to 2016 were obtained and the number of index cases completed per applicant tallied. Case volume trends were analyzed using ANOVA testing.

Results: 209 APSA applications had sufficient data to be included in the study. After analysis, only funduplications showed a statistically significant ($p < 0.05$) decrease in case volume (Table). All other measured index cases did not exhibit significant variation.

Conclusion: To date, case volumes of most index cases amongst recent APSA applicants have remained stable despite an increase in the number of pediatric surgeons and pediatric surgery fellowship programs. Funduplications seem to be an exception to this trend, suggesting that the decreased volume is related to less of these procedures being performed rather than the increase in number of surgeons. As the pediatric surgical workforce continues to enlarge, further studies will be needed to continue monitoring individual surgeon volume.



Scientific Session II (cont.)

Average index case volumes per surgeon per year				
Index Case	2008-2010 Average case/ surgeon/year	2011-2012 Average case/ surgeon/year	2013-2016 Average case/ surgeon/year	P-value
Chest Wall Reconstruction	2.87	1.98	1.43	0.2634
Congenital Diaphragmatic Hernia Repair	2.34	2.05	2.68	0.3576
Esophageal atresia/ tracheoesophageal fistula repair	1.96	1.80	2.59	0.1536
Nissen Fundoplication	11.37	7.79	5.08	0.0005
Intestinal atresia/stenosis	2.85	2.53	3.53	0.5210
Posterior Sagittal Anorectoplasty + Perineal anoplasty	2.49	2.44	2.82	0.8183
Hirschsprung's Disease pull-through	1.73	2.10	2.13	0.5366
Biliary Operations	0.80	1.11	0.65	0.1033
Neuroblastoma + Nephrectomy for tumor	1.99	2.01	2.14	0.9645

Scientific Session II (cont.)

33

PIT PICKING FOR ADOLESCENTS WITH PILONIDAL DISEASE

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Tweet it! #pitpickingpilonidals @hajarpa #eAPSA2018

Purpose: To evaluate the outcome of pit-picking (PP) on adolescents with pilonidal disease.

Methods: Following IRB approval (IRB-P00020745), patients who presented to a dedicated Pilonidal Clinic were managed by soaking and, as needed, hair removal. Once active infection resolved, they underwent pit-picking under local anesthesia by a pediatric surgeon or surgical physician assistant in the outpatient setting. A standardized 2 or 3 mm skin punch biopsy device was used to excise the epithelialized pits. Skin defects were closed with non-absorbable sutures, which were removed after 10 days. If present, pilonidal exit sites were debrided and left open; patients were instructed to soak daily. Those with > 3 pits underwent sequential PP, 2 months apart. Patient symptoms were surveyed at clinic visits or via telephone.

Results: Thirty-eight patients underwent at least one PP from February 2016 to September 2017. There were 27 (71%) males with a mean age of 17.5 years (range 12-24). The median BMI was 26 (range 19-47). Twelve patients (32%) had low disease severity (1-3 pits, no drainage or open wound); 21 (55%) had moderate (>3 pits, intermittent drainage, open wound <1cm); and 5 patients (14%) severe (multiple pits, chronic drainage, open wound >1cm) at initial presentation. There were 25 hirsute patients (66%) who underwent a series of laser epilations, in addition to pit picking. Patients required from 0-3 days of non-steroidal analgesia, and all returned promptly to pre-procedure activity levels. Four patients (11%) were lost to follow-up. Of the 34 patients with follow-up data, 32 (94%) were symptom-free an average of 4.2 (range 1-14) months post-procedure. Two patients (6%) were still experiencing intermittent drainage at the exit site.

Conclusion: Pit-picking is a simple and easy office procedure that may resolve pilonidal disease in adolescents. A longer follow-up interval is needed to determine the long term recurrence rate.



Scientific Session III

34*

SAFETY OF PROLONGED INTRA-AMNIOTIC CARBON DIOXIDE INSUFFLATION IN A FETAL SHEEP MODEL

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Background: Intra-amniotic carbon dioxide (CO₂) insufflation has been used with increasing frequency to improve visualization during fetoscopic surgery. However, its safety during prolonged surgeries has not been well established.

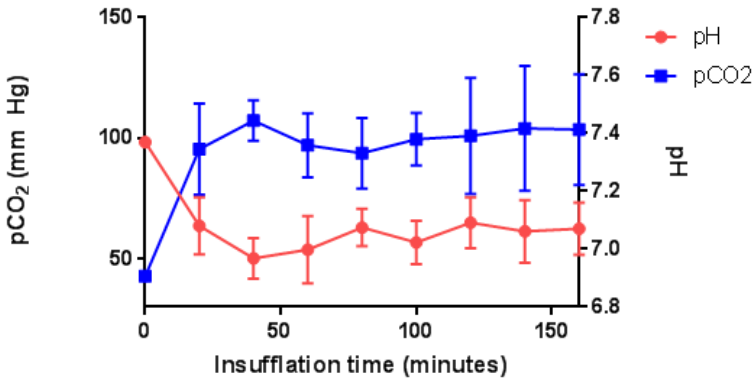
Methods: 7 mid-gestation fetal sheep (GA 95-105 days) underwent carotid artery catheter placement. Following a recovery period of 48-96 hours, ewes underwent repeat laparotomy and CO₂ insufflation of the amniotic cavity (n=4) (6mm Hg); the remaining 3 fetuses served as non-insufflated controls. Fetal hemodynamics were continuously monitored, and arterial blood gas samples were measured at regular intervals. Ultrasonographic evaluation of the middle cerebral artery was performed before and after insufflation. At study conclusion, fetal brains (n=4) were perfusion fixed for histologic analysis. Continuous variables were analyzed with Student's t tests or repeated measures ANOVA.

Results: 4 fetuses underwent CO₂ insufflation for mean duration 155±38 minutes, and 3 fetuses underwent anesthesia without insufflation for mean duration 187±44 minutes. Over time, the insufflated group demonstrated a significant increase in pCO₂ (43 vs 88 mmHg, p=0.006) and reduction in pH (7.37 vs 7.10, p=0.04). There was no significant change over time in pO₂ (28.0 vs 23.25 mmHg, p=0.57), mean arterial pressure (38.0 vs 37.5 mmHg, p=0.65) or heart rate (168 vs 143 bpm, p=0.16). Middle cerebral artery pulsatility index increased during insufflation, but this was not significant (0.92 vs 1.53, p=0.14). Compared to non-insufflated fetuses, the insufflated group had increased white matter cellularity (813 vs 735 cells/hpf, p=0.28) and number of apoptotic cells (2 vs 0.5 cells/hpf, p=0.31), but this did not reach statistical significance.

Conclusions: Intra-amniotic CO₂ insufflation leads to severe respiratory acidosis in a fetal sheep model. There are trends toward pathologic changes in cerebral blood flow and neuropathology which warrant additional study.

Scientific Session III (cont.)

Fetuses develop respiratory acidosis during intra-amniotic carbon dioxide insufflation





Scientific Session III (cont.)

35*

INCREASED OXYGENATOR RESISTANCE MIMICS INTRAUTERINE GROWTH RESTRICTION SECONDARY TO PLACENTAL INSUFFICIENCY IN THE EXTRAUTERINE ENVIRONMENT FOR NEONATAL DEVELOPMENT

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Purpose: The most common cause of intrauterine growth restriction (IUGR) is placental insufficiency. We have previously shown that the EXtrauterine Environment for Neonatal Development (EXTEND) provides physiological support for extreme preterm lamb fetuses. Here, we test the hypothesis that a high-resistance oxygenator, analogous to high placental resistance, would create an experimental model of IUGR.

Methods: 10 preterm lambs were cannulated at gestational age 105-116 days (term: 145 days) and supported by EXTEND for ≥ 20 days. Six lambs were connected to a low-resistance oxygenator (Standard group) and four lambs were connected to a high-resistance oxygenator (IUGR group). Hemodynamic parameters were measured continuously, and echocardiography was performed daily.

Results: The IUGR group had a higher oxygenator resistance ($3.7 \times 10^{-2} \pm 0.5 \times 10^{-2}$ mmHg/ml/min vs. $1.7 \times 10^{-2} \pm 0.6 \times 10^{-2}$ mmHg/ml/min; $p < 0.01$) and higher umbilical artery pulsatility index (0.63 ± 0.02 vs. 0.36 ± 0.10 ; $p < 0.01$) than the Standard group. Compared to the Standard group, IUGR fetuses had evidence of hypoxia, higher lactate, lower umbilical flow and worse nutrient utilization (i.e. lower RQ) (see Table). Although initial bodyweight was similar between the two groups (Standard 1.8 ± 0.5 kg vs. IUGR 1.5 ± 0.2 kg; $p = 0.31$), the growth rate during the run was lower in IUGR fetuses (10.8 ± 7.0 g/kg/day vs. 22.9 ± 2.5 g/kg/day; $p < 0.01$). Ultrasonography demonstrated decreased cardiac output, left ventricular diastolic dysfunction (i.e. lower mitral early filling/atrial filling ratio) and evidence of brain sparing (i.e. lower MCA/UA PI ratio) (see Table). At necropsy, IUGR fetuses had a higher heart-to-bodyweight ratio than in-utero controls (11.5 ± 2.5 g/kg vs. 8.9 ± 0.8 g/kg; $p = 0.048$).

Conclusions: Fetal lambs supported by EXTEND with a high-resistance oxygenator demonstrated low umbilical blood flow, hypoxia, cardiomegaly and ultimately diminished growth. These findings support the use of this model for experimental IUGR.

Scientific Session III (cont.)

Table			
	IUGR (n=4)	Standard (n=6)	p-value (ANOVA)
Umbilical artery pO ₂ (mmHg)	17.7 ± 2.0	22.9 ± 1.8	0.01
Lactate (mmol/L)	1.3 ± 0.3	0.9 ± 0.1	0.01
Umbilical flow (ml/min)	333 ± 33	405 ± 44	0.03
Respiratory quotient	0.78 ± 0.04	0.88 ± 0.04	0.02
Combined cardiac output (L/min)	1.04 ± 0.19	1.43 ± 0.26	0.04
Mitral E/A ratio	0.66 ± 0.03	0.74 ± 0.06	0.04
Middle cerebral artery:umbilical artery PI ratio	1.3 ± 0.2	2.5 ± 0.7	0.01



Scientific Session III (cont.)

36

ORTHOTOPIC TISSUE-ENGINEERED STOMACH ENGRAFTMENT IN A MOUSE MODEL

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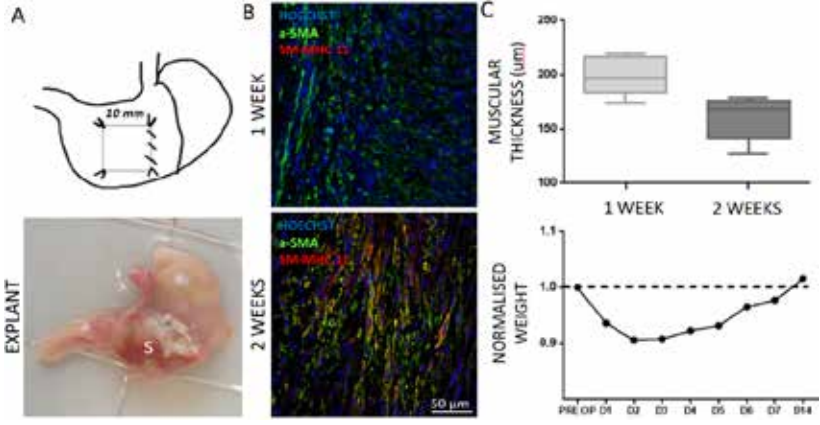
Purpose: Congenital and acquired conditions in childhood could lead to reduced gastric volume, morbidity and poor quality of life. Tissue-engineered stomach is a potential solution to restore adequate physiology and food reservoir. However, in-vivo models taking advantage of naturally-derived scaffolds are still lacking. The purpose of this study was to develop an animal model for orthotopic implantation of tissue-engineered stomach.

Methods: Stomachs harvested from newborn piglets were completely decellularized through luminal and vascular cannulation using 24-hour detergent-enzymatic treatment with the aid of a specifically designed bioreactor. The decellularized scaffolds were implanted in non-fasted NOD-SCID-gamma mice: a 5x5 mm section of stomach was orthotopically replaced with 10x10 mm patch anastomosed using running 8.0 non-absorbable sutures (A). Animals had free food access after surgery. Weight gain was monitored throughout follow-up.

Results: Anaesthetic and surgery were well tolerated in all animals (N=20). All animals survived with no leakages, except for one, which died on day 1 post-operatively. At sacrifice, the patch appeared macroscopically engrafted within the stomach (A). Histology demonstrated no sign of rejection and ingrowth of cells into the scaffold within one week; in two weeks, the scaffold was completely repopulated by host muscle cells, which expressed mature smooth muscle specific markers such as smooth muscle-myosin heavy chain and α -smooth muscle actin (B). Moreover, the muscularis layer had remodelled toward normal thickness and mice regained weight over the two weeks (C). However, mucosal regeneration was not achieved in the short term.

Conclusion: Implantation of decellularized porcine stomach scaffolds is possible in a mouse model with encouraging microscopic and macroscopic outcomes. Notably, the implanted decellularized scaffold appears impermeable. Use of decellularized xenogeneic material could be considered for repair of congenital malformations and acquired conditions. However further studies, involving epithelial cell engraftment, will be required to achieve mucosal regeneration.

Scientific Session III (cont.)





Scientific Session III (cont.)

37*

UNDERSTANDING THE MECHANISM OF ESOPHAGEAL REPAIR WITH A SYNTHETIC SCAFFOLD

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Purpose: Esophageal atresia affects 1 out of 4,000-5,000 live births per year, of which 7% have a long gap. We have demonstrated esophageal regeneration using a synthetic scaffold is feasible in large animal models, however the process of repair is elusive. Our goal was to further explore the regenerative process focusing on markers of inflammation and wound healing.

Methods: Wild type female Sprague-Dawley rats underwent a partial cervical esophagectomy with patch scaffold implantation. Implants (n=2 for each time point) were harvested on postoperative days (POD) 1, 2, 4, 5, and 15. Harvested implants underwent histologic and gene expression studies comparing the excised normal esophagus with the regenerated tissue over time.

Results: Gross histology demonstrated esophageal regeneration by POD5, and by POD14 scaffolds had been completely extruded extra-luminally. The PCR gene array demonstrated an upregulation in inflammatory genes (CCL12, CCL5, IL6) between POD2 and POD5, with normalization by POD15. TGF β 1 signaling was also upregulated between POD2-5, but was normalized by POD15.

Conclusion: We have demonstrated that cervical esophageal implantation of synthetic scaffold in a small animal model is feasible with resultant regeneration. An initial inflammatory response occurs within the first 4 days following implantation and corresponds to an upregulation in TGF β signaling. By POD15, there was normalization of inflammatory markers and extrusion of the scaffold. Further studies are focusing on investigating the cell type and mechanism of action responsible for the regeneration. This information can lend itself towards future therapeutics that can aid in regeneration.

Scientific Session III (cont.)

38*

PROLIFERATIVE AND MATURE CELL TYPES ARE DEMONSTRATED IN TISSUE-ENGINEERED LIVER DERIVED FROM HUMAN INDUCED PLURIPOTENT STEM CELLS IN A 3-MONTH MURINE MODEL

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Purpose: Pediatric liver disease such as inborn errors of metabolism require liver transplantation as the only definitive treatment for end-stage disease. Donor scarcity and immunosuppression remain obstacles to transplantation while stem cells offer a renewable source to produce tissue engineered liver (TELi). Previously, we generated TELi from H9 human embryonic stem cell line (hESC) and a WTC human induced pluripotent stem cell line (hiPSC) in a one-month murine model. These TELi contained hepatocytes, stellate cells and stem/progenitor cells. However, the starting materials are either embryonic or not GMP, and therefore unlikely to be approved for humans. We therefore hypothesized that TELi could be generated from the fully characterized cGMP- manufactured LiPSC-GR1.1 (Lonza), in a 3 month in-vivo model.

