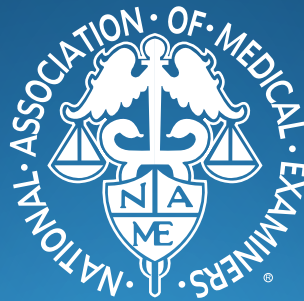


NAME 2020

ANNUAL MEETING

OCTOBER 16-17, 2020

<Virtual Conference>





Thank you

To our 2020 Annual Meeting Supporters



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Visit AutismBrainNet.org to learn more.

Autism BrainNet is a program of:



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Beth Israel Deaconess Medical Center

Welcome to the NAME 2020 Meeting!

Dear Colleagues and Friends,

Welcome to the National Association of Medical Examiners 2020 Annual Meeting, "Bringing Forensic Pathology to New Heights". The NAME Annual Meeting provides an international forum for discussion of a broad range of issues pertaining to forensic pathology and death investigation. This year we have much to discuss and unlimited virtual capacity within which to hold that discussion.

Meeting Highlights

The 2020 Annual Meeting will be held from Friday, October 16 through Saturday, October 17, 2020 at a virtual address to be distributed. The presentations will be "one way" with opportunities to submit questions throughout each day.

Our meeting will feature presentations and posters that cover a wide variety of topics in forensic pathology, including a session on COVID-19, updates in toxicology, and other critical issues for our specialty.

The NAME Business Meeting will be held on Monday, October 12, from 0900-1200 CDT, and the NAME Foundation business meeting will follow immediately. The business meeting will include discussion of matters of interest to all NAME members; we urge you to attend so that you may contribute your voice and vote to the decisions made by NAME.

The advance program and other information are available on NAME's website at <https://www.thename.org/2020-program>.

Special Events

Well, look at it this way – the meeting is virtual. You may take full advantage of this opportunity to create your own Special Event! Ever attend a NAME meeting in pajamas? How about that fine cigar, paired with a terrific bourbon? Cabernet Sauvignon, perhaps? All these things and more are open to you in 2020!

Sunday, October 18, from 1600-1730 CDT will be an optional NAME Foundation Outreach Fundraiser: "Drug Delivery Homicide: the Straw that Breaks the Camel's Back", featuring Dr. Barry Logan and M.J. Menendez, JD, of NMS Labs, as well as "Alabama Greg", Gregory G. Davis, MD, Jefferson County Medical Examiner, Birmingham, Alabama.

The NAME Foundation Silent Auction will be virtually present as well, with virtually unlimited hours of operation. Bid early, bid often!

Special Acknowledgements

We gratefully acknowledge all who have provided input and effort into the planning and implementation of the meeting, especially the Members and Chair of the Education, Program and Publications Subcommittee. Thank you to our speakers for their contributions to the program and to our colleagues who have been appointed to moderate sessions. We would not be here without the expertise of our Executive Director, Denise McNally. In particular, please thank Tara Snethen and Denise McNally when you see them.

Finally, the leadership and members of NAME acknowledge the gracious support of vendors and sponsors, without whom the meeting would be impossible.

We hope that the scientific program organized by the Program Committee will meet your highest expectations. The leadership of NAME asks all members to guarantee future successful meetings and the overall success of NAME by actively participating in the organization by joining one of our many committees and by completing the online meeting survey that will be sent to all participants at the end of the meeting. The Program Committee carefully considers this feedback, and vets all comments.

We welcome both our established and new colleagues and look forward to your active participation, which is essential to the success of this meeting. We hope that our new colleagues will consider joining NAME to take advantage of the year-round interactions that our current members enjoy.

Laura Knight, MD, 2020 Program Chair
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Whole case approach	✓	✓
Drug classes analyzed	9	25
Maximum analytes	62	303
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CME Accreditation Statement: This activity ("National Association of Medical Examiners 2020 Annual Meeting") has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of MedChi, The Maryland State Medical Society and the National Association of Medical Examiners (NAME). MedChi is accredited by the ACCME to provide continuing medical education for physicians.

MedChi designates this "virtual" educational activity ("NAME 2020 Annual Meeting") for a maximum of 18 (16.5 for the Annual Meeting portion and 1.5 for the Optional NAME Foundation Event) *AMA PRA Category 1 Credit(s)*[™]. Physicians should only claim credit commensurate with the extent of their participation in the activity.

Educational Objective/Target Audience

The objective of the NAME 2020 Annual Meeting is to increase basic and applied pathology knowledge, focusing on autopsy and forensic pathology. The NAME 2020 Annual Meeting is designed to meet the participants' education needs in the physician competency area of Medical Knowledge, as defined by the Accreditation Council for Graduate Medical Education (ACGME) and the American Board of Medical Specialties (ABMS), and to support participants' lifelong learning towards a goal of promoting patient safety and improving patient care and is specifically targeted to forensic pathologists, medical examiners, coroners, death investigators, forensic administrators, pathology assistants, laboratory personnel engaged in forensics, and forensic scientists.

At the completion of the NAME 2020 Annual Meeting, participants should be able to:

1. discuss medico-legal death investigation protocols;
2. describe regulations and competencies for medical examiners;
3. discuss the forensic investigation of accident- and trauma-related death;
4. discuss forensic science approaches to investigation of domestic violence and homicide; and
5. discuss forensic science approaches to sudden death in children and adult populations.

Disclosure of Financial Relationships and Resolution of Conflicts of Interest:

In order to ensure balance, independence, objectivity and scientific rigor in all its educational activities, and in accordance with ACCME Standards, MedChi requires that all individuals in a position to influence and/or control the content of MedChi CME activities disclose to MedChi and subsequently to learners whether they do or do not have any relevant financial relationships with proprietary entities producing health care goods or services that are discussed in CME activities. Faculty are asked to use generic names in any discussion of therapeutic options, to base patient care recommendations on scientific evidence and to base information regarding commercial products/services on scientific methods generally accepted by the medical community. All MedChi CME activities are evaluated by participants for the presence of any commercial bias and thus input is used to subsequent CME planning decisions. The primary purpose of this "virtual" CME activity is educational and the comments, opinions, and/or recommendations expressed by the faculty or authors are their own and not those of MedChi or NAME.

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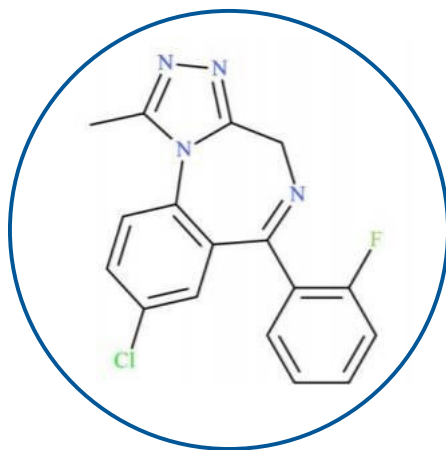
ADDITIONAL INFORMATION

How to Apply for CME Credit:

CME application forms will be available online at by October 16, 2020 and must be submitted no later than December 31, 2020. Should you have questions about your CME application contact Tara Snethen, Meetings Manager/Assistant Executive Director (phone 240-498-2918; email: tsnethen@thename.org).



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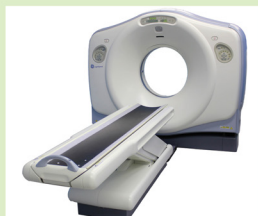
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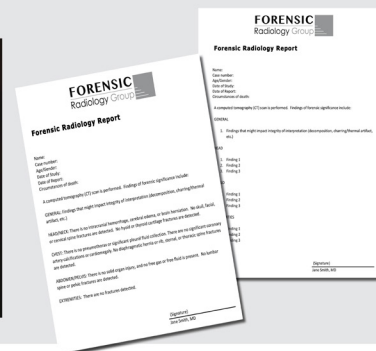
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Please note that recording (photographing, audio taping, videotaping, or capture of screen-shots) of any presentation/session is PROHIBITED, except by a NAME-authorized agent.

NOTE: All times are Central Time Zone (CDT) (US/Canada)

COMMITTEE MEETINGS [NOT CME]:

TUESDAY, OCTOBER 6, 2020

3:00 PM – 5:00 PM NAME Foundation Board of Trustees Meeting

THURSDAY, OCTOBER 8, 2020

9:00 AM – 12:00 PM Board of Directors Meeting

FRIDAY, OCTOBER 9, 2020

11:00 AM – 2:00 PM Inspection and Accreditation Training

MONDAY, OCTOBER 12, 2020

9:00 AM – 12:00 PM NAME Business Meeting
The NAME Foundation Business Meeting will immediately follow the NAME Business Meeting

WEDNESDAY, OCTOBER 14 – SUNDAY, OCTOBER 18, 2020

8:00 AM October 14 NAME Foundation Silent Auction Begins
1:00 PM October 18 NAME Foundation Silent Auction Concludes

FRIDAY, OCTOBER 16, 2020

PROGRAM INFORMATION:

****Indicates the following:***

- *John Smialek Best Resident Paper/Poster Competition*
- **Mary Fran Ernst Best Affiliate Paper/Poster Competition*
- ***Susan P. Baker Public Health Impact Award*
- ****Best Student Paper/Poster Competition*

8:00 AM – 8:10 AM Welcome and Introduction [NOT CME]

8:10 AM – 10:10 AM SESSION 1: EVERYTHING COVID-19
Moderator: Karen L. Kelly, MD, East Carolina University, Greenville, North Carolina, United States of America

8:10 AM – 8:30 AM 1.1 New Mexico's COVID-19 Experience
**Nicole R. Jackson, MD, MPH, Office of the Medical Investigator, University of New Mexico, Albuquerque, New Mexico, United States of America*

8:30 AM – 8:45 AM 1.2 Impact of the COVID-19 Pandemic on Cases and Medicolegal Death Investigation Policies at Franklin County Coroner's Office, Columbus Ohio
Maneesha Pandey, MBBS, Franklin County Forensic Science Center, Columbus, Ohio, United States of America and Katelyn Yoder, MA, F-ABMDI, Franklin County Forensic Science Center, Columbus, Ohio, United States of America

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8:45 AM – 9:00 AM	1.3 SARS-CoV-2 (COVID-19) Global Pandemic National Emergency “Stay at Home Order” Effects the Cause of Death (COD) or Manner of Death (MOD) In Autopsied 2020 Death Certificates; Bay County, Michigan US <i>William Ray Morrone, DO, MPH, MS, Office of the Medical Examiner, Bay County Health Department, Bay City, Michigan, United States of America</i>
9:00 AM – 9:15 AM	1.4 Using Death Certificates to Monitor the COVID-19 Pandemic <i>Margaret Warner, PhD, CDC National Center For Health Statistics, Hyattsville, Maryland, United States of America</i>
9:15 AM – 9:35 AM	1.5 Interaction of the Opioid Epidemic with the COVID-19 Pandemic: Impacts on the MDI Community <i>Barry K. Logan, PhD, NMS Labs, Horsham, Pennsylvania, United States of America, M.J. Menendez, JD, NMS Labs, Horsham, Pennsylvania, United States of America and Victor Weedn, MD, JD, George Washington University, Washington, DC, United States of America</i>
9:35 AM – 10:00 AM	1.6 NAME Toxicology Committee Presents: COVID-19 Medications – Reference Data and Resource Information <i>Jirair Gevorkyan, California Department of Justice, Sacramento, California, United States of America</i>
10:00 AM – 10:10 AM	1.7 WITHDRAWN
10:00 AM – 10:10 AM	Questions
10:10 AM – 10:30 AM	BREAK [NOT CME]
10:10 AM – 10:30 AM	VISIT VIRTUAL EXHIBITS [NOT CME]
10:30 AM – 12:25 PM	SESSION 2: PEDIATRIC CONCEPTS Moderator: Jan Gorniak, DO, Clark County Office of the Coroner/Medical Examiner, Las Vegas, Nevada, United States of America
10:30 AM – 10:45 AM	2.1 Flexion-Distracture Fracture Resulting from Shaken Baby Syndrome <i>Jaclyn Plotzke, MD, Michigan Medicine, Ann Arbor, Ann Arbor, Michigan, United States of America</i>
10:45 AM – 11:00 AM	2.2 Neck Injuries and Other Findings in Pediatric Homicide Cases Versus Controls: An Institutional Case Series <i>*Catherine Perez, MD, University of Michigan, Ann Arbor, Michigan, United States of America</i>
11:00 AM – 11:15 AM	2.3 Understanding the Pathology of Homicidal Pediatric Blunt Neurotrauma through Correlation of Advanced Magnetic Resonance Images with Histopathology <i>Heather S. Jarrell, MD, Office of the Medical Investigator/University of New Mexico, Albuquerque, New Mexico, United States of America</i>
11:15 AM – 11:30 AM	2.4 Inferior Vena Cava Lacerations and Liver Embolus to the Lung Resulting from Non-accidental Injury of the Abdomen <i>Kayla Hoerschgen, MD, USD Sanford School of Medicine, Sioux Falls, South Dakota, United States of America</i>
11:30 AM – 11:40 AM	2.5 Deadly Delays in Newborn Screening <i>Katherine Cochrane, University of Tennessee Medical Center Knoxville, Knoxville, Tennessee, United States of America</i>

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11:40 AM – 12:00 PM	2.6 Focus on Preschool-Aged Drowning: How Death Scene Investigation Can Inform Policy and Prevention <i>Todd R. Porter, MD, MSPH, Denver Health Medical Center, Denver, Colorado, United States of America, Abby Collier, MA, National Center for Fatality Review and Prevention, Okemos, Michigan, United States of America and Nicole Hughes, MA, Levi's Legacy, Knoxville, Tennessee, United States of America</i>
12:00 PM – 12:15 PM	2.7 Investigating the Completeness of Death Investigation Information Reported to the Sudden Unexpected Infant Death (SUID) Case Registry <i>Alexa B. Erck, MPH, DB Consulting Group, Contractor for Centers for Disease Control and Prevention, New Orleans, Louisiana, United States of America</i>
12:15 PM – 12:25 PM	Questions
12:25 PM – 1:20 PM	VISIT VIRTUAL EXHIBITS [NOT CME]
12:25 PM – 1:20 PM	LUNCH BREAK [NOT CME]
1:20 PM – 3:00 PM	SESSION 3: TOXICOLOGY I Moderator: Kristin Escobar Alvarenga, MD, Cook County Medical Examiner's Office, Chicago, Illinois, United States of America
1:20 PM – 1:35 PM	3.1 Novel Evaluation of Submandibular Salivary Gland Tissue for use as an Alternative Postmortem Toxicology Specimen <i>****Ernest Allen Morton, MBA, MS, Western Michigan University Homer Stryker MD School of Medicine, Kalamazoo, Michigan, United States of America</i>
1:35 PM – 1:45 PM	3.2 Kratom-Associated Fatalities in Northern Nevada – What Mitragynine Level is Fatal? <i>****Jessica S. Schmitt, BS, University of Nevada - Reno School of Medicine, Reno, Nevada, United States of America and Kaileigh M. Bingham, BS, University of Nevada - Reno School of Medicine, Reno, Nevada, United States of America</i>
1:45 PM – 2:00 PM	3.3 Use of Qualitative In-House Drug and Toxicology Testing by the King County Medical Examiner's Office in Seattle, WA. <i>Nicole Yarid, MD, King County Medical Examiner's Office, Seattle, Washington, United States of America</i>
2:00 PM – 2:10 PM	3.4 6-Acetylmorphine as an Impurity in Cases with Extremely Elevated Morphine Concentrations <i>Laura Labay, NMS Labs, Horsham, Pennsylvania, United States of America</i>
2:10 PM – 2:30 PM	3.5 NAME Toxicology Committee Presents: Contemporary Interpretation of Fentanyl Results <i>Laura Labay, NMS Labs, Horsham, Pennsylvania, United States of America</i>
2:30 PM – 2:50 PM	3.6 NAME Toxicology Committee Presents: Looking Ahead to Toxicology in 2021 <i>Laura Labay, NMS Labs, Horsham, Pennsylvania, United States of America</i>
2:50 PM – 3:00 PM	Questions
3:00 PM – 3:10 PM	BREAK [NOT CME]
3:00 PM – 3:10 PM	VISIT VIRTUAL EXHIBITS [NOT CME]
3:10 PM – 4:25 PM	SESSION 4: TOXICOLOGY II Moderator: Karen Zeigler, DO, Office of the Chief Medical Examiner, San Francisco, San Francisco, California, United States of America
3:10 PM – 3:25 PM	4.1 Fentalogs in Postmortem Investigations, January 2018 – April 2020 <i>Jolene J. Bierly, MSFS, NMS Labs, Horsham, Pennsylvania, United States of America</i>

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3:25 PM – 3:40 PM	4.2 Testing for Barium Before You Bury 'Em <i>Kathryn Pinneri, MD, Montgomery County Forensic Services, Conroe, Texas, United States of America</i>
3:40 PM – 4:00 PM	4.3 Toxic Adulterant Cutting Agents and Emerging Issues <i>Jennifer L. Turri Swatek, MSFS, D-ABFT-FT, NMS Labs, Horsham, Pennsylvania, United States of America</i>
4:00 PM – 4:15 PM	4.4 Eutylone Intoxications: An Emerging Synthetic Stimulant in Forensic Investigations <i>Barry K. Logan, PhD, Center for Forensic Science Research and Education (CFSRE), Willow Grove, Pennsylvania, United States of America</i>
4:15 PM – 4:25PM	Questions

SATURDAY, OCTOBER 17, 2020

PROGRAM INFORMATION:

8:00 AM – 10:20 AM	SESSION 5: TRAUMA Moderator: Adele Lewis, MD, Tennessee Department of Health, Nashville, Tennessee, United States of America
8:00 AM – 8:15 AM	5.1 Medicolegal Death Investigation of Railroad-Related Fatalities <i>*Jared Brooks, MD, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, Michigan, United States of America</i>
8:15 AM – 8:30 AM	5.2 Accidental Deaths Involving Trees: Professional and Non-professional Woodcutting and Tree Failures with Autopsy Findings <i>*Deland Weyrauch, MD, Yale University School of Medicine, New Haven, Connecticut, United States of America</i>
8:30 AM – 8:50 AM	5.3 Examining Differences In Injury Survivability Determinations Between Medical Examiners and Trauma Surgeons Evaluating Pre-hospital Trauma Deaths <i>Brian Eastridge, MD, UT Health San Antonio; Coalition for National Trauma Research, San Antonio, Texas, United States of America and MIMIC StudyGroup, Coalition for National Trauma Research, San Antonio, Texas, United States of America</i>
8:50 AM – 9:05 AM	5.4 Mortality Review: A Collaboration Between a Medicolegal Jurisdiction and Trauma System to Eliminate Preventable Death <i>Edward Mazuchowski, MD, PhD, Defense Health Agency - Joint Trauma System, Fort Sam Houston, Texas, United States of America</i>
9:05 AM – 9:35 AM	5.5 The Expanding Role of Biomechanics in Forensic Pathology <i>Sarah Sherman, PhD, Exponent, Farmington Hills, Michigan, United States of America</i>
9:35 AM – 9:55 AM	5.6 Determination of Force Required to Produce Stab Wounds in Cadaveric Chest Tissue <i>*Lorenzo Gitto, MD, State University of New York, Upstate Medical University, Syracuse, New York, United States of America</i>
9:55 AM – 10:10 AM	5.7 Dallas 7/7: Deployment of a Bomb Disposal Robot to End a Police Standoff <i>Reade A Quinton, MD, Mayo Clinic, Rochester, Minnesota, United States of America</i>
10:10 AM – 10:20 AM	Questions
10:20 AM – 10:30 AM	BREAK [NOT CME]

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10:20 AM – 10:30 AM	VISIT VIRTUAL EXHIBITS [NOT CME]
10:30 AM – 11:40 AM	SESSION 6: CRITICAL ISSUES Moderator: Catherine Miller, MD, Palm Beach County Medical Examiner, West Palm Beach, Florida, United States of America
10:30 AM – 11:00 AM	6.1 Missing and Murdered in Canada: A Call for Change to the Investigation of the Deaths of Indigenous People <i>Kona Williams, Bsc, MD, FRCPC (AP+FP), Northeastern Regional Forensic Pathology Unit, Sudbury, ON, Canada</i>
11:00 AM – 11:10 AM	6.2 CSI and Cadavers: Factors That Influence Physicians to Pursue Forensic Pathology <i>Mary Tuyetnhi H. Tran, Timber Creek High School, Orlando, Florida, United States of America</i>
11:10 AM – 11:40 AM	6.3 The Forensic Pathology Pipeline: Creating Forensic Pathologists through Proactive Pathology Residency Programs <i>Victor W. Weedn, MD, JD, George Washington University, Washington, District of Columbia, United States of America and M.J. Menendez, JD, NMS Labs, Horsham, Pennsylvania, United States of America</i>
11:40 AM – 11:50 AM	Questions
11:50 AM – 12:45 PM	VISIT VIRTUAL EXHIBITS [NOT CME]
11:50 AM – 12:45 PM	LUNCH BREAK [NOT CME]
12:45 PM – 2:35 PM	SESSION 7: MEDICAL EDUCATION AND ADMINISTRATION Moderator: Ashley Mathew, MD, Kentucky Office of the State Medical Examiner, Louisville, Kentucky, United States of America
12:45 PM – 1:00 PM	7.1 Autopsy Education In Canadian Pathology Programs: A Survey of Canadian Trainees <i>*Michael Multan, Dr, BHSc (Hons.), MD, University of British Columbia, Vancouver, British Columbia, Canada</i>
1:00 PM – 1:15 PM	7.2 Updates in Forensic Pathology Education: Milestones 2.0 <i>*Nicole Alyse Croom, MD, MPH, University of California, San Francisco, San Francisco, California, United States of America</i>
1:15 PM – 1:25 PM	7.3 Narrative Writing As a Part of Resident Education in Forensic Pathology <i>Mark A. Giffen, Jr, DO, Wake Forest School of Medicine, Winston Salem, North Carolina, United States of America</i>
1:25 PM – 1:40 PM	7.4 A Medical Examiner Bereavement Mementos Program via Nonprofit Auxiliary Organization <i>Nicole A. Franklin, Washoe County Regional Medical Examiner's Office and Benjamin Clark Foundation, Reno, Nevada, United States of America</i>
1:40 PM – 1:50 PM	7.5 Tweet, Tweet!: Using Twitter Chats To Teach Forensic Pathology <i>Ken Obenson, MD, Horizon Health Network, Saint John, New Brunswick, Canada</i>
1:50 PM – 2:00 PM	7.6 An Experiment In Short Live Broadcasts At A Name Meeting: Quo Vadimus? <i>Ken Obenson, MD, Horizon Health Network, Saint John, New Brunswick, Canada</i>
2:00 PM – 2:10 PM	7.7 The Potential Value Of Video Abstracts On Social Media To Disseminating Content from NAME Meetings <i>Ken Obenson, MD, Horizon Health Network, Saint John, New Brunswick, Canada</i>

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2:10 PM – 2:25 PM	7.8 Evaluation of the Impact of Post-mortem Computed Tomography at the New Mexico Office of the Medical Investigator <i>Natalie L. Adolphi, PhD, University of New Mexico, Albuquerque, New Mexico, United States of America</i>
2:25 PM – 2:35 PM	Questions
2:35 PM – 2:45 PM	BREAK [NOT CME]
2:35 PM – 2:45 PM	VISIT VIRTUAL EXHIBITS [NOT CME]
2:45 PM – 5:15 PM	SESSION 8: FORENSIC POTPOURRI: CERTIFICATION OF DEATH AND UNUSUAL CAUSES OF DEATH Moderator: Julia Shields, MD, Shield Forensics, Sykesville, Maryland, United States of America
2:45 PM – 3:00 PM	8.1 Classification of Autopsy Findings: Degrees of Certainty <i>Maura E. DeJoseph, DO, Connecticut Office of the Chief Medical Examiner, Farmington, Connecticut, United States of America</i>
3:00 PM – 3:15 PM	8.2 Positional Asphyxia In Opioid-Related Deaths: Is It Being Overlooked? <i>***Joyce L. deJong, DO, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, Michigan, United States of America</i>
3:15 PM – 3:30 PM	8.3 Homicide by Unspecified Means: Cleveland 2008-2019 <i>*Alison R. Krywaczyk, MD, Cuyahoga County Medical Examiner's Office, Cleveland, Ohio, United States of America</i>
3:30 PM – 3:40 PM	8.4 Overwork-Related Death (Karoshi): An Unrecognized Entity. Review of Literature and Topic of Discussion <i>*Jana Lesnikova, MD, PhD, RUSH Medical Center, Chicago, Illinois, United States of America</i>
3:40 PM – 4:00 PM	8.5 A Forensic Approach to Military Exertional Training Deaths <i>Paul S. Uribe, MD, Armed Forces Medical Examiner System, Dover Air Force Base, Delaware, United States of America</i>
4:00 PM – 4:15 PM	8.6 A Trait-or in Disguise: Hemoglobin AS as an Unexpected Cause of In-Custody Death <i>Allison Cooper, MD, Southwestern Institute of Forensic Sciences, Dallas, Texas, United States of America</i>
4:15 PM – 4:30 PM	8.7 Characteristics of Deaths with Evidence of Pathological Hoarding in Cook County 2017-2018 <i>*David Michael Waters, MD, Cook County Medical Examiner Office, Chicago, Illinois, United States of America</i>
4:30 PM – 4:45 PM	8.8 Bilateral Cerebellar Stroke Presenting as Sudden Death in Drug House, Following Head Injury Sustained in Police Altercation <i>Wendy M. Gunther, MD, Office of the Chief Medical Examiner, Commonwealth of Virginia, Norfolk, Virginia, United States of America</i>
4:45 PM – 5:00 PM	8.9 Acute Esophageal Necrosis (Black Esophagus): An Autopsy Case Series <i>*Lauren R. Crowson-Hindman, DO, MS, Medical University of South Carolina, Charleston, South Carolina, United States of America</i>
5:00 PM – 5:15 PM	Questions
5:15 PM	Meeting Adjourns

