University of Colorado Hospital
Trauma-Burn Service Line Report
FY 2018
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Trauma-Burn 2014 – 2018 Executive Summary

- **57%** increase in total volume since 2014
  - **11%** increase within the last year
- **102%** increase in critically injured patients since 2014
  - **20%** increase within the last year
- **67%** increase in burn center admissions since 2012
- Overall trauma mortality has decreased from **3.1% to 2.7%**
- **75%** increase in transfers into UCH since 2014
  - **21%** increase in transfers in from outside UCHealth since 2017
- In the most seriously injured patients, mortality decreased by **38%**
- **23** publications by Trauma-Burn faculty 2017-2018
UCH Trauma-Burn Volume
57% increase in total patient volume 2014-2018

UCH Critical Trauma-Burn Volume
102% increase in critically injured patients 2014-2018

Critically injured patients = Injury Severity Score >15 (includes burn)
Top 2018 Traumatic Mechanisms of Injury

- Blunt: 74%
- Thermal: 18%
- Chemical Burn, Fire/Flame, Explosion: 8%
- Gunshot Wounds, Stab Wounds: 8%
- Fall, Motor Vehicle Crash, Motorcycle Crash, Assault, Bicycle Crash, Sporting Accident: 74%
Burn Center Admissions
67% increase since FY 2012
Burn Center Clinic and Operative Cases

**Burn Clinic Visits**

- **FY 2016**: 2070 Completed Visits, 673 # of Patients, 404 # of Patients Managed Outpatient Only
- **FY 2017**: 2200 Completed Visits, 712 # of Patients, 423 # of Patients Managed Outpatient Only
- **FY 2018**: 2001 Completed Visits, 705 # of Patients, 378 # of Patients Managed Outpatient Only

**Burn Operative Cases**

- **FY 2016**: 379 Inpatient, 65 Outpatient
- **FY 2017**: 524 Inpatient, 54 Outpatient
- **FY 2018**: 514 Inpatient, 72 Outpatient
Demographics: Geriatric Admits vs. Non-Geriatric Admits by Fiscal Year

31% of all trauma patients admitted in FY 2018 to UCH are geriatric patients ≥ 65 years of age.

Top Inpatient Discharge Disposition

Our goal at discharge is that patients are recovered enough to either go home or into an active rehabilitation program. In FY 2018, we were able to accomplish this goal 82% of the time.
Trauma Mortality Rates: Total vs. Critically Injured

In FY 2018, mortality rates at UCH reflect an overall mortality of 2.7%. This is a decrease in mortality by 38% compared to 2014 even as volume grows. More importantly, the mortality rate in the most critically injured continued to decrease to 10.2%. Of all reporting trauma centers in North America, UCH is in the top 10% for overall trauma mortality.

<table>
<thead>
<tr>
<th></th>
<th>FY 2014</th>
<th>FY 2015</th>
<th>FY 2016</th>
<th>FY 2017</th>
<th>FY 2018</th>
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<tr>
<td>ISS &gt; 15</td>
<td>16.40%</td>
<td>12.70%</td>
<td>11.20%</td>
<td>11.20%</td>
<td>10.20%</td>
</tr>
<tr>
<td>Total</td>
<td>3.10%</td>
<td>2.70%</td>
<td>2.40%</td>
<td>2.30%</td>
<td>2.70%</td>
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38% Decrease in critical injury mortality since 2014 = 21 more lives saved
Referrals In

29% increase in transfers into UCH in the last year.

In 2018, 133 more patients were transferred to UCH compared to 2017. In 2018, the increase in transfers from freestanding EDs and other UCHealth hospitals to UCH was 61 patients; increase in external transfers was 72 patients.