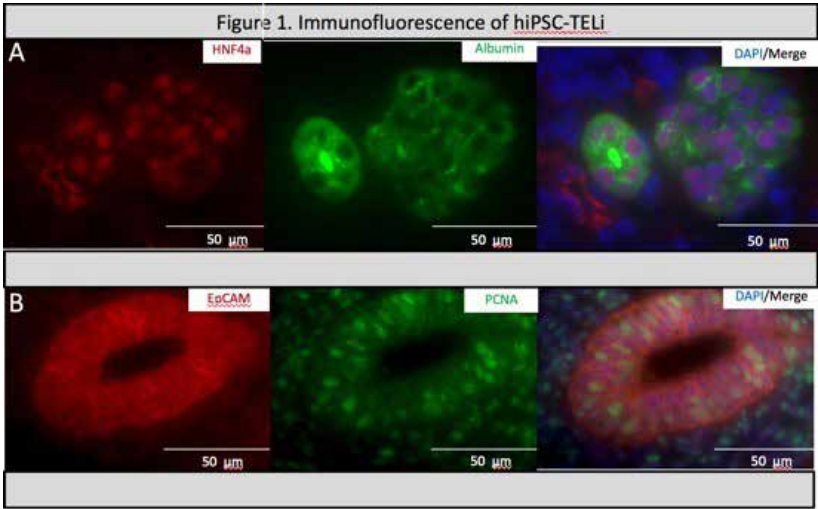
Methods: H9 and Lonza lines were cultured in suspension and differentiated to day 11 immature hepatoblasts. Hepatoblasts were seeded onto a polyglycolic acid/poly-L lactic scaffold and implanted into subcutaneous tissue or omentum of NOD/SCID mice (n=5). TELi was harvested at 1- and 3-month time points and analyzed by H&E and immunofluorescence staining of HNF4 α , albumin, CK19, PCNA, EpCAM, and human-specific nuclear lamin.

Results: TELi formed from H9 and Lonza lines at 1 and 3 months. TELi exhibited bile formation as evident by cholestasis on H&E. Immunofluorescence revealed numerous hepatocytes identified by metabolic regulator, HNF4 α , cholangiocytes were identified by biliary epithelial marker CK19. TELi formed hepatocytes secreting albumin (Fig. 1A). At 3 months, Lonza-TELi retained proliferative and hepatic progenitor cell types demonstrated by PCNA and EpCAM, respectively (Fig. 1B). Identification by lamin co-staining confirmed that TELi is composed of the donor transplanted human cells.

Conclusions: Tissue-engineered liver was generated from a GMP-compliant hiPSC line to contain mature liver cell types and proliferative/stem cell progenitor cells at 3 months in-vivo. Further investigation of TELi generated from this source may yield future human therapies.



Scientific Session III (cont.)



Scientific Session III (cont.)

39*

LIVER TRANSPLANTATION IN CHILDREN UNDER 25KG: A COMPARISON OF SPLIT-LIVER VERSUS WHOLE-LIVER GRAFT RECIPIENTS

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Purpose: Waitlist mortality of liver transplant candidates is directly related to organ shortage. The use of split-liver grafts has expanded the donor pool and become a life-saving measure in the pediatric population over the past 2 decades. Here we report our 14-year single-institution experience with split-liver transplantation (SL), with comparison to whole-liver transplantation (WL).

Methods: We performed a retrospective chart review of all primary deceased-donor liver transplants performed for patients under 25kg between January 2003 and July 2016. Multi-organ recipients were excluded.

Results: One hundred patients were identified, with a median age of 1.1 years (range 11 days-10.4 years) at the time of transplant. Median follow-up time was 5.7 years (range 3 days-13.6 years). Indications for transplantation were similar between groups, with biliary atresia being most common (45%) followed by malignancy (22%). The 1-, 5-, and 10-year graft survival rates were comparable between SL and WL recipients (94%, 89%, 81% SL; 96%, 90%, 87% WL; $p=0.67$), as were patient survival rates for the same time periods (98%, 93%, 85% SL; 96%, 94%, 94% WL; $p=0.62$). Hepatic artery thrombosis was more common in WL recipients (21% WL; 6% SL; $p=0.032$) as was biliary stricture (19% WL; 0% SL; $p=0.001$). SL recipients had a significantly higher risk of developing biliary leakage (17% SL; 4% WL; $p=0.033$), and a higher frequency of portal vein thrombosis (15% SL; 4% WL; $p=0.06$). Other complications such as sepsis and 30-day readmission rates were comparable between groups.

Conclusions: Nearly half of our patients under 25kg undergoing liver transplantation received split-liver grafts with outcomes comparable to those receiving whole-organ grafts. Hepatic artery thrombosis was more common in the whole-liver graft recipients with an associated increase in biliary strictures. Based on our findings, we support changes in allocation policy to provide more split-liver grafts for the pediatric population awaiting liver transplantation.

Table 1. Comparison of major complication rates between groups

	Whole liver group (% , n=52)	Split-liver group (% , n=48)	p-value
Hepatic artery thrombosis	21	6	0.032
Portal vein thrombosis	4	15	0.062
Biliary stricture	19	0	0.001
Biliary leakage	4	17	0.033
Sepsis	25	29	0.64
30-day readmission	50	50	1.00



Scientific Session III (cont.)

40*

DEPLETION OF FETAL HEMATOPOIETIC STEM CELLS IMPROVES ENGRAFTMENT AFTER TRANSPLANTATION

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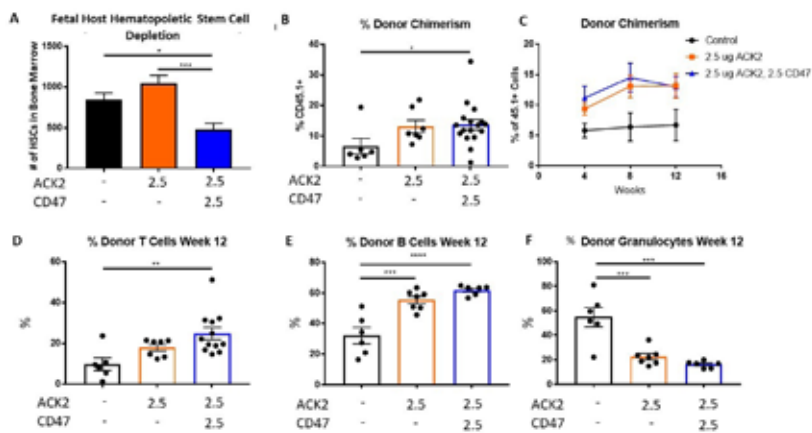
Purpose: In utero hematopoietic stem cell transplantation has the potential to treat congenital diseases such as hemoglobinopathies, but its success may be limited due to lack of “space” in the hematopoietic niche. Depletion of the fetal hematopoietic niche using an antibody against the Ckit receptor (ACK2) on hematopoietic stem cells (HSCs) to create space may improve engraftment. In this study, we compared the safety and efficiency of using a combination strategy in which ACK2 is combined with a CD47 antibody, which causes HSC phagocytosis.

Methods: We injected B6 CD45.2 fetal mice intrahepatically with saline, 2.5ug ACK2 alone, or 2.5ug ACK2 and 2.5ug MIAP410 (CD47 antibody) at E14.5. We first quantified fetal host HSCs in the bone marrow after treatment using flow cytometry to enumerate Ckit+Lin-Sca-1+ cells. We then transplanted the surviving mice with congenic B6.45.1 HSCs at birth. We measured the number of engrafted donor CD45.1 cells in the blood every 4 weeks by flow cytometry.

Results: Survival was not significantly different between groups (80% PBS, 68% ACK2 alone, 83% ACK2+CD47) although treated mice had transient anemia at birth. There was increased depletion of fetal host HSCs in ACK2+CD47 combination group compared to controls and ACK2 alone (Figure 1A). Chimerism levels were higher in both the ACK2 and the ACK2+CD47 groups compared to controls, but no additive effect was seen (Figure 1B). Donor chimerism was multilineage and remained stable in all groups (Figure 1C). Lineage profiles were different between depleted groups and controls with an increase in T and B cells among depleted mice and decrease in granulocytes (Figures 1D,E,F).

Conclusion: In utero depletion of fetal host hematopoietic stem cells improves chimerism after transplantation. Further dose response experiments and large animal studies are necessary to test the safety and efficacy prior to use in our current clinical trial of in utero transplantation.

Scientific Session III (cont.)





Scientific Session III (cont.)

41*

IN-HOSPITAL AND 90-DAY OUTCOMES AFTER TOTAL PANCREATECTOMY WITH ISLET AUTOTRANSPLANTATION FOR PEDIATRIC CHRONIC AND ACUTE RECURRENT PANCREATITIS

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Purpose: Total pancreatectomy with islet autotransplantation (TPIAT) is used to treat debilitating chronic pancreatitis (CP) and acute recurrent pancreatitis (ARP) that has failed medical and endoscopic therapy. There is limited knowledge about perioperative management and outcomes in pediatric patients. We describe our institutional experience with pediatric TPIAT.

Methods: A retrospective review of TPIAT patients at a free-standing children's hospital was performed to determine preoperative pancreatitis course and perioperative outcomes of TPIAT.

Results: Twenty patients [median age 13, (range 4-19); 65% female] underwent TPIAT (2015-2017). Ninety-five percent had CP; one patient underwent TPIAT for ARP. Eighty-five percent had a pancreatitis-associated genetic mutation; 40% had pancreas divisum. Partial or full parenteral nutrition (PN) was used in 25% preoperatively. Patients had a median of 4.5 hospitalizations (0-20) and 1 ERCP (0-4) in the year preceding TPIAT. Preoperatively, 75% were taking opioids for pain control (60% daily). Three had preoperative diabetes; 11 had exocrine pancreatic insufficiency. All underwent TPIAT with Roux-en-Y duodenojejunostomy and Roux-en-Y biliary reconstruction. Median operative duration was 803 minutes (406-1147). Median total islet equivalent count (IEQ) and dose (IEQ/kg) were 448,500 (228,000-927,000) and 6403 (1,904-14,242), respectively. Median length of stay was 27 days. Postoperative complications included percutaneous drainage of fluid collections (n=5), re-exploration for bleeding (n=1) and bowel obstruction (n=1). At 90 days postoperatively, all patients were off PN (p=0.01). There were significantly fewer patients on opioids at 90 days postoperatively, compared to preoperatively (42% vs 75%, p=0.007). Reflecting beta cell function, median stimulated c-peptide was 1.95 (range 0.5-4.3) at 90 days, with a median insulin requirement of 0.47 units/kg/day (range 0-0.82).

Conclusion: Pediatric CP/ARP can be treated with TPIAT when debilitating disease persists in spite of maximal medical and endoscopic therapy. Opioid and PN use can successfully be weaned in the ninety days after surgery, while insulin weans require a longer period.

Scientific Session III (cont.)

42

INHIBITION OF TLR4 SIGNALING ATTENUATES TBI-INDUCED NEUROINFLAMMATION

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Tweet it! Abstract 42: inhibit TLR4 using C34 and attenuate traumatic brain injury @youngchun16 #eAPSA2018

Purpose: Traumatic brain injury (TBI) induces a robust neuroinflammatory response that leads to the activation of both the innate and adaptive immune systems. In order to investigate the role of the innate immune system in TBI-induced neuroinflammation and microglial activation, we used a novel TLR4 inhibitor (C34) as well as a microglial TLR4 knockout mouse.

Methods: A murine controlled cortical impact TBI model was utilized, whereby the left parietal lobe is injured after a craniotomy. The experimental groups are: wild-type (WT), Microglial TLR4 conditional knockout (CKO), and WT treated with the TLR4 inhibitor C34 intraperitoneally. Real-time PCR (qPCR) was used to quantify expression of genes associated with microglial activation phenotypes M1 (pro-inflammatory) and M2 (anti-inflammatory) and MRI was used to measure lesion size. PCR and MRI analysis were performed at 24hrs post-injury. Student's T-test and One-way ANOVA were used for statistical analysis with significance achieved when $p < 0.05$.

Results: Mice treated with C34 had a significantly smaller lesion size ($4.3 \pm 0.5 \text{ mm}^3$, $n=5$) compared to the WT control group ($8 \pm 1.182 \text{ mm}^3$, $n=3$) 24hrs post-TBI ($p=0.047$). Interestingly, WT mice treated with C34 had a significantly decreased expression of genes associated with both pro-inflammatory M1 phenotype (TNF α and Lipocalin-2) as well as anti-inflammatory M2 phenotype (IL-10 and CD206) compared to the WT control group. C34 treated mice also had significantly decreased expression of apoptosis markers such as Caspase, Bad, and Bax. The CKO group did not show a significant difference compared to the WT group in any of the tested genes (Figure 1).

Conclusions: Our findings indicate that inhibiting the innate immune response using a novel TLR4 inhibitor (C34) can attenuate the TBI-induced neuroinflammatory response. This is manifested by decreased microglial activation, as well as decreased apoptosis and lesion size on MRI. Pharmacologic targeting of the innate immune pathway could play an important role in the future treatment of TBI.



Scientific Session III (cont.)

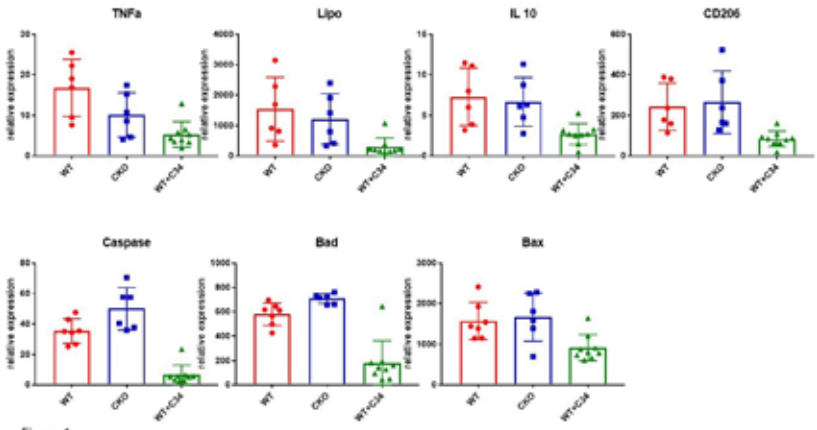


Figure 1

Scientific Session IV

43

AVOIDING LONG-TERM COMPLICATIONS FROM COMPLEX CLOACAL REPAIR USING OPEN AND LAPAROSCOPIC STAGED RECONSTRUCTIONS OF THE INTESTINAL, URINARY, REPRODUCTIVE AND NEUROLOGICAL SYSTEMS

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Purpose: To categorize the complications seen in patients with complex cloacal anomalies or cloacal exstrophy who underwent definitive repair in the newborn period and to propose a new staged approach to reconstruction.

Methods: Retrospective chart review evaluating patients with cloacal anomalies born between 1990 and 2017. Records reviewed for patient demographics, diagnoses, operative procedures and complications. Complex cloacal anomalies were defined as having long common channels and/or requiring bladder augmentation.

Results: 41 children with cloacal anomalies were identified; males were excluded due to the difference of internal anatomy. Thus, 34 females were included who were predominantly Caucasian (58.8%) and had public health insurance (64.7%). 38.2% had staged procedures or are undergoing delayed repairs rather than a definitive repair prior to one year of age. In complex cloacas (n=14), 50% had a complication after the definitive reconstruction. Of patients repaired within the first year of life (n= 16), 31.3% had major complications (e.g. urinary incontinence, revision of bladder augmentation) and 81.3% had minor complications (e.g. fecal incontinence, vaginal stenosis). Clinically, there were fewer complications with the staged approach vs early definitive repair (22.2% vs 77.7%, respectively) but these results did not reach statistical significance. (p=0.13)

Conclusions: Patients undergoing reconstructions for complex cloacal anomalies have an unacceptably high rate of complications, therefore a new management strategy involving delayed reconstructions should be considered. (Figure 1) After neurological procedures have been performed, a laparoscopic assisted anorectoplasty can be performed and can document reproductive anatomy. Urinary reconstructions should wait until the patient can reliably participate in care. In cases with Mullerian agenesis, reproductive reconstructions can wait until adolescence when patients can consider all options for vaginal replacement. The timing of reconstructions will be driven by the function of the four systems involved: intestinal, urinary, reproductive and neurological.



Scientific Session IV (cont.)



Figure 1. Staged reconstructions for patients with complex cloacal anomalies.

Scientific Session IV (cont.)

44*

OUTCOMES FOLLOWING HEINEKE-MIKULICZ ANOPLASTY (HMA) FOR POSTOPERATIVE ANAL STRICTURES AND CONGENITAL ANAL STENOSIS AT THE SKIN LEVEL

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Purpose: Acquired skin-level strictures following posterior sagittal anorectoplasty (PSARP) and some cases of congenital anal stenosis can be managed using a Heineke-Mikulicz like anoplasty (HMA).