SUNDAY, OCTOBER 18, 2020

4:00 PM – 5:30 PM

OPTIONAL EVENT: NAME FOUNDATION OUTREACH FUNDRAISER: Drug Delivery
Homicide: The Straw that Breaks the Camel's Back

*Barry K. Logan, PhD, NMS Labs, Horsham, Pennsylvania, United States of America,
Gregory G. Davis, MD, Jefferson County Medical Examiner, Birmingham, Alabama, United
States of America and M.J. Menendez, JD, NMS Labs, Horsham, Pennsylvania, United
States of America*

POSTER PRESENTATIONS:

CARDIOVASCULAR PATHOLOGY

P1 Sudden Maternal Cardiac Death Due To Primary Spontaneous Dissection of the Left Coronary Artery: A Case Report

Lineth Jacsenia Saldana, MD, Institute of Legal Medicine and forensic Science of Panama

P2 Myocardial Infarction with Nonobstructive Coronary Arteries (MINOCA): A Rare Finding in 10 Years of Medical Autopsies

Tuyet Hong T. Tran, DO, New York University Langone Health, New York, New York, United States of America

P3 Great Balls of Fire: Commotio Cordis Following Roman Candle Explosion

Teddi L. Tubre, MD, Broward Office of Medical Examiner and Trauma Services, Fort Lauderdale, Florida, United States of America

P4 Investigating Medical Examiners' Practices: Genetic Evaluation for Fatal Acute Aortic Dissection

Bradley Power, MS, University of Texas Graduate School of Biomedical Sciences, Houston, Texas, United States of America

P5 Thrombosis of Bioprosthetic Valve Associated with Acute Myocardial Injury

*****Cassandra Kambeitz, BS, BA, University of North Dakota School of Medicine and Health Sciences, Grand Forks, North Dakota, United States of America*

FORENSIC POTPOURRI - MISCELLANEOUS

P6 Your Patient is Going to Die I: A Review of Iatrogenic Injuries

Katherine Maloney, MD, Erie County Medical Examiner's Office, Buffalo, New York, United States of America

P7 Your Patient is Going to Die II: A Review of Missed Diagnoses

Katherine F. Maloney, MD, Erie County Medical Examiner's Office, Buffalo, New York, United States of America

P8 Checking In But Not Checking Out: Trends in Deaths Occurring in Hotels

**Claire Rosalie Sorensen, MD, Cook County Medical Examiner's Office, Chicago, Illinois, United States of America*

P9 A Novel Approach to Postmortem Needle Thoracentesis

Teddi L. Tubre, MD, Broward - Office of Medical Examiner and Trauma Services, Fort Lauderdale, Florida, United States of America

P10 Examining the Importance of Postmortem Computed Tomography Examination in Cases with Opposition to Conventional Autopsy

Avani Latchireddi, MS, University of Maryland, Baltimore, Baltimore, Maryland, United States of America

P11 Gender Differences in Method of Suicide

Michael Eckhardt, MD, Cook County Medical Examiner's Office, Chicago, Illinois, United States of America

INFECTIOUS DISEASE

P12 Who Died of Pneumonia Before the COVID-19 Pandemic? A Multicenter Cross-Sectional Study of Risk of Dying of Pneumonia or Having Pneumonia as a Significant Contributing Factor

**Iana Lesnikova, MD, PhD, RUSH Medical Center, Chicago, Illinois, United States of America*

P13 A Report of Myocarditis During a Viral Pandemic

****Lily Mahler, University of Alabama at Birmingham, Birmingham, Alabama, United States of America

P14 SARS-CoV-2 in the Kidneys: Postmortem Renal Histopathologic Findings in Three patients with COVID-19

*Batoul Aoun, DO, Michigan Medicine, Ann Arbor, Michigan, United States of America

P15 A Case of Clinically Unrecognized Adult Chicken Pox Revealed Postmortem

Nicholas J. Barna, II, MD, Miami-Dade Medical Examiner, Miami, Florida, United States of America

P16 Air Embolism Complicating Extracorporeal Membrane Oxygenation (ECMO) in the Setting of COVID-19 Pneumonia: A Case Report and Review of Literature

Zachary Michael Grimes, DO, Icahn School of Medicine at Mount Sinai, New York, New York, United States of America

P17 Postmortem Diagnosis of Clostridium Without Culture Confirmation

****McKenzie Jackson, BS, University of North Dakota School of Medicine and Health Sciences, Grand Forks, North Dakota, United States of America

NEUROPATHOLOGY

P18 Brain Herniation with Embolic Subarachnoid Displacement of Cerebellar and Brainstem Tissue to the Distal Lumbar Spine

Megan F. Lee, MD, Duke University Medical Center, Durham, North Carolina, United States of America

P19 Hypercoagulable: A Case of Dural Venous Sinus Thrombosis

Joseph Mininni, MD, University of Maryland Medical Center, Baltimore, Maryland, United States of America

P20 Pacific Northwest Brain Donor Network: A Collaborative Approach to Studying Military Traumatic Brain Injury

Kathryn P. Scherpelz, MD, PhD, University of Washington, Seattle, Washington, United States of America

P21 Fatal Case of Clinically Undiagnosed H3 K27M-Mutant Diffuse Midline Glioma Masquerading As Hypertensive Intraparenchymal Hemorrhage

Amber R. Wang, MD, Maricopa County Office of the Medical Examiner, Phoenix, Arizona, United States of America

P22 Colloid Cyst of the Third Ventricle in a Forensic Setting. A Case Series and Review of the Literature.

Alexander F. Blank, Cleveland Clinic Foundation, Cleveland, Ohio, United States of America

P23 Rapidly Progressive Dementia: A Case of Wernicke Encephalopathy Unrelated to Alcohol Use

Natalie Taylor, MD, MS, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin, United States of America

P24 Acute Ruptured Berry Aneurysm in Association with a Synchronous Cerebral Vascular Malformation: Differential Diagnosis and Classification

Jaclyn Plotzke, MD, Michigan Medicine, Ann Arbor, Ann Arbor, Michigan, United States of America

PEDIATRIC PATHOLOGY

P25 Blue Baby: An Uncommon Post Mortem Artifact due to Perimortem Methylene Blue Administration

Melinda Flores, MD, Southwestern Institute of Forensic Sciences, Dallas, Texas, United States of America

P26 The Utility of Postmortem Cultures in Pediatric Autopsies

Alexander F. Blank, Cleveland Clinic Foundation, Cleveland, Ohio, United States of America

P27 WITHDRAWN

TOXICOLOGY

P28 An Overdose Death Associated with Vaping Designer Fentanyl Analogs

Katherine Maloney, MD, Erie County Medical Examiner's Office, Buffalo, New York, United States of America

P29 Sudden Death Following Acute Phentermine Ingestion

Morgan Rene Long, DO, University of Arizona, Tucson, Arizona, United States of America

P30 Characteristics and Trends of Fentanyl Related Death in Marion County, Indiana: 2016-2019

Xin Zhang, Indiana University, Carmel, Indiana, United States of America

P31 Toxicology Testing When Traditional Matrices Are Non-Existent

Laura Labay, NMS Labs, Horsham, Pennsylvania, United States of America

P32 Designer Benzodiazepines: A Death from Flubromazolam Toxicity

Natalie Larsen, MD, University of Alabama Birmingham, Birmingham, Alabama, United States of America

P33 Postmortem Rapid Urine Drug Screen Analysis Compared to Standard Drug Screen

Butch M. Huston, MD, Ramsey County Medical Examiner's Office, St. Paul, Minnesota, United States of America

TRAUMA

P34 Evaluation of Pedestrian-Train Fatalities in the State of Maryland: a Five-Year Retrospective Study of Forensic Autopsy Cases

Claire K. Hammerschmidt, MS Forensic Medicine, University of Maryland, Baltimore, Baltimore, Maryland, United States of America

P35 Drowned in His Own Blood: Accidental Mechanical Asphyxia Due to a Massive Bleeding With Airway Obstruction

Giancarlo Di Vella, MD, Università degli Studi di Torino, Turin, Torino, Italy

P36 Nonfirearm Related Homicides at the Medical University of South Carolina, 2013-2019

Christopher Sullivan, MD, MPH, Medical University of South Carolina, Charleston, South Carolina, United States of America

P37 Putting the Pieces Together Again: A Case of Dismemberment Using a Circular Saw

Ben Murie, DO, University of New Mexico: Office of the Medical Investigator, Albuquerque, New Mexico, United States of America

P38 Exsanguination via a Right Radial Artery Posttraumatic Pseudoaneurysm Secondary to Dog Bite: A Case Report

**Daniel Vincent Sullivan, MD, MA, University of California-San Francisco, San Francisco, California, United States of America*

P39 Wall Falls: Blunt Trauma Sustained from Border Wall Crossings

**Nicole R. Jackson, MD, MPH, Office of the Medical Investigator, University of New Mexico, Albuquerque, New Mexico, United States of America*

P40 Analysis of Air Gun Parameters and Wounding Potential

Haley M. Carr, MS, Syracuse University, Syracuse, New York, United States of America

P62 G2 Research Radically Invasive Projectile: The Importance of Recognizing Its Imaging and Autopsy Patterns

**Xin Zhang, Indiana University, Carmel, Indiana, United States of America*

UNUSUAL CAUSE OF DEATH

P41 Sickle Cell Trait and Cold Induced Death: A Case Report

**Catherine Perez, MD, University of Michigan, Milan, Michigan, United States of America*

P42 Don't Frack Yourself Over: Death Due to Electrocution from Fractal Wood Burning

Varsha Podduturi, MD, Harris County Institute of Forensic Sciences, Houston, Texas, United States of America

P43 Undiagnosed, Unknown, and Unexpected: A Case Series of Lymphomas Discovered Postmortem

Anna Tart, MD, University of Arkansas for Medical Science, Little Rock, Arkansas, United States of America

P44 A Fatal Case of Metastatic Gastric Adenocarcinoma Mimicking Cirrhosis

Janet M. Basinger, MD, Vanderbilt University Medical Center, Nashville, Tennessee, United States of America

P45 Ruptured Ectopic Pregnancy in a Morbidly Obese Female

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**Fabiola A. Righi, DO, Mayo Clinic, Rochester, Minnesota, United States of America*

P46 Double Suicide Due to the Ingestion of Levamisole-Adulterated Cocaine: Case Report and Review of the Literature

**Serenella Serinelli, MD, PhD, State University of New York - Upstate Medical University, Syracuse, New York, United States of America*

P47 WITHDRAWN

P48 Death Due to Adrenal Crisis: Case Report and Review of the Literature

**Serenella Serinelli, MD, PhD, State University of New York - Upstate Medical University, Syracuse, New York, United States of America*

P49 Train-Related Suicidal Decapitation

*****Samantha Woolery, MS, Western Michigan University Homer Stryker M.D. School of Medicine, Kalamazoo, Michigan, United States of America*

P50 An Unusual Case of Water Intoxication

Amanda J. Hersh, DO, University of Missouri, Columbia, Missouri, United States of America

P51 Cocaine-Associated Acute Esophageal Necrosis Seen at Postmortem Examination

Kayla Dill, PA, Wayne County Medical Examiner's Office, Detroit, Michigan, United States of America

P52 Metastatic Melanoma with Aberrant Smooth Muscle Differentiation Diagnosed at Autopsy: A Case Report

Martin V. Burks, IV, MD, MBA, Wake Forest Baptist Health, Winston-Salem, North Carolina, United States of America

P53 A Rare Complication of Fetal Alcohol Syndrome Revealed at Autopsy

Nicholas J. Barna, II, MD, Miami-Dade Medical Examiner, Miami, Florida, United States of America

P54 WITHDRAWN

P55 Primary Cardiac Angiosarcoma Resulting in Tamponade and Sudden Death

Daniel Chadwick Butler, MD, Medical University of South Carolina, Charleston, South Carolina, United States of America

UNUSUAL SUICIDES & MIMICKERS

P56 A New Fad in Teenage Suicide? Sodium Nitrate/Nitrite as a Possible Emerging Methodology in Adolescents

Meagan Chambers, MS, MSc, MD, University of Washington, Seattle, Washington, United States of America

P57 It Could Be A Perfect Murder

Luisa Andrello, PhD, MD, Medico Legal Service of Canton Ticino, Bellinzona, Canton Ticino, Switzerland

P58 Sudden Death of an Inmate on Suicide Watch: Accident or Suicide?

Rasha Kiwan, BS, Sacramento County Coroner's Office, Sacramento, California, United States of America

P59 Blue in the Face: A Case Series of Suicidal Sodium Nitrite and Sodium Nitrate Ingestion

Shasta Theodore, MD, University of Texas Health Science Center at San Antonio, San Antonio, Texas, United States of America

P60 Suicide via Elaborate Electrical Device: The DIY Electric Chair

Kayla Dill, PA, Wayne County Medical Examiner's Office / Michigan Medicine, Detroit, Michigan, United States of America

P61 Multiple Shotgun Wound Suicide

Heath Blankenship, MD, Wake Forest Baptist Medical Center, Winston Salem, North Carolina, United States of America

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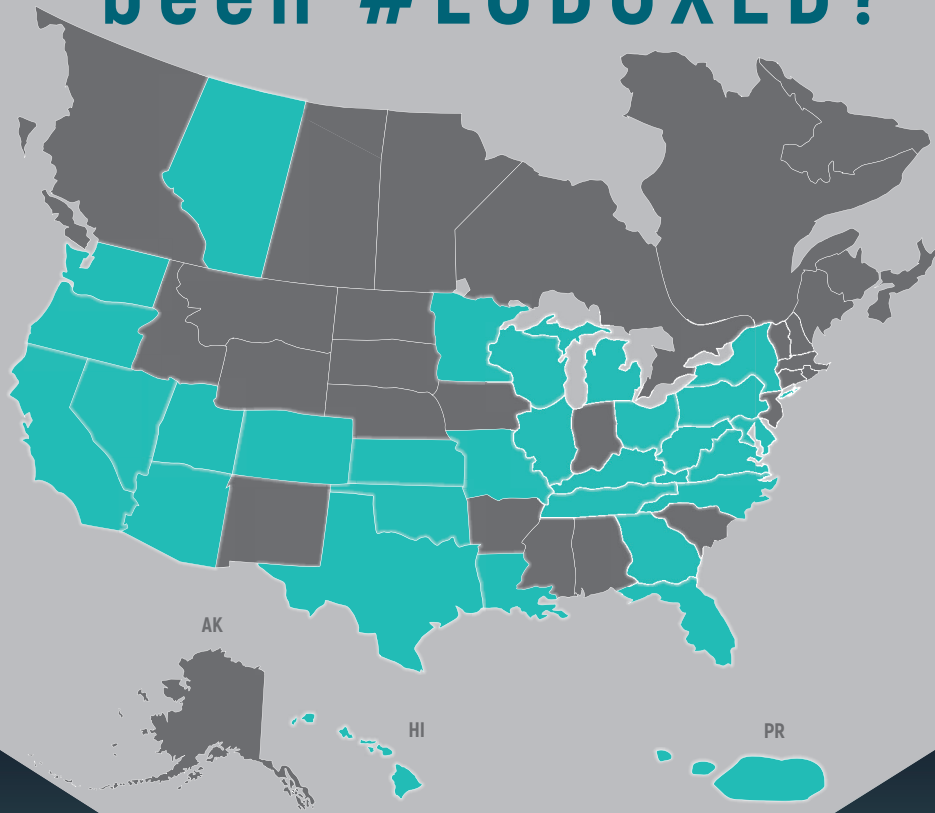
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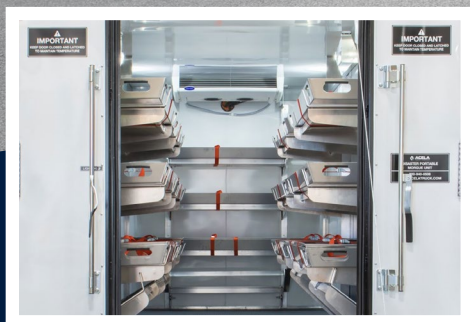
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Exhibit Schedule

NOTE: All times are Central Time Zone (CDT) (US/Canada)

PUBLISHED VISITING HOURS

Friday, October 16

10:10AM – 10:30AM

12:25PM – 1:20PM

3:00PM – 3:10PM

Saturday, October 17

10:20AM – 10:30AM

11:50AM -- 12:45PM

2:35PM – 2:45PM

It's a **Scavenger Hunt!** Stop by each Exhibitor's booth to find the piece of information requested on the form you were emailed on Thursday, October 15th.

Email your completed card to tsnethen@thename.org by 12 midnight EST on Saturday, October 17th.

To qualify, you **must correctly find all the answers**. We will be giving away two Amazon gift cards. Winners will be drawn at random. Exhibitors do not qualify to participate.

EXHIBITOR DESCRIPTIONS

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OPTIONAL MEETINGS/ACTIVITIES

NAME INSPECTION AND ACCREDITATION: INSPECTOR TRAINING COURSE

Date: October 9, 2020

Time: 12:00PM – 3:00PM EST

Barbara Wolf, MD

Chair, Inspection and Accreditation

Brian Peterson, MD

Co-Chair, Inspection and Accreditation

Steve Clark, PhD

Director of Inspection and Accreditation Training

COURSE DESCRIPTION: This course emphasizes the policies and procedures associated with the National Association of Medical Examiners (NAME) on-site inspection for core accreditation. The course content emphasizes the process of scheduling, conducting and completing a medicolegal office inspection. Both generic and specific inspection strategies are discussed to ensure standardized inspections across all jurisdictional types and configurations (i.e., medical examiner, coroner, state, regional, local). In addition, several verification methods are described to assist future inspectors in determining office compliance with NAME inspection and accreditation standards.

Additional Requirement: Course completers are also required to “ride-along” with a certified inspector to observe and participate in a full on-site inspection.

OBJECTIVES: As a result of this course, you will be able to:

- Describe the goals of the NAME I&A program.
- Describe the three levels of core accreditation (Full, Provisional, None)
- Describe the difference between full-service and autopsy-only accreditation.
- Describe the NAME I&A registration process.
- Describe the scheduling of an on-site inspection.
- Differentiate between Phase I and Phase II violations.
- Identify the functional areas covered in the on-site inspection.
- Describe when the checklist N/A rating is appropriately used.
- Explain when and why inspector discretion is used.
- Identify the content of the final inspection report.
- Describe the Annual Accreditation Verification (AAV) process.
- Describe the role of the NAME I&A Committee.

MATERIAL: Current NAME I&A Checklists (full and autopsy only).

OPTIONAL EVENT: NAME FOUNDATION OUTREACH FUNDRAISER: “Drug Delivery Homicide: The Straw that Breaks the Camel’s Back”

CME: 1.5

Date: Sunday, October 18, 2020

Time: 4:00PM – 5:30PM Central Time

EVENT DESCRIPTION: Presenters will include: M.J. Menendez, JD, General Counsel – Sr. V/P of Public Private Partnerships, NMS Labs.

Gregory G. Davis, MD, Jefferson County Medical Examiner.

Barry K. Logan, PhD, Executive Director, The Center for Forensic Science Research and Education, and The Fredric Rieders Family Foundation.

After attending this workshop, participants will be able to:

- Discuss the current theories of prosecution for drug-induced death cases under state and federal law as interpreted by judicial case law and authority.
- Discuss the theories of prosecution and defense under “drug-delivery-resulting-in-death” statutes and sentencing.
- Describe and explain the nuances of the SCOTUS decision in *US vs Burrage*.
- Analyze the strengths and weaknesses of fact patterns in drug-delivery-resulting-in-death cases.
- Identify and articulate the limitations of toxicological and medical testimony in these cases.
- Prepare for testimony, and direct and cross examination in drug-delivery-resulting-in-death cases.

In recent years with the rise in opioid related death, in addition to traditional prosecutions for drug possession and trafficking, some jurisdictions have pursued criminal charges for homicide against specific individuals who obtained or provided the drugs used by a decedent proximate to the time of their death. These cases have come to be known as “drug delivery resulting in death”, “drug delivery homicide”, and “but-for” causation. Similar theories have been invoked under federal law where prescribing physicians in “pill mill” cases, as well as members of transnational organized crime groups are held liable for significant enhanced penalties including 20 year mandatory minimum sentences if deaths resulted as a direct result of their involvement in the distribution of their product.

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In 2014, the United States Supreme Court handed down *US vs Burrage*, 571 U.S. ___, 134 S. Ct. 881 (2014), which represents the current legal authority on the standard of causation required for imposition of the federal sentencing enhancement, and which has been relied on in many state jurisdictions in these types of cases. The opinion states that the Government does not have to prove that the drug/drugs were the only cause of the decedent's death; but it must have been "the straw that broke the camel's back".

In this presentation, our presenters will review the underlying Federal and corresponding state statutes that address these issues, and how cases are being charged and prosecuted. The panel will include medical examiner and forensic toxicology perspectives on the complex nature of certification of drug related deaths, especially in the context of multiple mixed drugs being detected in the toxicological analysis, and suggest approaches for working with attorneys when consulted in these cases.

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Registration will be available on the NAME website.

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National Association of Medical Examiners

Abstracts of the 2020 Annual Meeting

October 16-17 2020
Cyberspace, Everywhere

ORAL PRESENTATIONS

1.1 New Mexico's COVID-19 Experience

N.R. Jackson¹, K. Zeigler¹, M. Torrez², Y. Makino³, N. Adolphi¹, S. Lathrop¹, L. Decker¹, L. Dvorscak¹, L. Proe¹, I.D. Paul¹, R.E. Zumwalt¹, H.S. Jarrell¹
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While New Mexico has not been an epicenter of the COVID-19 pandemic, our state is unique in that it is home to 23 Native American tribes, which have been amongst the hardest-hit communities in the nation. The Office of the Medical Investigator (OMI) has the privilege of serving the entire state of New Mexico, inclusive of these sovereign nations, determining cause and manner of death for those who die outside of the healthcare system.

As a biosafety level 3 laboratory in possession of multiple isolation autopsy rooms, OMI had the capacity and opportunity to perform full autopsy examinations on a majority of those suspected of dying from COVID-19 outside the care of a physician. With the added advantage of triaging every decedent that comes to our office with postmortem computerized tomography (PMCT) and in partnership with a forensic radiologist and pathologist, this series provides radiologic information on end-stage disease.

Mirroring the state's experience, American Indian decedents were overrepresented in our cohort. In general, decedents tended to be middle-aged, male, and overweight but not obese, with the common comorbidities of atherosclerotic cardiovascular disease, hypertension, diabetes mellitus, and chronic ethanolism. Several were either homeless or cohabiting with a known COVID-19 positive individual. Reported symptoms ranged from common flu-like symptoms to rare symptoms like abdominal and chest pain.

Decedents all showed varying degrees of diffuse bilateral opacities on PMCT and heavy, wet lungs grossly, but pathologists' impression on cut surface varied from unimpressed to highly concerned for significant underlying pathology. However, paralleling others' experiences, microscopically, the majority of lungs exhibited varying stages of diffuse alveolar damage. Thrombotic complications were rarely detected in our cohort and included single cases with each large and small caliber thrombi as well as cases with a coronary artery thrombus.

To date, only three other groups in the United States have published autopsy findings on COVID-19 positive decedents, with most representing the experience of those who received some level of medical care. Due to the rural nature of much of our state, this cohort received minimal, if any, medical intervention, and our findings represent the pure pathology of COVID-19, speaking to how exactly it brings about death. Additionally, this study sheds light on the experience of a historically vulnerable population in the United States and how communities are being disproportionately affected by this virus.

1.2 Impact of the COVID-19 Pandemic on Cases and Medicolegal Death Investigation Policies at Franklin County Coroner's Office, Columbus Ohio

M. Pandey, K. Yoder, A.M. Ortiz, K.B. Jenkins, J.A. Daniels
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In anticipation of a possible reduction in workforce of Franklin County Coroner's Office employees as well as the possible increase in workload due to the COVID-19 pandemic, the medicolegal death investigation policies were modified quite early on in the pandemic. Op23hio was one of the earliest states to close down schools, universities, nonessential services, and businesses.

The COVID-19 policy changes addressed the various ways of handling medicolegal death investigation of the reported cases to the coroner's office from all causes. The parameters in which the policies reflected change were hospital calls, scene responses, and exam disposition (i.e., external examination versus autopsy), which were updated to reflect a change in age cut-offs and consideration of the COVID-19 status of the deceased.

Per the Centers for Disease Control and Prevention (CDC) guidelines, the autopsy of a known or suspected COVID-19 deceased person should be performed in airborne infection isolation rooms (AIIRS). Since the office did not have a negative pressure autopsy suite, it was determined that an assessment of the decedent's COVID-19 status would be performed prior to a determination of case disposition, and cases where COVID-19 was detected would be discouraged from being brought into the office.

Investigators were the first point of contact, who were trained to triage the suspected COVID-19 cases during the initial death notification call and at the scene. They were encouraged to take a nasopharyngeal swab and collect blood specimens after being attired in appropriate personal protective equipment. The nasopharyngeal swabs were then sent to a local laboratory, and the results of SARS-CoV-2 virus detection were usually obtained within 24-48 hours.

As the pandemic evolved, the policies continue to be modified, primarily with emphasis on different COVID-19 symptoms for which the investigators had to triage.

The case load was also evaluated, documented and compared with cases from the previous year, 2019, for the same time period, January to July. This was done to see if the COVID-19 pandemic had any impact on the nature of the cases reported and accepted at the Franklin County Coroner's Office.

Even though a death attributed to COVID-19 is a natural disease process and does not come under the jurisdiction of the Coroner in Ohio, it was detrimental to the workflow of Franklin County.

1.3 SARS-CoV-2 (COVID-19) Global Pandemic National Emergency “Stay at Home Order” Effects the Cause of Death (COD) or Manner of Death (MOD) In Autopsied 2020

W.R. Morrone¹, K.L. Debelak²

¹Office of the Medical Examiner, Bay County Health Department, Bay City, Michigan, USA; ²Recovery Pathways BHI, Bay City, Michigan, USA

Introduction: This report identifies the specific drugs involved most frequently in drug overdose deaths in Michigan from 2017 through 2020 during the SARS-CoV-2 (COVID-19) pandemic stay at home order. Previous years were compared to 2020 in the same month.