Trauma and Burn Transfers, Excluding UCHealth Facilities

In FY 2018, UCH received transfers from nine states, the Netherlands and Mexico.
Injury Prevention Activities

Stepping On
An elderly fall reduction program

5 seven-week programs
50 seniors

PARTY PREVENT
Alcohol and Risk-Related Trauma in Youth
University of Colorado Health

STOP THE BLEED
SAVE A LIFE

26 programs
726 students

51 Courses
704 Participants

UCHealth staff come together in July 2018 to teach Stop the Bleed at Broncos Mile High Stadium

Robyn Wolverton applies a tourniquet on a 9News anchor for Stop the Bleed Day

Over 2,500 community members impacted by Outreach efforts!
Burn Injury Prevention Activities

• Electrical Company Injury Prevention
• Frostbite Prevention for the Homeless
• “It Happens in Seconds” Training for fire fighters
• Flame and Chemical Burn Injury Prevention for Glassblowers
• Marijuana Legalization and Butane Hash Oil Burns in Colorado – State Assembly
Trauma and Burn Outreach

**Conferences and Symposia**
- 8 major symposium appearances
- 8 physicians involved in outreach reaching over 942 participants

**Outreach Visits**
- 52 outreach visits completed in 5 states

**Future Outreach**
- 78 outreach events scheduled for FY 2019

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**2019 Conference Line-Up**
- Rocky Mountain Trauma Symposium – Helena, MT
- North Dakota State Trauma Conference – Bismarck, ND
- South Dakota State Trauma Conference
- North Platte Trauma Conference
- Northeast Kansas Trauma Conference
- UCHealth Trauma Symposium
- New Mexico State Trauma Conference

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[Map depicting conference and outreach visits]
An arsonist set fire to Alina Miller's apartment building. She escaped, but shattered her leg. Then she embarked on a remarkable journey.

Since that horrific day, Alina is now married and influences patients with new amputations through her role at Creative Technology Orthotic & Prosthetic Solutions, where she and another man who has also lost a leg spend time helping people who have lost limbs.

When she jumped, Alina’s bare left foot hit first and took the brunt of the 45-foot fall. Her weight shifted to the right foot, and then she fell straight back, landing hard on concrete which broke her back. “I didn’t open my eyes. I curled up into a ball,” she said. “I was overwhelmed with a huge, deep aching pain.”

An ambulance whisked Alina to nearby UCH ealth University of Colorado Hospital on the Anschutz Medical Campus where she received extraordinary care from a multi-disciplinary group of providers who have stood by her side since the day of her injury.

Alina has had a strong support system to help her push through the darkness. In the months and years after the fire, Alina had five more surgeries to repair her shattered foot. Alina Miller has embraced life's adventures after having her leg amputated, including going wakeboarding.

Her will to persevere and enjoy life despite extreme challenges reminds all of us why the care that we provide to patients at the University of Colorado Hospital Level I Trauma Center is so important. Alina’s courage and extraordinary ambition are truly remarkable.

See Alina’s full story here: https://www.uchealth.org/today/2018/10/05/finding-pearls-fire-forces-4-story-jump-and-a-woman-embraces-beauty/
When a dumptruck collided with the Ketchum’s SUV, more than 90 percent of Jamie’s body was burned. Her mother, Patti, suffered more than 60 percent burns and her father was killed. Despite the odds, Patti’s determination, phenomenal care and extraordinary people made it possible for Patti to walk out of the hospital after 97 days and 12 OR visits for debridement and grafting. Jamie was discharged after the longest ever stay in the Burn Center of 425 days. She had approximately 50 operations for debridement, grafting and reconstruction. To successfully graft all the burned areas, cultured epithelial cells were grown from a skin biopsy (due to lack of non-burned skin for donor site) – a specialized procedure not done by all Burn Centers. Jamie has now learned to walk on her prosthetic limbs and even plays ice-hockey.

Read more about Jamie’s story here:
In its 26th year, the Trauma Research Center is an international leader of trauma biology, coagulopathy and personalized treatment though its combination of clinical data analysis, advanced Omics measurements and rigorous T32 training. Together, surgeons and scientists at UCD continue to pave the way for decreasing post traumatic mortality rates.