Methods: We retrospectively reviewed all patients who underwent HMA for skin level strictures following PSARP or for certain congenital anal stenoses from 2014-2017.

Results: 28 patients (19 males, 9 females) with mean age of 5.8 years (range 0.5-24.4) underwent HMA. 26 had a prior PSARP, 18 redo and 8 primary procedures. We do not routinely dilate after redo PSARP but do dilate after primary PSARP. Of these, 25 had anorectal malformations and 1 had ALL with perineal sepsis who developed an anal stricture after prior anal repair. 2 patients had congenital skin level anal stenosis. The mean follow up was 0.5 years (range 0.1-2.9). Patients underwent HMA at a mean of 1.9 (range 0.2-13.1) years following PSARP. The average pre-procedure anal size of Hegar 8 (range 6-12) improved 8 Hegar sizes (95% CI 7-9, $p < 0.001$) to Hegar 16 after HMA. There were no intraoperative complications, episodes of perineal infection or dehiscences. 23 patients (79%) were discharged home the same day, 5/29 (17%) had the HMA as part of another procedure requiring admission, and 1 patient (3%) with a history of respiratory disease was admitted for overnight observation. 1 patient (3%) with a prior redo PSARP restenosed and requires a secondary procedure.

Conclusions: HMA is a safe outpatient procedure for skin-level anal strictures following PSARP (primary and redo) and can also be used in some cases of congenital anal stenosis. Long-term follow up to determine the resticture rate is ongoing. A plan to do a HMA if a stricture develops may offer an alternative to routine anal dilations after redo PSARP in older children.



Scientific Session IV (cont.)

45*

AN EVIDENCE-BASED PROTOCOL FOR CLOACAL MANAGEMENT: A PROPOSAL FOR A UNIFORM APPROACH FROM THE PRENATAL PERIOD TO ADULTHOOD, LITERATURE REVIEW AND TREATMENT OF MORE THAN 100 CASES

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Nationwide Children's Hospital, Columbus, OH, USA.



Tweet it! Abstract 45: An evidence based protocol for cloaca management from newborn to adulthood #eAPSA2018

Purpose: Cloacal anomalies represent the most complex of anorectal malformations, yet there is no comprehensive protocol in the literature defining their care. We performed a systematic literature review as well an analysis of our patients seeking an evidence-based collaborative protocol.

Methods: We concluded a systematic literature review (PRISMA guidelines) to determine the management and long-term outcomes in cloaca patients. 106 cloaca patients cared for in our Center (2014-2017) were reviewed. Articles and records were assessed for prenatal diagnosis, perinatal and newborn management, associated anomalies, type and age of repair, and colorectal, urological, gynecological and obstetrical long-term outcomes.

Results: Of 208 articles, 71 reported on prenatal diagnosis and perinatal management of hydrocolpos and hydronephrosis. 41 papers referenced newborn management and definitive surgical intervention based on anatomy (common channel and/or urethral length). Urologic assessment, bladder dysfunction and long-term renal impairment were assessed in 35 articles. Gynecological anomalies, menstrual obstruction, sexual outcomes and obstetric issues were described in 31 articles. Incidence of long-term fecal and urinary incontinence were assessed in 23, highlighting spinal anomalies and their effect on neurogenic bladder and bowel. 7 articles concerned long-term quality of life in adult patients. 106 cloaca patients under our care included: 37 with a short common channel (<3cm) , 35 with a long common channel (>3 cm), 25 with an unknown common channel, and 9 with cloacal exstrophy. Based on this review we developed a formalized protocol that addresses a cloaca patient's needs from fetus to adulthood (table 1).

Conclusion: Many articles have been written on cloacal malformations from the prenatal period to adulthood involving colorectal, urologic, gynecologic and spinal systems, but no multidisciplinary protocol has been proposed. We felt that a protocol, to avoid long term complications throughout a patient's life, was needed and propose one here.

Scientific Session IV (cont.)

Cloaca Management Protocol			
Period in Life	Fetal/Newborn	Age 6 months-2 years	Age 2-10 years
Number of patients	28	9	50
Number of articles referring to the group of age	71	30	40
Key Step	1. Assess for Hydrocolpos/ Hydroureterosis: CIC/surgical drainage	1. Avoid/treat urinary tract infections	1. Manage Fecal and urinary control
Key Step	2. Assess renal Function (Serum creatinine)	2. Determine Surgical Repair based on Common channel and urethral length	2. Assess renal function (U/S and urodynamics creatinine, and cystatin C)
Key Step	3. VACTERL screening: Renal, cardiac, spine, sacral, limb, GI tract	3. Assess Renal Function (U/S, Urodynamics, creatinine and cystatin C)	3. Avoid/ treat Urinary Tract infections
Key Step	4. Avoid nephrotoxic agents and consider nephron sparing medications	4. Assessment of gynecologic anatomy: at definitive repair/ colostomy closure.	4. Plan definitive urological reconstruction if required
Key Step		5. Avoid/ treat Constipation after colostomy closure	5. Monitor for fecal continence. Consider ACE option/enema program /laxatives
Key Step			



Scientific Session IV (cont.)

Cloaca Management Protocol		
Age 10-14 years	Age 14-18 years	Age 18-25 years
10	6	3
15	15	16
1. Ongoing assessment of mullerian anatomy: pelvic U/S after thelarche	1. Education regarding sexuality, sexual activity, and creation of an appropriate contraceptive plan. Counseling about reproductive potential	1. Ongoing reproductive health/gynecologic care including assessment of menstrual and sexual function, pregnancy intention, contraception and pregnancy outcomes
2. Monitor for potential menstrual outflow tract obstruction: assess menarche: consider pelvic U/S and assessment of introitus and vagina	3. Gynecological care including ongoing assessment of menstrual and sexual functioning as well as pregnancy intention	2. Operationalize Transitional care
3. Assess renal function (U/S, (creatinine and cystatin C)	3. Assess renal function (U/S), creatinine, and cystatin C	4. Assess renal function (U/S, creatinine, and cystatin C)
4. Avoid/ treat Urinary tract infections	4. Discuss Transitional care to adulthood	5. Avoid/ treat Urinary tract infections
5. Quality of Life Assessment	5. Avoid/ treat Urinary tract infections	
6. Monitor for fecal/ urinary continence		

Scientific Session IV (cont.)

46*

MALONE APPENDICOSTOMY, NEOAPPENDICOSTOMY OR CECOSTOMY FOR ANTEGRADE ENEMA ACCESS AS PART OF A BOWEL MANAGEMENT PROGRAM

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Purpose: Malone appendicostomy (native appendix or neoappendix) and cecostomy are used for antegrade access for enema flushes in children with severe constipation or fecal incontinence as part of a mechanical bowel management program. Each technique is associated with a unique set of complications.

Methods: We reviewed all patients in our Center who received a Malone appendicostomy, neoappendicostomy or cecostomy from 2014-2017.

Results: Of 181 patients, there were 98 Malone appendicostomies, 15 neoappendicostomies, 13 split appendices, 1 Monti channel, and 54 cecostomies. The mean age of patients undergoing appendicostomy was 7.9 (range 2.4-31.0) compared to 12.7 (range 2.4-35.6) years in the cecostomy cohort ($p<0.001$). Excluding combined procedures, those undergoing Malone had a 3.1 day length of stay compared to 7.1 days for cecostomies ($p=0.001$). Leakage occurred in 11 patients with cecostomy (20%) and 4 (3%) patients with appendicostomy ($p=0.001$). One of the 4 patients with leakage after appendicostomy required surgical revision to tighten the plication. Wound infections were seen in 14 (26%) after cecostomy compared to 9 (7%) after appendicostomy ($p<0.001$). Twelve Malones (13%) required revision for stenosis and 4 (3%) for mucosal prolapse. Intervention was needed in 19 (35%) cecostomy patients for an inability to flush the tube and for dislodged tubes in 15 (28%). Patients with cecostomies required regular tube exchanges by an interventional radiologist a median of 4 (range 1-13) times over 3 years. Five (9%) patients in the cecostomy group had major complications; 4 patients experienced free intraperitoneal spillage and 1 patient had their cecostomy inadvertently placed in the ileum.

Conclusions: Malone appendicostomy of all types in this cohort had a lower rate of complications and



Scientific Session IV (cont.)

47**

EVALUATION OF A WATER-SOLUBLE CONTRAST PROTOCOL FOR NON-OPERATIVE MANAGEMENT OF PEDIATRIC ADHESIVE SMALL BOWEL OBSTRUCTION

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Tweet it! Abstract 47: Water-soluble contrast has diagnostic and therapeutic role in management of pediatric adhesive SBO #eAPSA2018

Purpose: We compared outcomes before and after implementing an enteral water-soluble contrast protocol for management of pediatric adhesive small bowel obstruction (ASBO). We hypothesized that protocol-based treatment would reduce both operative intervention and length of stay.

Methods: Medical records were retrospectively reviewed with institutional IRB approval for all children admitted with ASBO to one pediatric hospital (November 2010 - June 2017). Those admitted between November 2010 through October 2013 received nasogastric decompression, with decision for surgery determined by surgeon judgment (pre-protocol). Patients admitted after October 2013 (post-protocol) received water-soluble contrast (diatrizoate meglumine) early after admission, and were monitored with serial radiographs and clinical examination. Patients underwent surgery if contrast was not visualized in the cecum by 24 hours. Outcomes were compared between the two groups, including hospital length of stay (LOS) and need for operation. Statistical analysis was performed using chi-square test, Fisher's exact test, Student's T-test, and the Mann Whitney U-test, with $p < 0.05$ deemed statistically significant.

Results: In the pre-protocol period, 26 patients experienced 29 admissions for ASBO. In the post-protocol period, 11 patients experienced 12 admissions for ASBO. Thirteen (45%) pre-protocol admissions underwent surgery compared to 2 (17%) post-protocol admissions ($p=0.04$). Diagnostic sensitivity of contrast studies as a predictor for ASBO resolution was 100%, and specificity was 90%. Median LOS for pre-protocol surgical patients was 9.2 days (IQR 11.8) versus 3.1 days (IQR 2.5) if successfully managed non-operatively. The reduction in LOS yielded \$19,974.83 in net cost savings per admission. No complications occurred that could be attributed to use of contrast in ASBO.

Conclusions: Administration of water-soluble contrast early after hospitalization for ASBO appears to be safe in the pediatric population. This strategy may have a dual diagnostic and therapeutic role in management of pediatric ASBO, resulting in decreased operative rates, shorter LOS and significant cost reduction.

Scientific Session IV (cont.)

48*

NEURECTOMY FOR CHRONIC ABDOMINAL PAIN IN CHILDREN

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Purpose: Chronic abdominal pain is common in children. Anterior cutaneous nerve entrapment syndrome (ACNES) is responsible in 14% of children seen in a pain clinic. We investigated the outcome of neurectomy for ACNES in children.

Methods: Demographic and clinical data on children who underwent neurectomy for ACNES from 10/2011 to 01/2017 were reviewed.

Results: Twenty-six patients underwent neurectomy. Five were male with mean age 15 years (10-21). Mean preoperative pain duration was 27 months (2-150) and 19 reported 10/10 pain (6-10). Thirteen were taking antidepressants, 12 Gabapentin and 4 narcotics. Most had been hospitalized at least once secondary to the pain. All 26 had undergone diagnostic studies including: nuclear medicine scan, fluoroscopy, computed tomography, magnetic resonance imaging, sonography, endoscopy and surgery. Once ACNES was suspected based on history and exam, all underwent at least one ultrasound-directed nerve block, providing relief from 6 hours to 14 days. Patients then underwent outpatient division of the involved nerve(s). There were no postoperative complications. Most children reported incisional discomfort for 3-14 days, and immediate resolution of nerve pain without cutaneous numbness. Fifteen patients (58%) were pain free long-term; 8 (31%) reported recurrent lesser pain, mean time to recurrence 6.7 months, and 3 (11%) reported no relief. Of those whose pain recurred, all achieved long term complete relief, 7 with time, 1 through repeat neurectomy. All 3 patients without relief underwent repeat neurectomy, and none of them achieved pain relief.

Conclusion: ACNES should be considered in children with chronic abdominal pain. Neurectomy is safe and relieves pain in around 88% of selected children. Further investigation is underway to optimize patient selection.



Scientific Session IV (cont.)

49

THORACOSCOPIC REPAIR OF SIBSON'S HERNIA

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Purpose: Cervical lung hernias through Sibson's fascia are extremely rare in children, and usually secondary to local external trauma. We present thoracoscopic repair of a spontaneous symptomatic Sibson's Hernia.

Methods: A 13-year-old girl was seen in clinic for shortness of breath, dizziness with exertion and right neck bulge. A 4 cm defect with significant lung herniation was seen on CT scan. Extrinsic compression on the right internal jugular vein from the hernia sac was felt to be contributing to her symptoms. Preoperative bronchoscopy with double lumen endotracheal tube placement was performed with isolation of the right lung. Upon thoracoscopic entry, the hernia was clearly visible, measuring 4 cm with no adhesions or attachments. After incising the hernia sac, we carefully identified and preserved the vagus and phrenic nerves, and internal jugular vein. The remaining hernia sac was excised, and the defect was closed with a running suture. An 8 x 8 cm circular patch of Gore-tex was cut to size to allow for an additional 2 cm of coverage beyond the fascial defect. Sutures were placed in all four quadrants prior to insertion into the thoracic cavity-utilizing adult technique for ventral hernia repair. The patch was unfurled, and the sutures were secured to the parietal pleura. The patch was secured with additional sutures and tacs to ensure adequate apposition. A chest tube was placed in the right chest, and the lung was reinflated. There was no visible herniation at the end of the procedure.

Results: The patient was extubated postoperatively and recovered well. Her chest tube was removed on postoperative day 1, and was discharged home the following day. Patient had complete symptom resolution at time of follow-up visit.

Conclusion: Thoracoscopic repair of Sibson's Hernia is feasible in the pediatric patient.

Scientific Session IV (cont.)

50*

IS THE VACUUM BELL DEVICE A SAFE AND EFFECTIVE ALTERNATIVE TO SURGICAL TREATMENT OF PECTUS EXCAVATUM IN PEDIATRIC PATIENTS? A PRELIMINARY NORTH-AMERICAN EXPERIENCE

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Purpose: Pectus excavatum (PE) remains the most common chest wall deformity in children. Though surgical repair is possible in most cases, conservative management using a vacuum bell device presents an attractive alternative for patients with moderate depression or refusing surgery. We describe the first Canadian experience with this device.

Methods: A prospectively maintained multidisciplinary chest-wall clinic registry from 2 quaternary institutions was reviewed to identify all patients ≤ 21 years treated with the vacuum bell for PE from 2013-2017. Demographics, symptoms, comorbidities, morphology, treatment characteristics and compliance were assessed. Wilcoxon-Mann-Whitney test and multi-variable linear regression models were used to compare mean improvements in deformity-depth and Haller Index between groups of patients based on age and compliance metrics (hours/day and days/week).

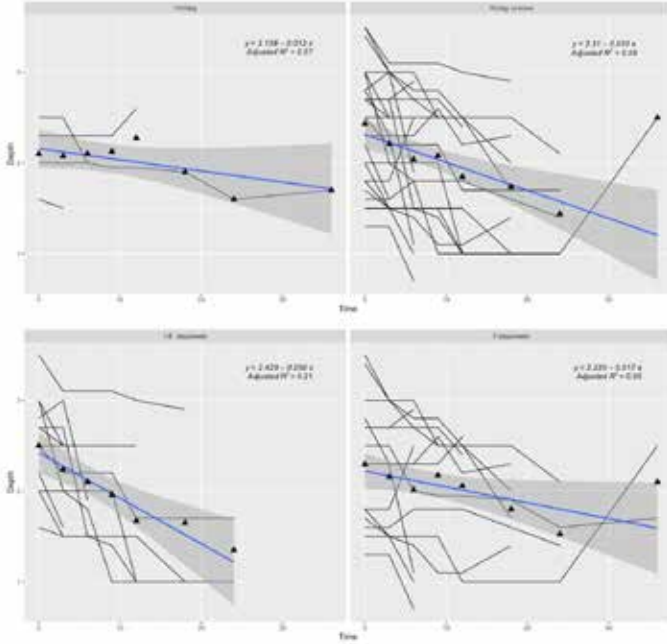
Results: Forty patients with a median age of 15 years (11,16) received treatment with the vacuum bell. Six patients never attended the first assessment at 3 months. Mean follow-up duration was 12 months (6,24). Median depth and Haller Index at treatment onset were 2.3 cm (1.8,2.8) and 4 (3.4,4.7), respectively. Improvements in deformity-depth were superior with vacuum compliance >1 hour/day ($p=0.02$). Daily use showed a trend towards better depth outcomes ($p=0.16$), see [figure 1](#). After adjusting for compliance, the age of treatment onset was not associated with depth improvements. Age of treatment onset and compliance were not associated with changes in Haller Index. Complications encountered include petechiae ($n=6$), pain ($n=2$) and seromas ($n=2$). Principal causes for treatment interruption were cutaneous ($n=4$), breathing-related ($n=1$) and transition to dynamic bracing for asymmetrical defect ($n=1$).

