
BIOGRAPHICAL SKETCH

NAME: Mary Clyde Pierce

eRA COMMONS USER NAME (credential, e.g., agency login): MCPIER02

POSITION TITLE: Professor of Pediatrics

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Loyola University of New Orleans		12/1979	Music Theory and Composition
Louisiana Tech University	BS	05/1985	Zoology
Louisiana State University	MD	05/1989	Medicine
Johns Hopkins Hospital		06/1992	Pediatrics residency
Children's Hospital of Pittsburgh		06/1994	Pediatric emergency medicine fellowship

A. Personal Statement

I have 23 years of experience in child abuse and injury research. I am the research director for Child Abuse Pediatrics at Ann & Robert H. Lurie Children's Hospital of Chicago, and I am on faculty in the Department of Pediatrics at Northwestern University Feinberg School of Medicine. I am also an adjunct faculty member in the Department of Preventive Medicine at Northwestern University. I am board-certified in Pediatrics and Pediatric Emergency Medicine and an attending physician in the pediatric emergency department at Ann & Robert H. Lurie Children's of Chicago. I am also the Medical Director for the Injury Risk Assessment and Prevention Research Laboratory at The University of Louisville. This lab combines the expertise of medicine and engineering to conduct bioengineering-based injury research. My collaborative work results in pragmatic, translational research that is guided by case-based studies with clinical, social, and basic science research, experiments, and computer modeling directly linked to pertinent clinic issues.

My research has focused on the delineation between abusive and accidental injuries in young children with a specific focus on bruising, fractures, and head injuries. My key interest is the development of injury plausibility models, including clinical decision rules as well as novel biomarkers, for improving the differentiation of abusive and accidental trauma in the young child. These models utilize a combination of medical, social, biologic, and engineering information and are intended for the "front line" worker. The purpose of this work is to improve the evidence-base for decision-making across different professions with the intent to ultimately improve outcomes for children. Recently my work has extended to include the study of epigenetics in young children with abusive vs. accidental injuries with goals to 1) improve the accuracy in decision-making to differentiate abuse from accident by incorporating epigenetic biomarkers into clinical decision models, and 2) to better understand the biological link between early childhood abuse and subsequent adverse health outcomes moderated through epigenetic pathways. I was the recipient in 2017 of The Visionary Award (a pilot grant from Lurie Children's Hospital) to identify epigenetic modifications associated with child abuse.

Education and training is also a passion of mine. In addition to providing education at the local, national and international level to medical professionals, I also provide education to professionals in the judicial system, and have an appointment as Faculty by the Illinois Supreme Court of Justice to provide formal teaching to Illinois judges on the topic of child abuse and neglect. My educational efforts include lectures for juvenile and criminal court judges, state social workers, and juvenile court appointed attorneys. It is in the context of my clinical and educator work that I have developed key interests in improving the evidence-base for the diagnosis of abuse, and implementing scientific knowledge regarding injuries in children, both abusive and accidental

injury. I have authored over 40 peer-reviewed publications in addition to other invited authorships such as editorials, chapters and textbooks related to child abuse.

I am the Principal Investigator for a multi-centered NICHD funded (R01) study focused on bruising characteristics of young children. We successfully enrolled over 2,000 patients and are actively publishing results from the study. I am also the Principal investigator for a recent Foundation award (Anonymous Donor) I have also been the Principal Investigator for non-federally-funded studies (The Whitaker, Grainger, and Goldwin Foundations), and have served as a co-investigator on both federally and non-federally funded studies. One of my strengths is pulling research teams together and ensuring synergy between the medical and engineering components. I have extensive experience working with the current team of investigators and I am well qualified and excited to continue this collaboration on the project titled: "Development of a Probability Model to Predict Head Injury Risk in Pediatric Falls."