Methods: Vital Statistics Data from the 2017–2020 Michigan Department of Health and Human Service–Mortality files were linked to death certificates containing literal text information from death certificates. Drug overdose deaths were identified using the International Classification of Diseases, Tenth Revision. Drug mentions were identified by searching the literal text in three fields of the death certificate: the causes of death from Part I, significant conditions contributing to death from Part II, and a description of how the injury occurred. Contextual information was used to determine natural, suicide, or accidental drug involvement in the death. Homicide and Pending cases were excluded. Descriptive statistics were calculated for drug overdose deaths involving the most frequently mentioned drugs. Deaths involving more than one drug (e.g., a death involving both heroin and fentanyl) were counted in all relevant drug categories (e.g., the same death was included in counts of heroin deaths and in counts of fentanyl deaths).

Results: Among drug overdose deaths that mentioned at least one specific drug, the five most frequently mentioned drugs during 2017–2020 included fentanyl, heroin, morphine, cocaine, and methamphetamine. During the study period, cocaine consistently ranked fourth through 2019 and the age-adjusted rate of drug overdose deaths involving fentanyl or fentanyl analogues more than tripled, as did the rate of drug overdose deaths involving methamphetamine. In the United States, the rate of drug overdose deaths involving heroin doubled from 2014 through 2016. The five most frequently mentioned drugs often were found in combination with each other. The drugs most frequently mentioned varied by the intent of the drug overdose death. In 2017–2020, the drugs most frequently mentioned in unintentional drug overdose deaths were methamphetamine, fentanyl, heroin, and cocaine. Drug related overdose accidental deaths increased during the SARS-CoV-2 (COVID-19) pandemic stay at home order.

Discussion: Homicide and Pending data were excluded. This report identifies patterns in the natural, suicidal or accidental drug overdoses with specific drugs most frequently involved in drug overdose deaths from 2017 through 2020; (specifically the COVID-19)pandemic) during the stay at home order and highlights the importance of complete and accurate reporting in the literal text on death certificates.

1.4 Using Death Certificates to Monitor the COVID-19 Pandemic

M. Warner

CDC National Center For Health Statistics, Hyattsville, Maryland, USA

The National Center for Health Statistics (NCHS) has been providing information on the numbers of deaths involving COVID-19 as reported on the death certificate since the beginning of the pandemic. Information reported includes weekly counts of COVID-19 deaths by demographic, geographic, disposition, and contributing causes of death. NCHS also releases information on number of deaths which exceed the expected number of deaths for that period (i.e., excess deaths). This mortality information is used on its own and in conjunction with other sources to get a broader understanding of the impact of the pandemic.

Preliminary guidance on completing the death certificate was issued in early March followed by final guidance in early April. The guidance was consistent with previous guidance from NCHS on completing death certificates. NCHS adopted the International Classification of Diseases code to identify deaths due to the Coronavirus 2019. The provisional counts for COVID-19 deaths are based on a current flow of mortality data in the National Vital Statistics System and are reported lagged by an average of 1–2 weeks. Data from death certificates are analyzed by age, sex, race, disposition, and contributing causes of death. The parts and lines of the death certificate where causes are reported provides information about contributory causes of death.

As of May 26, 2020, there were 75,283 deaths involving COVID-19 reported on death certificates for the weeks ending February 1, 2020 to May 23, 2020. These numbers do not represent all deaths that occurred during the period and are continually updated. Provisional estimates of excess death indicate that from mid-March to mid-May, there were about 90,000 more deaths than the historical average number for that time period; however this estimate is subject to change as more data are available and is contingent on how the expected number of deaths is derived. At the NAME Annual Meeting when additional information is available, a range of values using different assumptions will be presented.

In addition to death investigation duties and other contributions required during the pandemic, such as mass fatality-related, many medical examiners are reviewing certificates, case reports, and providing pathology and forensic expertise as it relates to cause of death and the death certificates, which improves the quality of the associated mortality data. This review is often done in conjunction with the state health department or the state vital registrar or both. These efforts will be highlighted during the presentation.

1.5 Interaction of the Opioid Epidemic with the COVID-19 Pandemic: Impacts on the MDI Community

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As COVID-19 struck the United States in January 2020 and transitioned to pandemic status, the opioid/fentanyl epidemic raged on. While finalized 2019 data from the CDC are not yet available, a review of available state data reveals that after a leveling off of deaths in 2018, the number of positive fentanyl cases again began to increase in 2019. As 2020 dawned, the nation's Medical Examiner/Coroner communities continued to answer the persistent call for comprehensive and timely autopsy and toxicology testing to inform the Nation on the drug crisis. With U.S. COVID-19 mortality projected to exceed 132,000 this summer, the interaction of these two crises are causing dramatic detrimental impacts to the work of strained MDI resources.

In 2017, the American Academy of Forensic Sciences formed a multi-disciplinary Opioids and Emerging Drugs ad hoc Committee whose members are forensic pathologists, death investigators, forensic toxicologists, forensic chemists, epidemiologists, academics, and

attorneys. As part of their work, the committee collects and analyzes opioid mortality data from a multidisciplinary perspective. In this presentation, members of the committee will present provisional local and regional data relating to trends and patterns in overdose deaths that occurred during the COVID-19 pandemic. For example, the Miami-Dade County Medical Examiner Department reported year-over-year increases in fentanyl positivity from postmortem toxicology casework through January - April of 2020 of 57%, compared to 2019, while NMS Labs saw an increase of 29% across multiple states during the same period. The month-over-month changes in positivity fluctuate more significantly, making it difficult to see the true impact of the interaction between COVID-19 deaths and opioid positivity. Fentanyl positivity was up in April over March in both the NMS Labs data and Miami-Dade data. As additional data become available through the spring and summer of 2020 and the peak of the first wave of coronavirus deaths are behind us presumptively, this interaction should become more apparent.

At the conclusion of this presentation, the attendee will understand the cumulative impact of the COVID-19 pandemic and the opioid / fentanyl epidemic on opioid and polydrug positivity in postmortem casework, and the likely future impacts on Medical Examiner/Coroner resources.

1.6 NAME Toxicology Committee Presents: COVID-19 Medications – Reference Data and Resource Information

L. Labay¹, C. Catanese², L. Apollonio³, G. Davis⁴, L. Decker⁵, A. Falzon⁶, A. Gonzalez⁷, W. Humphrey⁸, D. Isenschmid⁹, G. Jackson⁶, P. Jones¹⁰, F. Miller¹¹, K. Molina¹², R. Stoppacher¹³, J. Walterscheid¹⁴, M. Quinn¹⁵, J. Gevorkyan¹⁶, N. Lemos¹⁷

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As of mid-April 2020, COVID-19 has been attributed to more than over 150,000 deaths with more than 2 million confirmed cases worldwide. Even though no specific treatments exist beyond supportive care, several medications are being investigated in clinical trials and/or being prescribed under compassionate care guidelines. Examples of medications currently receiving attention in the media include the antimalarials, chloroquine and hydroxychloroquine; the antiviral drugs, remdesivir, ritonavir, and lopinavir; the antibiotic, azithromycin, in combination with hydroxychloroquine; the H2 blocker, famotidine; and the monoclonal antibodies, tocilizumab and sarilumab. As these treatments are studied and some administered to patients, it will be incumbent upon the pathologist and their support staff to have an understanding about these medications as they relate to COVID-19 treatment and impact on patient outcomes. The purpose of this presentation is to provide an overview of these medications to include chemical information, mechanism of action, pharmacokinetic parameters, trial research specific to COVID-19, side effects, reference range information, and interpretive considerations.

2.1 Flexion-Distract Fracture Resulting from Shaken Baby Syndrome

J. Plotzke, J. Jentzen

Michigan Medicine, Ann Arbor, Ann Arbor, Michigan, USA

Traumatic injuries to the vertebral column are rare accounting for approximately 1-3% of reported spinal injuries. Flexion-distract fractures were first described in 1948 as an injury that occurs when the spine is forcefully flexed forward, causing simultaneous compression of the anterior vertebral body and stretching of the posterior longitudinal ligament. With enough force, the ligamentous attachments themselves can rupture, or the vertebral body can fracture with an anterior or lateral dislocation. Distract and compression fractures of the spine have been well described in radiologic and orthopedic literature, but are rarely mentioned in forensic pathology literature and are most recognizably involving a lap-belted motor vehicle collision. This case represents a rare remote distract injury in a case of shaken baby syndrome.

We present the case of a 5-month-old female with brain death and injuries suspicious for child abuse. She presented one day prior to death to Michigan Medicine as a transfer from an outside hospital with intracranial hemorrhage. According to the infant's parents, she was placed into a swing without being properly secured and was found to have fallen to the ground some minutes later. After approximately two to three hours, she exhibited abnormal posturing and was unresponsive, with unequal pupils. Radiology at the emergency department revealed numerous fractures in various stages of healing and intracranial hemorrhage. Records revealed Child Protective Services had been previously involved with the family, however, the investigation was inconclusive at that time. Her mental status did not improve throughout the hospitalization, and she was eventually pronounced dead.

Gross examination was significant for diffuse brain swelling, subdural hemorrhage, cerebellar tonsillar herniation, laceration of the superior frenalum, rib fractures in various stages of healing, and most pertinent to this presentation, a distract fracture of L4-5. Microscopic examination revealed global hypoxic changes of the central nervous system and confirmed the fracture impressions from gross examination with a healing, remote distract fracture of the lumbar vertebrae. The cause of death was certified as: Abusive head and spine injuries with shaken baby syndrome considered a contributing factor. The manner of death was homicide.

In this case, we present the finding of a rare remote distract fracture of the lumbar spine, which is a unique finding that has not commonly been described in the setting of nonaccidental trauma. The injury is most commonly the result of hyperflexion-hyperextension forces and consistent with similar descriptions in the literature.

2.2 Neck Injuries and Other Findings in Pediatric Homicide Cases Versus Controls: An Institutional Case Series

C. Perez, A. Wilson, J. Jentzen

University of Michigan, Milan, Michigan, USA

Introduction: The mechanism of death in pediatric homicides involving abusive head/neck injuries has been a topic of recent study and debate. Matshes et al. proposed the mechanism in shaken baby syndrome to be hyperflexion/extension neck injuries with findings of cervical spinal root/ganglion hemorrhages that cause anoxia due to disruption of diaphragmatic breathing. These findings expanded on the previous triad of shaken baby syndrome; retinal hemorrhage, subdural hemorrhage, and anoxic brain injury. We aimed to investigate these findings and their significance in the interpretation of pediatric injuries at our institution.

Methods: Completed pediatric autopsy cases were collected from the autopsy service at the University of Michigan. Search criteria included pediatric autopsies in which cervical neck dissections were performed since 2012. We collected 13 cases with head and neck injuries that had manner of death certified as homicide. We also collected 18 control nonhomicide cases. We then reviewed the completed autopsy reports and ancillary materials to document metrics including age, sex, presence of skull fractures, brain, retinal, and cervical nerve hemorrhage; anoxic brain injury, rib fractures, and case history. The results between groups were then compared.

Results: In the homicide cases, there were increased rates of skull fractures; brain, retinal/optic nerve, and cervical nerve hemorrhage; anoxic brain injury, rib fractures, other fractures, and contusions. All of these rates were increased by at least 23% from controls (absolute percentage difference). Metrics that had at least a 50% difference between the two included subdural hemorrhage, retinal/optic nerve hemorrhage, diffuse anoxic injury, rib fractures, and other fractures. Cervical ganglion hemorrhage had an absolute difference of 47%, sensitivity of 69.2%, specificity of 77.8%, positive predictive value of 69.2%, and negative predictive value of 77.8%. Gender makeup and average age were similar in the homicide group (61.5% male, 4.8 months, range 1.5-18) versus control group (50% male, 5.25 months, range 1.75-33).

Discussion: We believe that performing routine cervical neck dissections in pediatric autopsies, especially those in which abuse is suspected or cannot be ruled out, is not only useful in fully documenting the extent of injuries, but can assist in the determination of the manner of death. In conjunction with an investigation of the scene and circumstances, the statistical results of the above findings can assist in the assessment of the probability that inflicted head and neck injuries were the cause of death. This study strengthens the statistical likelihood analysis of the interpretation of these injuries.

2.3 Understanding the Pathology of Homicidal Pediatric Blunt Neurotrauma through Correlation of Advanced Magnetic Resonance Images with Histopathology

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In the United States, approximately one-third of children who are victims of abusive head injury die and those who survive have worse neurological outcomes compared to children who survive accidental head injuries. Current forensic pathology practice relies on autopsy examination with comprehensive neuropathological examination for the diagnosis of fatal nonpenetrating blunt head injury. Although considered the gold standard for forensic pathology, neuropathologic examination may be limited, particularly in the evaluation of traumatic axonal injury. The use of advanced magnetic resonance (MR) imaging may facilitate the forensic examination of brains, allowing the pathologist to target specific regions that may not be macroscopically visible during examination. In order to evaluate whether MR imaging supplements the neuropathologic evaluation of traumatic brain injury in homicidal pediatric blunt head trauma, this study compares standard routine neuropathologic examination to examination guided by any findings detected on advanced MR. *Ex vivo* formalin-fixed brains removed at the time of forensic autopsy on children ages birth to 15 years who died as a result of abusive head injury (non-penetrating) underwent 7T MR imaging within a 3D printed brain holder including diffusion tensor imaging (DTI), T2 weighted, T1 weighted, and susceptibility weighted imaging (SWI). MR images were visually assessed by a neuroradiologist to evaluate for any focal findings that might help guide pathological evaluation, followed by examination by a forensic

neuropathologist, with radiologic/histologic correlation. This study is an ongoing study that has collected data from 4 control studies (ages one month to one year) and three blunt head trauma cases (ages one year to five years). Macroscopic brain examination included histologic sections of the anterior and posterior corpus callosum, internal capsule, midbrain, pons, and cervicomedullary junction with immunohistochemistry for amyloid precursor protein (APP), as well as immunohistochemistry for CD68, p62, and GFAP on select sections. Thus far, neuropathologic examination has demonstrated traumatic axonal injury patterns with APP, while T1W, T2W and SWI MR has shown no visible evidence of subtle axonal injury or other significant anatomic findings that weren't visible by macroscopic examination. Studies are underway using advanced MRI, including diffusion tensor imaging (DTI) and more cases are being collected for quantitative comparison to controls.

2.4 Inferior Vena Cava Lacerations and Liver Embolus to the Lung Resulting from Nonaccidental Injury of the Abdomen

K. Hoerschgen, K. Snell

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Homicide is the second-leading cause of death amongst children aged one to 19 years of age. Head injuries remain the most common form of injury, while abdominal injuries are second. Intentional blunt abdominal trauma can cause damage to the liver, spleen, kidneys, adrenals, and small bowel. The damage to the liver can include lacerations, subcapsular hematomas, contusions, and avulsions of tissue. Vascular injuries rarely occur, with most reported cases involving the aorta. However, minimal information exists on inferior vena cava lacerations in nonaccidental abdominal blunt trauma. Here, two cases of nonaccidental abdominal blunt trauma inflicted on a three-year-old and four-year-old child are presented. The first case involves a four-year-old child who was discovered unresponsive in his bedroom and later died at a local hospital. At autopsy, numerous contusions and abrasions of varying ages were observed on the body. Bilateral rib fractures with associated right-sided pneumothorax, laceration of the caudate lobe, transection of the left liver lobe with free tissue in the left upper peritoneal cavity, and hemoperitoneum were identified. The inferior vena cava adjacent to the caudate lobe was lacerated, with liver tissue extending into the vessel and into the left pulmonary artery creating a true liver embolus. Other injuries identified included mesenteric hemorrhage, transection of the head of the pancreas, and right adrenal gland laceration. The second case is a three-year-old child that was found unresponsive in the bottom bunk bed. Earlier that week, the child had fallen off the top bunk bed and off the trampoline. At autopsy, multiple contusions and abrasions of various ages were identified all over the body. Internally, the superior dome of each diaphragm and the right adrenal medulla had hemorrhages and the transverse colon mesentery had a laceration with associated hemorrhage. Extensive damage to the liver was identified and included retroperitoneal hemorrhage, an avulsed caudate lobe that was located posterior to the stomach, and a parenchymal laceration. The anterior portion of the inferior vena cava deep to the caudate lobe had a laceration. The child in the first case received cardiopulmonary resuscitation, while the second did not. While abdominal injuries are well-documented in accidental trauma, nonaccidental trauma, and resuscitative efforts, inferior vena cava lacerations and liver emboli are not documented. These cases represent interesting findings and add knowledge to the different types of injuries that can be encountered in nonaccidental abdominal blunt trauma.

2.5 Deadly Delays in Newborn Screening

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¹University of Tennessee Medical Center Knoxville, Knoxville, Tennessee, USA; ²Knox County Regional Forensic Center, Knoxville, Tennessee, USA

Newborn screening (NBS) is one of the most successful public health initiatives of modern times. It was created to detect metabolic disorders early to treat newborns quickly, preventing or limiting brain damage and avoiding death. Required by law in every state and coordinated by state labs, NBS reaches virtually every newborn in the United States. Approximately one in every 800 newborns has a potentially life-threatening condition that can be treated with a special diet if properly tested. We present the case of a two-day-old, full-term male who was born without complications on a Friday in 2014. Sunday, as he was being fed by his mother, he became lethargic. Fifteen minutes later, he was not breathing, and despite resuscitative efforts, he never regained consciousness. Autopsy findings were unremarkable aside from the liver histology, which revealed diffuse microvesicular steatosis. NBS results, received Wednesday, revealed medium-chain acyl-CoA dehydrogenase deficiency (MCADD), a condition where medium-chain fatty acids are not metabolized properly. Fatty acids build-up in tissues causing death or brain damage. MCADD is the most common fatal inherited disorder of fatty acid metabolism, with a prevalence of one in 15,000. However, if diagnosed early, it can be managed with regular feedings and a lifelong low-fat diet. Although the premise of NBS is to detect disorders quickly, thousands of tests are delayed every year. Delays can be catastrophic, marking the difference between death or brain damage and a healthy child on a modified diet. Unfortunately, the administration of NBS is so inconsistent among states that an affected newborn in one state could have a worse outcome than one from another state. In 2013, in Colorado, two babies with MCADD were born the same week. The first baby was born on Tuesday and is now healthy and thriving. The second baby was born on Friday and died Tuesday night; NBS results were received Wednesday. Like many states, the lab was closed on weekends, resulting in a delayed diagnosis. Reporting of these Colorado and Tennessee cases prompted the state labs to institute NBS testing on Saturdays. Unfortunately, despite the potentially fatal consequences, there are still currently 14 states that do not have weekend testing. We recommend that forensic pathologists report similar deaths due to delayed NBS testing in order to prevent similar deaths in the future.

2.6 Focus on Preschool-Aged Drowning: How Death Scene Investigation Can Inform Policy and Prevention

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Drowning is a leading cause of unintentional injury death among children. According to the Centers for Disease Control and Prevention, between 2005 and 2014 there were an average of 3536 fatal, unintentional, non-boating related drownings annually in the US. This is the equivalent of 49 school buses full of children with 72 children per bus. In 2014, among children one to four years old who died from an unintentional injury of any kind, one in every three died from drowning. Within this same age group, those who drown are likeliest to drown in a home pool, while children five years and older are more likely to drown in natural water, such as ponds, lakes, or rivers. For pool submersions, 75% of children less than five years of age had been missing for less than five minutes and 69% of cases were unplanned swimming exposures. For every child who dies from drowning, another five receive emergency department care for nonfatal submersion injuries.

Drowning is now the number one cause of death in children one to four years of age despite policy attempts to bolster layers of protection including caregiver supervision and limiting access by barrier methods. A 2009 landmark study for the first time showed a protective role of formal swim lessons in this vulnerable age group, yet the confidence interval was imprecise due to small sample size. The authors highlighted the need for medical examiners to collect information about swimming ability and past participation in formal swimming lessons" as part of the routine investigation. Presently, little is still known about the protective role of differing types of formal swim lesson programs in this age group due to a lack of detailed drowning death investigation data pertaining to this layer of protection. The consequence of this limited understanding results in vague pediatric injury prevention policy guidelines to parents and pediatricians on preschool-age swimming instruction.

Using data from the National Fatality Review-Case Reporting System collected by child death review teams across the country and other available research, the presenters will discuss what is known about child drownings; the gaps in understanding and data limitations; and potential for improved primary prevention driven by more granular death scene investigations in youth drownings, including that of nonfatal drownings. The presenters will also make the case for a process for collecting standardized, in-depth drowning data to include decedents' history of past participation in formal swim lessons and level of water competency obtained.

2.7 Investigating the Completeness of Death Investigation Information Reported to the Sudden Unexpected Infant Death (SUID) Case Registry

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Introduction: The medicolegal community is a critical partner in public health surveillance and child death review, which are important programs for understanding the etiology of sudden unexpected infant deaths (SUID). There may be barriers for medical examiner offices to complete and document SUID investigations. The Centers for Disease Control and Prevention's SUID Case Registry classification system can identify gaps in the documentation of SUID investigation data reported to the Registry. We assessed SUID cases classified as *Incomplete Information* for the completeness of SUID scene investigation and autopsy information reported to the Registry.

Methods: Cases classified as *Incomplete Information* per the Registry's classification system that occurred from 2013-2017 in 18 Registry states/jurisdictions were characterized. SUID cases included those with a cause of death determination on the death certificate indicating SIDS, SUID, undetermined, known, unintentional sleep-related asphyxia/suffocation, or other ill-defined causes with an unsafe sleep factor. Deaths were classified as *Incomplete Information* when they lacked documentation of autopsy or death scene investigation, and among those with a documented autopsy and death investigation, missing data on toxicology, imaging, pathology, known found position or known found location. We determined the trend in the proportion of cases classified as *Incomplete Information* during 2013-2017 using linear regression models. We explored the reasons cases were categorized as *Incomplete Information* for deaths occurring in 2017 by quantifying missing scene investigation and autopsy components.

Results: We observed a significant decreasing trend in cases classified as *Incomplete Information* from 36% (178/494) in 2013 to 21% (185/862) in 2017. In 2017, 5% of the *Incomplete Information* cases did not have an autopsy and 8% did not have a death scene investigation. In 2017, among

cases with a documented death scene investigation and autopsy, the percentage of missing components were: 44% position found, 40% imaging, 21% pathology, 18% toxicology, and 11% location found.

Discussion: Documentation and reporting of SUID death scene investigation and autopsy to the SUID Case Registry improved from 2013 to 2017. In 2017, although >90% of SUID cases had a documented death scene investigation and autopsy, many cases lacked documentation of imaging and the found position. With Registry participants and the medicolegal community working together, documentation of case investigations reported to the Registry can be further improved. Improved death investigation and autopsy documentation at a population level may lead to increased understanding of how and why SUID occurs, and ultimately lead to a reduction in these deaths.

3.1 Novel Evaluation of Submandibular Salivary Gland Tissue for use as an Alternative Postmortem Toxicology Specimen

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Biological specimens collected during autopsy and submitted for toxicological analysis provide valuable information in determining the cause of death in cases of suspected drug overdose. Specimens commonly collected during autopsy include central and/or peripheral blood, vitreous fluid, urine, and occasionally cerebral spinal fluid, bile, gastric contents, and various other tissues. It is advantageous to collect blood from more than one location and to collect more than one type of specimen for autopsy cases, thus providing an opportunity for a comparison of analytical results. Occasionally during autopsy, there is a lack of appropriate alternative postmortem specimens from which to make a comparison.

In this study, we present the use of the submandibular salivary gland as an alternative postmortem sample source in cases of suspected drug overdose. The testing of saliva for drug screening is commonplace in living individuals, and we hypothesized that numerous drugs and their metabolites will be present postmortem in submandibular salivary gland tissue.

The submandibular salivary glands of 52 subjects from both drug-negative and drug-positive cases, were removed during autopsy and a portion of the tissue was homogenized. A solid phase tissue extraction was performed on the supernatant, then analyzed using liquid chromatography tandem mass spectrum (LC-MS/MS). These results were then compared to LC-MS/MS analyses of corresponding postmortem blood samples. Both the salivary gland and blood samples were analyzed for 48 different opioid and non-opioid drugs/drug metabolites.

Twenty-three opioid and nonopioid drugs/drug metabolites were identified in the salivary gland tissue, each with varying degrees of sensitivity and specificity. However, when accounting solely for opioids, the salivary gland tissue had a sensitivity of 0.944 and a specificity of 0.941. While 25 drugs/drug metabolites included in this study were not identified in the salivary gland tissue, in the corresponding blood samples these substances were likewise not identified; thus suggesting that these 25 substances were most likely not present in the decedents; therefore, the potential for their detection in salivary gland tissue could not be determined. To our knowledge, this is the first example of salivary gland tissue being used for postmortem toxicology testing. Our findings suggest that submandibular salivary gland tissue is a suitable alternative postmortem sample for both opioid and non-opioid drugs/drug metabolites when compared to postmortem blood samples.

3.2 Kratom-Associated Fatalities in Northern Nevada – What Mitragynine Level is Fatal?

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Mitragyna speciosa, also known as the Kratom tree, has been utilized for centuries in Southeast Asia both medicinally and recreationally for its opioid-like effects at higher doses and stimulant-like effects at lower doses. The active compound is mitragynine, an indole alkaloid that acts as a mu-, kappa-, and delta-opioid receptor agonist. Despite the lack of clinical research to determine the safety and efficacy of Kratom, the use of this extract has become widespread. In the United States, Kratom has grown in popularity due to the ease of access via the internet; it is legal in all but six states. With increased usage, more fatalities have been observed associated with Kratom use.

We present 35 deaths in Northern Nevada in which mitragynine was detected and quantitated. Cases were identified from the timeframe 2015 to spring 2020 from the Washoe County Regional Medical Examiner's Office VertiQ database. The selected cases fell into one of two categories: mitragynine was listed on the death certificate as part of the cause of death or under contributory conditions; or, mitragynine was detected on toxicology testing but not listed as a cause or contributory factor.