Conclusion: No published literature from North America has yet prospectively evaluated the vacuum bell as a safe potential alternative to surgical treatment for PE and assessed factors associated with non-efficacy. Further prospective studies are required to determine how to optimize the yield of this alternative therapy, considering issues of comfort and compliance.



Scientific Session IV (cont.)

Figure 1. Trajectory of deformity depth over time in patients according to daily compliance (hours/day) and weekly compliance (days/week).



Scientific Session IV (cont.)

51*

THE RELATIONSHIP BETWEEN OPERATIVE VOLUME AND OUTCOMES IN ESOPHAGEAL ATRESIA

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Purpose: A relationship between surgeon or hospital operative volume and patient outcomes has been established for a variety of surgical procedures. Esophageal atresia and tracheoesophageal fistula (EA/TEF) are rare congenital malformations, with most pediatric surgeons treating <2 patients annually. We aimed to determine whether higher surgeon and hospital volumes are associated with better outcomes after EA/TEF repair in order to inform potential credentialing processes or referral practices.

Methods: Neonates with a diagnosis of EA/TEF and EA/TEF repair at their index hospital admission were identified in the Pediatric Health Information System. Patients treated in Jan 2000–Sept 2015 across 44 hospitals were included. For each patient, hospital and surgeon operative volumes were defined as the number of EA/TEF cases treated in the previous 365 days. As no thresholds were detected in volume-outcome relationships, volumes were dichotomized at their upper tertiles. Propensity score weighting was used to estimate relationships between operative volumes and rates of in-hospital mortality, readmission within 30 days, and readmission, reoperation, and dilation within one year.

Results: A total of 3085 patients were included. Variables associated with higher mortality included lower birth weight, earlier gestational age, and the presence of congenital heart disease and certain other anomalies. When risk-adjusted outcomes were compared across groups defined by treatment by a low- or high-volume surgeon practicing at a low- or high-volume hospital, there were no differences in any evaluated outcome (Table). Risk-adjusted outcomes were also similar across groups defined by just hospital or surgeon volume.

Conclusions: Neither surgeon nor hospital volume significantly impacted outcomes after EA/TEF repair. Our findings do not provide evidence in support of selective referral or pediatric surgeon subspecialization in EA/TEF. However, future analyses evaluating additional outcomes and incorporating measures of hospital resources relevant to this patient population are warranted.



Scientific Session IV (cont.)

Adjusted outcomes across surgeon and hospital volume categories					
	Hospital volume < 11		Hospital volume ≥ 11		P
	Surgeon volume < 2 (N=1352)	Surgeon volume ≥ 2 (N=668)	Surgeon volume < 2 (N=486)	Surgeon volume ≥ 2 (N=579)	
In-hospital mortality (%)	6.2	6.4	5.3	4.7	0.45
30-day readmission (%)	16.9	19.9	15.6	16.5	0.27
1-year readmission (%)	47.8	49.8	48.6	50.0	0.77
1-year reoperation (%)	8.5	7.6	7.6	7.7	0.81
1-year dilation (%)	30.2	31.8	30.7	31.2	0.88

Innovation Session

i1

A NOVEL DRESSING FOR GASTROSTOMY BUTTONS IN CHILDREN

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Purpose: Three-dimensional movement of gastrostomy buttons (G-button) is thought to contribute to common tract complications such as granulation tissue formation, leakage and device dislodgement. We collaborated with a group of graduate mechanical engineering students to develop two motion-limiting G-button dressings. We performed a pilot study to evaluate parental satisfaction with the two prototype designs.

Methods: The two prototype dressings were composed of three layers - adhesive, absorptive and securement. More than 20 different securement methods were mocked up, two of which were incorporated into the final prototypes: saddle and foam. The students handmade 300 dressings; 150 of each type. Children with new or previously placed G-buttons were provided with 20 dressings, 10 of each type. Feedback was obtained from parents or caregivers (providers) in person or over the telephone by one dedicated researcher.

Results: Ten children were enrolled in the study between June and September 2017. All of the providers were able to independently apply the dressings. One provider had difficulty connecting the extension tubing. Nine of ten providers (90%) were satisfied with the novel dressings, and eight (80%) preferred them over the traditional dressing method of using gauze and tape. All providers agreed that the novel dressings were intuitive and provided more security to the G-button compared to the traditional dressing method. Eight providers (80%) preferred the foam design for its conformability and two families (20%) preferred the saddle type, as it was thought to provide greater security during sports. Half of the providers thought the adhesive layer should be stronger.

Conclusion: Most of the providers who trialed the two prototype G-button dressings were satisfied and preferred the foam-based prototype over the traditional gauze and tape method for securing their child's G-button. We continue to optimize the design and components of our G-button dressing, based on feedback from this and future pilot studies.



Innovation Session (cont.)



Saddle Design



Foam Design

Innovation Session (cont.)

i2

AUGMENTED REALITY IN A HYBRID OR FOR PULMONARY NODULE LOCALIZATION AND THORACOSCOPIC RESECTION - FEASIBILITY OF A NOVEL TECHNIQUE

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Tweet it! Abstract i2: Collaborative approach combining skill sets and technologies of IR and Surgery offers new opportunities @racadio #eAPSA2018

Purpose: To assess the feasibility of utilizing a novel technique of augmented reality on a hybrid operating room C-arm system for image-guided localization and thoracoscopic resection of pulmonary nodules.

Methods: After obtaining IACUC approval, silicone pulmonary nodules were created and subsequently localized in a swine model in our research lab equipped as a hybrid operating room. Four optical cameras embedded in a C-arm system allowed video co-registration with a C-arm cone beam CT. Skin marker fiducials allowed for optical tracking and motion compensation. An integrated navigation system enabled optically guided nodule localization without the need for fluoroscopy, thus reducing radiation exposure. The optical augmented reality navigation was used to both create and localize nodules. Localization was performed with microcoils. Thoracoscopic resection of the nodules was accomplished using direct visualization and fluoroscopic guidance.

Results: As demonstrated in the video, realistic pulmonary nodules were created and imaged using the C-arm cone beam CT and an optical/image guidance system to direct placement. Lesions were accurately localized using optical/image guidance, enabling placement of microcoils at the nodules. Combined thoracoscopic and fluoroscopic guidance allowed accurate wedge resection of the nodules.

Conclusions: Injection of silicone creates a realistic pulmonary nodule model. Image guidance using emerging technology combining radiographic and optical imaging is effective in creating and localizing pulmonary nodules. Real-time imaging combined with thoracoscopic visualization facilitates wedge resection of nodules marked with microcoils. The hybrid operating room simplifies the radiographic localization and resection of pulmonary nodules by eliminating the need to move the patient from radiology to the operating room. A collaborative approach combining the skill sets and technologies of Interventional Radiology and Surgery offers new opportunities for image guided surgery.



Innovation Session (cont.)

i3

DYNAMIC ULTRASOUND EVALUATION IN PATIENTS WITH SUSPECTED SLIPPING RIB SYNDROME

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Purpose: Slipping Rib Syndrome (SRS) is a condition that affects adolescents and young adults. Dynamic Ultrasound imaging has a potential and likely significant role; however, limited data exists describing the protocol and techniques available for evaluating SRS. It is the intent of this article to describe the development of an effective and reproducible protocol for dynamic imaging in patients with SRS.

Methods: Retrospective review was performed of suspected SRS patients that presented either to the radiology or surgery department from March through October of 2017. 21 patients were evaluated utilizing a high frequency 12-5 linear transducer. Focused history was taken and imaging was performed at the site of pain. Images of the bilateral 7th-11th ribs were obtained in the parasagittal plane at rest and with dynamic maneuvers. Dynamic maneuvers included Valsalva, crunch, focal rib push/compression, and any other provocative movement that elicited pain per the patient. Imaging results were correlated with medical and surgical records generated by the pediatric surgeon specializing in treatment of slipping ribs.

Results: 86% (18/21) of patients had a clinical diagnosis of SRS with an average age of 18 years. 15 patients were female, while 6 were male. 76% (16/21) of patients were athletes, with average BMI 22.6. Dynamic ultrasound correctly detected the presence of SRS in 83% (15/18) of patients and correctly detected the absence of SRS in 100% of patients (3/3). Two of the three examinations which did not detect SRS did not utilize dynamic crunch or push maneuvers. In the last patient, crunch was performed, but push maneuver was not. All but one exam utilizing the crunch and push maneuver correctly detected SRS.

Conclusion: Dynamic Ultrasound imaging of the ribs, particularly with utilization of crunch and push maneuvers, is an effective and reproducible tool for the diagnosis of SRS.

Innovation Session (cont.)

i4

INTESTINAL ELECTRICAL STIMULATION TO INCREASE THE RATE OF PERISTALSIS

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Purpose: Pediatric gastrointestinal motility disorders are a large and broad group. Some of these disorders have been effectively treated with electrical stimulation. However, intestinal electrical stimulation is still not fully understood. Therefore the goal of our current study is to determine whether the rate of intestinal peristalsis can be altered by performing *in vivo* electrical stimulation of pig jejunum.

Methods: Juvenile mini-Yucatan pigs were placed under general anesthesia. Laparotomy was performed to externalize a short segment of the jejunum. The jejunum was transected and 5 mL of electrode gel was placed inside (Figure). The segment of jejunum (n=12) was then monitored for 20 minutes first under no stimulation, and then under direct electrical stimulation. A planar electrode was used to deliver a biphasic current of 2 mA with a pulse width of 2 ms. All the gel that was forced back out of the intestine via peristalsis was collected and weighed for each 20 minute time interval. A second electrode was used to measure the current and impedance in the jejunal segment. Paired t-tests were used to compare results from the two conditions.

Results: An impedance of ~3,000 ohms at 1 kHz was measured at the interface of the electrode and intestine. Effective delivery of the current to the intestine was confirmed via direct measurements. When there was no direct intestinal electrical stimulation, an average of 0.51 grams of gel were expelled in 20 minutes, compared to 1.67 grams of gel expelled during direct electrical stimulation (p<0.05).

Conclusions: We conclude that intestinal electrical stimulation is effective in increasing the rate of peristalsis to accelerate the transit of gastrointestinal contents. A small and implantable device can be used to deliver the stimulus, and thus could be used in the clinical setting. This may be useful in the treatment of a range of pediatric motility disorders.



Innovation Session (cont.)

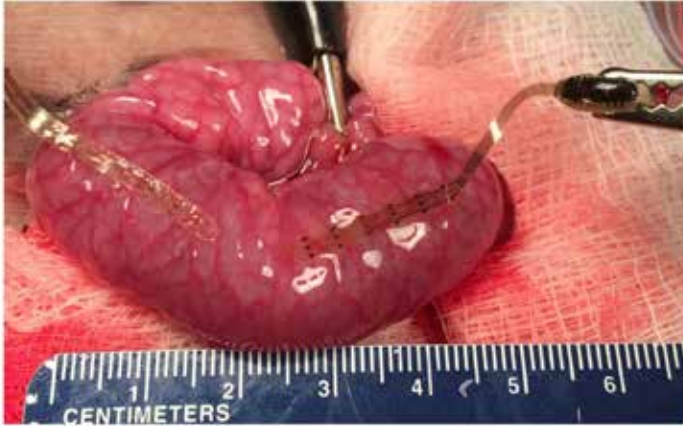


FIGURE. Externalized segment of jejunum containing electrode gel. Planar electrodes are placed on the surface of the intestine to deliver and record electrical impulses.

Innovation Session (cont.)

i5

RANDOMIZED CONTROLLED TRIAL: INTRAOPERATIVE INTERCOSTAL NERVE CRYOABLATION DURING NUSS PROCEDURE REDUCES LENGTH OF STAY AND IN-HOSPITAL OPIOID USE

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Purpose: Minimally invasive repair of pectus excavatum via the Nuss procedure is associated with significant post-operative pain, which drives prolonged hospital stays. Common pain management strategies include epidural analgesia, as well as opioid and non-opioid adjuncts. Intercostal nerve cryoablation has been described, but is not widely utilized for nerve blockade during the Nuss procedure. We sought to determine if intraoperative intercostal nerve cryoablation during Nuss procedure reduces hospital length of stay compared to thoracic epidural analgesia.

Methods: Single institution prospective randomized controlled trial comparing intraoperative intercostal nerve cryoablation and thoracic epidural analgesia in the Nuss procedure between 5/2016 and 8/2017. Primary outcome measure was hospital length of stay. Secondary outcomes included total in-hospital opioid requirement, daily opioid requirement, outpatient opioid use, inpatient and outpatient pain scores, operative time, room time and adverse reactions. Intention to treat analysis was performed using two-tailed t-test for continuous variables, and Fisher's exact test for categorical variables, with alpha=0.05 for significance.

Results: 17 patients were randomized; eight patients underwent cryoablation and nine had thoracic epidural. Patients undergoing cryoablation had mean length of stay 4.0 days (95% C.I. 3.4-4.6 days) compared to 6.1 days (95% C.I. 5.4-6.8) for the epidural group (p=0.0001). Additionally, patients receiving cryoablation used less total in-hospital opioid (310.3 mg oral morphine equivalent vs. 682.2 mg, mean decrease 371.9 mg [95% C.I. 182.1-561.8 mg], p=0.0008), and less opioid per hospital day (76.1 mg vs. 112.6 mg, p=0.042). There was no difference in post-operative pain scores, outpatient opioid use, or adverse events. OR times were longer with cryoablation (mean increase 41.4 min [95% C.I. 20.1-62.8], p=0.0009).

Conclusions: Intraoperative intercostal nerve cryoablation during Nuss procedure allows decreased hospital length of stay and less total and daily opioid use compared to thoracic epidural, while offering equivalent inpatient and outpatient pain control assessed via pain scores.



Innovation Session (cont.)

i6

EXPERT OUTPATIENT BURN CARE IN THE HOME THROUGH MOBILE HEALTH TECHNOLOGY

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Purpose: Access to care for pediatric burn injury remains a major public health problem in the US. Telemedicine has an opportunity to improve patient care, but current models are expensive and inefficient. We have developed, deployed and pilot-tested a novel smartphone application (TeleBurnApp) to treat partial thickness burns in the outpatient setting.

Methods: The TeleBurnApp allows the provision of tertiary clinical burn care directly in the patient's home through text and image messaging, video conferencing and instructional videos. After IRB approval, we retrospectively reviewed clinical outcomes and usability in partial thickness burn patients treated using the TeleBurnApp with standard therapy (APP) compared to standard therapy alone (ST).

Results: Burn wound care was provided to 32 patients via the APP and 35 patients with ST. 74% of patients used the TeleBurnApp with no burn wound infections or unexpected returns to clinic or ED. Patients and providers sent 239 store-and-forward pictures (mean, range: 6, 0-34), 529 text messages (16, 0-162), and four patients utilized the video calls (11%). The instructional videos were accessed a total of 155 times (4.2, 0-10). When compared to a group of patients treated with ST, the APP patients had similar burn injury severity (mean %TBSA; ST vs APP: 3.1 ± 2.9 (range: 1-15) vs 3.75 ± 4.5 (range: 1-14) ($p=0.48$) Age, ethnicity and burn mechanism did not differ. The mean time to healing was shorter in the APP group (days, STvsBA: 14.3 ± 5.4 (range: 6-25) vs 11.6 ± 4.7 (range: 5-22) ($p=.03$) with fewer clinical encounters, STvsBA: 3.3 ± 1.0 (range 2-6) vs 0.93 ± 0.6 (range 0-2) ($p=0.001$). Compliance with completion of therapy with patients using APP was 80% vs 64% compliance with ST.

Conclusions: We describe a functional, scalable TeleBurnApp in clinical use in a pediatric burn program. Further prospective, randomized studies may validate this mobile health platform, improving access to expert burn care to a vulnerable population.