B. Positions and Honors

1994-1996	Instructor – Department of Pediatrics Pediatric Emergency Medicine, Johns Hopkins University School of Medicine, Baltimore MD
1996-2003	Assistant Professor of Pediatrics, Children’s Hospital of Pittsburgh – Pediatric Emergency Medicine, University of Pittsburgh School of Medicine, Pittsburgh PA
1999-2000	Interim Co-director, Family Intervention Center, Children’s Hospital of Pittsburgh, Pittsburgh, PA
2000-2003	Division Chief, Pittsburgh Child Advocacy Center – Children’s Hospital of Pittsburgh, Pittsburgh PA
2003-2008	Associate Professor of Pediatrics, University of Louisville School of Medicine, Louisville KY
2003-2008	Director of Research for Pediatric Emergency Medicine, Kosair Children’s Hospital, University of Louisville, Louisville KY
2003-present	Medical Director, Injury Risk Assessment and Prevention Laboratory, University of Louisville, Louisville KY
2008-present	Associate Professor of Pediatrics, Gratis Faculty, University of Louisville School of Medicine, Louisville KY
2008-present	Professor of Pediatrics, Northwestern University, Feinberg School of Medicine, Chicago IL
2008-2010	Protective Services Team, Children’s Memorial Hospital, Chicago IL
2010-2015	Co-Director of Faculty Research Development for the Division of Pediatric Emergency, Ann & Robert H. Lurie Children’s Hospital of Chicago, Chicago IL
2015-present	Director of Research for Child Abuse Pediatrics, Ann & Robert H. Lurie Children’s Hospital of Chicago, Chicago IL

Honors

1985	Phi Kappa Phi Honor Society, Louisiana Tech University, Ruston LA
1985	Outstanding Premedical Student Award, Louisiana Tech University, Ruston LA
1985	Magna Cum Laude, Louisiana Tech University, Ruston LA
1999	Attending of the Year Award, Residency Class, 1999, Children’s Hospital of Pittsburgh
2001	Distinguished Alumnus Award of the Year, College of Applied and Natural Sciences, Louisiana Tech University
2007	Dr. Thomas H Pinkstaff Child Advocacy Award, awarded by Residency Class of 2007, University of Louisville School of Medicine
2008	Dr. Thomas H Pinkstaff Child Advocacy Award, awarded by Residency Class of 2008, University of Louisville School of Medicine
2013	Eunice Kennedy Shriver National Institute of Child Health and Human Development "Inaugural Meeting of the Pediatric Trauma and Critical Illness Branch - abusive Head Trauma: Reviewing the Evidence" committee member to address future directions and current knowledge gaps
2013	National Institute of Health audio/podcast on abusive head trauma and the state of research in this area. The podcast is available to public on NICHD webpage
2014	NICHD advisory committee member regarding the new "Pediatric Trauma and Critical Illness Branch" at NIH
2014	Illinois Supreme Court: appointed as Faculty for Illinois Judicial Education program

- 2017 American Academia of Pediatrics Section on Emergency Medicine “Best PAS Abstract” for “Bruising Clinical Decision Rule (BCDR) discriminates physical child abuse from accidental trauma in young children”, Pediatric Academic Society Meeting, San Francisco, 2017.
- 2017 Ray Helfer International Child Abuse Society, 2 abstracts Best short research presentation tie for “The impact of age on the performance of a Bruising Clinical Decision Rule (BCDR), Kaczor, Pierce, Lorenz, et. al, and “Bruising Clinical Decision Rule (BCDR) discriminates physical child abuse from accidental trauma in young children” Pierce, Kaczor, Lorenz, et al, Denver, 2017 meeting.

C. Contributions to Science

1. My most recent area of study is bruising in children less than four years of age. Bruising is the most common injury from physical child abuse, and it is also the most common injury to be overlooked – unrecognized abuse in the form of bruising was present in more than half of young children prior to their fatal event. We developed a model for predicting abuse based on differences in bruising characteristics of abused vs. accidentally injured young children. These bruising characteristics were used to derive and validate the first bruising clinical decision rule for differentiating abusive and accidental trauma and identifying children who require further assessment for abuse. Implementation of this simple to use rule has the potential to improve outcomes for abuse victims, and in some instances to even save lives. I served as PI on both the derivation study and on the validation study.
 1. **Pierce MC**, Magana JN, Kaczor K, Lorenz DJ, Meyers G, Bennett BL, Kanegaye JT. The Prevalence of Bruising Among Infants in Pediatric Emergency Departments. *Ann Emerg Med*. 2016;67:1-8. doi: 10.1016/j.annemergmed.2015.06.021. PMID: PMC4695295
 2. **Pierce MC**, Kaczor K, Aldridge S, O’Flynn J, Lorenz D. Bruising characteristics discriminating physical child abuse from accidental trauma. *Pediatrics* 2010;125:64-71. doi: 10.1542/peds.2008-3632 PMID: 19969620
 3. **Pierce MC**, Kaczor K, Lorenz DJ, Makoroff K, Berger RP, Sheehan K, et al. Bruising Clinical Decision Rule (BCDR) Discriminates Physical Child Abuse from Accidental Trauma in Young Children. Pediatric Academic Societies’ Annual Meeting; 2017; San Francisco
 4. **Pierce MC**, Kaczor K, Acker D, Webb T, Brenzel A, Lorenz D, Young A, Thompson R. History, injury, and psychosocial risk factor commonalities among cases of fatal and near-fatality physical child abuse. *Child Abuse and Neglect*, 2017 DOI: 10.1016/j.chiabu.2017.04.033