Blood samples were analyzed by National Medical Services Laboratories for mitragynine using high-performance liquid chromatography/tandem mass spectrometry (LC-MS/MS). For those cases with drug toxicity as the cause of death, mitragynine concentrations ranged from 8.7-1,800 ng/mL (n=28). In only one case was mitragynine listed as the sole intoxicant for the cause of death; the blood concentration was 950 ng/mL. In cases with another cause of death like trauma, where mitragynine was detected in blood but not listed as a cause or contributory factor, blood concentrations ranged from 110-980 ng/mL (n=7). There was no statistically significant difference between cases where mitragynine was detected in blood but not listed as a cause of death (mean = 344.3 ± 308.3 ng/mL) and cases in which mitragynine contributed to death (mean = 263.7 ± 376.6 ng/mL, p<0.155).

Ten other studies have reported fatalities involving mitragynine with blood concentrations from 16-4,800 ng/mL (n=31; mean = 769.5 ± 1,074.3 ng/mL). The concentrations vary widely due to the combined effects of other substances, medical conditions, and body mass index that ultimately led to lethal outcomes. This report and review of the literature establishes a potential lethal range for mitragynine in mixed drug intoxications, and reports the drug concentration in a fatality in which mitragynine was the sole intoxicant implicated.

3.3 Use of Qualitative In-House Drug and Toxicology Testing by the King County Medical Examiner's Office in Seattle, WA

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As the drug overdose epidemic has challenged the timeliness of toxicology reporting, which in turn burdens death investigation systems and delays death certification, qualitative in-house testing has potential merit for medical examiners. As a response to this problem, the King County Medical Examiner's Office (KCMEO) in Seattle, WA developed several in-house methodologies for toxicology and drug evidence testing. An algorithm for probable overdose death was used to triage cases for in-house testing, contingent upon the availability of blood, urine, and drug evidence. Drug evidence collected from the scene was tested at KCMEO by ThermoFisher TruNarc™ and Rigaku ResQ™ Raman spectrometers and MX908™ high-

pressure mass spectrometer. Blood samples obtained at autopsy were tested by Randox Evidence MultiSTAT™ automated immunoanalyzer; urine was tested using One Step Detect Multi-Panel Forensic Test urine cups. Cases had confirmatory blood or drug evidence testing at the Washington State Patrol (WSP) Laboratory.

From 1 January 2019 to 28 April 2020, there were 604 confirmed fatal drug overdose deaths. Randox testing was performed on 667 cases and urine screening on 522 cases. In-house drug evidence testing was performed on 445 cases; of these, 193 (43%) were sent to WSP. Randox testing relative to WSP results had sensitivity ranging from 85 to 100% and specificity ranging from 86 to 98% for fentanyl, opiate, cocaine, and methamphetamine. Drug evidence testing was evaluated in aggregate and compared to final WSP crime lab test results. Sensitivities were 61% for fentanyl, 88% for opiates, 90% for cocaine, and 84% for methamphetamine. Scene investigation, postmortem examination, drug evidence testing, and urine/blood testing were taken together to certify overdose deaths. In 309 deaths that otherwise would have been delayed until WSP toxicology results, death certificates were certified based on Randox results. Of these, 8 required removal of a drug listed on the original death certificate, and no certificates were changed from overdose to a different cause of death. Over the study period, the average time from postmortem examination to certification of death due to overdose dropped from 75 days to 31 days.

In-house testing of biologic and drug evidence in suspected overdose deaths provides timely information for families, law enforcement, and public health. For medical examiners, a well-established algorithm and a minimum of two independent positive tests per drug result in expedited death certification. Furthermore, during the COVID-19 pandemic, in-house testing reduces the number of autopsies required, helping to limit biohazard risk and conserving valuable resources.

3.4 6-Acetylmorphine as an Impurity in Cases with Extremely Elevated Morphine Concentrations

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Heroin is an illicit, highly addictive drug that has caused lethal outcomes. Several routes of administration exist, but once introduced into the body heroin undergoes rapid deacetylation to 6-acetylmorphine (6-AM) and then to morphine. 6-AM is often considered unequivocal proof of heroin use. Interpretation of opiate results can be complex. This is because opioids undergo extensive biotransformation, and genetic polymorphism can influence parent to metabolite ratios. The unexplained presence of 6-AM without morphine in urine, and *in vivo* formation from co-administration of aspirin and morphine has also been reported. These intricacies are now extended to include the purity of the administered morphine; 6-AM as an impurity may be identified in a biological specimen if a sufficient quantity of morphine is administered.

This work was prompted when in a handful of postmortem blood cases, low 6-AM concentrations (<5.0 ng/mL) were observed with extremely elevated morphine concentrations (>5,000 ng/mL). One case showed 43,000 ng/mL morphine with 1.3 ng/mL 6-AM with the case history stating the decedent took morphine. A second case showed 6,100 ng/mL morphine with <1.0 ng/mL 6-AM with the case history stating the decedent was a 95-year-old female that took liquid morphine. The low 6-AM concentrations in combination with case histories not supportive of heroin use warranted further investigation.

Two matrix types were evaluated: blood samples prescreened negative for 6-AM and water blanks. Samples were fortified with 10,000 to 100,000 ng/mL morphine, codeine, and mixtures of morphine and codeine. Some samples underwent extraction prior to LC-MS/MS testing and others did

not. Results showed that approximately 2.0 ng/mL 6-AM was identified in all morphine containing extracted blood and nonextracted water samples. The water sample data demonstrates the source of the 6-AM is not due to the extraction process. Based upon these findings, Certificates of Analysis were evaluated to determine if 6-AM can be present in manufactured morphine solutions. While not every lot of material showed the presence of 6-AM, some did. One had a certified concentration of morphine at 1.000 ± 0.0005 mg/mL, but also contained 10.5 ng/mL of 6-AM. It was concluded that 6-AM is not being created during the sample extraction process and that morphine products may contain 6-AM as an impurity.

This work underscores that the presence of 6-AM in cases with extremely elevated morphine concentrations must be evaluated in context with case history and should not be taken as definitive evidence that heroin was used.

3.5 NAME Toxicology Committee Presents: Contemporary Interpretation of Fentanyl Results

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Fentanyl is a potent μ -opioid agonist used for intraoperative analgesia and to manage chronic intractable pain. In prescription form, it is available as an oral transmucosal lozenge, transdermal patch, and as an aqueous solution for intravenous or intramuscular injection. It is, however, subject to diversion, abuse, and illicit manufacturing practices. From 2005 to 2007, the Drug Enforcement Agency identified over 1,000 deaths associated with illegally manufactured fentanyl. By 2017, more than 20,000 deaths in the U.S. were attributed to fentanyl and its analogues.

Interpretation of postmortem toxicology results includes evaluating several variables including scene investigation, autopsy findings, a review of prescription and medical records, and a comparison of the case concentration with concentrations that have been attributed to therapeutic or lethal outcomes. From this perspective, it is important to study fentanyl concentrations in the user population especially during this time of widespread opioid abuse to determine if the span of blood concentrations in living individuals overlaps that of blood concentrations traditionally associated with cause of death. An assessment of fentanyl blood concentrations in samples collected for driving under the influence of drugs (DUID) investigation purposes in 2019 (n=1900) shows the following result distributions: 100-140 ng/mL (n=4, mean = 125 ng/mL); 77-97 ng/mL (n=5, mean 83 ng/mL); 50-69 ng/mL (n=6, mean 57 ng/mL); 30-48 ng/mL (n=37, mean 35 ng/mL); 20-29 ng/mL (n=66, mean 23 ng/mL); 15-19 ng/mL (n=83, mean 16 ng/mL); 10-14 ng/mL (n=189, mean 11 ng/mL); 5.0-9.9 ng/mL (n=512; mean 7.0 ng/mL); 3.0-4.9 ng/mL (n=295; mean 3.9 ng/mL); 1.0-2.9

ng/mL (n=427; mean 1.9 ng/mL); 0.99-0.11 ng/mL (n=276; mean 0.55 ng/mL). Other drugs for each individual case may have been present.

A review of the data shows it is difficult to differentiate therapeutic, impairing, and overdose events based solely upon drug concentrations in the absence of other relevant information. The extreme fentanyl concentrations (e.g., >50 ng/mL) found in some DUID cases underscore the body's ability to develop tolerance. Interpretation of fentanyl results is even more complex today compared to the time when the main source was prescribed medications. This presentation will focus on the concentration ranges that have been observed over the last several years in DUID and postmortem cases to show the concentration overlap, the need to consider tolerance including the use of norfentanyl as an indicator of such, and other factors including significant underlying pathology, when interpreting results for cause of death determinations.

3.6 NAME Toxicology Committee Presents: Looking Ahead to Toxicology in 2021

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Toxicology is an important component of postmortem investigation work and, therefore, it is relevant to discuss topics that affect its practice. The purpose of this presentation is to highlight those topics that we believe will have special interest in 2021 for death investigators who rely upon toxicology results for cause and manner of death determinations.

There is reason to have confidence that some trends observed over the past several years, such as the frequency of opioid (e.g., fentanyl) and stimulant (e.g., methamphetamine) positive findings, will continue to increase. In this regard, laboratory work should always include these core drug classes in their standard analytical tests. In addition to drugs, however, it is important to have some mechanism to identify other nondrug substances that can lead to a lethal outcome.

A proportion of laboratory testing is best described as specialty testing; these are not the high volume analyses (e.g., ethanol, drugs of abuse, benzodiazepines) and are not representative of the routine testing a laboratory performs on every case received. Yet, on a case-by-case basis, these specialty tests become important when a suspicion based upon case history requires analytical verification. Prime examples include suicide by chemicals involving solutions made with sodium nitrite or sodium azide, death by asphyxiation due to gases such as helium or lack of oxygen (e.g., low carboxyhemoglobin saturation with a running car in a confined space), and poisoning via ingestion of commercial household products such as bleach, acids, solvents, and pesticides. Directed tests for some of these

analytes are not available in all laboratories, are extremely challenging or laborious to perform, or simply do not exist. In some cases, indirect markers of exposure are used (e.g., cholinesterase for organophosphate pesticides), but these might not be satisfactory for all cases. The analytical challenges, the current state of testing for these substances, and strategies to identify or indicate their presence will be discussed to aid in the investigation of non-drug deaths.

4.1 Fentalogs in Postmortem Investigations, January 2018 – April 2020

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Fentalogs were detected in approximately 19% of opioid-involved overdose deaths (n = 14,571) reported between July and December 2018 in 28 states and the District of Columbia (1). Since fentalogs vary greatly in potency and popularity, this presentation aims to provide current information on fentalog trends. In addition, the pharmacokinetics and pharmacodynamics of the most commonly identified fentalogs will be reviewed as well as toxidromes and common autopsy findings.

From January 2018 to April 2020, NMS Labs identified greater than 9,000 fentalogs in postmortem blood specimens; these include 7,274 acetylfentanyl, 349 cyclopropylfentanyl, 333 carfentanil, 322 methoxyacetylfentanyl, 309 valeryl fentanyl, 254 para-fluorobutylfentanyl (FIBF), 152 2-furanylfentanyl, and 28 acrylfentanyl identifications. While FIBF, cyclopropylfentanyl, and methoxyacetylfentanyl were prominent in 2018, confirmations for these analogs decreased as valeryl fentanyl and 2-furanylfentanyl identifications increased in 2019. Acetylfentanyl and carfentanil were consistently identified throughout the time period evaluated. Based on NMS testing, identifications of cyclopropylfentanyl and acrylfentanyl were concentrated in the Midwest, whereas others such as FIBF were concentrated in the Northeast. The remaining fentalogs were predominantly identified across the East Coast and Midwestern United States.

The most commonly identified fentalogs in this data set with noted average blood concentrations (and ranges) were: 4.8 ng/mL (0.1 – 560 ng/mL) acetylfentanyl, 11 ng/mL (0.05 – 330 ng/mL) cyclopropylfentanyl, 0.84 ng/mL (0.05 – 110 ng/mL) carfentanil, and 61 ng/mL (0.05 – 7,200 ng/mL) methoxyacetylfentanyl. While these compounds produce fentanyl-like effects, their potency varies from 10,000 times that of morphine with carfentanil to approximately 16 times that of morphine with methoxyacetylfentanyl and acetylfentanyl. The most common fentalogs are stable in blood and urine for at least 30 days under room temperature, refrigerated (4°C), and frozen (-20°C) conditions. Aside from the parent compounds, testing blood or urine for known metabolites of these common fentalogs may also prove useful, as multiple metabolites have been identified, including many normetabolites and 4-ANPP.

Common autopsy findings in fentalog cases include general central nervous system depression with cerebral edema, pulmonary congestion and edema, and generalized visceral congestion. Current trends imply that fentalogs will continue to play a role in drug overdose deaths in the future. Knowing the most commonly identified analogs may help direct toxicological testing and provide answers in death investigations.

1. O'Donnell J, Gladden RM, Goldberger BA, Mattson CL, Kariisa M. Notes from the Field: Opioid-Involved Overdose Deaths with Fentanyl or Fentanyl Analogs Detected — 28 States and the District of Columbia, July 2016–December 2018. *MMWR Morb Mortal Wkly Rep* 2020; 69:271–273. DOI: <http://dx.doi.org/10.15585/mmwr.mm6910a4external icon>.

4.2 Testing for Barium Before You Bury 'Em

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Barium is a silvery white alkaline earth metal found naturally in the environment. Because of its high reactivity with oxygen and water, barium is encountered combined with other elements as solids, powders or crystals. Barium is used in many industries, such as oil and gas, pest control, ceramic and glass production, and even medicine. Barium sulfate is utilized as a radio-opaque contrast agent to visualize the gastrointestinal tract. Because it is not water-soluble, it is not readily absorbed by the body and is therefore considered nontoxic. Other barium compounds, such as barium chloride, barium nitrate, and barium acetate, are water-soluble and subsequently can be toxic if ingested. Exposure to barium can be through the environment, water, and certain foods, although usually not in concentrations high enough to be toxic. Many glass and rubber products contain barium, so special metal-free containers must be utilized for toxicology testing to accurately interpret the results.

Symptoms of barium poisoning include vomiting, diarrhea, abdominal cramps/pain, cardiac arrhythmias due to hypokalemia, and respiratory failure due to muscle weakness. The hypokalemia is thought to result from disruption of the sodium-potassium pump resulting in redistribution of the potassium from extracellular to intracellular. The marked reduction in potassium in the blood results in cardiac arrhythmias, such as prolongation of the PR interval, ST segment depression and T wave inversions, which can result in sudden death. Often no clues exist at the scene to suggest barium poisoning; therefore, in autopsy negative suspicious deaths, consider preserving blood in a metal free tube.

This presentation will describe the circumstances and autopsy findings of two women who died suddenly, five years apart, after experiencing similar symptoms while married to the same man. The first wife's death was classified as undetermined. After the second wife's sudden death, the first wife was exhumed for further examination. Toxicologic findings will be discussed, including barium testing on multiple samples.

4.3 Toxic Adulterant Cutting Agents and Emerging Issues

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Illicit drugs, such as heroin, fentanyl and methamphetamine, may be combined with other pharmacologically active substances for the purpose of increasing profits or masking a poorly made product with a compound that has a similar psychoactive effect. These adulterants have the potential to cause or contribute to death aside from the presence or absence of the traditional illicit drugs, contributing to the morbidity and mortality in U.S. population. Utilizing data from seized paraphernalia in combination with toxicological data in combination is beneficial for medical examiners for a complete assessment of all substances contributing to death.

The objective of this presentation is to highlight the most commonly encountered adulterants detected in the analysis of seized drug materials and routine toxicology casework from various locations around the United States.

Common adulterants identified in seized drugs from 2018 - 2019 included caffeine, levamisole, acetaminophen, lidocaine, diphenhydramine, vitamin E acetate, phenacetin, benzocaine, salicylic acid, procaine, xylazine, and quinine. Recently, vitamin E acetate made headlines as an adulterant found in vaping products that causes adverse pulmonary effects. Also, the presence of xylazine, a tranquilizing agent used in veterinary medicine, has increased in cases involving opioids, notably fentanyl and heroin.

The prevalence of these substances was evaluated in both the states of Pennsylvania and Texas to provide a perspective into regional differences. Postmortem and human performance toxicology casework was compiled to corroborate the findings in seized evidence and gain insight into demographic and combined drug use trends.

4.4 Eutylone Intoxications: An Emerging Synthetic Stimulant in Forensic Investigations

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Synthetic stimulants/hallucinogens are the largest class of novel psychoactive substances (NPS) identified each year by forensic laboratories internationally. While hundreds of these drugs appear in seized drug investigations, only a few become popular, eventually emerging in postmortem and clinical intoxications. Beta-keto-methylenedioxyamphetamines (e.g. butylone, ethylone, N-ethylpentylone, methylone) are currently the most popular subclass of synthetic stimulants. Leading up to its federal scheduling in 2018, N-ethylpentylone was the most commonly encountered NPS stimulant. Its popularity declined once it was scheduled, but it was quickly replaced by eutylone (bk-EBDB), a structurally-related analogue from the same family of NPS.

In cases encountered between January 2019 and April 2020, eutylone was quantitatively confirmed in 80 forensic investigations, including 67 postmortem cases and seven driving under the influence of drugs (DUID) cases. Sample types included blood, urine, and tissue. Eutylone was identified in cases submitted from thirteen states, demonstrating proliferation around the United States; Florida accounted for 60% of the positive cases. The mean concentration of eutylone in postmortem blood was 1,020±2,242 ng/mL (n=67, median=110 ng/mL, range= 1.2-11,000 ng/mL). The mean concentration of eutylone in blood from DUID cases was 942 (n=7; SD=1,407 ng/mL; median=140 ng/mL, range=17-3,600 ng/mL). Of the twenty postmortem cases where blood was submitted with case histories, three apparent drug overdose cases with no other significant toxicological findings had blood eutylone concentrations of 1,100, 3,100, and 4,400 ng/mL.

Polysubstance use was common, with fentanyl, cocaine and benzodiazepines being among the most frequent drugs detected along with eutylone. Several cases had medical histories of pre-existing heart disease.

Eutylone and other emerging NPS stimulants/hallucinogens may not be part of routine toxicology panels, depending on laboratory resources. Cases with histories suspicious for illicit drug use where routine test results are inconsistent with the scene or history should be considered for more enhanced analysis.

5.1 Medicolegal Death Investigation of Railroad-Related Fatalities

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According to the National Transportation Safety Board, 1,000 railroad-related fatalities occurred in the United States in 2018, compared to 703 in 2016 and 761 in 2017. The railroad industry reports train-related fatality statistics to the Federal Railroad Administration (FRA) of the US

Department of Transportation. According to the FRA, between 2010 and 2020, Michigan had 63 railroad fatalities. Most fatalities occurred in June and July. We report on a subset of train-related deaths occurring in western Michigan and propose protocols for investigating train-related deaths.

From 2015 to 2019, 14 train-related fatalities occurred in multiple counties in western Michigan, which included nine (64%) pedestrian versus train and five (36%) motor vehicle versus train cases. The average age was 32 years and male victims (64%) were more common than females (36%). The manner of death was accident in 11 deaths (79%) and suicide (all pedestrians) in three deaths (21%). Seven (50%) individuals had reported mental illness or recent stressors prior to death. Potentially important information when investigating train-related deaths include weather conditions and visibility, railroad safety mechanisms, train speed, decedent's position and actions when struck, and review of available image and audio recordings. While such information can be extremely important when investigating a train-related death, we found that, with the exception of basic weather conditions, the remaining information listed above was rarely reported in all death investigative reports. Only three (21%) deaths reported the availability of train image and audio recordings, with only one (7%) where an investigator reported the opportunity to view the recording at the death scene. In none of the cases were the train recordings provided to the medical examiner's office.

Regulatory oversight and laws regarding railroad-related fatalities are in development, in large part due to national attention following train collisions that result in multiple fatalities in which engineers operating the trains cannot recall the circumstances of the accident.

The FRA has recently proposed a new rule that would require the installation of inward- and outward-facing image recording devices on all lead locomotives in passenger trains to aid railroad accident investigations. While much is reported in the literature regarding injuries sustained in railroad-related deaths, little to no literature exists regarding the medicolegal death investigation of railroad-related deaths. We propose a stepwise approach to ensure a thorough medicolegal death investigation and identify strategies to obtain train image and audio recordings to best understand the circumstances of train-related fatalities.

5.2 Accidental Deaths Involving Trees: Professional and Non-professional Woodcutters and Tree Failures with Autopsy Findings

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We present 64 accidental fatalities involving trees, including storm-related injuries from falling trees and occupational hazards of tree removal.

We reviewed all accidental deaths in Connecticut involving a tree (struck by a tree/tree limb; other injuries and falls associated with tree removal operations). Records of the Connecticut Office of the Chief Medical Examiner including autopsy, toxicology, and investigators' reports of deaths from 2004-2019 were reviewed. All underwent autopsy and toxicological examination. Motor vehicle collisions in which the vehicle, for any nontree related reason, struck a tree after driving off the road were excluded.

There were 64 fatalities with ages ranging from 4 to 90 years (mean: 50 years) and racial/ethnic breakdown of 51 White, 8 Hispanic, 3 Black and 2 Asian. Overall, the causes of death involved: 56 (88%) blunt injury (primary site: 25 head, 13 severe combined multisite, 11 torso, and seven neck), five traumatic asphyxial, two electrocution, and one chainsaw injury. They were divided into three groups: 21 nonprofessional woodcutters, 19 professional woodcutters, and 24 tree failures. Among all woodcutters, impact by a

falling tree/limb (78%) was the most common fatal event, and the most common lethal injury site was head (45%). For tree failures, 58% involved storm/high wind events and 42% were spontaneous failures. Of the tree failure events, 58% involved motor vehicles with most (86%) occurring while driving. For primary injury site in these instances, head (29%) and combined multisite trauma (29%) were most common. Ethanol was detected in six decedents with blood concentrations from 0.02 to 0.19 gm% of which four were nonprofessional woodcutters and two were professional.

Overall, fatalities of nonprofessional woodcutters, compared to professionals, more likely involved an older man (58 years vs. 40 years), working alone (67% vs. 11%), under the influence of alcohol (19% vs. 11%), in late summer-autumn who dies from a blunt head trauma from a fallen tree or tree limb. Aggressive tree control management along highways has been used to attempt to decrease storm-related fatalities.

5.3 Examining Differences In Injury Survivability Determinations Between Medical Examiners and Trauma Surgeons Evaluating Pre-hospital Trauma Deaths

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Introduction: The Multi-Institutional Multi-Disciplinary Injury Mortality Investigation in the Civilian Pre-Hospital Environment (MIMIC) study was conceptualized to characterize the survivability of civilian pre-hospital injury death cases to identify opportunities for trauma system improvement. Central to this investigative effort was the development of multidisciplinary review teams, including medical examiners (MEs) and trauma surgeons, to provide subject matter expertise-based survivability determinations.

Methods: In this preliminary analysis, a total of 607 cases from study sites in New Mexico, Oklahoma, Connecticut, Maryland, District of Columbia, and a region of Iowa were reviewed. A comparison of survivability determinations was made between two reviewer types: trauma surgeon and medical examiner. Data available for survivability determinations included autopsy data, imaging reports, field investigator reports, Abbreviated Injury Scale codes, geospatial data (injury location, EMS location/response time, location/time to nearest trauma center) and EMS data. Each reviewer made a survivability determination (Non-Survivable (NS), Potentially Survivable (PS), or Definitely Survivable (DS) under two scenarios: 1) optimal clinical circumstances: with immediate access to care at a level I trauma center and 2) within the context of the scenario: given the conditions of the actual injury scenario.

Results: Analyzing survivability determinations from MEs versus surgeons, we found that there was consistent agreement for cases given the conditions of the actual scenario. However, there was more variability when making a survivability determination under the idealized assumption that a patient would have immediate access to care at a level I trauma center. When assuming a patient would have immediate access care, MEs determined that 81% of cases were NS, whereas surgeons determined that 72% of cases were NS. Furthermore, MEs determined that 13% of cases were PS compared to 23% as determined by their surgeon counterpart. A total of 27 cases were deemed as Survivable by surgeons, but MEs classified them as NS. The most substantial areas of discordance were cases where the principal mechanism of death was truncal hemorrhage within the thorax, traumatic brain injury, or asphyxia.

Discussion: Creating a diverse team allows for a broader discussion on PS injury deaths. It is encouraging that both specialties agreed about survivability in true scenarios attesting to the validity of the results. The discrepancies when a patient would have immediate access to care likely indicates bias based on the different professional experiences between these two communities. Further research is needed to identify opportunities to improve collaboration between MEs and trauma surgeons to improve regional trauma systems.

5.4 Mortality Review: A Collaboration Between a Medicolegal Jurisdiction and Trauma System to Eliminate Preventable Death

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Introduction: Injury remains the leading cause of death in the United States for individuals between one and 44 years old. To achieve the 2016 National Academies of Sciences, Engineering and Medicine's published goal of zero preventable deaths after injury, medicolegal jurisdictions and their respective trauma systems must routinely conduct fatality reviews on all trauma-related deaths.

Methods: A mortality review was conducted on a subset of U.S. Service Member battle-injured fatalities who died from September 11, 2001 to September 10, 2018. A subject matter expert (SME) panel consisting of trauma surgeons, prehospital specialist and forensic pathologist reviewed Abbreviated Injury Scale (AIS) coded injury data from autopsy, medical treatment documentation, and tactical situation data to determine injury survivability and death preventability. Additional information (e.g., autopsy reports, radiology, photos) were reviewed in detail as required. Fatalities were analyzed by demographics, mechanism of injury, cause of death, mechanism of death, injury survivability, and death preventability. Injury survivability, as determined by the SME panel, was compared to injury patterns among the Department of Defense Trauma Registry survivors. Medical opportunities for improvement (OFIs) were determined for fatalities with potentially survivable or survivable injuries (PS-S).