Innovation Session (cont.)

i7

PEDIATRIC ACUTE SURGICAL SUPPORT PASS - INITIAL ASSESSMENT OF THE MULTIMODAL COURSE FOR TEACHING THE INITIAL RESPONSE TO ACUTE PEDIATRIC SURGICAL EMERGENCIES TO MEDICAL PROFESSIONALS IN A DEVELOPING COUNTRY

Ai-Xuan Holterman, MD¹, Ginger Barton, RN², Girish Deshpande, MD², Thanh Dinh, MD³, Toufic Kharallah, RN², Sara Krzyzaniak, MD², Frederick Nguyen, BA¹, Chau Nguyen, MD⁴, Can Ta, MD⁵, Thao Tran, MD⁴.

¹University of Illinois College of Medicine at Chicago, Chicago, IL, USA, ²University of Illinois College of Medicine at Peoria, Peoria, IL, USA, ³Pham Ngoc Thach University of Medicine, Ho Chi Minh City, Viet Nam, ⁴Children's Hospital 1, Ho Chi Minh City, Viet Nam, ⁵City Children's Hospital, Ho Chi Minh City, Viet Nam.



Tweet it! Abstract i7: PASS course for medical front liners response to pediatric surgical emergencies #eAPSA2018

Purpose: Pediatric Acute Surgical Support (PASS) course was developed for Vietnam with the goal to prepare “front line” medical professionals from low resources facilities for proper assessment and initial management of children with life-threatening surgical illnesses and injuries. It was piloted in 2016 and subsequently modified to meet learners-specific needs. We report our evaluation of PASS short-term outcome.

Methods: The course was taught in 3 sessions by a team of US simulation nurse specialists, pediatric surgery, ICU and emergency medicine faculty, along with VN faculty equivalents. Didactic lectures on pediatric GI emergencies and organ-specific trauma, technical skills stations, case scenario discussion with audience response and pediatric multitrauma simulation were delivered to 57 learners in 13 teams from 3 children hospitals. Learners demographics; pre- and post-course multiple-choice exam scores; check lists performance of team clinical case management and team dynamics; post-course learners’ evaluation and comments of course approach, content and delivery and faculty performance were collected and compared using Wilcoxon and Chi-square tests.

Results: Median year in clinical practice was 5 (range 1-15), 65% have not been exposed to simulation teaching, 28% are pediatric surgeons, 31% were nurses, 78% reported average or above average “comfort level” managing acute pediatric surgical emergencies. Test scores improved from 54%+/-14% to 84%+/-14%, simulated trauma case scenario and team performance scores improved significantly (31% to 65% and 28% to 70%), p<0.001. The course contents met the needs of 95% of learners. Overall satisfaction scores were 4.96+/-0.23 (5 being best score).

Conclusions: PASS course improved learners’ knowledge, team function and case management competencies and met the learners educational need in self-reported surveys in short-term. Future directions include continuing course refinement, ongoing education and longitudinal follow up to sustain the learning and evaluate learners’ skills retention, eventual PASS deployment to district hospitals and long-term effects on clinical outcome.



Plenary Session II

52*

INTERVENTIONS FOR PATIENTS WITH HIRSCHSPRUNG DISEASE WITH OBSTRUCTIVE SYMPTOMS AFTER PULL-THROUGH: A REVIEW OF 62 CASES

Carlos A. Reck-Burneo, MD, **Alejandra Vilanova-Sanchez, MD**, Christopher McCullough, MD, Alessandra C. Gasior, MD, Laura Weaver, Tassiana Maloof, Erin Hoover, Jordan Jagers, Renae Gagnon, Richard J. Wood, MD, Marc A. Levitt, MD.

Nationwide Children's, Columbus, OH, USA.



Tweet it! Abstract 52: Redo surgery and/or Botox injection in Hirschsprung Disease improve obstructive symptoms #eAPSA2018

Purpose: Following a pull-through for Hirschsprung disease (HD), some patients struggle with obstructive symptoms. We wanted to establish the most frequent causes for this, determine if an intervention could improve these symptoms, and assess for quality of life (PedsQL).

Methods: We reviewed patients referred to our Center (2014-2016) with obstructive symptoms following pull-through performed elsewhere.

Results: For 62 patients the average age at time of intervention was 5.58 years (range 0.5 -15). Obstructive symptoms included recurrent episodes of enterocolitis [n=34 (54.8%)], failure to thrive (FTT) [n= 13 (20.9%)], severe constipation unresponsive to laxatives [n=16 (25.8%)], and inability to wean off of irrigations [n=2(3%)]. The causes of the obstruction are listed in Table 1. After 51 reoperations (82%), the enterocolitis rate dropped (6 months after surgery) from 1.81[1-6] to 0.08 [0-2] episodes; (p<0.001). In the FTT group, the growth %ile increased (in the six months following surgery) from 3.47 %ile [<0.1-90] to 14 %ile [0.6-99.2];(p<.0001). Reoperations were performed transanal only [n=29 (54%)], transanal plus laparotomy [n=15 (28%)], posterior sagittally [n=4 (7%)], and laparoscopically [n= 3 (4.8%)]. 11 patients with obstructive symptoms had no identified anatomic or pathologic abnormality and were treated with Botox injection, and their symptoms improved including elimination of all cases of enterocolitis. PedsQL showed no statistical significance 12 months after intervention, with the median score pre-intervention 82.2 [35-94] and post 87.4 [48-96].

Conclusions: Reoperation in patients with anatomic or pathologic obstruction after primary surgery for HD can significantly improve bowel emptying, weight gain, enterocolitis episodes. For those with no anatomic or pathologic abnormalities (thus with no need for a reoperation) Botox injection is a helpful intervention.

Causes of obstruction after HD pull-through requiring reoperation		
	Number of patients	%
Transition zone	18	35.2%
Soave Cuff	17	33.3%
Stricture	10	19.6%
Duhamel Pouch	3	5.8%
Twisted Pull-Through	3	5.8%

Plenary Session II (cont.)

53*

IN UTERO ENZYME REPLACEMENT THERAPY IMPROVES SURVIVAL AND NEUROLOGIC OUTCOMES IN MPS VII MICE

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University of California, San Francisco, San Francisco, CA, USA.



Tweet it! Abstract 53: In utero enzyme replacement therapy for lysosomal storage disease may be the next frontier in fetal therapy #eAPSA2018

Purpose: Mucopolysaccharidosis Type VII (MPS7) is an autosomal recessive inborn error of metabolism resulting from a single defective enzyme, β -glucuronidase (GUS). The disease is characterized by accumulation of glycosaminoglycans within cells, with consequences including developmental delay, heart failure, and, in severe cases, fetal demise secondary to hydrops. Postnatal therapy is associated with allergic reactions to the new protein and may not improve neurologic outcomes. We developed a model of in utero enzyme replacement therapy (IUERT) using recombinant human GUS (rhGUS) in the mouse model of MPS7 as a platform to improve morbidity and mortality.

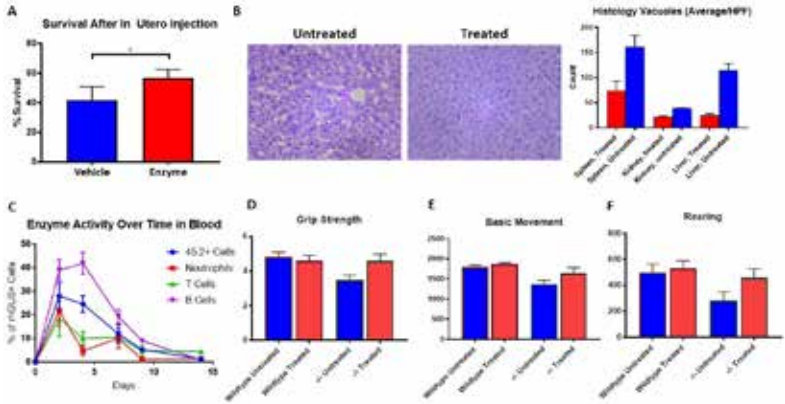
Methods: We bred heterozygous MPS7^{+/-} females to MPS7^{+/-} males and performed IUERT into the fetal liver at E14.5 with rhGUS or a vehicle control. Surviving mice received intravenous booster injections of rhGUS every 2 weeks starting at week 3. Circulating enzyme activity levels were determined by flow cytometry. Neurologic testing was performed at 6-8 weeks of age to assess grip strength and behavior.

Results: Litters receiving enzyme replacement therapy had improved total survival compared to controls (Figure 1A). Enzyme was detectable in all harvested tissues of MPS7^{+/-} mice, with decreased glycosaminoglycan accumulation in all organs at 8 weeks (Figure 1B). Active rhGUS enzyme was detected in circulating leukocytes, particularly B cells (Figure 1C). Formal neurologic testing showed that grip strength, basic movement and rearing (Figure 1D,E,F) were rescued to wild-type levels with IUERT.

Conclusion: In utero enzyme replacement therapy improves survival in MPS7^{+/-} pups, allows widespread distribution of the enzyme, decreases glycosaminoglycan storage in tissues, and rescues grip strength and motor activity. We are currently determining whether in utero enzyme also tolerizes recipients to this foreign protein and improves the skeletal and cardiac phenotypes. Our study, if successful, would lead to further investigation of in utero enzyme replacement for lysosomal storage diseases for which current treatments are still suboptimal.



Plenary Session II (cont.)



Plenary Session II (cont.)

54

MULTICENTER PRE-OPERATIVE ASSESSMENT OF PEDIATRIC OVARIAN MALIGNANCY

Arin L. Madenci, MD, MPH¹, Robert Vandewalle, MD², Bryan V. Dieffenbach, MD¹, Marc R. Laufer, MD¹, Theonia K. Boyd, MD¹, Stephan D. Voss, MD, PhD¹, A. Lindsay Frazier, MD¹, Deborah F. Billmire, MD², Frederick J. Rescorla, MD², Brent R. Weil, MD¹, Christopher B. Weldon, MD, PhD¹.

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Purpose: The purpose of this study was to develop a pre-operative risk assessment strategy for ovarian malignancy, based on a multicenter cohort of pediatric patients with ovarian tumors, in order to help guide operative management.

Methods: We conducted a retrospective, complete case analysis of patients <18 years old who underwent ovarian surgery at two quaternary care centers over a four-year period (1/1/13-12/31/16). Patients with gonadal dysgenesis or previously diagnosed non-ovarian metastatic disease were excluded. We calculated risk of malignancy based on imaging characteristics (simple cyst, heterogeneous, or predominately solid), tumor diameter (large, defined by Youden's J Index as >10cm), and tumor markers (aFP and b-hCG). Heterogeneous lesions were <50% solid, including non-simple cysts (i.e. wall thickening, septations, calcifications, and/or mural nodules).

Results: Among 188 children with ovarian tumors, the malignancy rate was 11% (Table). The median (interquartile range) age was 14 (9.1-13.9) years. Among simple cysts, the malignancy rate was 0% (0/24, 95% CI=0-17%). Of solid tumors, 44% (15/34, 95% CI=28-62%) were malignant. Among heterogeneous tumors with positive tumor markers, 25% (2/8, 95% CI=7-59%) were malignant. Conversely, among heterogeneous tumors with negative tumor markers, those that were small (≤ 10 cm) and large (>10cm) had malignancy rates of 0% (0/33, 95% CI=0-13%) and 5% (2/43, 95% CI=1-17%), respectively. Those patients with heterogeneous tumors and unavailable tumor marker status had a 2% (1/42, 95% CI=0.1-14%) malignancy rate.

Conclusions: Given the risk of malignancy from these multi-institutional data, we make recommendations based on tumor characteristics. We suggest cystectomy for simple cysts or tumor marker negative heterogeneous lesions ≤ 10 cm. Conversely, we recommend oophorectomy for solid tumors or heterogeneous tumors with positive tumor markers. Finally, large (>10cm) heterogeneous tumors with negative tumor markers warrant discussion of ovarian-sparing techniques. Staging maneuvers should be considered part of optimal treatment regardless of operative procedure undertaken.



Plenary Session II (cont.)

Table. Malignancy rate and recommendations based on pediatric ovarian tumor characteristics.		
Tumor characteristic	Malignancy rate (#/total, 95% CI)	Recommendation ^a
Simple cyst	0% (0/24, 0-17%)	Ovarian-sparing
Solid-predominant tumor	44% (15/34, 28-62%)	Oophorectomy
Heterogeneous tumor (see subcategories)		
...and tumor marker positive	25% (2/8, 7-59%)	Oophorectomy
...and tumor marker negative, ≤10cm	0% (0/33, 0-13%)	Ovarian-sparing
...and tumor marker negative, >10cm	5% (2/43, 1-17%)	Ovarian-sparing ^b
CI, confidence interval. ^a Staging maneuvers should be considered part of optimal treatment regardless of operative procedure undertaken. ^b With discussion, given a 5% malignancy rate.		

Plenary Session II (cont.)

55

ULTRASOUND GUIDANCE IMPROVES SAFETY AND EFFICIENCY OF CENTRAL LINE PLACEMENTS

Cory N. Criss, MD¹, Niki Matusko, BS², Samir K. Gadepalli, MD, MBA¹, Marcus D. Jarboe, MD¹.

¹C.S. Mott Children's Hospital, Ann Arbor, MI, USA, ²Michigan Medicine, Ann Arbor, MI, USA.



Tweet it! Abstract 55: Ultrasound decreased rate of pneumothorax in central lines @cory_criss #eAPSA2018

Purpose: There is a growing body of evidence supporting ultrasound-guided techniques for central line access in both adult and pediatric literature. As it stands, there is a paucity of data evaluating ultrasound-guided central lines in pediatric surgeons and their subsequent learning curve during a complete practice change. We sought to evaluate outcomes of ultrasound-guided central line placement in a pediatric surgical population.

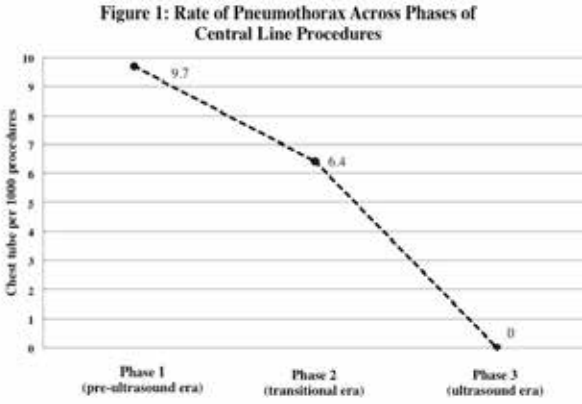
Methods: A single institution, retrospective chart review was performed on all tunneled central lines placed between 2004-2017. CPT codes for tunneled central lines were included (36558,36561,36560, 36557). During the study period, a practice conversion of the pediatric surgical group occurred from exclusively landmark-based line placement to ultrasound-based line placement. Groups were divided into three phases: pre-ultrasound era (Phase 1), the transitional learning period (Phase 2), and ultrasound era (Phase 3). Outcomes including pneumothorax requiring chest tube, operative room time, and intraoperative morbidities were analyzed.

Results: A total of 2,010 tunneled central lines were placed by pediatric surgeons during the study period. Phase 1 (n=930), Phase 2 (n=313) and Phase 3 (n=767) were similar patient populations, with neoplasm/malignancy (66%) as the most common indication for line placement. Phase 1 had a pneumothorax rate of 9.7/1000 procedures, while Phase 2 had a rate of 6.4/1000 procedures, and Phase 3 had no chest tube insertions for pneumothorax (p=0.009). Phase 1 had longer OR times compared to Phase 3 (57 vs. 46 minutes, p=0.003). Additionally, patients with multiple previous lines (≥2) had statistically longer OR times in Phase 1 compared to Phase 3 (56 vs. 44 minutes, p=0.001).

Conclusions: This study represents the largest analysis of ultrasound guided-access by pediatric surgeons. In addition to showcasing a complete practice change within a two year period, our data suggests image-guided central lines results in less chest tube insertions and shorter operative times compared to the traditional approach.



Plenary Session II (cont.)



Plenary Session II (cont.)

56

A NOVEL PLATFORM FOR DETERMINING THE EFFECTS OF THE ENTERIC NERVOUS SYSTEM ON THE INTESTINAL EPITHELIUM

Mitchell R. Ladd, MD, PHD¹, Blake Johnson, BS¹, Carolyn Gosztyla, MD², Cait Costello, PhD³, Adam Werts, DVM, PhD¹, Laura Martin, MD¹, Emily Banfield, MS¹, Hongpeng Jia, MD¹, Peng Lu, PhD¹, William Fulton, MS¹, Sanxia Wang, MS¹, Thomas Prindle, BS¹, Yukihiro Yamaguchi, PhD¹, Jungeun Sung, BS¹, Chhinder Sodhi, PhD¹, John March, PhD⁴, Davi J. Hackam, MD, PhD¹.