2. When a child is diagnosed with a fracture and is undergoing an abuse evaluation, one of the most common questions I am asked from investigators is “how much force did it take to cause this fracture?” Although that answer is obviously complicated, I am passionate about improving our ability to objectively assess fracture compatibility with the history of injury provided. This question and need for more objective information lead me to another area of research aimed at better delineating abusive from accidental fractures. I performed clinical studies to investigate femur and humerus fractures to better understand the fracture morphologies that result from given injury event scenarios. I have also conducted animal studies to investigate bone strength, energy to failure, and fracture morphology resulting from different load applications. I collaborated with the bioengineering team to study the classic metaphyseal lesion from a biomechanical perspective. This paper was the first to create the CML and defined and quantified the loading characteristics. This is a fracture type that is highly specific for abusive trauma. We used immature porcine bone to understand the loading characteristics that result in this fracture type. I served as PI or co-PI for both the clinical and animal studies that were funded through the Whitaker Foundation and then through the DOJ.
 1. Thompson A, Bertocci G, Smalley C, Kaczor K, **Pierce MC**. Biomechanical Investigation of the Classic Metaphyseal Lesion using an Immature Porcine Model. *American Journal of Roentgenology* 2015;(5):W503-9.
 2. **Pierce MC**, Bertocci GE, Janosky J, Aguel F, Deemer E, Moreland M, Boal D, Garcia S, Herr S, Zuckerbraun, N, Vogeley E, Femur Fractures Resulting From Stair Falls in Children: An Injury Plausibility Model, *Pediatrics* 2005;115(6):712-22.
 3. **Pierce MC**, Bertocci GE, Vogeley E, Moreland M. Evaluating long bone fractures in children: a biomechanical approach with illustrative cases. *Child Abuse and Neglect*. 2004;28:505-524.