Results: Of the 369 battle-injured fatalities (median age, 29 years; male, 98.6%), the cause of death was blast injury (45.0%), gunshot wound (39.8%), and multiple/blunt force injury (15.2%). The leading mechanism of death was catastrophic tissue destruction (73.7%). Most fatalities sustained nonsurvivable injuries (74.3%). For fatalities with PS-S injuries, most had hemorrhage as a component of mechanism of death (88.4%); however, the mechanism of death was multifactorial in the majority of these fatalities (58.9%). Only 5.4% of all fatalities and 21.1% of fatalities with PS-S injuries had comparable injury patterns among survivors. Accounting for tactical situation, a minority of deaths were potentially preventable (5.7%) and a few preventable (1.1%). Time to surgery (93.7%) and prehospital blood transfusion (89.5%) were the leading OFI for PS-S fatalities. Most fatalities with PS-S injuries requiring blood (83.5%) also had an additional prehospital OFI.

Discussion: Comprehensive mortality reviews, incorporating a standardized lexicon and SMEs from both the medicolegal jurisdiction and trauma system, can identify PS-S survivable injury patterns and OFIs in prehospital casualty care. This information can direct prevention strategies, research, and therapeutics that extend survival time and eliminate preventable death.

5.5 The Expanding Role of Biomechanics in Forensic Pathology

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Forensic biomechanics is an engineering science that relates the disruption of anatomical structures to mechanical loading. Anatomical structures, like all objects, have material properties that define their behavior when exposed to external loading. When the mechanical loading exceeds the material properties of tissue, injuries are produced. Through the application of engineering principles and the understanding of tissue response, the field of biomechanics can determine the forces, moments, energy, and mechanism required to generate an injury. The field of biomechanics utilizes this understanding to mitigate or prevent injuries. Many of these principles are integrated in traditional forensic examinations; however, only through association (e.g. base of skull fractures and rapid hyperextension) and seldom through the application of engineering principles. The forensic role of biomechanics has become one of litigation support but should be more broadly accessible and utilized to identify if and how mechanical loading resulted in fatal and nonfatal injuries. In addition, utilization of biomechanics will bolster injury causation and plausibility determination particularly in the cases of alleged child abuse where caregivers may claim accidental trauma. We will discuss the emerging biomechanical presence in forensic pathology via analysis of distinct injury patterns such as pediatric thoracolumbar fractures, spiral fractures of long bones, and *commotio cordis*. We will discuss the functional anatomy, kinematics, and injury mechanisms to explain not only how these injuries occur, but the mechanical loading necessary to create these injuries. With a greater understanding of injury causation through the engineering principles of biomechanics, context can be given to an injury for either confirmation or exclusion of a mechanical loading scenario.

5.6 Determination of Force Required to Produce Stab Wounds in Cadaveric Chest Tissue

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When investigating deaths due to stab wounds, a common question asked of the forensic pathologist concerns the force required to inflict a given wound. This is particularly relevant in court, where a common defense hypothesis involves an accidental event in which the victim fell upon the passively held knife. With the current knowledge, it is almost impossible to give a clear and reliable answer to this question. On the one hand, the perception of the degree of the force required to produce a stab wound is subjective. While on the other hand, providing an exceedingly technical description is difficult for a jury and the court to understand. Previous research has been directed at determining the force needed to produce a stab wound on synthetic or animal skin samples; however, that cannot directly compare with human tissues. This is the first study to determine the force required to produce human chest wounds in recent years. Tests were performed on six human cadavers donated to the Anatomical Gift Program of the State University of New York, Upstate Medical University in Syracuse. A material testing machine (MTS 858 Bionix, Eden Prairie, MN) was used to produce the stab wounds and to record the force required to penetrate skin, muscle, cartilage, and rib bone of the chest. Human torsos were positioned in the MTS machine to create stab wounds to the chest tissues. Three different blades were used: a steak knife, a butcher knife, and a lockblade knife. Blade handles were fixed to the end of the actuator of the MTS and aligned perpendicular to the skin, 2 cm above the chest. The actuator displacement was 10 cm, allowing a 8 cm knife penetration into the body. On each cadaver, chest injuries were produced at the following locations: a) skin, muscle, and intercostal space; b) skin, muscle, and cartilage; and c) skin, muscle, and bone. Each of the 3 blades

was used for each location, for a total of 9 anterior chest injury sites. Wound locations were determined *a priori* and randomized based on tissue location and blade type. The force required to penetrate the tissues was then recorded. After the experiment, a chest dissection was performed to confirm the correct locations of the produced stab wounds. Despite limitations, this can be an essential study to allow further research in this field. A thorough discussion of the results will be presented.

5.7 Dallas 7/7: Deployment of a Bomb Disposal Robot to End a Police Standoff

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On July 7, 2016 a protest was organized in downtown Dallas, Texas in response to two recent police-involved shootings in Baton Rouge, Louisiana and Falcon Heights, Minnesota. Approximately 800 protesters were organized in downtown Dallas and approximately 100 police officers were assigned to the event. During the protest, a gunman began specifically targeting police officers. After trading fire on the street with multiple officers, the shooter entered El Centro College and was eventually pinned down in a second floor corridor. Negotiations proceeded for several hours, but the shooter refused to cooperate. Officers felt that they could not extract the individual without significant risk to themselves, and his position in the building made the use of rooftop snipers impossible. Eventually the controversial decision was made to use a Remotec ANDROS Mark V-A1 bomb disposal robot in an offensive capacity. The manipulator arm of the robot was rigged with a C4 explosive charge and the robot was remotely controlled to the shooter's position, where the C4 was detonated. This action ended the standoff, killing the shooter with no additional injuries or casualties to police or civilians.

The incident resulted in the deaths of five officers and injuries to nine additional officers and two bystanders. Complete autopsies were performed on the five officers, all of whom sustained gunshot wounds. A complete autopsy of the perpetrator identified blast injuries of the head resulting in the cause of death. Additionally, he had three gunshot wounds of the left upper extremity, at least one of which was sustained on the street prior to entering the building.

It is the goal of this session to share the experience of the 2016 Dallas shooting and discuss the complexities of the scene investigation, decedent recovery, and autopsy findings. As of 2020, this is the only documented use by law enforcement of a bomb disposal robot as an offensive weapon.

6.1 Missing and Murdered in Canada: A Call for Change to the Investigation of the Deaths of Indigenous People

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The Missing and Murdered Indigenous Women and Girls (MMIWG) Inquiry has an impact on all pathologists involved in postmortem examinations in Canada and abroad. Generations of historical trauma as a result of government policies under the Indian Act, including the residential school system, has created a crisis within Indigenous communities in the form of poverty, violence, food and housing insecurity, increased rates of suicide and incarceration, and barriers to education, employment and healthcare. For decades, Indigenous women and girls have been murdered, found dead or have gone missing in numbers disproportionate to the general population. The MMIWG Inquiry officially launched in 2016, with a mandate to investigate all forms of violence against First Nations, Inuit and Métis women and girls, including 2 SLGBTQQIA people. Across the country, gatherings were held to hear the stories and experiences from

survivors and family members. The final report was released in 2019, with Calls for Justice translating across all sectors of Canadian society. Although the death investigation system with respect to forensic pathologists and medical examiners was a small but important part of the Inquiry, there are many levels of intersection that can be addressed to better understand the impact we have on Indigenous people. A brief overview of the background and significance of the Inquiry, some of the historical aspects related to Indigenous women in Canada, and where the Inquiry stands today, will be presented. Selected cases will be reviewed, highlighting some of the pitfalls and challenges faced by pathologists when dealing with the death of an Indigenous woman or child. The potential impact on cultural and traditional practices will be emphasized. Possible approaches to appropriately handle these deaths before, during and after the postmortem examination will be discussed, as well as advice to ensure open communication with the families and/or communities during the death investigation process. Emphasis will be placed on the team approach to these deaths and future directions following the Inquiry.

6.2 CSI and Cadavers: Factors That Influence Physicians to Pursue Forensic Pathology

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According to the 2009 National Research Council report, there are currently fewer than half the recommended number of practicing forensic pathologists working in the United States. This staffing shortfall impacts both the legal and public health systems, as they rely on data from death investigations performed by forensic pathologists. The shortage has been attributed to low pay, poor working conditions and funding, and the lack of academic exposure to the field during training. National Association of Medical Examiners (NAME) members were surveyed about what influenced them to enter the field of forensic pathology. Positive experiences during their education and the mentorship of a forensic pathologist played a large role in encouraging physicians to become forensic pathologists. Respondents reported concern about the financial ramifications of pursuing forensic pathology compared to academic or hospital-based practice. The most common obstacle experienced by respondents was a negative perception of the field by instructors and peers during medical school and residency. These findings point towards a need to expand opportunities for exposure to forensic pathology in medical school and increase salaries for existing medical examiners. They also point toward a need to dispel misconceptions about the work of forensic pathology among the academics who train pathologists in order to encourage more residents to enter the field.

6.3 The Forensic Pathology Pipeline: Creating Forensic Pathologists through Proactive Pathology Residency Programs

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Lack of exposure to forensic pathology in medical school is a causative factor in diminishing the number of forensic pathology practitioners. Exposure to forensic pathology in medical school, including establishment of successful programs that ensure a flow of pathology residents into forensic pathology (FP) fellowship programs, is necessary to address the critical shortage of forensic pathologists. The presenters will discuss ongoing due diligence and efforts to identify model pathology residency programs that should be emulated.

In 2018, approximately 16% of graduates of pathology residency programs entered forensic pathology fellowships. Pathology residency programs that

produce relatively large numbers of graduates going into FP fellowships should be emulated; therefore, a data pull was sought regarding those programs. FP fellowship programs were asked to provide the medical school and pathology residency origins of their 2017-2020 FP fellows. Data were provided in a blinded fashion for 33 FP fellows over the four-year period. These 33 FP fellows originated from 31 medical (27) and osteopathic (4) schools, including six international schools, and 24 pathology residencies. Only four FP fellows attended medical school and pathology residency from the same institution. No medical or osteopathic school was represented more than two times. Only UCLA and USC pathology residencies were represented more than two times; four fellows originated out of each of those pathology program over the four-year period. These two Los Angeles area programs are undoubtedly feeder programs to the large LA County Medical Examiner-Coroner fellowship program located there. Based on data received, no medical or osteopathic school, nor pathology residency program truly stands out as a successful driver of pathology residents into forensic pathology fellowships. Due to the blinded nature of this survey, we were not able to associate feeder programs with fellowships.

Unfortunately, a minority of FP fellowship programs provided data from which solid statistical conclusions could be reached. As a supplement to current informational bases, the presenters will highlight anecdotal evidence of medical school pathology programs linked to successful forensic pathology formation emanating from robust medical education and fellowship programs.

The presenters will conclude by urging NAME leadership to promote and support data and informational collection from which model programs in academia and practice can be identified. Using that information and data, NAME leadership can fashion action plans to promote academic, residency, and professional programs relating to pathology and forensic pathology.

7.1 Autopsy Education In Canadian Pathology Programs: A Survey of Canadian Trainees

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Introduction: This survey of Canadian pathology residents was designed to quantify the number of autopsies Canadian residents complete during training and to better understand the perception of residents pertaining to access and quality of autopsy skills education. The interest of current pathology residents in autopsy and forensic pathology as a future career was also assessed.

Methods: A web-based survey was sent to all Canadian pathology residents. This survey comprised of 19 questions regarding institution, level of training, intention to complete the American Board of Pathology (ABP) examination, number of autopsies completed, perception of quality/access to autopsy skills education, interest in autopsy and forensic pathology, and factors contributing to interest in autopsy and forensic pathology as a future career.

Results: 82 of a possible 310 (26%) residents (47 General Pathology, 263 Anatomical Pathology) across all Canadian institutions offering anatomical or general pathology programs (16/16 institutions) participated in the survey. 83% of respondents rated autopsy education as either very important or important. 55% of respondents intended to either challenge the ABP or wanted the option to do so in the future, while only 46% of participants agreed that all residents who wish to challenge the exam will easily be able to complete the 50 ABP required autopsies during residency. Only 18% of respondents were interested in performing autopsies as a major component of their career, and a combined 52% were only interested

in performing autopsies as far as securing a desired position or felt having to perform autopsies would be a job deterrent. The quality of autopsy teaching received and the number of autopsies performed were identified as the most significant factors affecting interest in performing autopsies as part of a future career. A combined 67% of respondents felt that the job market in forensic pathology in Canada was either good (better than most subspecialties) or very good (more jobs than graduating fellows). 11% of respondents did not agree that all residents who document having completed an autopsy at their institution will have participated in all 8 essential autopsy tasks. 24 of 82 (29%) respondents provided detailed narrative comments.

Discussion: The vast majority of Canadian pathology residents believe autopsy education is an important component of residency training. Limited access to quality autopsy training seems to be an important factor in resident interest in forensic pathology as a future career, despite a perceived good job market in comparison to most other sub-specialties.

7.2 Updates in Forensic Pathology Education: Milestones 2.0

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The ACGME Milestones offer a framework for competency-based assessment of forensic pathology fellows. The initial forensic pathology-specific milestones (Milestones 1.0) were developed in 2014. Though a great foundation, this first iteration of the milestones was somewhat convoluted and exhibited areas of discrepancy. A Forensic Pathology Milestone 2.0 Working Group of 11 volunteers, with various levels of experience in the field, sought to reduce milestone complexity and modify the cross-specialty "harmonized" milestones to ensure they fit within the context of forensic pathology training. The group also created a supplemental guide to provide additional clarification for each milestone. Overall, five specialty-specific subcompetencies were drafted and the language in the 14 harmonized subcompetencies was adjusted to reflect the unique population of patients and multidisciplinary medicolegal systems inherent to forensic pathology. Once the initial development was complete, the Milestones 2.0 draft was made available for review by the greater forensic pathology community with the aim of creating a shared mental model for forensic pathology education and the trajectory of the field. Additional changes were made based on the survey results and Milestones 2.0 will be implemented during the 2021-2022 academic year.

7.3 Narrative Writing As a Part of Resident Education in Forensic Pathology

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Medical school and residency curricula are regularly utilizing narrative writing as a tool for learner engagement and critical thinking. Narrative writing is a method of analyzing a particular event, interaction, or idea in a

short, succinct way that allows the writer to focus on specific aspects of the experience. In this way, it allows the writer to explore their role in an experience, their thinking and feelings about that experience and to process them in a positive and constructive way. In the era of awareness about physician and resident burnout, this can also act as a viable coping mechanism when under stressful circumstances. With recent changes to our residency program, we instituted resident health and wellness initiatives. To help combat the perceived stresses associated with autopsy pathology in our autopsy program, an academic-based combined hospital and forensic pathology program, we initiated narrative writing as means for the residents to explore their experiences, especially their experiences during their first rotation, which for most was their first exposure to autopsy pathology. This exercise was unstructured and included writing down any thoughts, feelings or other observations of an autopsy of their choosing. The narratives were shared with the faculty overseeing the initiative and then a discussion was held for all of the first-year residents. Overall, the residents found the exercises to be useful, notably as a way to process the complex emotions associated with autopsies at the beginning of residency training. Residents who had utilized narrative writing in medical school found the experience to be more positive than those that did not. As forensic pathology is perceived to be a potentially stress inducing field, especially amongst residents, narrative writing might be a helpful tool to help combat emotional fatigue and pressures associated with the field of work.

7.4 A Medical Examiner Bereavement Mementos Program via Nonprofit Auxiliary Organization

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The Washoe County Regional Medical Examiner's Office in Reno, NV, is the Medical Examiner and Coroner for Washoe County and provides autopsy services to 19 other Nevada and California counties. Following a dramatic increase in child deaths in 2013, Medical Examiner's Office (MEO) investigators recognized a need to provide keepsakes to families following the death of a child. Funding the expenses out-of-pocket, the employees began to provide memory boxes containing a lock of hair, handprints, and footprints to families losing a young child. Subsequently, a nonprofit 501c3 organization was formed to allow the employees to continue and expand this work without depleting their personal resources, as an auxiliary organization. The organization was named The Benjamin Clark Foundation to honor a young man who was lost suddenly and unexpectedly, leaving behind a deeply bereaved family. Since that time, the program has expanded to increase the scope of bereavement gifts to include framed Legacy Handprints for older children, teenagers, and adults leaving a family with young children behind; Memory Quilts for seniors losing their lifelong partner; and Heartbeat in a Bottle, a partnership with a local hospital to capture the heartbeat of a loved one who is passing, by placing an electrocardiogram rhythm strip in a bottle. MEO staff members often find making the gifts to be therapeutic and benefit from the feeling of making a difference in tragic times for families, and the families are extremely grateful for these mementos. This presentation will highlight the features of the program, benefits to staff and the community, the process to form a nonprofit, future goals, and how our successes might be applied in other jurisdictions.

7.5 Tweet, Tweet!: Using Twitter Chats To Teach Forensic Pathology

K. Obenson

Horizon Health Network, Saint John, Canada

Introduction: Recently, certain observers remarked that the use of Twitter in medical education would be a one-directional tool where the professor would "push" information to the student, the presumed passive recipient of knowledge. That prediction has long since been invalidated. Twitter is now

well established as teaching platform for surgical pathology and its subspecialties especially since it lends itself to displaying multiple photomicrographs, gross images and videos with room for questions, comments and explanations. This abstract focuses on the use of Twitter to teach autopsy and forensic pathology to residents and medical students by using a series of tweets.

Methods: Twenty separate teaching cases dealing with autopsy or forensic pathology that had been uploaded from six randomly selected registered pathologists accounts within the first five months of 2020 were analyzed for number of comments associated with the tweet, the nature of the content (organ or body part depicted), the nature of the images (gross versus microscopic or both), the number of "likes" and any comment critical of the post or of any complaint of the post violating decedent privacy or allegations of impropriety.

Results: There were 238 comments with a range of three to 76 and an average of 12 comments per post. Retweets ranged from five to 473 with an average of 64 per post and likes from 16 to 945 with an average of 150 likes per post. Just over half of the posts were on cardiac or pulmonary pathology (12/20) while the rest were on brain, liver, bowel, and kidney pathology. Seven cases involved COVID19 or its complications. Three quarters (15/20) of cases posted were of combined images of gross and microscopic findings, while the rest were microscopic only. None of the cases had identifying information. None showed any external body part. There was not one single adverse comment or a complaint of decedent privacy violation in the more than 200 comments. To date, there were no requests for the images to be taken down.

Discussion: Gross and microscopic findings of teaching cases relating to autopsy or forensic pathology can be safely posted to Twitter (social media) if appropriate safeguards are taken. This should encourage more forensic pathologists to register accounts on and teach on Twitter. For those attached to academic institutions, an added bonus is the possibility of using social media posts as part of a teaching portfolio in anticipation of academic promotion.

7.6 An Experiment In Short Live Broadcasts At A Name Meeting: Quo Vadimus?

K. Obenson

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Introduction: The annual meetings of the National Association of Medical Examiners (NAME) have never been broadcast live. This is to respect decedent privacy and to avoid gratuitous use of images by nonforensic pathologists. However there are sessions to which outside viewers could be invited and several platforms exists for live broadcasts. Periscope, an application designed to broadcast live from Twitter, was first used as a pilot project at the 2018 NAME Annual Meeting and the results are described below.

Methods: Three physicians at the 2018 NAME meeting participated in impromptu, live broadcasts from the Twitter account of member of NAME Social Media (SoMe) Committee on topics of general interest: 1) Visa rules for foreign national forensic pathologists in the US; 2) Transfer to forensic pathology (FP) from another subspecialty; 3) How to get into a career in forensic pathology. Broadcasts were automatically posted as a tweet once terminated. The broadcasts were analysed for length, number of views of the video (in the tweet), impressions (number of times the tweet was seen), the number of retweets, and the engagement rate (ER, the percent number of views to number of impressions). NAME provided the number of attendees.

Results: Broadcast #1: 2.19 minutes, 273 views, 2849 impressions. 6 retweets; ER of 10.43%. Broadcast #2: 1.26 minutes, 178 views, 1804 impressions and 3 retweets; ER of 10.13%. Broadcast #3: 55 seconds, 154 views, 1488 impressions and 6 retweets; ER of 9.62%. There were 520 attendees.

Discussion: Compared to SoMe broadcasts in surgical pathology, these were short and the audience size and number of retweets small. However, the substantial numbers of impressions far exceed the total for conference attendees, suggesting that many more people were exposed to the content. The ERs of approximately 10% are also encouraging, given that rates above 5% are considered excellent by SoMe standards. This bodes well for one of forensic pathology's largest professional meetings especially since there are not a plethora of platforms such as Facebook Live, Instagram Live, and Snapchat. Notwithstanding the limitations of the sample size, SoMe broadcast platforms such as Periscope permit forensic pathologists to present their research to a larger, more diverse audience. SoMe use in FP is still in its infancy, but the Covid19 pandemic may persuade NAME to develop creative ways to use such platforms to broadcast lectures beyond the physical confines of its annual meetings.

7.7 The Potential Value Of Video Abstracts On Social Media To Disseminating Content From Name Meetings

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Background: Abstracts may be presented as posters at National Association of Medical Examiners (NAME) meetings. Maximum exposure to the posters is therefore a function of attendee numbers. The purpose of this study is to determine whether video abstracts posted online to a social media platform (Twitter) increased dissemination of abstract content.

Methods: At the 2018 and 2019 meetings, 20 authors accepted random invitations from a NAME member to record visual abstracts which, with their permission, were subsequently uploaded (tweeted) online to Twitter from the NAME members account. Each video was recorded by mobile phone and tweeted immediately with the author's approval. Results were analyzed to determine the number of times the video in each tweet was viewed and the number of impressions generated by the tweet. Impressions are defined as the number of times the tweet was seen by others (appeared in their streams, essentially as an unpaid advert). The number of attendees for each meeting was obtained from NAME for comparison.

Results: Twenty authors (12 from 2018 and 8 from 2019) participated. Of the 20 tweets, four (20%) had > 100 video views, four (20%) had 100 to 200, six (30%) had 200 to 400, one (5%) was within the range of 400 to 500, while five (25%) had more than 600. Video views per tweet ranged from 34 to 824, with a mean of 338. The number of impressions per tweet ranged from 192 to 4629, with a mean of 1811. Of the 20 tweets, six (30%) had fewer than 500 impressions, two (10%) had 500-1000, five (25%) had 1000-2000, two (10%) had 2000 to 3000, and five (25%) had greater than 3000. Average conference participation for the two meetings was 501.

Discussion: Given the lack of Twitter accounts by self-identified forensic pathologists, it is likely that in at least 25% of tweets, the videos were watched by more people than would have been possible at the conferences alone. The number of impressions generally surpassed the number of attendees per meeting, which at the upper end of 4629, indicates a 900% increased exposure to that particular abstract. Given the potential for dissemination, NAME should take advantage of the Covid-19 pandemic to facilitate the development and publication of video abstracts on social media platforms at future meetings.

7.8 Evaluation of the Impact of Postmortem Computed Tomography at the New Mexico Office of the Medical Investigator

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Introduction: The New Mexico Office of the Medical Investigator (OMI) is a state-wide office serving a diverse population of 2.1 million. In 2018, greater than 7500 deaths were reported, resulting in nearly 3000 in-office examinations. Postmortem Computed Tomography (PMCT) scanning began at the OMI in 2010 with a double-blinded study comparing autopsy and PMCT, funded by the NIJ (PI Nolte). Since 2013, the OMI has increasingly incorporated PMCT into daily practice, and in 2018, a scanner upgrade resulted in an improved imaging workflow. The purpose of the study is to present our current PMCT protocol and imaging workflow, and the results of a PMCT utilization survey, completed by OMI forensic pathologists, characterizing their use of PMCT and its impact on case management.

Methods: Whole-body PMCT was performed using a 16-slice Philips Big Bore scanner (3 mm and 1 mm reconstructions, soft tissue and bone algorithms). An online survey consisting of 15 questions was created in REDCap and completed (over nine months during 2018-19) for each of N=2027 cases by the case pathologist.

Results: During this period, 1913 PMCT studies were performed, representing 94% of cases undergoing an in-office examination. The average imaging time was 16 minutes per subject, with an average of seven PMCT studies performed per day. PMCT was reviewed during morning case conference in 79% of these cases and by a radiologist in 2.3% of cases. PMCT had a significant impact on case management, impacting the choice of exam type (full autopsy, partial autopsy, or external only) in 31% of cases, impacting the final determination of cause and manner in 20% of cases, and demonstrating a significant finding that would not have been seen at autopsy in 2.6% of cases.

Discussion: Over five years of incorporating PMCT into daily practice, the New Mexico OMI was able to slightly decrease the number of full autopsies performed each year, even as the total number of cases reported rose substantially (by 50%). PMCT has enabled several types of cases that would have previously received a full autopsy to be investigated using PMCT together with a pathologist external examination. Through comparison to pre-PMCT OMI data, we estimate that the use of PMCT at the OMI reduced the required number of forensic pathology FTEs by approximately 15% in 2018. Further, a new protocol (2019) involving a urine drug screen and PMCT is now decreasing the rate of full autopsies performed in suspected drug overdose deaths that meet specific criteria.

8.1 Classification of Autopsy Findings: Degrees of Certainty

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A four-tiered classification system (I-IV) has been proposed to grade autopsy findings for the degree of certainty to explain death. A class I finding is incompatible with continued life; class II is a disease with lethal potential, sufficiently advanced to be capable of causing death; class III is marginal pathology; and class IV has no structurally demonstrable lesion. We retrospectively examined 1,819 out-of-hospital natural deaths autopsied at our facility over the past 10 years to evaluate this classification system in a single, state-wide medical examiner practice.

All death certificates and select autopsy reports were reviewed and graded independently by two forensic pathologists using the classification system. The average age was 56 years (range 1-98 years). The primary organ system pathology was: 989 cardiovascular, 105 central nervous system, 53 pulmonary, and 29 gastrointestinal. In addition, there were 445 chronic ethanolism deaths. The grade distributions were 119 (7%) class I; 1,284 (70%) class II; 356 (20%) class III; and 60 (3%) class IV. Diagnoses for class I included pulmonary thromboembolism, ruptured myocardial infarct, intracerebral hemorrhage, and ruptured esophageal varices; for class II, coronary atherosclerosis (greater than 70% stenosis), cardiac hypertrophy (weight greater than 500 g or greater than 20% of expected), chronic alcoholism with cirrhosis; for class III, moderate cardiac hypertrophy/atherosclerosis, chronic alcoholism without cirrhosis; and for class IV, epilepsy.