¹Johns Hopkins Hospital, Baltimore, MD, USA, ²Walter Reed, Bethesda, MD, USA, ³Cornell University, Ithaca, NY, USA, ⁴Cornell University, Ithaca, MD, USA.



Tweet it! Abstract 56: Understanding intestinal epithelial and enteric nervous system interactions. @mrladd #eAPSA2018

Purpose: The enteric nervous system (ENS) serves integral functions in the intestine such as maintenance of intestinal barrier function and coordination of peristalsis, and is impaired in Hirschprung's disease and short bowel syndrome. Recent advances in the development of an artificial intestine have been limited by failure to achieve peristalsis, in part due to inadequate techniques to study the ENS. We have now isolated enteric neurospheres from the intestine, and sought to develop an *ex vivo* platform for the study of the effects of ENS on proliferation and differentiation of intestinal stem cells (enteroids) and evaluate the ability of enteric and neural cells to populate poly(glycerol sebacate) (PGS) synthetic bioscaffolds.

Methods: Intestinal stem cell crypts and myenteric plexus ENS cells were isolated from murine small intestine and differentiated into enteroids and neurospheres; these were then combined in physiologically relevant ratios for 48 hours and analyzed for growth and differentiation. Enteroids and neurospheres were then seeded and co-cultured on biological PGS intestinal scaffolds and assessed for coverage over time via confocal microscopy.

Results: The presence of neurospheres induced increased enterocyte proliferation as revealed by upregulation of Ki-67 and decreased differentiation as revealed by reduced secretory (mucin 2, lysozyme) and absorptive (sucrase-isomaltase) markers. Strikingly, enteroids and neurospheres demonstrated ability to co-populate synthetic intestinal scaffold over time, with neural projections extending between enteroids on neighboring villi, indicative of functional potential.

Conclusion: We have developed a novel platform for the study of neural interactions with enteroids *in vitro*, and determined that neurospheres maintain enteroids in a more stem-like, less differentiated state, which would be expected to enhance *in vivo* intestinal regenerative capacity, in the management of diseases like short bowel syndrome and Hirschprung's disease.



Plenary Session II (cont.)

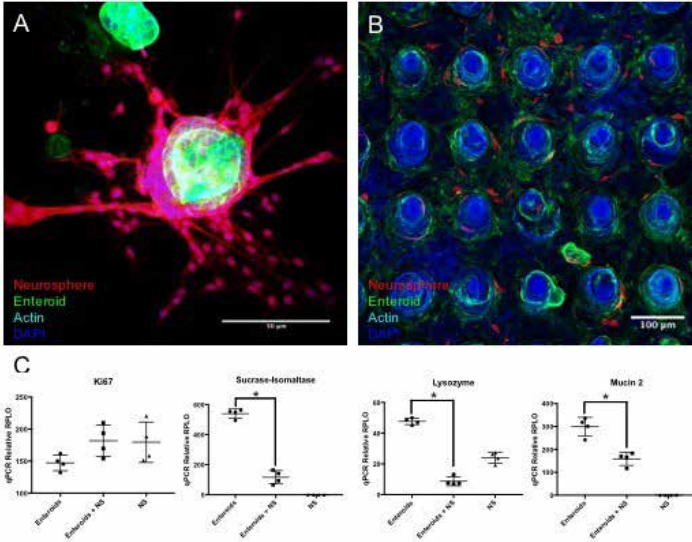


Figure 1. Tomato red expressing neurospheres and green fluorescent protein enteroids co-cultured **A)** in Matrigel and **B)** on PGS intestinal scaffold. Note, the patterned blue staining are the villi of the scaffold. **C)** Gene expression analysis quantified by qRT-PCR comparing enteroids and neurospheres (NS) alone to co-cultured enteroids and neurospheres. * indicates statistical significance.

Plenary Session II (cont.)

57*

OUTCOMES OF INFANTS WITH CONGENITAL DIAPHRAGMATIC HERNIA TREATED WITH VENOVENOUS VERSUS VENOARTERIAL EXTRACORPOREAL MEMBRANE OXYGENATION: A PROPENSITY SCORE APPROACH

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¹Community Memorial Hospital, Ventura, CA, USA, ²University of California, Irvine, Irvine, CA, USA, ³University of Texas Health Science Center, Houston, TX, USA, ⁴Cottage Children's Medical Center, Santa Barbara, CA, USA, ⁵Children's Hospital of Orange County, Orange, CA, USA, ⁶Seattle Children's Hospital, Seattle, WA, USA.

Purpose: Previous studies comparing extracorporeal membrane oxygenation (ECMO) modality for congenital diaphragmatic hernia (CDH) have accounted for confounding by indication. We therefore hypothesized that using a propensity score (PS) approach to account for selection bias may identify outcome differences based on ECMO modality for infants with CDH.

Methods: We utilized ELSO Registry data (2000-2016). Patients with CDH were divided to either venoarterial (VA) or venovenous (VV) ECMO. Patients were matched by PS to control for non-random treatment assignment. Subgroup analyses were conducted on infants who either underwent pre-ECMO CDH repair or did not. Primary analysis was the "intent-to-treat" (ITT) cohort based on the *initial* ECMO mode. Mortality was the primary outcome, and severe neurologic injury (SNI) was a secondary outcome.

Results: PS matching (3:1) identified 3,304 infants (VA=2,470, VV=834). In the main group, mortality was not different between VA and VV ECMO (OR=1.01, 95%CI:0.86-1.18) and there was no difference in SNI between VA and VV (OR=0.80; 95%CI:0.63-1.01). For the pre-ECMO CDH repair subgroup, 175 VA cases were matched to 70 VV. In these neonates, mortality was higher for VV compared to VA (OR=2.10, 95%CI:1.19-3.69), without any difference in SNI (OR=1.48; 95%CI:0.59-3.71). For the subgroup that did not have pre-ECMO CDH repair, 2,030 VA cases were matched to 683 VV cases. In this subgroup, VV was associated with 27% lower risk of SNI relative to VA (OR=0.73, 95%CI:0.56-0.95) without any difference in mortality (OR=0.94, 95%CI:0.79-1.11).

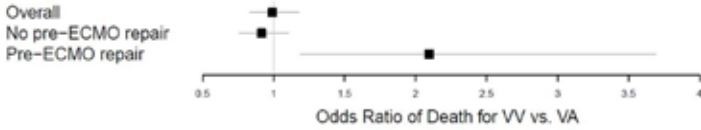
Conclusion: This study revalidates that ECMO mode does not significantly affect mortality or SNI in infants with CDH. In the subset of infants who require pre-ECMO CDH repair, VA favors survival. Whereas, in the subgroup of infants that did not have pre-ECMO CDH repair, VV favors lower rates of SNI. We conclude that neither mode appears consistently superior across all situations, and clinical judgement should remain a multifactorial decision.



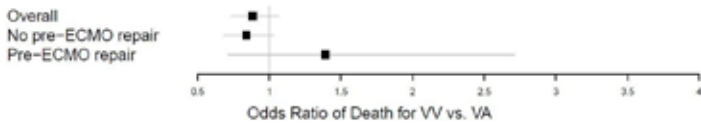
Plenary Session II (cont.)

Figure. Odds ratio of death between neonates treated with VV relative to VA ECMO in (A.) IIT cohort and (B.) the cohort with exclusion of VV-VA conversion.

A. IIT Cohort



B. Cohort with Exclusion of VV-VA Conversion



Plenary Session II (cont.)

58*

PROSTAGLANDIN E1 IMPROVES MARKERS OF PULMONARY HYPERTENSION IN CONGENITAL DIAPHRAGMATIC HERNIA

Kendall M. Lawrence, MD, Rachel K. Hopper, MD, Kelsey Berger, BS, Lisa M. Herkert, RN, MSN, Christine D. Franciscovich, RNC, Emily A. Partridge, MD, PhD, Lindsay Waqar, MPH, Brian D. Hanna, MDCM, PhD, William H. Peranetau, MD, Natalie E. Rintoul, MD, Holly L. Hedrick, MD.

Children's Hospital of Philadelphia, Philadelphia, PA, USA.

Purpose: In neonates with congenital diaphragmatic hernia (CDH) and pulmonary hypertension (PH), prostaglandin E1 (PGE) is used to promote ductus arteriosus patency to offload the right ventricle (RV). However, its effectiveness in this population is not well studied. Here we evaluate the response to PGE in CDH.

Methods: We performed a retrospective chart review of infants with CDH treated at our center 2011-2016 (n=203). PGE was initiated for echocardiographic evidence of RV failure with a restricted ductus arteriosus, metabolic acidosis or hypoxemia. We evaluated clinical data, including brain natriuretic peptide (BNP) and echocardiograms. Subgroup analysis was performed based on extra-corporeal membrane oxygenation (ECMO) status. In non-ECMO patients, PH severity was assessed based on RV pressure estimates by echocardiogram. Categorical and continuous data were analyzed by Fisher's exact test and Mann-Whitney t-tests, respectively. Repeated measure ANOVA analysis was used for multiple comparisons over time.

Results: We identified 57 CDH infants with severe PH who were treated with PGE. In this cohort, 87.7% (n=50) of patients received inhaled nitric oxide and 50.9% (n=29) required ECMO. PGE was mostly initiated before CDH repair (92.3%, n=52) on day 6 of life (range, 1-11 days) in the non-ECMO group, but timing varied widely in the ECMO group (range, 0-44 days). Following PGE initiation, BNP decreased by 46.4% in non-ECMO (p=0.01) and 68.2% in ECMO patients (p=0.02). In non-ECMO patients, there was significantly reduced RV pressure estimate by ductal shunting (p=0.01) and tricuspid regurgitant jet (p=0.01) on echocardiogram, as well as significant improvement in acidosis (p=0.01) and hypercarbia (p=0.01) but not oxygenation (p>0.99). PGE was discontinued in 6 patients (10.5%) for side effects: fever (n=1), hypotension (n=2) and periosteal reaction (n=3).

Conclusion: In patients with CDH and severe PH, PGE is well tolerated and associated with improved BNP and echocardiographic indices of PH, suggesting successful offloading of the RV. Patients with the most significant response do not require ECMO.



Plenary Session II (cont.)



Figure 14-C shows right ventricle pressure estimates on echocardiograms for CDH patients before and after prostaglandin E1 (PGE1) administration.

Scientific Session V

59**

NON-OPERATIVE MANAGEMENT OF PERFORATED APPENDICITIS IS COST-EFFECTIVE IN PATIENTS PRESENTING WITH PROLONGED DAYS OF SYMPTOMS

Mubina Isani, MD, Jeremy Jackson, MD, Wesley E. Barry, MD, Michael Mallicote, MD, David Rosenberg, BS, Grace Asuelime, MS, Choo Phei Wee, MS, James E. Stein, MD, MS, Aaron R. Jensen, MD, MEd, Eugene S. Kim, MD.

Children's Hospital of Los Angeles, Los Angeles, CA, USA.

Purpose: Controversy exists in the management of perforated appendicitis in children. Previously, we found that perforated patients who undergo non-operative management incur higher overall costs and worse outcomes compared to immediate operative patients. However, after a prolonged number of days of symptoms, is it still cost-effective to treat perforated appendicitis non-operatively as opposed to a difficult and risky operation? We hypothesized that patients with perforated appendicitis who present with a greater number of days of symptoms are more cost-effective to manage non-operatively.

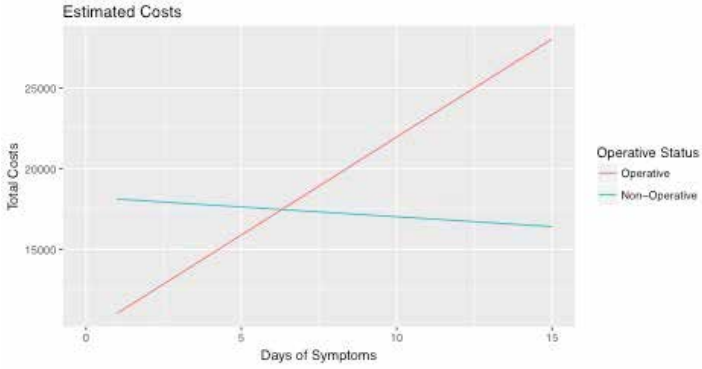
Methods: After IRB approval, we analyzed 228 patients that presented with perforated appendicitis and underwent appendectomy from 2012-15. Of those, 145 patients underwent immediate operation, and 83 were treated non-operatively. Patients were defined as perforated if there was evidence of free fluid, abscess or phlegmon on imaging studies. We excluded patients that presented with sepsis, organ failure and VP shunts. Linear and multivariate analyses were done where appropriate and p-value <0.05 was considered significant.

Results: Using multivariate regression, we found a significant interaction between operative management and number of days of symptoms (p=0.01). Subsequent linear regression of the operative and non-operative groups independently found that overall cost of care increased by \$1216 per day of symptoms for immediate operative management and decreased by \$121 per day for non-operative management. Plotting the predicted cost curves for immediate operative and non-operative management demonstrated a higher predicted cost **for patients with more than 6.3 days of symptoms (Figure 1).**

Conclusion: Our data suggests that it is more cost-effective to immediately operate on patients with perforated appendicitis who present with less than 6 days of symptoms, whereas patients that present with greater than 6 days of symptoms should be treated with non-operative management.



Scientific Session V (cont.)



Scientific Session V (cont.)

60*

LESSONS LEARNED FROM VALUE-BASED PEDIATRIC APPENDECTOMY CARE: A SHARED SAVINGS PILOT MODEL

Yangyang R. Yu, MD¹, Kathleen E. Carberry, RN, MPH², Hui Ren, BA², Charlene Barclay, RN, MBA², Binita Patel, MD¹, Jed G. Nuchtern, MD¹, Angelo P. Giardino, MD, PhD², Monica E. Lopez, MD¹.

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Tweet it! Abstract 60: Shared savings pilot in pediatric appendicitis @yangsie #eAPSA2018

Purpose: We aim to assess the healthcare value achieved after developing and implementing a shared savings program for pediatric appendectomy within our integrated health care delivery system.

Methods: A shared savings program was undertaken between a freestanding children's hospital and the largest Medicaid/Children's Health Insurance Program payer within our system. All children who underwent appendectomy covered by this health plan were included. We established baseline financial targets for an appendectomy episode using claims data for fiscal year 2014 (FY2014). Reductions in cost (savings) would be shared among the insurer and providers commensurate with number of quality metrics met, up to 50%. Quality targets were 15% reduction in time from presentation to surgery (PS), length of stay (LOS) and readmission rate (RR). A fourth quality metric entailed reporting patient satisfaction. Quality targets and costs for two consecutive 6-month performance periods (PP1, PP2) were compared to FY2014 baseline.

Results: 640 patients were included (baseline: 317, PP1:167, PP2:156). After the cost target for an appendectomy episode was determined, a minimal savings of 9% conferred shared savings eligibility. Comparison of performances for each period with respect to baseline is presented in Table 1. A 21-23% increase in inpatient complex appendicitis cases was seen in PP1 and PP2 compared to baseline (67.5%). During PP2, we met two quality targets: readmission rate and patient satisfaction. Although potentially eligible to share 30% of savings based on quality targets achieved, no savings were realized because the cost threshold was not met during PP1 (+1.71%) or PP2 (-0.41%).

Conclusions: Payer-provider partnerships can provide a platform for testing value-based reimbursement models to reduce healthcare costs and improve quality. Setting achievable targets, identifying affectable quality metrics, considering case mix index, and allowing sufficient lag time for interventions to generate cost savings should be considered in future applications of this paradigm.



Scientific Session V (cont.)

Comparison of quality metric benchmarks for each performance period compared to baseline (FY2014)				
	Presentation to Surgery (hours)	Length of Stay (days)	Readmission Rate	Patient Satisfaction
FY 2014 (baseline) performance	10.88	3.31	4.18%	-
Target performance (-15%)	9.24	2.81	3.55%	report data
Performance period 1	11.61	3.07	4.52%	not reported
Performance period 1 (% change)	7%	-7%	8%	-
Performance period 2	10.67	3.11	1.79%	reported
Performance period 2 (% change)	-2%	-6%	-57%	-

Scientific Session V (cont.)