**Gastrointestinal, Trauma, Endocrine Surgical Faculty**

Anirban Banerjee PhD *Program Director*

Ernest E. Moore MD

Erik Peltz DO

Mitchell Cohen MD

**2017-2018 T32 fellows**

Geoff Nunns, Gregory Stettler

Jason Samuels, Julia Coleman

**Collaborators**

Christopher C. Silliman MD, PhD; *Department of Hematology*

Kirk Hansen PhD; *Department of Biochemistry, Molecular Genetics*

Angelo D’Alessandro PhD; *Department of Biochemistry, Molecular Genetics*

**2017-2018 Accomplishments**

- 40 papers
- 24 scientific presentations
- Nearly **$4.48 million** in Grants, primarily from NIH and DOD
Dr. Franklin Wright – Trauma QI and Prehospital Research Lab

- Prehospital Trauma Research
- Quality Improvement and Process Improvement Projects
- Optimizing Early Trauma Care (EMS and ED/Trauma Bay)

Team
Franklin L. Wright MD – Assistant Professor
Erik Peltz DO – Assistant Professor
Alicia Heelan Gladden MD – Research Resident
Allie Kovar MD – Research Resident

Medical Student: Jacob Mago, MS4

Accomplishments
- 5 scientific presentations: 1 international, 3 national, 1 regional, 2 full podium
- 1 publication, 2 manuscripts in process
- Dr. Heelan Gladden awarded Clinical Effectiveness and Patient Safety (CEPS) – resident grant
- Dr. Heelan Gladden completed Institute for Healthcare Quality, Safety and Efficiency Certificate Training Program
- Co-Investigator on faculty CEPS grant

![Graph showing reduction in mortality of severely injured trauma patients](image-url)
Dr. Catherine Velopulos – Health Services Research Lab

- Examining Disparities in Surgical Outcomes/Access to Care
- Hospital Based Violence Intervention Programs/Intimate Partner Violence
- Geographic Information Systems
- Mentoring CU-UNITE Urban Underserved Track

Team
Catherine G. Velopulos MD, MHS, FACS – Associate Professor
Heather Carmichael MD – Research Resident

Medical Students and Undergraduate Student:
Allison Moore MS1, Joshua Abolarin MS1
Sara Muramoto MS1, Billy Tran MS3, Lesley McClafferty

Collaborators with Colorado Department of Public Health & Environment
Kirk Bol MSPH
Ethan Jamison MPH

Accomplishments Last 12 Months
- 9 scientific presentations: 7 national, 1 state, 1 institutional, 5 full podium
- 3 publications, 1 manuscript in final revisions, 6 manuscripts in progress for December deadlines
- 6 abstracts accepted for national scientific presentation next 3 months, 2 full podium
- Awarded as co-investigator on $950,000 Department of Justice Grant to evaluate Denver Health Hospital-based Violence Intervention Program At-Risk Intervention and Mentoring (AIM)
- Dr. Carmichael sponsored by Scholarships and Other Award Resources (SOAR) for the American College of Surgeons (ACS) Health Services Research Course
Burn Clinical Trials

21 active IRBs including:

- IV Lidocaine Infusions for Treatment of Pain in Burn Patients
- Impact of a Mobile Phone App on Triage and Transfer to a Large Regional Burn Center
- Evaluation of Use of t-PA in Treatment of Frostbite
- Ambulation in the Adult Burn Population: Perception versus Actuality – $10,000 grant
- Burn Trauma and Infection (MICROBIOME)
- Randomized Trial of Enteral Glutamine to Minimize Thermal Injury – RE-ENERGIZE
- Epicel, Cultured Epidermal Autographs (CEA)
Dr. Elizabeth J. Kovacs – Burn Research Lab

- Multi-organ system response in burn patients and murine models
  - Alcohol intoxication and burn injury (NIH R01)
  - “Inflamm-aging” and the gut-liver-lung axis after burn (NIH R01)
  - Mesenchymal stem cells and inflammation after burn (NIH R21)
  - Alcohol and lung immunity in the aged (New NIH R21)

Team

Elizabeth J. Kovacs PhD, Professor
Juan-Pablo Idrovo MD, Assistant Professor
Rachel McMahan PhD, Research Assistant Professor

Trainees – Postdocs, Research Residents, Graduate Students & Staff:
Kiran Dyamenahalli MD, PhD
Elizabeth Wheatley PhD
Devin Boe (MSTP student)
Holly Hulsebus MPH (PhD student)
Kevin Najarro MS (Lab Manager)
Juliet Mullen (PRA)

Major Collaborators:
Ellen Burnham MD, MS, Mashkoor Choudhry PhD
Dan Frank PhD, Anne Wagner MD
Arek Wiktor, MD, Sean Colgan, PhD