4. Bertocci G, Thompson A, **Pierce MC**. Femur fracture biomechanics and morphology associated with torsional and bending loading conditions in an in vitro immature porcine model. Nov 1 2017 [Journal of Forensic and Legal Medicine](#). 52, p. 5-11 7 p.
3. The ability to distinguish injuries due to accidental falls from abusive injuries is key to early diagnosis of physical abuse and is needed to prevent exposure to continue, often escalating violence. A significant line of research has involved studying falls in children accordingly. This work has been conducted in collaboration with bioengineers. The investigative team has utilized computer simulation and crash test dummies to study several fall scenarios and understand the influence of biomechanics and injury potentials for each the various fall types. I contributed the medical relevance and clinical expertise to this body of work.
 1. Thompson A, Bertocci G, **Pierce MC**, Assessment of Injury Potential in Pediatric Bed Fall Experiments using an Anthropomorphic Test Device, *Accident Analysis and Prevention* 2013 Jan;50:16-24.
 2. Thompson A, Bertocci G, Rice W, **Pierce MC**, Pediatric Short-Distance Household Falls: Biomechanics and Associated Injury Severity, *Accident Analysis and Prevention* 2011;43:143-150.
 3. Knight A, Bertocci G, **Pierce MC**, Assessment Of Head Injury Risk Associated With Feet-First Free Falls In 12-Month-Old Children Using An Anthropomorphic Test Device, *Journal of Trauma* 2009;66(4):1019-1029.
 4. Bertocci GE, **Pierce MC**, Deemer E, Aguel F, Computer Stair Fall Simulation to Investigate Scenarios in Child Abuse. *Archives of Pediatric and Adolescent Medicine* 2001;155(9):1008-1014.
 4. Traumatic brain injury, specifically inflicted traumatic brain injury, is an early area of focus that I have continued to pursue throughout my career. This topic was approached from the biomechanics and biochemistry perspectives with two different collaborative teams. Firstly, I collaborated with the bioengineers utilizing biomechanics to better understand risk of head injury from falls (see section #3 above). Secondly, I collaborated with a clinical team utilizing blood samples to identify biomarkers of injury. I contributed medical relevance and clinical expertise to this body of work.
 1. Berger RP, Pac B, Kolesnikova M , Fromkin J, Saladino R, Herman B, **Pierce MC**, Englert D, Smith PT, Kochanek P. Derivation and validation of a serum biomarker panel to identify infants with acute intracranial hemorrhage. *Jama Pediatrics*, 2017 Apr 10:e170429. doi: 10.1001/jamapediatrics.2017.0429
 2. Berger RP, Fromkin J, Herman B, **Pierce MC**, et al. Validation of the Pittsburgh Infant Brain Injury Score for Abusive Head Trauma. *Pediatrics*. 2016;138(1).
 3. Berger RP, Adelson PD, **Pierce MC**, Dulani T, Cassidy LD, Kochanek PM. Serum neuron-specific enolase, S100B and myelin basic protein concentrations after inflicted and non-inflicted traumatic brain injury in children. *Journal of Neurosurgery*. 2005;103(1 Suppl):61-68.
 4. Berger RP, Kochanek PM, **Pierce MC**. Biochemical markers of brain injury: could they be used as diagnostic adjuncts in cases of inflicted traumatic brain injury? *Child Abuse Negl*. 2004;28(7):739-754.

D. Additional Information: Research Support and/or Scholastic Performance

Ongoing Research Support

Anonymous Foundation	Pierce (MPD)	11/1/2017- 10/31/2020
The Humagram – software to improve the detection of physical child abuse		
The major goal of this study is to develop interactive software that is pixelated to allow evidence based decision support to improve the detection of abuse based on exam and history findings.		
Role: PI		

The Visionary Award, Lurie Children’s	Pierce (PI)	6/1/2017- 6/31/2019
---------------------------------------	-------------	---------------------

Epigenetics and Child Abuse: A Pilot Study

The goal of this pilot study was to inform study design, address potential pitfalls, and determine sample size requirements in preparation for a future multi-center study on epigenetics and child abuse.

Role: PI

Completed Research Support

NIH (NICHD) R01HD060997-01A2

Pierce (PI)

5/1/2011- 9/30/2018

Clinical Decision Rules to Discriminate Bruising Caused by Physical Child Abuse

The major goals of this study are to identify key predictors of abuse, and validate a bruising clinical decision rule (BCDR), which can be used as a screening tool to identify children and infants with bruising who are at high risk for physical abuse, and require further evaluation.

Role: PI

NIJ 2015-DN-BX-K018

Thompson and G Bertocci (PIs)

1/1/2016-12/31/2018

Biomechanical Investigation of the Effect of Bone Disorders on Pediatric Femur Fracture Potential. National Institute of Justice. Research and Development in Forensic Science for Criminal Justice Purposes.

The goal of this study is to determine how material and morphologic bone differences in children with osteogenesis imperfecta and rickets affect bone strength and fracture potential.

Role: Site PI – Project Co-Investigator

NIJ 2014-DN-BX-K006

G Bertocci (PI)

1/1/2015-12/31/2016

Development of a Computer Simulation Model to Describe Potential Bruising Patterns Associated with Common Childhood Falls.

The goal of this study is to develop a computer model that is capable of identifying impact locations on the body and thus potential bruising locations when simulating falls involving children given that bruising patterns have been shown to be a discriminating factor in the identification of abuse.

Role: Co-Investigator

NIH (NICHD) 1R03HD078491-01

Thompson and Bertocci (PIs)

4/12014-3/31/2016

Biomechanical Assessment of Femur Fracture Potential in Pediatric Falls.

The goal of this study is to measure femur loading associated with short-distance falls using a 12-month-old child surrogate and describe the likelihood of femur fracture.

Role: Co- Investigator