61**

REDUCING NARCOTIC USAGE IN POSTOPERATIVE APPENDECTOMY PATIENTS

Andrew Nordin, MD, Karen Diefenbach, MD, Jeff Christensen, MHA, Abigail Nelson, MSN, Gail Besner, MD, Brian Kenney, MD, MPH.

Nationwide Children's Hospital, Columbus, OH, USA.

Introduction: Opioid over-prescription has fostered opioid abuse and overdoses, costing over \$20 billion in hospital-related care annually. In postoperative follow up for appendicitis patients, we discovered that most patients required only a fraction of the prescribed opioids. We therefore sought to reduce the number of narcotic doses prescribed to postoperative appendicitis patients using quality improvement methodology.

Methods: We prospectively collected data for all pediatric patients undergoing laparoscopic appendectomy at our institution from 6/2015 to 6/2017; patients undergoing open or interval appendectomy were excluded. We began several interventions in 11/2016, including limiting the maximum number of prescribed narcotics at discharge to 4 doses, educating providers and families on the importance of minimizing narcotics, and using scheduled non-narcotic analgesics. We provided ongoing regular feedback with prescribers to ensure compliance. Data points included demographics, appendicitis severity classification, and number of narcotic doses prescribed upon discharge. The number of narcotic doses taken was evaluated via postoperative phone survey. Balancing measures included 30-day emergency department (ED) visits and readmissions. Data points were analyzed using student's t-test or chi-square analysis as appropriate, and average opioid doses prescribed and taken were analyzed using process control charts. As a quality improvement project, this study was exempt from IRB approval.

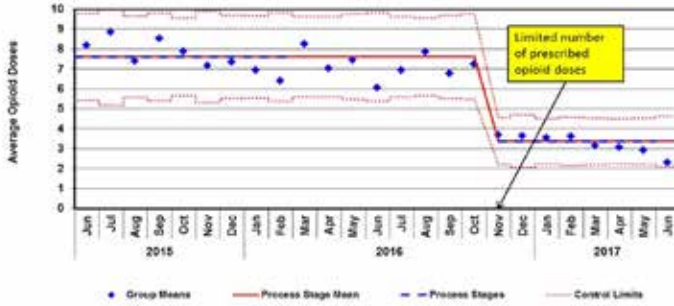
Results: A total of 911 appendicitis patients were included. At baseline, patients were prescribed an average of 7.6 narcotic doses, even though only one quarter of these were taken. Post-intervention, our average number of prescribed narcotic doses decreased to 3.4 (Figure 1) with no change in the number of doses taken; there were no significant differences in ED visits ($p = 0.41$) or readmissions ($p = 0.16$).

Conclusions: Postoperative pain following laparoscopic appendectomy can be successfully managed with fewer narcotic prescriptions, thereby eliminating unused medications and potentially minimizing inappropriate access to opioids. By extension, non-narcotic analgesics can be used to effectively treat postoperative pain.



Scientific Session V (cont.)

Figure 1: Average Number of Opioid Doses Prescribed for Post-Appendectomy Patients



Scientific Session V (cont.)

62**

THINKING OUTSIDE THE (CHECK)BOX: EVALUATING SUSTAINABLE SURGICAL SAFETY CHECKLIST PERFORMANCE

Kathryn T. Anderson, MD, MPH¹, Marisa A. Bartz-Kurycki, MD¹, Maria Matuszczak, MD¹, Rhashedah A. Ekeoduru, MD¹, Jannette Clary, RN, BSN², Dorothy Serralles, MSN-Ed, RN², Akemi L. Kawaguchi, MD, MS¹, Kevin P. Lally, MD, MS¹, KuoJen Tsao, MD¹.

¹McGovern Medical School, University of Texas Health Sciences Center at Houston, Houston, TX, USA, ²Children's Memorial Hermann Hospital, Houston, TX, USA.



Tweet it! Abstract 62: Think outside the checkbox! Improving the utility of surgical checklists is possible but requires continuous QI. @jainraisig
#eAPSA2018

Purpose: The surgical safety checklist (SSC) has been a widely advocated and often mandated tool to promote safe surgery. The purpose of this study was to evaluate the performance over time of a SSC program in pediatric operating rooms (OR).

Methods: In 2011, a pediatric OR safety council established a pediatric specific SSC through a multispecialty quality improvement initiative. Performance improvement interventions and subsequent observations for adherence, simple completion of a checklist item, of each SSC phase were conducted in a step-wise fashion (Pre-incision: 2011, Debriefing: 2013, Pre-induction: 2015). Iterative modifications were made to reflect stakeholder feedback and safety regulations. Evaluation of fidelity, meaningful completion of an item, of the pre-incision phase began in 2014. Degree of adherence and fidelity were calculated as proportions of items completed. Annual SSC performance was assessed by trained observers. Interrater reliability was established for each phase and observer group. Cochran-Armitage test for trend was used for analysis.

Results: In 7 annual observation periods, 1,817 pediatric pre-incision SSCs were observed; 1,253 debriefings were observed in 5 periods; 703 pre-induction SSCs in 3 periods. Interrater reliability was greater than $\kappa > 0.70$ for all periods. Adherence to all phases of the SSC improved over time (test for trend, all $p < 0.01$) (figure). Median pre-incision adherence for all years was 90% (IQR 72-100%). Fidelity increased with time ($p < 0.01$) but remained consistently lower than adherence (median, all years, 83%, IQR 69-92%). Adherence to debriefing showed initial improvement and subsequent waning (median 2013: 50%; 2014: 90%; 2015: 90%; 2016: 83%; 2017: 82%). Pre-induction adherence continues to improve but is the lowest performing phase overall (median 67%, IQR 27-92%).

Conclusions: SSC performance achieved high adherence and fidelity with targeted efforts through a SSC implementation program. Sustained high fidelity performance may require novel and dynamic interventions to maintain a positive safety culture in pediatric operating rooms.



Scientific Session V (cont.)

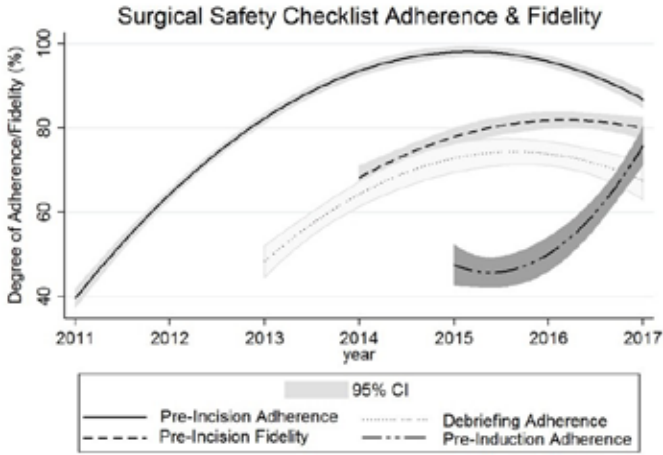


Figure: Degree of adherence and fidelity over 7 annual observation periods for the 3 phases of the surgical safety checklist.

Scientific Session V (cont.)

63**

ROOM FOR “QUALITY” IMPROVEMENT? VALIDATING NATIONAL SURGICAL QUALITY IMPROVEMENT PROGRAM-PEDIATRIC APPENDECTOMY DATA

Kathryn T. Anderson, MD, MPH, Marisa A. Bartz-Kurycki, MD, Mary T. Austin, MD, MPH, Akemi L. Kawaguchi, MD, MS, Lillian S. Kao, MD, MS, Kevin P. Lally, MD, MS, KuoJen Tsao, MD. *University of Texas Health Sciences Center at Houston, Houston, TX, USA.*



Tweet it! Abstract 63: Room for Quality Improvement: How can we improve and validate NSQIP-Pediatric Data? @jainraisig #eAPSA2018

Purpose: National databases and clinical registries are used to compare similar institutions after appropriate risk adjustment. This may improve patient safety, quality of care and clinical outcomes. However, highly accurate data is essential for the validity of these databases. The purpose of this study was to validate the National Surgical Quality Improvement Program-Pediatric (NSQIP-P) appendectomy data at a single institution.

Methods: A prospective appendectomy-specific pediatric surgery department database (DD) maintained by clinical researchers was compared to the NSQIP-P data for appendectomies performed in 2016 at a tertiary children’s hospital. NSQIP-P data, collected by trained surgical clinical reviewers (SCR), was compared to the DD. NSQIP-P definitions were used for both datasets. Revisits include emergency department (ED) visits and readmissions (inpatient or ≥ 2 midnights). Morbidity is a composite outcome combining all NSQIP-P collected adverse events. χ^2 tests were used to compare outcomes.

Results: The department performed 458 appendectomies for acute appendicitis in 2016, of which 250 (55%) were abstracted by SCRs. Patient demographics were similar between datasets however (table). Amongst all abstracted cases, categorization of disease severity (NSQIP-P: 50% complicated vs DD: 31% complicated), revisits (NSQIP-P: 4.0% vs DD: 11%), and composite morbidity (NSQIP-P: 6% vs DD: 14%) were significantly different (all $p < 0.01$). Readmissions were much higher when including those admitted under observation (NSQIP-P: 1% vs DD: 5%, $p < 0.01$). The DD found more revisits, surgical site infections (SSI) and composite morbidity than NSQIP-P in complicated patients. Similarly, NSQIP-P under reported revisits and morbidity in simple appendectomy patients.

Conclusions: Despite a detailed sampling process, rigorously trained abstractors, and defined variables, 2016 NSQIP-P appendectomy data was not consistent with department data. Discrepancies appear to be the result of under collection of outcome variables and misclassification of disease. Greater collaboration between surgeon champions and SCRs or increased auditing may be required to improve the consistency of NSQIP-P data compared to DD.



Scientific Session V (cont.)

*1 patient with normal appendix classified as simple by NSQIP (diagnosis: psoas abscess)			
	NSQIP-P Reported Data	Department Database (DD)	p-value
All Patients	n=250	n=250*	
Female gender, n (%)	85 (34.0%)	85 (34.0%)	1.00
Age in years, mean±SD	11.4±4.0	11.6±3.7	0.56
Complicated	125 (50%)	78 (31.3%)	
Surgical Site Infection	9 (7.2%)	13 (16.7%)	0.04
Morbidity	9 (7.2%)	16 (20.5%)	<0.01
Simple	125 (50%)	171 (68.7%)	
Surgical Site Infection	2 (1.6%)	5 (2.9%)	0.46
Morbidity	5 (4.0%)	19 (11.1%)	0.03

Scientific Session V (cont.)

64**

SIMPLE PREOPERATIVE RADIATION SAFETY INTERVENTIONS SIGNIFICANTLY LOWER RADIATION DOSES DURING CENTRAL VENOUS LINE PLACEMENT IN CHILDREN

Beatrix Hyemin Choi, BA, Kamalou Yaya, MD, Vinay Prabhu, MD, Nancy Fefferman, MD, Beverly Mitchell, RN, Keith A. Kuenzler, MD, Howard B. Ginsburg, MD, Jason C. Fisher, MD, Sandra Tomita, MD.

NYU School of Medicine, New York, NY, USA.

Purpose: Pediatric central venous lines (CVL) are commonly placed in the operating room under fluoroscopic guidance by individuals with varying degrees of training in radiation safety. These procedures are often followed by a routine chest radiograph (CXR) in recovery regardless of clinical indication. To reduce radiation exposure during CVL placement, we implemented a radiation safety process in the form of a radiation safety briefing and a job-instruction model that supports a pre-radiation time-out.





Methods: We reviewed the records of all children under 21 years of age who underwent CVL placement in the operating room at an academic institution from May 2013 through September 2016, which included 22 months prior to, and 10 months following, the safety intervention. The intervention consisted of a radiation safety briefing by the surgeon to the intraoperative staff before each case and a radiation-safety time-out accompanied by a job-instruction model (Figure 1). We measured and analyzed the dose area product (DAP, a quantitative measure of absorbed radiation dose) and total radiation time pre- and post-intervention, as well as the use of post-procedural CXR. Data were analyzed using Mann-Whitney U and Fisher's exact testing.

Results: 100 patients with valid DAP measurements were identified for analysis (59 pre-intervention, 41 post-intervention). Following implementation of the radiation safety process, there was a 79% decrease in median DAP (61.4 vs 13.1 rad*cm², P<0.001) and a 73% decrease in the median radiation time (28 vs 7.6 seconds, P<0.001). Additionally, there was a significant reduction in use of confirmatory CXR (95% vs 15%, P<0.01). During the post-intervention period, there were no post-operative complications directly related to the procedures.

Conclusion: A preoperative radiation safety briefing and a radiation safety timeout supported by a job-instruction model were effective in significantly lowering the absorbed doses of radiation in children undergoing CVL insertion.



Scientific Session V (cont.)

Institution Logo Removed for Abstract	Institution Logo Removed for Abstract	
Pediatric Intra-Op Radiation Reduction TIME – OUT		
1	C-Arm set to "Low Dose"	
2	C-Arm set to "Pulse"	
3	Left Side of Foot Pedal	
4	Child Shielded Posteriorly	

Scientific Session V (cont.)

65

MAKING THE DIAGNOSIS OF MIDGUT VOLVULUS: LIMITED ABDOMINAL ULTRASOUND HAS CHANGED OUR CLINICAL PRACTICE

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Purpose: To assess the diagnostic accuracy of limited abdominal ultrasound (US) examination for midgut volvulus (MGV) and to evaluate how clinical practice has changed in a free-standing children's hospital leading to the near obsolescence of upper GI (UGI) studies for the diagnosis of MGV.

Materials and Methods: All patients with suspected MGV who underwent abdominal US during 2016-2017 were identified using keyword search tools in the radiology information system. Retrospective, blinded image review was performed by a certificate of added qualification (CAQ) pediatric radiologist. US were evaluated for the presence of the superior mesenteric artery (SMA) cutoff sign and twisting of the mesentery (whirlpool sign). Results were compared with the original radiology report and operative reports.

Results: 195 US studies were performed from 2016-2017. Most common presentations were vomiting (44%), abdominal pain (7%), and suspected mal-rotation (10%). 195 US were reviewed of which 16 were non-diagnostic. 179 diagnostic studies showed MGV in 14 patients. Those 14 patients were surgically explored and confirmed to have midgut volvulus. 10 of the 16 non-diagnostic US studies were further evaluated with UGI examination or CT with 1 patient demonstrating mal-rotation without volvulus. This 1 patient was explored surgically and was found to have mal-rotation without volvulus. The remaining 6 patients were followed clinically or found to have other etiologies of abdominal pain on surgical exploration. There were 164 negative US, none of whom went to surgery. The sensitivity and specificity of US was 100%.

Conclusion: Limited abdominal US is a highly accurate examination for the diagnosis of midgut volvulus. UGI exposes patients to ionizing radiation and should be reserved for patients in whom US is non-diagnostic or inconclusive.



Scientific Session VI

66*

PROCEDURAL BURDEN EXPERIENCED BY CHILDREN WITH CANCER DURING THEIR TERMINAL ADMISSION

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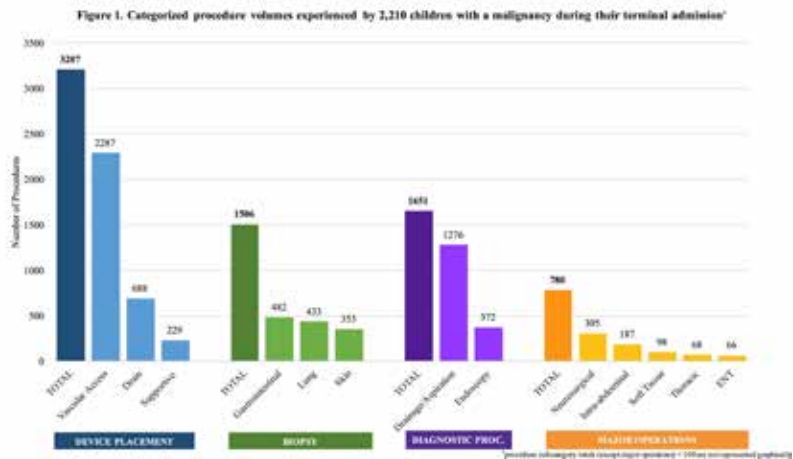
Purpose: Recent publications have highlighted the magnitude of healthcare utilization during the last year of life for children with chronic life-threatening conditions, including children with cancer. Less is known about the specific procedures that occur during their hospital stays. We assessed the volume and timing of invasive procedures that children with cancer undergo during their terminal admission.