Of the 989 cardiovascular deaths, 39 were class I (9 ruptured infarcts, 27 aortic dissections); 822, class II; and 128, class III. Acute myocardial infarcts and/or coronary thromboses were diagnosed in 4% (32/822) of class II cardiovascular deaths. Of the 218 hypertensive disease deaths, 86 were class II. Among the 445 chronic alcoholism deaths, 194 (44%) had cirrhosis.

This study demonstrates how this system performed in a statewide medical examiner jurisdiction. Most deaths had cardiovascular pathology and most of the autopsy findings were class II. Class I autopsy findings are rare and moderate to marked pathology is sufficient to explain most deaths. The cause of death statement alone occasionally posed a challenge. It is valuable to include immediate causes to demonstrate the extent of the underlying disease. A death due to chronic alcoholism could be class I (exsanguination due to variceal rupture), class II (cirrhosis), or class III (hepatic steatosis). Classifying these natural deaths was done with ease, offered excellent concordance between pathologists, and can be used to provide a degree of certainty in determining cause of death that can be helpful to families, death certifiers, and public health analysts.

8.2 Positional Asphyxia In Opioid-Related Deaths: Is It Being Overlooked?

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Introduction: Diagnostic criteria for positional asphyxia are multiple and include finding the decedent in a position that does not allow for adequate respiration and an inability to extricate oneself from the position due to various conditions. Our primary objective is to assess whether airway compromise is a contributing factor in deaths due to the toxic effects of opioids.

Methods: We evaluated 225 deaths where the death scene investigation documented possible airway obstruction and performed a Pearson Chi-Square test to determine whether the proportion of deaths found in an airway compromising position is higher when opioid(s) caused the death. 115 of the deaths were natural and 110 of the deaths were accidents or undetermined manners. Of the 110 deaths classified as accident/undetermined, seven were not related to drugs. In 98 of the 103 deaths considered to be drug-related, one or more opioids were a contributing factor. Complete autopsies with toxicology was performed in all of the deaths believed to be drug-related. With each case, the evaluator answered whether the position found dead would cause airway compromise with options to answer either Yes, Maybe, or No.

Results: Of those opioid-related deaths, 24 (24.49%) were determined to be found in an airway compromising position, and 12 (12.24%) were found

in a position that was potentially airway compromising. Of the natural deaths, there were 14 (11.02%) determined to be in an airway compromising position and three (2.36%) were found in a position that was potentially airway compromising. With an associated p-value of <.0001, the proportion of decedents found in a potential airway compromising position is greater when the death was related to opioid use. After removing the maybes [Yes (27%) vs No (11.29%)], there was also sufficient evidence, with a p-value of 0.0021, that the proportion of decedents found in a definite airway compromising position is greater in deaths related to opioid use. Other results included a higher proportion of facial compression in the opioid-related deaths (28% vs 13%, p-value 0.0057), and at least one of the positions the decedents were found in differed depending on whether the death was related to opioid use.

Discussion: Careful documentation by investigators regarding the position in which the decedent was initially found may be a significant factor in accurate reporting of whether positional asphyxia contributed to the death. This may be of great significance for harm reduction efforts to decrease the opioid mortality rate.

8.3 Homicide by Unspecified Means: Cleveland 2008-2019

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Determining cause and manner of death requires integration of autopsy findings, scene investigation, circumstantial and medical history, and ancillary studies. Challenges arise when a decedent is found under suspicious or criminal circumstances, but no cause of death is identified at autopsy.

Homicide by Unspecified Means (HUM) is a diagnostic terminology derived from International Classification of Diseases (ICD) coding, meant to aid in classifying such deaths. In 2010, five diagnostic criteria were set forth to encourage consistent and algorithmic application of the diagnosis; however, no literature has examined the validity and utility of these criteria. The Cuyahoga County Medical Examiner's Office (CCMEO) is the medicolegal authority for metropolitan Cleveland. CCMEO records were searched from 2008-2019 for cases certified as HUM or an equivalent terminology. Over this time frame, there were 1810 homicides, with a total of 13 HUM-type cases (0.7%). The victims ranged in age from 3 to 56 years (mean and median, 28 years), with eight female and five male. Eight victims were Black, three White, and two White-Hispanic. Decompositional changes were prominent in nine cases.

Revisiting the HUM criteria, all 13 cases were objectively suspicious, including evidence of deliberate concealment (8), burning (5), and containment in bags (6). Three were part of a larger cohort of serial killer victims; two other decedents were victims of perpetrators of multiple homicides. Only one decedent had a potential anatomic cause of death identified (an enlarged heart); six showed nonlethal injuries, and one had evidence of antemortem restraint. Toxicologic analyses could not be conducted in three cases due to complete skeletonization and in eight cases was negative. Two victims tested positive for cocaine but were found in proximity to other decedents for whom a specific, violent cause of death was determined. No significant environmental, circumstantial, or historical circumstances were identified in any cases to suggest a cause of death and in no case was it felt that a more specific cause of death was suggested by the scene, autopsy, and ancillary study dataset.

In seven cases, perpetrators confessed. One case involved witness statements of maltreatment, and another case was adjudicated with a conviction for murder, both without perpetrator confession.

HUM is an infrequent diagnosis in our jurisdiction. Foul play was confirmed in the majority of cases by perpetrator confession or witness corroboration. The proposed diagnostic criteria provide a reasonable foundation for this determination; however, flexibility based on clinical judgment is advisable.

8.4 Overwork-Related Death (Karoshi): An Unrecognized Entity. Review of Literature, and Topic of Discussion

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Japan was the first country to introduce the concept of overwork-related death (karoshi) in the early 1960s. The Japanese Ministry of Health, Labor, and Welfare classified such deaths as "occupational accident involving death" and recognized karoshi as a "serious social problem for society". The original recognition criteria were implemented in 1961 and later revised. The revised criteria resulted in 2.58-fold increase of overwork-related cardiovascular diseases. According to the Japanese Ministry of Health, Labor, and Welfare the current incidence of karoshi in Japan is around 700 per year including approximately 200 cases of suicide or attempted suicide. The Japanese Ministry of Health, Labor, and Welfare defined karoshi as "Death due to cerebrovascular/heart diseases caused by an overload of work, suicide due to mental disorders caused by a significant psychological burden, or related cerebrovascular/heart diseases or mental disorders".

Taiwan, Japan and Korea are the only three countries in the world in which the national government has officially announced criteria for recognition of overwork-induced cardiovascular disease. Numerous reports of overwork-related deaths (karoshi) in China are published; however, the recognition criteria are unclear.

The European Guidelines on cardiovascular disease prevention in clinical practice (version 2016) identify "...chronic stress at work (e.g., long working hours, extensive overtime work, high psychological demands, unfairness and job strain)" as a strong risk factor for coronary artery disease in men [relative risk (RR) ~1.2–1.5].

A large meta-analysis of published and unpublished data for 603 838 individuals published in Lancet in 2015 demonstrated that long working hours can expose workers to workplace stress and also cause sleep deprivation, which may result in increased risk of depression, hypertension, and heart disease. Similar conclusions were made in smaller studies.

Long working hours are not uncommon and sometimes they are expected as a part of employment or business. From time to time, forensic pathologists handle cases of sudden natural death, suicide, or drug overdose in people who are exposed to long working hours or/and significant work-related stressors. However, the subjectivity of this diagnosis and the lack of accepted definitions and clear recognition criteria have limited the forensic diagnoses of overwork-related death. Mentions of overwork as a condition contributing to death are rare to nonexistent.

8.5 A Forensic Approach to Military Exertional Training Deaths

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This presentation will impact the forensic science community by familiarizing attendees with the investigation of exertional training deaths that occur in the military. After attending this presentation, attendees will better understand the elements involved in how the Armed Forces Medical Examiner System (AFMES) investigates exertional training deaths in military personnel. The elements discussed include features surrounding

the terminal incident, medical intervention, autopsy, ancillary postmortem studies, and medical record review.

Physical fitness has long been a key component of military readiness. This is a relatively young and overall healthy population in which unexpected sudden cardiac death during physical training is an uncommon but highly publicized event. Outside of AFMES, these cases are often signed out as "cardiac arrhythmia/natural" with little to no investigation into the origin of the cardiac arrhythmia. Although sudden cardiac death a common general category in deaths within this population, there are additional categories that medical examiners should be aware of, including electrolyte abnormalities, hyperthermia, sickle cell trait, and unidentified medical diagnoses that are revealed from autopsy and additional investigation.

Autopsy findings may be revealing of previously unidentified medical diagnoses not represented in the patient's history, but autopsy alone does not represent the only element of investigating these deaths. The additional elements necessary in these death investigations include features of the terminal incident, the medical intervention and resuscitation efforts, and a thorough medical record review. The terminal incident may involve a sudden unexpected terminal collapse suggestive of a severe terminal arrhythmia or may involve a larger spectrum of mental status changes, seizure activity, or thermal dysregulation. The struggle to meet the military weight and appearance standards may reveal recent attempts to rapidly lose weight. Thorough scene investigation and history may indicate suspicious nutritional supplements, the significance of which is often difficult to interpret. In assessing medication intervention, the rush to reach a correct initial diagnosis and appropriate treatment has recently been simplified by new treatment algorithms. Thorough review of the medical records may result in directed ancillary postmortem testing, to include sickle cell trait and previous undiagnosed metabolic abnormalities. At this point, molecular cardiac testing is utilized sparingly and reserved for cases in which there is no anatomic, toxicologic, or other identified cause of death.

This presentation will attempt to provide an organized and thorough approach to this category of challenging cases.

8.6 A Trait-or in Disguise: Hemoglobin AS as an Unexpected Cause of In-Custody Death

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Hemoglobin S is a hemoglobin (Hb) variant with a point mutation at position 6 of the beta-globin chain that substitutes valine for glutamic acid. In the homozygous state (HbSS), it causes abnormal polymerization and "sickling" of erythrocytes with subsequent vaso-occlusive events and hemolytic anemia. In contrast, the heterozygous sickle cell trait (HbAS) is often considered innocuous, offering a selective advantage in regions with endemic *Plasmodium falciparum*. Although individuals with HbAS typically have normal lifespans, case series of military and athlete deaths demonstrate that periods of exertion may create hypoxic and acidotic environments that induce clinically significant sickling. We present the case of the in-custody death of an otherwise healthy man with HbAS diagnosed at autopsy.

A 23-year-old man with remote history of asthma died in the hospital following an attempt to evade arrest for suspected theft. He had run for approximately one-third of a mile on a summer day with a recorded high temperature of 94 degrees Fahrenheit and low of 70 degrees. He was taken to the ground by the arresting officer without using weapons and handcuffed. During transport in the police vehicle, he complained of dyspnea and leg pain before losing consciousness.

Autopsy demonstrated a well-developed Black male with a BMI of 25.21 kg/m². Dissections of the anterior and posterior neck and testicles were performed, the skin of the back was reflected, and the wrists and soles were incised. These dissections showed no evidence of trauma. No skeletal fractures were identified. There was mild cardiomegaly. The spleen appeared mottled. Toxicology demonstrated tetrahydrocannabinol and resuscitative medications. Microscopic examination revealed sickled erythrocytes throughout the lungs, liver, kidney, heart, and spleen. The spleen displayed increased interstitial fibrosis and hemorrhage, and hypereosinophilic myocytes with contraction band necrosis were found in the heart. Hemoglobin electrophoresis resulted in 56.0% HbA, 4.2% HbA₂, and 39.8% HbS, consistent with sickle cell trait.

In the United States, HbAS is most common among Black Americans, with an estimated 8% of this population affected. Despite this high prevalence, sickle cell trait may be overlooked as a potential cause of natural death. Individuals may be unaware of their carrier status as the condition is typically asymptomatic. Interpretation of histology may be complicated because sickling is both reversible and an inducible antemortem artifact. Herein we will discuss the clinical symptoms described in deaths attributed to sickle cell trait as well as mechanisms by which injury and death may occur.

8.7 Characteristics of Deaths with Evidence of Pathological Hoarding in Cook County 2017-2018

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Hoarding disorder has recently been recognized as an independent diagnosis in the Diagnostic and Statistical Manual of Mental Disorders 5th Edition (DSM-5); it is characterized by the accumulation of objects causing a functional impairment and is commonly associated with increased risk of injury or death. Numerous psychiatric publications highlight associated risks including falls, being crushed by the hoard, or fires due to the hoard. However, despite the publications, limited data exist about deaths of persons found in hoarding environments. This study investigated the characteristics and circumstances surrounding deaths found in 'hoarding like' environments.

Qualitative analysis was performed on cases with sufficient scene photographs to characterize the degree of hoarding and describe the types of objects being hoarded. Using the Cook County Lablynx system, a search for the term 'hoard' from 2017-2018 identified 138 cases. The mean age was 67 years, 56% were male, 76% were Caucasian, and 86% of decedents lived alone. Decomposition was noted in 61% of cases and 16 decedents were veterans (12%). A full autopsy was performed in 36 cases (26%); natural was the most common manner of death (80%), followed by accident (14%). Cases in which hoarding was thought to be contributory to the cause of death occurred in five cases including four fires and one cold exposure. Employment information was available for 82 cases (59%) and the most common profession was educator (7 cases, 8.5%). There were ten decedents (12%) employed in the medical field, ranging from nurse to medical doctor. The primary address of the decedents showed no discernable hotspots throughout Cook County with no apparent association to socioeconomic status when overlaid on a map of unemployment rates. A qualitative hoard evaluation was done on 29 cases (21%) with sufficient scene photographs. Of those, 28 were determined to have evidence consistent with pathological hoarding. A hoarding level was assigned using the clutter hoarding scale with an average of 3.39/5. Squalor conditions were noted in ten of 29 cases (34%). Hoarded materials included general refuse, household items, food, and clothing. Two of the decedents were found with hoarded materials on top of them; however, no evidence of positional asphyxia was present in either case. Overall, the analysis showed that deaths in pathological hoarding environments appeared to

impact all socioeconomic groups and was associated with increased risk of accidental death and decomposition.

8.8 Bilateral Cerebellar Stroke Presenting as Sudden Death in Drug House, Following Head Injury Sustained in Police Altercation

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Cerebellar or posterior circulation stroke occurs in about 20% of all stroke patients, who often present with a younger age profile (41-70 years with a median age of 56.5 years) (1). Deterioration from cerebellar stroke is reported to peak 3 days after incidence; strokes may be initially asymptomatic (2), or may present with ataxia, vertigo, cranial nerve involvement, or altered sensorium. Bilateral cerebellar strokes occur in less than one-third of all patients with cerebellar stroke (4).

This case report describes a 36-year-old man with a history of illicit and prescription drug and alcohol abuse who was found dead seated on a couch in a reported drug house that was not his residence. Scene investigation documented that he had pushed aside laundry piled on the sofa to make a place for himself to sit; he died leaning against the laundry. Medical records documented a recent two-week hospitalization for head injury sustained after a backwards fall during an altercation with police. At autopsy, evidence of the head injury was restricted to a flat orange-brown subdural hematoma with granulation tissue over healing contusions of the orbital surfaces and temporal tips; the trauma was deemed unrelated to his death. Bilateral cerebellar infarcts were identified, each measuring 5.5 cm in greatest dimension. Histology was most consistent with 12-24 hour old infarcts. Autopsy findings included foam in the nares and trachea, a hypertensive heart with cardiomegaly to 565 g, fatty liver, and distended urinary bladder and gallbladder. Postmortem toxicology showed a nonfatal concentration of morphine (0.030 mg/L); 6-acetyl morphine was identified, without sympathomimetic drugs. Death was attributed to bilateral cerebellar strokes due to hypertensive cardiovascular disease, with some contributory role for heroin use in death. This presentation reviews the features of cerebellar stroke as it may present at forensic autopsy.

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8.9 Acute Esophageal Necrosis (Black Esophagus): An autopsy case series

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Acute esophageal necrosis (AEN), also known as black esophagus and acute necrotizing esophagitis, is a rare pathologic finding of unknown etiology. It was first described in 1990 by Goldenberg et al. and primarily characterized as diffuse circumferential black discoloration of the esophageal mucosa that affects predominantly the distal esophagus with sharp transition to normal-appearing mucosa at the gastroesophageal junction. While clinical diagnosis can be made by the gross appearance on endoscopy, pathologic diagnosis is

confirmed by histology that is most notable for mucosal necrosis without viable epithelium, frequently extending into submucosa or even muscularis propria. Case frequency of AEN remains low and mainly found incidentally, with up to 0.2% in both autopsy and endoscopy studies. Men are four times more commonly affected and overall mortality is approximately 32%. Patients often go undiagnosed until an autopsy is performed, with vague histories of abdominal signs/symptoms and previous medical histories including multiple comorbidities, of which alcohol abuse is commonly listed.

We present the case background, gross autopsy findings, and microscopic findings of nine cases of AEN, found incidentally from May 2019 to May 2020, at the Medical University of South Carolina, in Charleston SC. All nine cases were forensic autopsy cases, authorized by local coroner jurisdiction. Five cases will be described in depth, showing both classic and variations in AEN presentation. Eight of nine deceased were male, with an age range of 26-67 years old. The most common pre-existing pathological condition was chronic alcohol consumption, seen in five of nine cases, and in seven cases, the death occurred suddenly at home. Upper gastrointestinal hemorrhage due to acute necrotizing esophagitis was established as the immediate cause of death in six of nine cases. A literature review is performed to correlate the case findings with previously described entities, as well as discuss the etiology and clinical and pathological presentations of black esophagus.

POSTER PRESENTATIONS

P1 Sudden Maternal Cardiac Death Due To Primary Spontaneous Dissection of the Left Coronary Artery: A Case Report

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Primary spontaneous coronary artery dissection (SCAD) is a rare cause of non-atherosclerotic coronary artery pathology that clinically manifests as acute coronary syndrome and causes sudden death in pregnant women. Initial reports on this condition were scarce as they were based on postmortem examination of fatal cases. Its etiology is still unknown, it has been linked to multiple diseases and clinical situations such as pregnancy, postpartum, connective tissue diseases, physical exercise, and atherosclerotic coronary disease. As several diseases and conditions have been associated with SCAD, it therefore probably constitutes a heterogeneous entity.

Histopathologic studies have often shown periadventitial inflammation, in which eosinophils predominate, and may be linked to the medial degeneration often found in these cases. The common observation of eosinophilic periadventitial inflammation suggests a role in the pathophysiology of this rare, yet serious condition.

We present the case of a sudden death in a 34-year-old woman, 33 weeks pregnant, with no known medical history of cardiac disease and following acute coronary syndrome secondary to spontaneous dissection of the left coronary artery and eosinophilic periadventitial inflammation.

P2 Myocardial Infarction with Nonobstructive Coronary Arteries (MINOCA): A Rare Finding in Ten Years of Medical Autopsies

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Introduction: Clinically, myocardial infarction (MI) is divided into myocardial infarction with obstructive coronary artery disease (MI-CAD) or myocardial infarction with nonobstructive coronary arteries (MINOCA). MI-CAD is critical coronary artery stenosis with an obstructive lesion defined as 50% or greater diameter narrowing on antemortem coronary artery angiography which correlates to 75% or greater cross-sectional luminal narrowing upon autopsy dissection. MINOCA, coined in 2013, is a clinical diagnosis currently recognized in patients with an acute MI evidenced by elevated troponin concentration, ischemic ECG changes, pathologic Q waves on ECG, and/or noninvasive imaging, and non-obstructive lesion described as less than 50% stenosis on angiography. The prevalence ranges from 2 to 25% depending on different cohorts of patients with MI. Demographically, MINOCA patients are often younger and female. There is no current literature on MINOCA in the autopsy setting; our study presents clinicopathologic findings from patients with MINOCA at medical autopsies.

Methods: A retrospective review of autopsy records from 2009 to 2019 in our pathology database was performed. Autopsy cases with remote MI and coronary arteries with less than 75% cross-sectional luminal narrowing were included. The electronic medical records and death certificates of selected cases were reviewed for risk factors and cause of death.

Results: Of 1174, a total of 26 cases comprised of 13 males and 13 females were reviewed. The age range is 17 to 95 years with a median of 61.2 years (standard deviation, 3.6). The locations of the MI were the left ventricle (18/26), interventricular septum (7/26), and right ventricle (1/26). The arteries with the highest percentage of stenosis are left circumflex (11/26), left anterior descending (9/26), right coronary artery (5/26), and left main coronary artery (3/26). The extent of stenosis ranged from no evidence of atheroma up to 70% stenosis. Common comorbidities include hypertension (21/26), morbid obesity (15/26), diabetes mellitus (7/26), tobacco use disorder (4/26), hyperlipidemia (3/26), and depression (3/26). Four of 26 were clinically diagnosed with a MI. Cardiac-related cause of death was 13/26, and non-cardiac was 13/26.

Discussion: Our results show no predilection for gender and median age of 61.2 years. This differs from demographics of clinical cohorts. MINOCA is likely underreported at autopsy as pathologists may not be aware of this entity. Gross and/or histologic evidence of MI with coronary artery stenosis less than 75% stenosis should warrant a diagnosis of MINOCA. Proper autopsy documentation could provide vital statistics to identify at-risk patient populations for clinical prevention and management.

P3 Great Balls of Fire: Commotio Cordis Following Roman Candle Explosion

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Commotio Cordis is generally accepted as a cause of sudden cardiac death due to a nonpenetrating impact to the precordium. Studies have revealed that the electrophysiologic consequences of precordial chest wall blows are dependent upon the precise timing of the impact; namely, on the upslope of the T-wave during cardiac repolarization predominantly inducing ventricular fibrillation. Since its induction, the National *Commotio Cordis* Registry has recorded over 220 cases, approximately 75% of which occurred during sporting events with relatively few reported cases associated with violent assaults and motor vehicle accidents. Herein we

present a case report of the firework related death of a previously healthy male in which the underlying mechanism was *commotio cordis*.

Per investigative reports, the decedent was holding a roman candle firework in his hand at chest height when the firework exploded backwards. Witnesses report the decedent fell immediately to the ground after the explosion. Bystander evaluation found the decedent unresponsive, without respirations or a pulse. Emergency medical services arrived on the scene within five minutes. The initial EKG was PEA. Physical examination revealed multiple ballistic impact points and thermal artifact involving the chest, face, right lateral side of the torso, and right upper extremity. Importantly, there was no palpable underlying trauma to the sternum or chest wall. Manual CPR was initiated and converted to automated CPR, however, all resuscitative measures were unsuccessful and the decedent was pronounced.

Autopsy revealed a well-developed, well-nourished, adult male. External examination was significant for multiple ballistic impact points including a large V-shaped thermal injury to the precordial region. Internal examination revealed a sternal fracture with penetration of the pericardial sac and right ventricle of the heart; however, due to the lack of surrounding soft tissue hemorrhage, coupled with witness reports and EMS evaluation, the injuries were considered to have been iatrogenically introduced during resuscitative efforts. The heart was otherwise free of congenital abnormalities and was grossly and histologically normal. The remaining internal organs were unremarkable. Postmortem toxicology was negative.

This case highlights a mechano-electric mechanism of sudden death due to a precordial chest blow by an exploding firework. Coupled with the firework injury and the already challenging diagnosis of *commotio cordis* for the forensic pathologist, this case provides a prime example of how investigative efforts, witness statements, and toxicological analysis in combination with a postmortem exam are imperative to determining the most accurate cause of death statement.

P4 Investigating Medical Examiners' Practices: Genetic Evaluation for Fatal Acute Aortic Dissection

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Pathogenic variants in 11 genes associated with aortic aneurysm and dissection predispose to a heritable form of disease. Due to its high fatality rate, medical examiners and coroners (ME/Cs) may be the first to identify thoracic aortic dissection (TAD) cases and initiate genetic testing for the decedent and at-risk relatives. ME/Cs were surveyed about practices and barriers related to TAD using three clinical vignettes detailing two cases of early-onset TAD, one with syndromic features and another without, and a later-onset TAD case. Respondents were significantly more likely to perform all proposed actions in the two early-onset cases versus the late-onset, nonsyndromic case (e.g., collect sample for testing, refer relatives to cardiology). ME/Cs were significantly more likely to speak with the decedent's next-of-kin (NOK) about increased TAD risk and refer for genetic counseling in the early-onset syndromic case compared to early-onset nonsyndromic case. Cost of genetic testing was the most frequently reported barrier, followed by contacting NOK. Our results suggest that ME/Cs recognize the utility of postmortem genetic testing and the clinical risk factors for hereditary TAD. However, ordering genetic testing and recommending aortic imaging for at-risk relatives appears to be inhibited by concerns including cost of genetic testing and access to NOK.

P5 Thrombosis of Bioprosthetic Valve Associated with Acute Myocardial Injury

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Case Report: we report the death of 61-year-old male who presented to hospital with a several-day history of chest pain and shortness of breath. Just over two years prior to this presentation, he received a bioprosthetic replacement of his aortic valve. Based upon ST elevations, an acute myocardial infarct was diagnosed; however, a heart catheterization revealed no sites of significant stenosis in the coronary arteries. An echocardiogram revealed an ejection fraction of 20-25% and akinesis of the apex, septum, and free wall (anterior and lateral). The aortic valve could not be adequately visualized. He died on the same day as admission to the hospital. At autopsy, the heart weighed 671 g. No significant foci of coronary artery atherosclerosis were identified (i.e., none greater than 25-50% stenosis). The anterior and anteroseptal myocardium had ill-defined red and yellow discoloration and a 1.5 cm mural thrombus was attached to the anterior endocardium. The aortic side of the bioprosthetic valve had thrombus on all three leaflets and the valve did not fully open. The thrombus did not bridge any commissures. Microscopic sections of anterior, lateral, inferior, and septal wall of left ventricle revealed patchy coagulative necrosis from epicardium to endocardium associated with mixed inflammatory infiltrate.