Accomplishments Last 12 Months

- 7 scientific presentations: 1 presidential address, 1 international conference, 2 national conference, 3 University
- 10 manuscripts published/in press, 17 abstracts presented at national/international conferences, 6 oral presentations, 4 travel awards, 1 poster selected as best poster among 460 posters

Grants

- Continuing: NIH, NIA R01 age & burn YR15; NIGMS R01 alcohol & burn YR18; NIAAA R1 MSC & burn YR2; NIAAA R13 meetings grant YR6
- New & approved to fund: NIAAA R21 alcohol & aging; VA merit award burn & biomarkers; NIAAA R13 meetings grant
- Pending: NIGMS R35 MIRA burn & microbiome
- Fellowships submitted: NIH F31 H Hulsebus (age alcohol); NIH K08 J-P Idrovo (age, burn & liver)

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Sham BE+PIK Burn EtOH BE+PIK

Cytokine Storm Activates MLCK

Commensal bacteria

1. PIK (permeant inhibitor of MLCK)
2. MLCK knockout mice
3. Prophylactic oral antibiotics

Siglec-F Alveolar Macrophage, Dapi

Healthy Conditions Injury In the Aged

Dr. Elizabeth J. Kovacs – Burn Research Lab


Invited Lectures

1. Dumond, R. BSN, RN, TCRN, AEMT. “Getting Involved with TQIP.” American College of Surgeons TQIP Annual Meeting; Chicago, IL; November 11-13, 2017.
3. Dumond, R. BSN, RN, TCRN, AEMT. “How to Make Your Trauma Team Perform Like a Pit Crew.” American College of Surgeons Connecticut Committee on Trauma Conference; Uncasville, CT; April 6, 2018.
32. Wagner, A. M.D. EMS Mini-conference; Parker Hospital, Burning Questions, Parker, CO, 2018.
34. Wiktor, A. M.D. 7th Annual Wilz Trauma Symposium, Burn Care in the ED/Urgent Care and Field Management of Burns Pueblo, CO, 2018.


Awards and Achievements

Dumond, R
- Colorado Department of Health and Environment, State Emergency Medical and Trauma Services, Positively Collaborative Award

Kovacs, E
- Scientific Achievement Award, Shock Society, 2017 Recipient

McIntyre, RC Jr
- 5280 Magazine Best Doctor for both Surgical Critical Care and Surgery
- Colorado Parent’s Magazine Top Doctors

Velopulos, CG
- At-Risk Intervention and Mentoring (AIM) – Hospital-Based Violence Intervention Program, Annual Award: $950,000; $750,000 for expansion, $200,000 for research/program evaluation, dates of award 10/01/2018 – 09/30/2019

Wagner, AL
- Extraordinary Service Award, Medical Staff, University of Colorado Hospital, 2017
Dumond, R

- American College of Surgeons, Trauma Quality Improvement Program (TQIP), Training Project Team, Program Manager Representative
- Treasurer and Board of Directors, Colorado Trauma Network
- American College of Surgeons, Trauma Systems Consultation Program, Program Manager Reviewer
- Colorado American College of Surgeons Committee on Trauma Stop the Bleed Executive Committee, Outreach Chair
- Colorado Department of Health, State Trauma Designation Site Reviewer

Ferrigno, L

- Chair, American College of Surgeons Committee on Trauma, Colorado
- Education Committee, American College of Surgeons Committee on Trauma, 2018
- Research Committee, American College of Surgeons Committee on Trauma, 2018
- Publications Committee, Western Trauma Association, 2017-2018
- Multicenter Trials Committee, Western Trauma Association, 2018

Kovacs, E

- President, Shock Society, 2018
- President-Elect, Shock Society, 2017
- Co-Chair, Radiation Research Society
- Co-Chair, Program Committee, Alcohol and Immunity Research Interest Group (AIRIG)
- Co-Chair, American Association of Immunologists (AAI)
- Co-Chair, Society for Leukocyte Biology

McIntyre, RC Jr

- Western Trauma Association, Vice President, 2018
- Western Trauma Association, Treasurer, 2015-2018
Velopulos, CG