Methods: The Pediatric Health Information System (PHIS) database was queried between 2011-2015 for patients who died in the hospital (terminal admission (TA)). Patients between the ages of 1 and 18 years with a 'chronic complex condition' malignancy flag were included. Patient demographics, admission details, ICD-9/10 procedures codes, and date of service were extracted. Procedures were categorized into 'major operations', 'invasive diagnostic procedure', 'biopsy', and 'device placement' for descriptive statistical analysis.

Results: During the study period, 2,210 children with a cancer diagnosis were identified as having died in the hospital. 1,423 (64.4%) patients underwent an invasive procedure of any kind during their TA and 855 (38.7%) underwent 3 or more procedures. See Figure 1 for volume, type, and distribution of all procedures. 466 (21.1%) patients underwent a total of 780 major operations, of which 223 (28.6%) were performed within 48 hours of admission (162 (72.6%) emergent, 46 (20.6%) elective). Most common procedures overall were ventriculostomy/ventriculoperitoneal shunt (n=211), intra-cranial mass excision (n=60), bowel resection (n=56), and exploratory laparotomy/laparoscopy (n=46). Of patients who underwent a major operation during their TA, 96 (21.7%) died within 48 hours of surgery.

Conclusions: Children with cancer, who die in the hospital, face a large procedural burden prior to their death. This study highlights the need for open, multi-disciplinary discussions between oncologists, intensivists, and surgeons regarding the necessity of these procedures and for surgeon involvement in the complex end of life care decisions made for these children.

Scientific Session VI (cont.)





Scientific Session VI (cont.)

67*

LYMPH NODE RATIO PREDICTS RECURRENCE IN PEDIATRIC PAPILLARY THYROID CANCER

Jill Rubinstein, MD, PhD¹, Kayleigh Herrick-Reynolds, MD², Raffaella Morotti, MD³, Manju Prasad, MD¹, Robert Udelsman, MD, MBA⁴, Glenda G. Callender, MD¹, Catherine Dinauer, MD³, Emily Christison-Lagay, MD³.

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Purpose: Regional lymph node (LN) metastasis at the time of presentation plays a significant role in predicting recurrence in patients with papillary thyroid cancer (PTC). Multiple studies in the adult population have demonstrated that the lymph node ratio (LNR) both in the central and lateral neck, can improve the accuracy of recurrence prediction; this ratio has not been studied in the pediatric population. In this study we investigated LNR in the central and lateral compartments as a prognostic predictor for recurrence in pediatric patients with PTC.

Methods: Single institution retrospective analysis of pediatric patients (<21 years) with at least 24 months follow-up data available who underwent total thyroidectomy with prophylactic central neck dissection (TTpCND) with ≥ 3 sampled nodes, or total thyroidectomy with unilateral modified radical neck dissection (TTMRND) with ≥ 10 sampled nodes. LNR was defined as the ratio of metastatic to total number of investigated LNs. Recurrence (locoregional and distant) after TTpCND was examined as a function of LNR, using the adult defined ratio of 0.65 as a cutoff. Recurrence after TTMRND was examined as a function of LNR, using cutoff ratio of 0.45.

Results: Thirty-four patients met inclusion criteria. Nineteen underwent TTpCND and fifteen underwent TTMRND. Median age at operation was 17 years (range 6-20), median duration of follow-up was 54 months (range 26-136). In the TTpCND, LNR ranged from 0 to 0.78. There was only one recurrence in this group, occurring in the patient with the highest LNR. In the TTMRND patients, LNR ranged from 0.11 to 1.0. In this group, 4 of 11 patients with $LNR \leq 0.45$ recurred (36%) whereas all 4 patients with $LNR > 0.45$ recurred (100%) ($p=0.05$).

Conclusions: Although limited by small sample size, LNR may be a useful predictor to stratify the likelihood of recurrence in pediatric patients undergoing TTpCND or TTMRND for pathologic N1a or N1b PTC.

Scientific Session VI (cont.)

68*

COMPARISON OF POST-OPERATIVE COMPLICATION RATES IN CHILDREN UNDERGOING HEPATECTOMY OR NEPHRECTOMY BETWEEN KID, NSQIP AND PHIS DATABASES

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Purpose: Three large national databases are commonly used to assess surgical utilization and outcomes in children, each with specific strengths and limitations. The National Surgical Quality Improvement Program (NSQIP) reports clinically-abstracted data and is the gold-standard for surgical outcomes but has limited patient capture. The Kids' Inpatient Database (KID) is limited to administrative data but is nationally representative and captures 80% of pediatric discharges. The Pediatric Health Information System (PHIS) captures both administrative data and resource utilization at 49 children's hospitals. An understanding of how outcome measures correlate between the three databases will better inform the appropriateness of using KID & PHIS to study surgical outcomes.

Methods: All patients ≤ 18 years old who underwent hepatectomy or nephrectomy in KID (2012), NSQIP or PHIS (2012-2015) were included. Cases were identified using CPT codes in NSQIP and ICD-9 codes in PHIS and KID. Complications were extracted using unique variables from NSQIP, ICD-9 codes, flags, and charge codes from PHIS, and ICD-9 codes from KID. Re-admissions within 30 days were captured in NSQIP if related to surgery, in PHIS for all reasons, and not-captured in KID.

Results: Demographic data was similar across all databases. A current malignancy diagnosis was associated with hepatectomy in 66.7%, 66.5%, and 35.4% of cases ($p < 0.0001$) and 30.8%, 38.0%, and 27.6% of nephrectomy cases ($p < 0.0001$) in NSQIP, PHIS, and KID, respectively. Selected complication rates are represented in Table 1. Re-admission rates were 17.9% in NSQIP and 56.4% in PHIS ($p < 0.0001$) for hepatectomy, and were 7.6% in NSQIP and 32.6% in PHIS ($p < 0.0001$) for nephrectomy.

Conclusions: Rates of surgical complications for children undergoing hepatectomy or nephrectomy vary between NSQIP and the administrative data sets, with PHIS showing better correlation than KID. Reported surgical outcomes from these sources should be interpreted within the context of the strengths and limitations of each database.



Scientific Session VI (cont.)

Select surgical complications of hepatectomy or nephrectomy compared in KID, NSQIP, and PHIS						
Complication	Operation	NSQIP	PHIS	p-value NSQIP vs PHIS	KID	p-value NSQIP vs KID
Total Cases	Hepatectomy	273	484		376	
	Nephrectomy	1796	2427		1299	
Blood Transfusion	Hepatectomy	50.9% (139)	43.0% (208)	0.0424	32.4% (122)	<0.0001
	Nephrectomy	12.0% (215)	14.0% (340)	0.0585	13.0% (169)	0.4166
Postoperative Infection, Any	Hepatectomy	12.5% (34)	11.8% (57)	0.8625	19.7% (74)	0.0197
	Nephrectomy	3.5% (62)	6.1% (149)	<0.0001	8.5% (110)	<0.0001
Mortality, 30-day	Hepatectomy	0.4% (1)	1.2% (6)	0.4166	6.4% (24)	0.0002
	Nephrectomy	0.3% (5)	0.4% (9)	0.0031	2.0% (26)	<0.0001

Scientific Session VI (cont.)

69

NEUTROPENIA AT THE TIME OF SUBCUTANEOUS PORT INSERTION IS NOT A RISK FACTOR FOR EARLY INFECTIOUS COMPLICATIONS IN PEDIATRIC ONCOLOGY PATIENTS

Lisa Taylor VanHouwelingen, MD¹, John M. Lu, BSc², Laura V. Veras, MD³, Jessica Staszak, MD³, Lynn Wynn, MSN⁴, William Wu, MS⁴, Jianrong Wu, PhD⁴, Andrew J. Murphy, MD⁴, Ankush Gosain, MD, PhD³, Andrew M. Davidoff, MD⁴, Ching-Hon Pui, MD⁴, Israel Fernandez-Pineda, MD⁴.

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Purpose: Subcutaneous ports (SQP) are implantable vascular devices used in the treatment of pediatric malignancies. Infectious risk associated with SQP placement in the setting of neutropenia is undefined. We therefore compared the rate of early infectious complications (<30 days) following SQP placement between oncology patients with or without neutropenia (absolute neutrophil count <500 mm³).

Methods: We conducted an IRB-approved retrospective review of pediatric oncology patients who underwent SQP placement at a single center between 2013 and 2016. Baseline characteristics and infectious complications were compared between neutropenic and non-neutropenic patients using univariate analyses and multivariable logistic regression.

Results: 614 SQP were placed in 542 patients (44% with leukemia and 56% with solid tumor). The majority (79%) of SQP were first-time insertions. All patients received prophylactic antibiotics prior to placement. 79 ports (12%) were placed in neutropenic patients and 535(88%) in non-neutropenic patients. Compared to non-neutropenic patients, those with neutropenia were significantly younger (62 vs 96 months); and more likely to have leukemia (94% vs 50%), pre-operative fever (22% vs 5%), and pre-operative infection (19% vs 9%) (all p values <0.01). Early infectious complications occurred in 18 (2.9%) SQP placements. Univariable logistic regression identified early infectious complication was associated with pre-operative fever (14.3% vs 2.1% without fever, P=0.004) and leukemia diagnosis (4.4% vs 1.1% with solid tumor, P=0.028). In the multivariable logistic model, only the presence of pre-operative fever retained independent significance (OR, 6.16, 95% CI 2.11 -18.03; P=0.0017). Importantly, neutropenia was not associated with early infectious complications in both univariate (P=0.16) and multivariate analysis (P=0.14).

Conclusion: Neutropenia was not associated with an increased risk of early infectious complications and should not be considered a contraindication to SQP placement. Further studies with larger samples sizes are needed to confirm our results.



Scientific Session VI (cont.)

70*

R1 RESECTION IN PATIENTS WITH STAGE 3 NEUROBLASTOMA IS ASSOCIATED WITH THE ABSENCE OF NEURAXIAL IMAGE-DEFINED RISK FACTORS

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Purpose: Image-defined risk factors (IDRFs) are an integral part of the International Neuroblastoma Risk Grouping (INRG). Stage 3 neuroblastomas often exhibit vascular encasement and neuraxial infiltration. In this study, we analyzed the effect of the presence and number of IDRFs on R1 resection rate, occurrence of surgical complications, and outcomes in patients with International Neuroblastoma Staging System (INSS) Stage 3 neuroblastoma.

Methods: After obtaining an IRB waiver (#16-1327), medical records of 95 consecutive patients with INSS stage 3, non-*MYCN*-amplified neuroblastoma were reviewed. International Neuroblastoma Pathology Classification (INPC) classification, Children's Oncology Group (COG) risk status, treatment details, surgical complications, progression, and survival were assessed. Diagnostic imaging was re-reviewed in consensus with a pediatric radiologist to evaluate for IDRFs.

Results: The median age at diagnosis and follow-up time were 1.86 and 5.4 years, respectively. 47% of patients had unfavorable histology and 35% were high COG risk. 37% of patients had neuraxial IDRFs and 81% had vascular IDRFs. Eighty-six patients (90%) underwent an R1 resection. In the 9 remaining patients with residual gross disease, the cause was involvement of the neural foramen, epidural space or infiltration of the lumbosacral plexus in 8, while one patient developed dysfunctional clotting intraoperatively. R1 resection was associated with absence of neural infiltration ($p=0.02$) but not with the presence or number of vascular IDRFs. 69% of patients who were treated with neoadjuvant chemotherapy had no further chemotherapy following surgical resection. Ten-year overall survival was 75% (95% CI: 0.65-0.87). Factors associated with overall survival were the COG risk status ($p=0.005$) and INPC ($p=0.0003$). Surgical complications were not associated with IDRFs and did not affect survival.

Conclusions: R1 resection in stage 3 neuroblastoma is significantly associated with the absence of neural infiltration and not vascular IDRFs.

Scientific Session VI (cont.)

71*

C-KIT DIRECTED IMMUNOTOXINS IMPROVE ALLOGENEIC ENGRAFTMENT AFTER FETAL HEMATOPOIETIC STEM CELL TRANSPLANTATION

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Purpose: In utero hematopoietic cell transplantation is a non-myeloablative approach that exploits fetal immunologic immaturity for induction of donor specific tolerance. Though it has the potential to treat many congenital hematologic disorders (including sickle cell anemia), it is limited by levels of engraftment below those anticipated to be therapeutic for most target diseases. C-kit is a cell surface marker expressed by all hematopoietic stem cells. We hypothesized that postnatal conditioning with an anti-c-kit-saporin immunotoxin followed by a boosting bone marrow transplant would improve allogeneic engraftment to therapeutic levels while avoiding the toxic effects of traditional myeloablative approaches.

Methods: 5×10^6 mononuclear bone marrow cells from C57Bl/6 mice (H2K^b, CD45.2⁻) were injected intravenously into gestational day 14 Balb/c fetuses (H2K^d, CD45.2⁻). Peripheral blood chimerism was confirmed at 4 weeks of age; chimeric mice were then injected with saline or c-kit-saporin. Six days later, mice received either 30×10^6 B6Pep3b (H2K^b, CD45.1⁺) bone marrow cells or saline. Chimerism was assessed bi-weekly by flow cytometry. Statistical comparison was performed using Student's *t*-test at each time point.

Results: Low-level allogeneic chimerism following intrauterine hematopoietic stem cell transplantation was significantly enhanced to high-level chimerism following conditioning with c-kit-saporin + bone marrow transplantation when compared to postnatal bone marrow transplantation ($56.7 \pm 18\%$ vs. $4.30 \pm 6.2\%$ at 22 weeks, $p < 0.0001$). The majority of donor cell chimerism resulted from the postnatal donor population in recipients of c-kit-saporin, compared to mice receiving only a postnatal transplant ($91.6 \pm 2.5\%$ vs $22.5 \pm 13.4\%$, $p < 0.0001$). All mice demonstrated appropriate weight gain with minimal phenotypic evidence of graft-versus-host disease.

Conclusions: Prenatal tolerance induction via in utero bone marrow transplantation followed by postnatal c-kit-saporin conditioning and a boosting transplant results in enhanced allogeneic engraftment at therapeutic levels. This strategy has the potential to significantly expand the applicability of in utero approaches to treating hematologic disorders.



Scientific Session VI (cont.)

72*

CHARACTERISTICS AND OUTCOMES IN PEDIATRIC NON-CENTRAL NERVOUS SYSTEM RHABDOID TUMORS: A REPORT FROM THE NATIONAL CANCER DATABASE

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Purpose: Pediatric non-central nervous system (CNS) rhabdoid tumors are rare and aggressive malignancies without standard treatment strategies. We utilized a national database to describe the incidence, characteristics, treatment strategies, and outcomes in this patient population.

Methods: We reviewed the National Cancer Database for patients <18 years diagnosed with non-CNS rhabdoid tumors between 2004 and 2014. Log-rank tests were used to compare differences in Kaplan-Meier survival distributions. Univariate and multivariate Cox proportional hazard regression models were used to identify predictors of mortality. A *P*-value of ≤ 0.05 was considered significant. Analysis was performed using Stata 14/MP (StataCorp LP; College Station, TX).

Results: Two-hundred and two patients were identified. Soft tissue tumors were most common ($n=94$), followed by kidney ($n=90$) and liver ($n=18$). There was no gender predisposition; most patients were white (84.8%) and diagnosed before the age of 1 year (53.5%). Distant metastases were present at diagnosis in 27.4% of patients. The one- and five-year OS for the total cohort was 48.8% and 35.9% respectively. Multivariate analysis revealed that age of diagnosis <1 year ($HR=5.56$; CI 0.99-33.3, $P=0.05$) and presence of metastases at diagnosis ($HR=32.9$; CI 1.57-689.8, $P=0.02$) were negative prognostic indicators. One- and five-year OS was 59.9% and 46.5% respectively for patients that received surgical intervention ($n=146$) and 12.3% and 7.4% for the non-surgery group ($n=56$). This difference was statistically significant ($P<0.01$) and remained significant after multivariate analysis ($HR=0.20$; CI 0.09-0.4; $P<0.01$) that controlled for patient factors and extent of disease. In the cohort of surgical patients, the presence of residual disease was associated with worse survival ($HR=5.51$; CI 1.23-24.5, $P=0.03$).

Conclusions: Patients with non-CNS rhabdoid tumors who were diagnosed before the age of 1 year and who had metastatic disease at diagnosis had worse survival. Surgical intervention was associated with improved outcomes and should be strongly considered in all cases that appear amenable to resection.



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