Discussion: in meta-analysis of 4820 patients who had received either transcatheter or surgical aortic valve replacement, 452 (9.7%) had cusp thrombosis (Tian et al., 2020). In comparing patients with thrombosis to those without thrombosis, the incidences of stroke and of transient ischemic attack (TIA) were higher in thrombosis patients, but incidence of myocardial infarct or all-cause death was not statistically significantly different. In a study of 642 patients with bioprosthetic valves, Jose et al., found that 18 (2.8%) developed thrombosis. The median time to diagnosis was 181 days, with a range of 25 to 297 days. Most patients did not have worsening of symptoms with thrombosis and 7 of 18 patients had immobile or partially restricted cusp mobility. The authors reported no deaths associated with valve thrombosis. Based upon these two papers, thrombosis of a bioprosthetic aortic valve is relatively uncommon, most often occurs within one year following its placement, and is not clearly associated with an increased risk of death. In the case we present, thrombosis of a bioprosthetic aortic valve occurred almost two years after placement and was associated with sudden death, with evidence of acute myocardial injury in the background of minimal coronary artery atherosclerosis.

P6 Your Patient is Going to Die I: A Review of Iatrogenic Injuries

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In the field of medicine, it is not uncommon for patients to die related to mistakes made by their providers. Whether due to a missed diagnosis or inadvertent error, the death of a patient related to the care they received is obviously a dreaded outcome in the medical field. In this paper, we hope to give examples of the most common inadvertent errors that we have seen over the past ten years at our office with the goal of educating clinicians and forensic pathologists in order to prevent these deaths in the future.

A common iatrogenic injury encountered is a death related to vascular perforation. In our experience, they have ranged from perforation of the right brachiocephalic vein during placement of a thoracostomy tube to perforation of the coronary arteries during a routine cardiac catheterization. In some cases, variations in the patient's anatomy, such as marked atherosclerosis, have predisposed them to these misadventures. In other

cases; however, there is no issue with the patient, but rather with the technique that was used.

Another common iatrogenic injury is intestinal perforation associated with endoscopy. In our experience, the most commonly perforated viscus is the colon associated with colonoscopy, which is mostly likely a reflection of the fact that of all of the types of endoscopies that are performed, colonoscopy is the most common. Occasionally these perforations are associated with altered anatomy related to previous surgeries, but this is not always the case. Although less common, esophageal and gastric perforations have also been seen in our practice.

Intubation-associated injuries are relatively common in the medical examiner setting. Often they are of little consequence as the patient was already in extremis and most likely would have died regardless of endotracheal tube placement. Rarely though, a patient who is in danger of becoming unstable (but not actually unstable) will undergo a "prophylactic" intubation. Complications related to these procedures are more important for medical and legal reasons as it is possible that the patient may have survived but for the injury sustained during the intubation procedure.

Iatrogenic injuries are an unfortunate yet common complication of medicine. In this ten-year review of our files, we sought to highlight some of the more common medical misadventures we have seen and offer insights and an explanation into how they happened. Our goal is to avoid future preventable deaths and encourage medical examiners and coroners to investigate these cases.

P7 Your Patient is Going to Die II: A Review of Missed Diagnoses

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In the field of medicine, it is not uncommon for patients to die related to mistakes made by their providers. Whether due to a missed diagnosis or inadvertent error, the death of a patient related to the care they received is obviously a dreaded outcome in the medical field. In this paper, we hope to give examples of the most common missed diagnoses that we have seen over the past ten years at our office with the goal of educating clinicians and forensic pathologists in order to prevent these deaths in the future.

A common missed diagnosis in our practice is pulmonary embolism. Often, the patient has presented to medical care with shortness of breath in the days or weeks prior to death and been prescribed an inhaler and diagnosed with a respiratory illness or reactive airway disease. While some of the patients have known risk factors for pulmonary embolism and deep vein thrombosis such as obesity or undiagnosed cancer, often there is no risk factor identified at autopsy. In these latter cases, referral for genetic testing is of the utmost importance to prevent deaths in family members.

Myocardial infarct due to atherosclerotic cardiovascular disease is another diagnosis that is often missed in our practice. Often these patients are young and otherwise healthy, and even when they present with classic symptoms such as chest and left arm pain, their complaints are ignored or downplayed. In more than one instance, a patient was correctly diagnosed as having an acute myocardial infarct; however, appropriate care such as cardiac catheterization was not given.

Another not uncommon missed diagnosis in our practice is ruptured appendicitis. In these cases, the patients have been young and/or mentally ill and thus potentially would have had problems articulating their symptoms. Additionally in at least one case the symptoms were not classic for appendicitis; however, given the easily diagnosable and treatable nature of this condition, one would hope the diagnosis could have been made.

Missed diagnoses are an unfortunate yet common complication of medicine. In this ten-year review of our files, we sought to highlight some of the more common medical misadventures we have seen and offer insights and an explanation into how they happened. Our goal is to avoid future preventable deaths and encourage medical examiners and coroners to investigate these cases.

P8 Checking In But Not Checking Out: Trends in Deaths Occurring in Hotels

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Hotels serve numerous purposes in society: they are a place to stay while on vacation, during travel for work, or during home renovations. Their air of neutrality and anonymity also make them attractive places for drug use and other illegal activities, suicides, and even homicides. Identifying trends in the causes of deaths of those who passed away after checking into hotels can help identify and potentially mitigate high-risk situations.

The Cook County Medical Examiner's Office database was reviewed over a three-year period from July 2016-July 2019 to identify deaths that took place at hotels or motels in the Chicagoland area. An interactive map was constructed showing the locations and types of all deaths.

A total of 217 deaths occurred during this period, including 132 accidents, 65 natural deaths, 14 suicides, 4 homicides, and 2 deaths of undetermined cause. 43 (20%) were female, and 174 (80%) were male. The average age was 46 years, with an age range of 15-92 years. 174 deaths (73%) occurred within 25 miles of the decedent's home address. There were peaks in number of both accidental and natural deaths in March/April and also December. The accidents were exclusively related to drug abuse, and 83 (63%) involved fentanyl or a fentanyl analog. The most common cause of natural death was organic cardiovascular disease, accounting for 28 (43%) of the natural deaths. Nine of the suicides (64%) occurred within 5 miles of the decedent's home address. The most common method of suicide was hanging, followed by gunshot. The homicides occurred exclusively within five miles of the decedent's home address. Two were due to gunshot and two were due to assault with multiple injuries. Multiple high-risk establishments with multiple deaths were identified.

Examination of deaths occurring in hotels and motels can shed light on vulnerable regions of the Chicagoland area. Knowledge of high-risk populations and high-risk establishments may lead to closer monitoring, improved drug overdose response and decreased overall mortality.

P9 A Novel Approach to Postmortem Needle Thoracentesis

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Tension pneumothorax is a not uncommon finding in the forensic autopsy setting. While demonstration of a pneumothorax is a necessary method one should learn as a fellow, the implementation and perfection thereof is dubious. The current methods for demonstration have been studied, performed, and unfortunately, rarely provide a consistent and reproducible result. With the accumulation of years of experience, trials, and tribulations, we propose a novel approach to the formidable needle thoracentesis.

A pneumothorax is a collection of air between the pleural space, which is the area between the visceral pleura of the lung and the parietal pleura of the chest wall. The etiology is variable, and may include iatrogenic introduction, natural disease processes or chest wall trauma. Current

radiographic imaging techniques can detect the presence of a 35 millimeter or less pneumothorax, most likely an inconsequential finding at autopsy, if even demonstrable. On the other hand, a relatively large pneumothorax significant enough to cause dyspnea and an anterior mediastinal shift would be of consequence and demonstrable at autopsy.

Two methods readily accepted include filling the cavity between the body wall and chest wall with water prior to entering the pleural cavity to visualize escaping air as water bubbles and the other includes carefully dissecting the chest wall to expose the underlying parietal pleura with absence of visualization of the underlying visceral pleura. We respect and applaud those that have the ability to reliably perform the above specialized methods. We suggest a much less technically complex approach. After having completed a record review, evaluated the appropriate radiographic imaging methods, and deemed it necessary to perform a needle thoracentesis to demonstrate a tension pneumothorax, please accept the following steps as our proposed approach:

- 1: Take a 10 milliliter syringe with an 18 gauge needle
- 2: Remove cap and plunger
- 3: Insert needle superficially into adipose within chest wall - DO NOT ENTER THE PLEURAL CAVITY
- 4: While needle is resting within adipose tissue, fill 10 milliliter syringe with water
- 5: Advance needle into the pleural cavity
- 6: Watch as air bubbles ascend through water column

The above method is simple and thus reproducible. Further research and prospective analysis are necessary to determine the overall sensitivity of our method. In future analysis, we strive to correlate radiographic size estimates with the ability to confirm the presence of a simple or tension pneumothorax at the autopsy table.

P10 Examining the Importance of Postmortem Computed Tomography Examination in Cases with Opposition to Conventional Autopsy

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Computed tomography (CT) is routinely used as a diagnostic tool in clinical medicine. The use of postmortem CT (PMCT) scans in a forensic setting is a growing field that is becoming increasingly significant. Comparative studies show that conventional autopsies have proven to be the gold standard while virtual autopsies can help detect findings that were overlooked through examining difficult or not routinely dissected anatomic areas and identify abnormalities pointing to the cause of death. Currently only a few medical examiner's offices in the United States are utilizing PMCT.

In 2017 and 2018, the OCME performed PMCT scans on 46 cases because of opposition to an autopsy by the families. We analyzed the 46 PMCT cases. The age of our study population ranged from one month to 103 years with 27 males and 19 females. The reasons for opposition to autopsy included religions (n=4) with Jewish religion (n=8), Muslim (n=3), other cultural opposition (n=17), and no specific reason (n=11). Of the 46 cases, the manner of death was classified as natural (n=15), accidents (n=19), undetermined (n=8), suicide (n=3), and homicides (n=1). The cause of death included trauma-related (n=14), followed by atherosclerotic cardiovascular disease (n=11), and drug intoxication (n=10). Positive PMCT findings consisted of head injuries (n=12) that include scalp lacerations and contusions, skull fractures, various intracranial hemorrhages, and posterolateral dislocation of C2/dens. Positive coronary artery disease findings (n=7) included calcification of coronary arteries, iliac arteries, and

aorta. Other positive CT findings included changes in organs such as cholelithiasis, liver cirrhosis, cysts, malignant tumors, and calcified pleural plaques, cerebral atrophy, cervical spine degenerative changes, subcutaneous emphysema, pulmonary contusions, and hemothorax. In 15 cases with suspected head trauma, head injury was excluded by a CT scan. This group mainly consisted of suspicious falls with no witnesses.

PMCT imaging is a well-proven alternative to conventional autopsy having many utilities in forensic settings as an adjunct tool to conventional autopsy. In cases of family opposition to an autopsy, CT not only plays an important role in identifying the cause of death but also to honor the wishes of the family. Through our study we hope to shed light on the need for further development of PMCT in a medicolegal death investigation.

P11 Gender Differences in Method of Suicide

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There have been multiple assertions in regard to the demographics of the methods people choose to commit suicide. In particular, it has been taught that women tend to choose methods they perceive to be less painful or those which do not create a gruesome scene for those left alive. This is generally thought to be methods such as hanging and drug overdose. Men are likewise regarded to choose more violent, final methods such as deaths involving firearms as their preferred method. Additionally, females are thought to attempt suicide more before the final event whereas males are typically choosing the final method only once.

To scrutinize these long-held assumptions, a study was undertaken using data obtained from the Cook County Medical Examiner's Office. Using the Lablynx case management system, 15,716 suicides were found between 1984 to 2018. Of these, 3539 were female, with an age range of 10 to 96 years old. There were 12,177 male decedents, with an age range of nine to 98 years old.

Looking more in depth into the actual methods of suicide, the most common method employed by females was drug overdose, accounting for 30% of the cases. The second most common was hanging, accounting for 20% of the cases. All methods in which there was external injury resulting in significant blood loss or disfigurement were combined and accounted for 34% of all cases whereas those in which there was no blood loss or disfigurement accounted for 66% of the cases.

For males, the most common method involved firearms, accounting for 40% of cases, closely followed by hanging accounting for 27% of cases. When comparing those cases that involved significant blood loss or disfigurement versus those that did not, 53% involved the more violent methods while 47% were those where there was less external injury.

It seems the old maxims taught about suicide are true in that females appear to choose those less disfiguring methods and males tend to choose those that are more violent and final. This could also account for the higher proportion of male suicides in this study as it can be hard to determine in certain circumstances whether a drug death was suicidal or accidental.

P12 Who Died of Pneumonia Before the COVID-19 Pandemic? A Multicenter Cross-Sectional Study of Risk of Dying of Pneumonia or Having Pneumonia as a Significant Contributing Factor

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Pneumonia is regarded as a treatable condition. However, the diagnosis of pneumonia is commonly seen on death certificates as the cause of death or as a condition contributing to death. The current pandemic of COVID-19 results in fatal pulmonary complications in a very small group of infected individuals and mild benign course in most others. The risk factors for developing pulmonary complications are not completely clear and are a matter for future studies. Early literature reports and media presentations are showing that risk factors for COVID-19 deaths include increased age and comorbidities.

The purpose of the present study is to define the group of individuals who died of pneumonia or had pneumonia as a contributing factor prior to COVID-19 pandemics in order to compare it with COVID-19 related death in future studies.

We identified 104 autopsy cases, performed at Rush Medical Center, Chicago, IL, Department of Pathology Jacobs School of Medicine, Buffalo NY and Brody School of Medicine, Greenville, NC from 2014 to 2019 with pneumonia as the cause of death or a significant condition contributing to death. Complete hospital autopsies were performed in all cases.

Our study cohort had nearly equal numbers of males and females (0.9:1.0) and near equal distribution of Caucasian and African-American races (42% and 43%, respectively). The age groups ranged between 0 and 9 decades; most of deaths occurred among those 60-69 years of age. 35% were overweight and 37% were obese (BMI > 30 kg/m²). 5.5% were underweight. No significant seasonal variation was identified. All decedents had at least one comorbidity in addition to the previously mentioned overweight-obesity factor. Commonly observed comorbidities included hypertensive and arteriosclerotic cardiovascular disease (47.6%), history of hypertension (35.3%), diabetes (31.4%), chronic kidney disease (22%), chronic obstructive pulmonary disease (19%), history of cancer or nonadvanced cancer (15.2%), advanced cancer (11%), liver cirrhosis (6.7%), dementia (5.7%), connective tissue disorder (3.3%), and mental disorder (3.3%). Other comorbidities included stroke, HIV-positive status, acute glomerulonephritis, sleep apnea, endocarditis, recent surgery for diverticulitis, acute myocardial infarct, Turner syndrome, and epilepsy.

Our data showed that risk of dying of pneumonia increases after 60 years of age. Other significant risk factors included obesity, hypertensive and arteriosclerotic cardiovascular disease, history of hypertension, diabetes, chronic kidney disease, chronic obstructive pulmonary disease cancer and chronic obstructive pulmonary disease. Patients with chronic obstructive pulmonary disease had a statistically significant increased risk of dying of pneumonia during winter months ($p=0.04$).

P13 A Report of Myocarditis During a Viral Pandemic

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Myocarditis is an inflammatory disease of the heart that is an established cause of sudden death for both adult and pediatric populations alike. The clinical presentation of myocarditis varies drastically from asymptomatic to nonspecific symptoms to cardiogenic shock and sudden death. Myocarditis can also mimic acute coronary syndrome and asthma. We present the case

of a two-year-old African-American male who became unresponsive while being transported to the hospital. The child had a history of asthma and was reported to have breathing difficulties earlier in the day. Notably, he was also seen by the pediatrician the morning of his death after a week of a febrile illness with nausea and vomiting. At autopsy, the child was noted to be in the greater than 99th percentile for height and weight. The only internal abnormality was the presence of multiple well-demarcated areas of mucosal thinning, free of erythema or hemorrhage, within the stomach. Sections from the stomach were submitted for histologic examination as were additional standard sections of other organs. Microscopic examination of the myocardium revealed a diffuse lymphocytic infiltrate with foci of myocyte necrosis. Histologic examination of the gastric mucosa revealed ischemic ulcers with a paucity of inflammatory cells and a characteristic "volcano-like" appearance to the submucosa. These findings of ischemia within the gastrointestinal tract further illustrate the sequence of lymphocytic myocarditis resulting in heart failure and cardiogenic shock. The histologic appearance of focal ischemic gastric changes has not been well-documented and contrasts the widespread ischemic changes seen in the small bowel and colon. Although myocarditis is a well-known cause of sudden death (usually due to heart failure or a fatal dysrhythmia), it is a relatively rare event. Lymphocytic myocarditis is typically the most common presentation and is usually the result of an autoimmune condition or viral pathogen. Viral lymphocytic myocarditis is often reported to be due to an infection by enteroviruses (most notably Coxsackie B serotype), parvoviruses, and adenoviruses particularly within the pediatric population. Oftentimes, viral testing is not obtained in the postmortem period for cases of lymphocytic myocarditis, but in the midst of a viral pandemic and with reports of myocarditis associated with COVID-19, a myocardial sample was submitted for molecular testing (a viral panel and SARS-CoV-2). The cardiac tissue was negative for SARS-CoV-2. This case illustrates how case management can be altered during a pandemic while also documenting histologic features of myocarditis and gastric ischemia.

P14 SARS-CoV-2 in the Kidneys: Postmortem Renal Histopathologic Findings in Three Patients with COVID-19

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As the mortality rate of COVID-19 continues to rise throughout the country, forensic pathology has been integral in meeting the demands of this pandemic while providing valuable information on the pathogenesis of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) through postmortem examination. Currently, the majority of the pathologic investigation surrounding COVID-19 has been primarily focused on the effect of the disease on the immune and respiratory systems. However, new-onset acute kidney injury and proteinuria have been observed in hospitalized patients with COVID-19 and those with no prior medical history of kidney disease.

To better understand the distribution and the effect of the virus on the kidneys, we present the renal findings in three autopsies of hospitalized patients. In the hospital, nasopharyngeal swab testing was performed; two of the patients tested positive for SARS-CoV-2 while one of the patients tested negative. The patients were 52, 53, and 79 years of age (2 males and 1 female). One of the patients had a history of renal transplantation secondary to end stage renal disease and had been maintained on immunosuppressive therapy; the other two patients had no previous history of kidney disease. During their hospitalization, all three patients showed clinical signs of acute kidney injury, including a rise in serum creatinine, blood urea nitrogen, and/or proteinuria. In addition, one patient required placement on continuous renal replacement therapy (CRRT). After postmortem examination, the causes of death were determined to be acute respiratory distress syndrome and multi-organ failure. On light microscopy, there was evidence of glomerulosclerosis, rare

glomerular microthrombi, isometric vacuolization, and sloughing of the tubular epithelial cells. Interestingly, there was no overt evidence of severe inflammation. Electron microscopy and ultrastructural evaluation revealed intracellular viral arrays morphologically consistent with SARS-CoV-2 in renal tubular epithelial cells as well as glomerular podocytes. It is worth mentioning that one of the three patients displayed these microscopic abnormalities despite multiple negative nasopharyngeal swab viral testing.

In addition to the direct virulence of SARS-CoV-2, there are other contributing causes to the development of acute kidney injury including hypoperfusion, sepsis, coagulopathies, and possible drug interaction. Nevertheless, the viral particles visualized on electron microscopy proves that SARS-CoV-2 has the capability to invade into renal tissue. Therefore, these cases illustrate findings that can add to the current understanding and pathogenesis of SARS-CoV-2.

P15 A Case of Clinically Unrecognized Adult Chicken Pox Revealed Postmortem

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Human herpesvirus 3 (HHV-3)/Varicella Zoster Virus (VZV) is a highly contagious pathogen that causes the conditions commonly known as "chickenpox" and "shingles." In the mid-1990s, an average of four million Americans presented with VZV infections annually, of which 100 to 150 persons died. With the advent of widespread vaccination, reported VZV infections have declined drastically over the past two decades. Primary VZV infections in adults are uncommon and rarely encountered in a forensic pathology setting.

Our case is that of a 49-year-old male with past medical history of obesity and tobacco use who presented to a local emergency department in mid-September with a diffuse, maculopapular and vesicular skin rash that began on his face and extremities approximately two days prior. He also reported fever, chills, vomiting, and abdominal pain one day prior to the appearance of the rash, which rapidly spread to involve his torso. Treating physicians noted numerous mucocutaneous lesions of the palate on physical exam. The decedent reportedly received his childhood vaccinations. Of note, his stepdaughter had a similar rash and symptoms approximately 4 weeks before his symptoms began, which abated with oral steroids. Extensive antemortem testing included blood cultures and a respiratory infection panel that did not reveal an etiology of his illness. He was not immunosuppressed. The clinical differential diagnosis included hand, foot, and mouth disease or rubeola. He was discharged to home, where he was found unresponsive one day later and unable to be resuscitated.

Postmortem examination revealed numerous skin lesions of varying appearance, ranging from erythematous and violaceous macules to crusted and pitted ulcers. Internal examination revealed evidence of hypertensive and atherosclerotic cardiovascular disease as well as marked pulmonary congestion and edema. Postmortem blood cultures and a neuropathology consultation were noncontributory. Histologic examination of the skin lesions showed evidence of a herpesvirus, including pathognomonic viral cytopathic changes of ground glass nuclei, margination chromatin, and multinucleation. The lungs showed focal necrotizing pneumonia in a background of exudative phase diffuse alveolar damage and the liver showed areas of zone 1 necrosis. HHV-3/VZV infection was confirmed via immunohistochemistry at the Centers for Disease Control and Prevention. This diagnostically challenging case highlights pitfalls of antemortem laboratory testing and classic features of VZV infection that can be revealed postmortem.

P16 Air Embolism Complicating Extracorporeal Membrane Oxygenation (ECMO) in the setting of COVID-19 Pneumonia: A Case Report and Review of Literature

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COVID-19, caused by Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) is a newly emerging infectious disease associated with upper and lower respiratory involvement. While some patients are asymptomatic, other patients present with severe respiratory compromise necessitating advanced medical intervention. One such advanced intervention, approved by the FDA in April 2020, is the use of extracorporeal membrane oxygenation (ECMO). ECMO has long been utilized for severely ill patients to assist with and maintain gas exchange. However, to our knowledge, possible complications associated with the use of ECMO in the setting of SARS-CoV-2 is unknown.

We present the case of an adult male in his 30s with no past medical history who presented to the hospital with fever, sore throat, and worsening shortness of breath. On admission the patient was found to be COVID-19 positive. The patient's hospital stay was complicated by worsening respiratory function requiring intubation. Given his lack of improvement the patient was started on a veno-venous ECMO involving the left and right femoral veins. Six days following the placement of the ECMO, the patient was found to have bilaterally fixed and dilated pupils. Head CT showed significant bilateral cerebral edema with concern for large acute ischemic infarct, and extensive pneumocephalus. Postmortem examination revealed a slender middle aged male with cardiomegaly (590 g), pulmonary consolidation (Left: 940g; Right: 1000g) and pulmonary thromboemboli involving the left and right pulmonary arteries. Examination of the brain revealed multiple blood clots with occlusion and distention of vessels and focal hemorrhagic slit-like spaces suggestive of entrapped air (pneumocephalus) were seen, corresponding to the radiological findings. Histological examination of the lungs revealed diffuse alveolar damage, the characteristic findings in COVID-19 pneumonia. Brain histology confirmed the presence of distended and thrombosed blood vessels in the deep and peripheral portions of the brain, along with anoxic brain damage.

This case report is presented to draw attention to possible complications in patients requiring advanced medical intervention in the setting of SARS-CoV-2.

P17 Postmortem Diagnosis of Clostridium Without Culture Confirmation

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We report three individuals with Clostridial sepsis, two culture confirmed, and one assumed based upon historical information and autopsy findings. Case 1: A 46-year-old male with history of colon cancer status post colectomy was found unresponsive and rapidly developed decomposition changes. At autopsy, within one day of his death, he had marked gaseous distention of the scrotum and palpable crepitation from the eyes to the feet, with bullae formation in the suprapubic region and left thigh. Postmortem culture of bullae fluid grew *C. septicum*. Case 2:

A 63-year-old female with history of non-Hodgkin lymphoma who was identified to have *C. perfringens* by hospital cultures. Autopsy was performed the day after death. The skin had a generalized red-tan discoloration. The liver had large gas pockets in the parenchyma. Microscopic examination revealed bacterial rods. Other than diverticulosis and mild coronary artery atherosclerosis, no other disease process was identified. Case 3: A 34-year-old male was found dead in his

apartment, which was 68 degrees Celsius, just under one day after having last been known alive. He was cooled prior to autopsy and autopsied less than 24 hours after being found. He had fixed anterior lividity, an abdomen that was distended by gas formation, and a scrotum that was distended by gas formation. There was no green discoloration of the abdomen. Glomerular capillaries contained bacterial rods with terminal spores. As no other cause was identified, the cause of death was certified as probable Clostridial sepsis.

Based upon their case report and review of literature, Yamaguchi et al. (2015) indicate that 1) *C. perfringens* is a common contaminant of autopsy blood (50-70% of cultured cases) and thus a causative postmortem diagnosis of *C. perfringens* is difficult without specific antemortem information, 2) histopathologic findings of disseminated Gram-positive bacilli, especially in vessels, occurs, and 3) postmortem CT scan can reveal extensive gas in the subcutaneous tissue and thoracic cavity, within only a 29 hour interval between death and autopsy. In addition, vanBunderen et al. (2010) indicate that *C. perfringens* septicemia can develop with no underlying etiology. Based upon the fact that Case 3 had evidence of postmortem gas formation out of proportion to other decomposition changes and evidence of bacterial rods filling glomerular capillaries, consistent with features described by Yamaguchi et al., a presumed diagnosis of Clostridial sepsis was made.