- Association for Academic Surgery, Program Committee, Annual Meeting 2017 - Present
- Eastern Association for the Surgery of Trauma, Program Committee, 2016 - Present

Vega, S

- Colorado Trauma Network Performance Improvement and Registry Subcommittee, Chair
- Colorado Department of Health, Continuous Quality Improvement Taskforce, Member, Trauma Program Representative
- Colorado Department of Health, State Trauma Designation Site Reviewer

Wright, FL

- Southwestern Surgical Congress, Budget and Finance Committee, 2015 - Present
ERIK PELTZ, DO

Dr. Anne Slaughter

- T32 mentor 2014-2016
- Education and supervision of investigational development (background research, hypothesis, methods, data analysis, data interpretation)
- Presentations: mentorship and constructive review of poster and oral presentations for local and national forums
- Mentorship of authoring/successful submission of scientific, peer reviewed publication
- Mentorship and co-authored *Project Mu – Metabolomics* for the P50 – “Trauma Primes Cells” NIH grant renewal

**Achievements of Mentee**

- 3rd place, *Earl Young paper competition, Western Trauma Association 2016*
- UCH, Ben Eiseman Basic Science Award – 2016
- ACS Committee on Trauma, resident paper competition, Region 8 winner - 2016
- Oral presentation, ASC 2016
- Poster presentation, 38th Annual Conference on SHOCK, 2015
- Oral presentation, SWSC 2015
- Oral presentation, scientific forum, ACS, 2015
- Co-author publication, Shock. 2016
- 1st author publication, JTACS. 2016
- Co-author publication, Shock. 2015
- 1st author publication, Shock. 2015

Dr. Toni Bacon

- T32 mentor 2014-2016

**Achievements of Mentee**

- 3 co-author peer reviewed publications
- Oral and poster presentations at national forums.

Dr. Alex Morton

- T32 mentor 2015-2016

**Achievements of Mentee**

- 3 co-author peer reviewed publications
- Oral and poster presentations at national forums.
Dr. Peter Einersen

- T32 mentor 2015 – present

**Achievements of Mentee**

- 1st author publication
- Development of advanced evaluation of TEG assessment with 2 manuscripts in process/submission

Dr. Geoff Nunn

- T32 mentor 2016 – present

**Achievements of Mentee**

- Oral presentation, ASC 2017
- Oral presentation, SWSC 2017

Catherine Velopulos, MD, MPH

  - Billy Tran, CU Medical Student (Class of 2019)
- Proposed Capstone (proposal submitted and accepted) – CU-UNITE student. Using ArcGIS for quantifying factors related to lived environment and Markov modeling for a cost-utility analysis of converting emergent general surgery to elective surgery through improved access to primary care and screening in the Park Hill Neighborhood.
  - Sara Muramoto, CU Medical Student (Class of 2021)
- At-Risk Intervention and Mentoring (AIM) Program – in conjunction with Katie Bakes, MD. Analysis of the intervention program through pre/post risk survey and structured interviews. 2017 EAST Templeton Injury Prevention Scholarship Finalist.
  - Joshua Abolarin, CU Medical Student (Class of 2021)
- Proposed Capstone – CU-UNITE student. Disparities topic TBD.
  - Heather Carmichael, CU Surgical Resident
- Using geographic information systems to link data to address surgical healthcare disparities and violence prevention. Analysis of the Colorado Violent Death Reporting System – Abstracts presented at the 2018 Academic Surgical Congress for Oral Presentation and 2018 Alcohol and Immunology Research Interest Group.

Elizabeth Kovacs, PhD

- Postdoctoral Fellows, Research Associates, Clinical Residents/Fellows, Research Assistant Professors.
  - Anita Zahs, PhD, Postdoctoral Research Associate, Department of Surgery, 2016 (moved with lab to the University of Colorado Denver)
  - Lisbeth A. Boule, PhD, Research Postdoctoral Research Associate, Department of Surgery, 2016 - 2017
  - John Frankel, MD, Surgical Resident, Department of Surgery, 2017
- Mentoring of Faculty Career Development Applicants and Awardees.
  - Juan-Pablo Idrovo, MD, Assistant Professor of Surgery, Division of GI Trauma and Endocrine Surgery, University of Colorado Denver, Aurora, CO, 2017 - Date
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