P18 Brain Herniation with Embolic Subarachnoid Displacement of Cerebellar and Brainstem Tissue to the Distal Lumbar Spine

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An adult female with a history of lupus/lupus profundus, end-stage renal disease, and Graves' disease presented with hypertensive emergency and left-sided weakness. Neuroimaging showed multiple areas of acute hemorrhage in the brainstem, thalamus, basal ganglia, and temporal lobe, with diffuse white matter changes. The patient suffered cardiac arrest following hemodialysis, and imaging of the brain showed transtentorial and tonsillar herniation. The patient had had three lumbar punctures in the three months pre-mortem. At autopsy, there was diffuse cerebral edema; bilateral tonsillar herniation and transtentorial herniation; intradural extramedullary tissue predominantly on the ventral aspect of the cervical, thoracic, and lumbosacral spinal cord; multiple hemorrhages located at the gray-white junctions of the occipital and temporal lobes, bilateral thalami, pons, midbrain, cerebellum, and basal ganglia; and Duret hemorrhages within the midbrain. Histological sections of the cerebellum, brainstem, basal ganglia, thalamus, and supratentorium showed small- and medium-sized blood vessels with perivascular chronic lymphocytic vasculitis adjacent to hemorrhages. The cervical, thoracic, and lumbar spinal cord sections confirmed there was glial and cerebellar tissue consistent with herniation and embolic displacement. The differential diagnosis of the vasculitis included primary angitis of the central nervous system, autoimmune disease, and others. The hemorrhages and ischemic effects appeared to be most likely associated with and secondary to the vasculitis. Additional autopsy findings included lymphocytic myocarditis with multifocal healing injury and few scattered giant cells, compatible with a possible healing T-cell dominant lymphocytic myocarditis; severe cardiomegaly; and severe left ventricular hypertrophy. In conclusion, this case illustrates a prominent example of embolic subarachnoid displacement of cerebellar and brainstem tissue extending to the lumbar spine in a patient with cerebral edema, bilateral tonsillar and transtentorial herniation, Duret hemorrhages, and hypoxic ischemic changes. This finding should be considered in the differential diagnosis of a spinal cord "mass" encountered at autopsy.

P19 Hypercoagulable: A Case of Dural Venous Sinus Thrombosis

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The decedent was a 24-year-old African-American female with a prior history of miscarriage and current oral contraceptive use. She presented to the emergency department with a sudden onset of severe headache, loss of hearing bilaterally, and confusion. A computed tomography scan of the head was significant for a dural venous sinus thrombosis. Interventional radiology performed a mechanical thrombectomy, but the thrombus was unable to be completely removed. Shortly after the procedure, her neurological status declined, with loss of brain stem reflexes. Comfort care measures were initiated and her family requested an autopsy. Gross examination of the brain revealed a cerebellar tonsillar herniation, right cerebellar parenchymal hemorrhage, and a 11.5 cm thrombus in the superior sagittal sinus. The remaining internal organs were unremarkable. Histologic examination of the sagittal sinus clot revealed lines of Zahn, consistent with an antemortem thrombus. Given her history of miscarriage, ongoing oral contraceptive use, and development of a sagittal sinus thrombosis, it is likely that she had an underlying blood clotting disorder (e.g., Factor V Leiden mutation, anti-phospholipid syndrome, protein C/S deficiency). Unfortunately, antemortem serologic testing to confirm a clotting disorder was not performed. The cause of death is ruled as sagittal sinus thrombosis. The manner of death is natural.

P20 Pacific Northwest Brain Donor Network: A Collaborative Approach to Studying Military Traumatic Brain Injury

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Traumatic brain injury (TBI) is a common form of trauma causing a wide range of acute and chronic effects. Neuropathologic effects of TBI experienced in military service, including blast and other mechanisms, are not well characterized. The Pacific Northwest Brain Donor Network (PNBDN) is a repository of brains for the study of brain injury and disease, focusing on acute and chronic effects of TBI, arising from military, sport, motor vehicle, and other mechanisms, both singular and repetitive. This cohort has a diverse set of cases (mechanism, severity, and symptom chronicity) compared to studies focused on identifying chronic traumatic encephalopathy (CTE) following repeated head trauma, and younger age than neurodegenerative brain banks.

The PNBDN provides an example of the benefits of collaboration between community partners, including local medical examiner offices (ME), academic medical centers (University of Washington and VA Puget Sound), and organ procurement organizations (OPO). Donors are referred via ME, OPO, or family request. Emphasis is placed on identifying donors with military service history (with and without TBI), but nonveterans (with and without TBI) are also included. MEs play a crucial role in donor identification and referral because many deaths in this cohort are sudden and unexpected. After consent is obtained, MEs facilitate brain removal and fixation. A questionnaire is conducted with family regarding TBI and military history, supplemented by obituary and medical records review. The neuropathology core performs detailed gross and histologic examination of the brain and provides a copy of the final report to the ME. To date, the PNBDN has received donation of 67 brains. Of 41 cases with completed examination, there are 32 men and nine women with median age 43 years (range 22-71). The cohort contains 23 with military service, three with known military TBI, and 22 with other TBI. Diagnoses include CTE (three

cases), possible CTE (three cases), Alzheimer disease (12 cases), and Lewy body disease (six cases). In cases without CTE, Alzheimer disease, or Lewy body disease, numerous cases show abnormal tau accumulation, including primary age-related tauopathy (three cases), age-related tau astrogliopathy (three cases), and additional cases that do not meet criteria for a defined tauopathy but which have cortical neurofibrillary tangles, pretangles, or threadlike and dotlike aggregates (20 cases, ages 22-57). The cooperative approach between ME and academic brain bank is essential for identifying cases and controls to allow study of military TBI and other TBI in this unique cohort.

P21 Fatal Case of Clinically Undiagnosed H3 K27M-Mutant Diffuse Midline Glioma Masquerading As Hypertensive Intraparenchymal Hemorrhage

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Fatal primary intracranial neoplasms are most often preceded by months or years of symptoms and diagnosed clinically well before death. In a medical examiner/coroner system, deaths due to unsuspected primary intracranial neoplasms have been reported to constitute as few as 0.02% of cases, and are likely decreasing with advances in imaging. Of those, gliomas, specifically astrocytomas, are the most commonly encountered.

Diffuse midline glioma with histone H3 K27M mutation was a newly established diagnostic category described in the 2016 update of the World Health Organization (WHO) Classification of Tumors of the Central Nervous System. These tumors have predominantly astrocytic differentiation and a K27M mutation in either the histone *H3F3A* gene or *HIST1H3B/C* genes, which encode the histone H3 variants H3.3 and H3.1, respectively. The *H3F3A* K27M mutation can be detected by immunohistochemistry using a mutation-specific antibody. Diffuse midline gliomas, H3 K27M- mutant, are most often found in children and young adults, and due to their aggressive nature and poor prognosis, they are designated WHO grade IV, regardless of their histologic features. They typically arise throughout midline structures (thalamus, brainstem, and spinal cord), and their symptoms reflect their location. In thalamic gliomas, common symptoms include signs of increased intracranial pressure, motor weakness/hemiparesis, and ataxia. Pathologic and imaging studies have shown intratumoral hemorrhage to be extremely rare.

Herein we present a case of a 34-year-old male inmate with a past medical history of hypertension, hepatitis C, psychiatric disease, and polysubstance abuse who presented to the hospital with hemiplegia before becoming unresponsive. Imaging showed massive intraparenchymal hemorrhage involving the right deep gray structures concerning for a hypertensive bleed, and brain death was pronounced the following day. Postmortem examination revealed abundant intraparenchymal hemorrhage and a poorly defined mass centered in the right thalamus, which appeared histologically as a low-grade glioma. A histone H3 K27M mutation was detected by surrogate immunohistochemistry.

Until now, this newly defined tumor as a cause of massive intraparenchymal hemorrhage and sudden, unexpected death has not been described in the literature. Despite advances in imaging, deaths due to undiagnosed primary intracranial neoplasms are still referred to the medical examiner/coroner. This case highlights a relatively new tumor entity with an unusual presentation and fatal outcome, the utility of surrogate immunohistochemistry to determine mutation status for proper diagnosis, and the importance of autopsy correlation with antemortem imaging.

P22 Colloid Cyst of the Third Ventricle in a Forensic Setting. A Case Series and Review of the Literature

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Introduction: Colloid cysts of the third ventricle are uncommon, benign tumors, mostly located near the foramen of Monro in the third ventricle. They are encountered in young to middle-aged adults and can cause obstructive hydrocephalus with associated symptoms, such as headaches and vomiting. Histologically, they show a single layer of columnar epithelial cells and may contain goblet and ciliated cells, as well as eosinophilic cyst fluid. In the majority of cases, they have an excellent prognosis and can be treated, if necessary, by excision or cyst drainage. However, rare examples are associated with sudden death. In this case series we present the clinicopathological features of four cases of sudden death due to a colloid cyst of the third ventricle and review the literature.

Methods: The database of the Cuyahoga County Medical Examiner's Office was used to identify relevant cases. Subsequently, a literature search in PubMed was performed. Gender, age, relevant antemortem symptoms, macroscopic and histological findings were included.

Results/Discussion: Four cases were identified in the Cuyahoga County Medical Examiner's Office database, consisting of two women and two men. The average age was 33 years (range 19 – 50 years). Two individuals did not have previously reported symptoms and died suddenly at home. One individual presented with a migraine headache the previous night. Another individual presented with a four-year history of migraines with exacerbation two days prior to death with severe headaches, nausea, vomiting, and photophobia. All cysts were located in the third ventricle, measuring from 1.5 x 1 x 1 cm to 2.0 x 1.5 x 1.5 (average greatest dimension was 1.8 cm). Histological findings showed cysts lined by flattened cuboidal to columnar epithelium with some ciliated epithelial cells. The cyst contents consisted of mostly denuded epithelium, cellular debris, polymorphonuclear leukocytes and eosinophilic amorphous material. On literature review, all fatal colloid cysts were located in the third ventricle. They were predominantly found in young adults of both sexes. Sizes ranged from 1.0 cm in greatest dimension to 4.0 x 3.5 x 3.5 cm. Similar to the cases in our office, headache and vomiting were present most frequently in other reported cases. Even though they are a rare diagnosis, colloid cysts of the third ventricle are important to be recognized as a differential diagnosis for headache in young adults due to the possibility of sudden death as well as a cause of hydrocephalus at autopsy in the same population.

P23 Rapidly Progressive Dementia: A Case of Wernicke Encephalopathy Unrelated to Alcohol Use

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Case: A 67-year-old woman had a reported six-month history of rapidly progressive dementia associated with visual changes, ataxia, and weight loss, and four months of severe nausea and vomiting. A head MRI two weeks prior to death was concerning for Wernicke encephalopathy (WE). The clinical team also considered variant Creutzfeldt-Jakob disease (vCJD, a prion disease) and autoimmune/paraneoplastic-related encephalopathy. She was started on high-dose thiamine supplementation, steroids, and intravenous immunoglobulins. Following minimal clinical improvement after five days of treatment, her family decided to transition her to comfort care. She died seven days later, and an autopsy was requested.

Due to concern for vCJD, a brain-only autopsy was necessary. There were no histologic changes of vCJD (spongiform change or prion protein

deposition), which were confirmed by the Prion Disease Surveillance Center workup (negative RT-QuC). The primary pathology identified was periaqueductal and peri-third ventricular vacuolar degeneration, gliosis, and petechial hemorrhages. The differential diagnosis included foremost alcohol-related WE, although alcohol use was not supported for this patient. The differential diagnosis also included malnutrition-related WE due to intractable emesis and adult-onset subacute necrotizing encephalomyelopathy (Leigh disease). Leigh disease is an inherited progressive neurometabolic disorder that does not typically involve the mamillary bodies. However, to rule out Leigh disease, electron microscopy was performed and did not support a diagnosis of mitochondrial/Leigh disease. Thus, the cause of this patient's neurologic signs and symptoms and histopathology findings were attributed to thiamine deficiency related to the recent period of intractable emesis and subsequent malnutrition.

Discussion: Wernicke-Korsakoff syndrome is the prototypic neurologic complication of thiamine (vitamin B1) deficiency. Wernicke encephalopathy represents the acute form of the disease and is most often associated with alcoholism but can also occur due to malnutrition related to gastrointestinal malabsorption, poor dietary intake, and hyperemesis. Up to 23% of patients with WE do not have a history of heavy alcohol use. In cases unrelated to alcohol use, the diagnosis is often delayed and when thiamine supplementation is initiated, it is typically inadequate and/or too late in the disease process for significant benefit. Unfortunately, in the present case, the etiology of intractable emesis could not be delineated due to the necessity of a brain-only autopsy. This case illustrates the utility of having a high index of suspicion for WE in the antemortem and postmortem evaluation of patients presenting with rapidly progressive dementia and a history of malnutrition regardless of etiology.

P24 Acute Ruptured Berry Aneurysm in Association with a Synchronous Cerebral Vascular Malformation: Differential Diagnosis and Classification

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Cerebral berry aneurysms and arteriovenous malformations (AVMs) are known causes of subarachnoid hemorrhage. Approximately one in four people with a subarachnoid hemorrhage will die before ever receiving care in a hospital. Factors that increase the likelihood of sudden death from subarachnoid hemorrhage include smoking, elevated systolic blood pressure, and living alone. Cerebral vascular malformations can be classified as developmental venous anomalies, capillary telangiectasias, cavernous malformations, or arteriovenous malformations, with AVMs being the most dangerous with the highest risk for intracranial hemorrhage (approximately 3% annual risk of hemorrhage). Arteriovenous malformations are known to be associated with saccular aneurysms, which further increase the risk of hemorrhage. The association with aneurysms is uncommon with other cerebral vascular malformations. This poster aims to discuss the classification of cerebral vascular lesions in order to determine risk for surviving family members and whether the entity identified is likely contributing to the death or an incidental finding at postmortem examination.

We present the case of a 59-year-old male smoker with a history of hypertension, Parkinson Disease, chronic obstructive pulmonary disease, and alcohol use disorder who was found deceased at the bottom of his stairs with only minor external evidence of trauma. Toxicology revealed a blood alcohol concentration of 0.373 g/dL and the presence of THC breakdown products. In this case, an obvious ruptured aneurysm was discovered with a secondary vascular malformation.

Gross examination revealed a 1420 gram brain with subarachnoid hemorrhage mainly involving the cerebral convexities most prominent on

the right side. There were additional significant abnormalities of the cerebral vasculature including a ruptured 0.8 cm berry aneurysmal sac in the right posterior cerebral artery with a continuous feeder vessel that supplied a 3 x 5 cm tangled, calcified aggregate of blood vessels within the right occipital pole. The identity of the occipital pole lesion was uncertain grossly, and the differential diagnosis at this point included AVM and cavernous angioma. Sections of the vessel aggregate revealed a mixture of both arteries and veins (confirmed by Movat stain) with myxoid change, intimal proliferation, and arterial duplication of the elastic laminae, most consistent with arteriovenous malformation. The ruptured berry aneurysm in close proximity to the vascular malformation is also supportive of the diagnosis of AVM.

A cerebral vascular lesion is often grossly evident, but definitive classification requires knowledge of the differential diagnosis and classic microscopic features.

P25 Blue Baby: An Uncommon Post Mortem Artifact due to Perimortem Methylene Blue Administration

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Methylene blue is an oxidizing agent used as an adjunct treatment in many medical conditions, including methemoglobinemia. Methemoglobinemia is an uncommon, potentially fatal disorder characterized by the inability of hemoglobin to carry oxygen due to oxidation of the ferrous part of the heme molecule to ferric iron. Ferric iron decreases oxygen supply to the tissues, and produces a functional anemia. Methylene blue reduces methemoglobin, in the ferric Fe³⁺ state, to normal hemoglobin with ferrous Fe²⁺ iron. Benzocaine, a topical anesthetic present in teething medications such as Baby Orajel®, has been well reported to cause acquired methemoglobinemia. Adverse effects of methylene blue administration are typically dose-dependent; however, blue discoloration of skin, mucosa, and urine has been well documented.

A 4-month-old male with unknown medical history at the time of autopsy was found unresponsive and prone in and adult bed. Autopsy findings and a review of the literature are discussed.

External examination at autopsy revealed prominent blue coloring of the subcutaneous vasculature and a puncture mark with blue dye staining on the right leg. Additionally, internal examination revealed blue discoloration of the brain, heart, and adrenal glands that intensified over the course of the examination. Subsequently obtained hospital records indicated methylene blue and Narcan administration during resuscitation efforts. Microbiology studies for respiratory syncytial virus and rhinovirus were positive and likely contributed to death; however, due to the unsafe sleep environment, his death was ultimately ruled undetermined.

Methylene blue is used in the treatment of several conditions, including methemoglobinemia. Acquired methemoglobinemia is a known complication of teething medication administration, and thus methylene blue may be administered to a teething infant in an emergent situation. We present a case of an uncommonly seen postmortem resuscitation artifact that may cause concern without documented medical history.

P26 The Utility of Postmortem Cultures in Pediatric Autopsies

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Introduction: A blood culture is frequently obtained in autopsies of children two years of age or younger. Results can be genuinely positive due to an

infectious focus, while other reasons may be agonal spread, postmortem translocation, or contamination. We compared culture results with infectious foci found on macroscopic and microscopic postmortem examination.

Methods: 287 autopsies of children two years of age or younger performed from 2014 to 2019 at the Cuyahoga County Medical Examiner's Office were reviewed. The cases were evaluated for performance of postmortem culture, type and site of culture, culture result and subsequently correlated with gross and histologic findings, anatomic diagnoses and cause of death.

Results: Cultures were performed in 57 out of 287 cases (19.9%). In those 57 cases, types of cultures performed were blood cultures (40 cases, 70.2%), CSF cultures (10 cases, 17.5%), tissue cultures (25 cases, 43.9%) including lung, spleen, brain, and inner ear culture, nasal swab cultures (8 cases, 14.0%) and pleural fluid cultures (one case, 1.8%). Cultures resulted as mixed growth without focus of infection were observed in 22 cases (38.6%), negative cultures without focus of infection in 13 cases (22.8%), and mixed growth with a focus of infection in six cases (10.5%). Four cases yielded a single isolate with correlating focus of infection identified (7.0%). Two cases were negative on culture even though a focus of infection was identified (3.5%). There were ten cases with a single contaminant without focus of infection (17.5%). While most of these cultures were positive for typical contaminants, a single case was positive for *Streptococcus pneumoniae*. Manner and cause of death in this case were undetermined and "*Streptococcus pneumoniae* bacteremia" was included as a contributing condition.

Discussion: The majority of positive cultures are false positives without infectious foci found. Of the culture positive cases with infectious foci, most are mixed growth (contaminated), with only a small fraction identifying a single organism that may be causative for the infectious focus. Even with an infectious focus present, cultures can be negative. Postmortem cultures may be of limited value in a substantial portion of cases, mostly not contributing substantial information regarding cause of death determination, while consuming money and other resources. If performed, careful technique to avoid contamination and accurate correlation with investigative and possible clinical findings is necessary.

P27 WITHDRAWN

P28 An Overdose Death Associated with Vaping Designer Fentanyl Analogs

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We examined a 33-year-old White male with a history of drug dependency who was found dead at home after a suspected drug overdose. At the scene, the decedent's mother informed investigators that in addition to conventional injection of illegal drugs, the decedent would also vape these drugs, allegedly making his own vaping liquids. A vaping device was discovered on the bed next to the decedent and was submitted for toxicological analysis.

The social interest in vaping has fueled an exponential rate of evolution within vaping technology and consumer customization of vaping devices. These devices allow vaping liquids to be made into a vapor via contact with a heating element, and then inhaled. The typical ingredients include vegetable glycerin, propylene glycol, diluted nicotine or nicotine salts, and flavor concentrates; however, there are now emerging reports of other illicit drugs finding their way into vaping mods, which are larger devices than traditional vape pens owing to their modifications and enhancements. With

recent reports of vaping-associated lung injury and deaths, there is now mounting scrutiny of what is a largely unregulated industry.

Independent of the vaping craze, there has been an epidemic in opioid-related deaths escalating over the past decade. These deaths, which were initially driven by heroin and prescription opioid abuse, are now rising because of a common anesthetic and pain management therapeutic: fentanyl. Because of its potency and wide availability, fentanyl has been abused and misused for the past several decades. In addition, clandestinely manufactured fentanyl and designer analogs are introduced into illicit markets on a monthly basis.

Postmortem toxicology performed on the decedent's peripheral blood revealed the presence of fentanyl (20.7 ng/mL), butyrylfentanyl (4 ng/mL), valeryl fentanyl (0.93 ng/mL), b-hydroxyfentanyl, cocaine (330 ng/mL), buprenorphine (0.52 ng/mL), and sertraline (190 ng/L). Concomitant testing of the liquid from the vaping device revealed the presence of nicotine, butyrylfentanyl, and valeryl fentanyl.

Vaping illicit substances is not a new phenomenon and has been reported previously with heroin, but to our knowledge this is the first case of a vaping device being used as a delivery mechanism for fentanyl or fentanyl analogs. It is unknown at this time if this route of administration is associated with an increased risk of morbidity or mortality. Given the nature of this case, it is recommended that vaping devices found at death scenes be collected and the contained vaping liquid tested for the presence of illicit substances.

P29 Sudden Death Following Acute Phentermine Ingestion

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Phentermine is a widely used diet pill approved for use of twelve weeks or less to treat obesity. It is an analogue of amphetamine and acts to upregulate the central and sympathetic nervous systems by increasing release and inhibiting uptake of norepinephrine. Weight loss is thought to be secondary to this upregulation. Phentermine was initially approved for medical use in the United States in 1959 and was marketed in combination with fenfluramine as "fen-phen." It was found to be associated with heart valve disease and was taken off of the market in 1997. Phentermine alone is still available today as a schedule IV controlled medication.

We present a case of a 32-year-old, obese female with no known past medical history who presented to the emergency department with a headache and chest pain. While in triage, she experienced a witnessed collapse with seizure-like activity and was found to be in ventricular fibrillation. Cardiopulmonary resuscitation was initiated and she was intubated. The patient was coded for an hour and twenty minutes but was unable to be resuscitated. Her electrocardiogram during the code was suspicious for an anterior wall myocardial infarction.

Autopsy revealed an obese (BMI= 44.1 kg/m²) female with no evidence of trauma. There was cardiomegaly (460 g; predicted: 367 g) with microscopic mild interstitial fibrosis and myocyte hypertrophy. Toxicology was positive for 210 ng/mL of phentermine. Investigation proved the decedent had taken an unknown dose of phentermine, prescribed to her sister, the day before she expired in an attempt to lose weight.

Acute phentermine toxicity can result in nervousness, tremor, confusion, headache, hallucinations and psychotic episodes. There have been sparse other case studies of patients developing ventricular fibrillation, acute coronary syndrome, or cardiac arrest after using the diet drug phentermine. One study presented two patients with proven coronary vasospasm via

invasive coronary angiography and subsequent myocardial infarction after taking phentermine. The lesions resolved with intracoronary nitroglycerin. This patient's postmortem concentration of phentermine was within the average of chronic therapy (190-510 ng/mL) while concentrations from fatal overdoses are reportedly in the range of 1,500-7,600 ng/mL. Because of the lack of obstruction in the coronary arteries on autopsy, it is hypothesized that the phentermine caused an acute vasospastic event leading to ventricular fibrillation and subsequent death. We therefore postulate this patient had an increased adrenergic response to the drug phentermine with possible increased coronary sensitization as a mechanism for her sudden death.

P30 Characteristics and Trends of Fentanyl Related Death in Marion County, Indiana: 2016-2019

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Fentanyl, a potent opioid, has been increasingly abused. Here we review the deaths resulting from drug overdose in the Marion County Coroner's Office's jurisdiction from 2016 to 2019 to identify the characteristics of fentanyl-related death as well as its public health implications.

A total of 1379 drug overdose deaths were brought into the facility for examination and 228 cases were investigated without the decedents being brought into the office for examination. All of these cases were included in this study. The number of cases requiring pathologist examination increased from 310 in 2016 to 378 in 2019. The proportion of drug overdose deaths involving fentanyl dramatically increased in cases requiring examination of the decedent by the pathologists (from 28% in 2016 to 60% in 2019).

Age and sex distribution in overdose deaths involving fentanyl remained stable during the study period. Approximately 60% of these decedents died during their second and third decades of life. Males constituted 70.6% of the cases. Caucasians, which make 64% of county population, were more likely to be succumb to both fentanyl involved (74.2%) and nonfentanyl overdose (75.8%) compared to those of other races. The percentage of Caucasians dying of fentanyl involved intoxications increased from 2016 (69%) to 2019 (76%). The number of drugs detected in drug related fatalities increased over time, and fentanyl analog involvement increased from 3% in 2016 to 21% in 2019. Carfentanil was the most common fentanyl analog causing death in the absence of fentanyl.

Compared to nonfentanyl drug overdose death, decedents who died in overdoses involving fentanyl died at younger ages (range: 1 day-72 years; median age 36 years) than those died of non-fentanyl drugs (range: 14-81 years; median age 42 years). Accidental death involving fentanyl (98.3%) was more common than that from non-fentanyl drugs (90.2%). The percentage of men dying of intoxications involving fentanyl (70.6%) was higher than that in nonfentanyl related deaths (62.8%).

In conclusion, we have observed a drastic increase in drug overdose deaths involving fentanyl and its analogs in the past four years. Young males were at high risk, which is likely due to their risk-taking behavior. These deaths represent an important target for intervention. Additionally, toxicology testing will be required to adapt to the rapidly emerging fentanyl analogs. Also, with the opioid crisis and increasing need of autopsies, the shortage of forensic pathologists must be addressed.

P31 Toxicology Testing When Traditional Matrices Are Non-Existent

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Postmortem toxicology work is sometimes hampered by the absence of preferred matrices for analytical testing. In certain instances where traditional specimen types (e.g., blood, tissue, fluids) are nonexistent, the analysis of non-biological materials (e.g., clothing, bedding, blankets) stained with suspected biologicals should be considered. Analytical findings derived from these sample types can often provide insight into drug exposure in an individual prior to death.

A general analytical protocol has been developed that takes into account differences in the starting material (e.g., nylon, fleece, cotton) of evidence to be tested. Following a visual examination of the submitted item, multiple similar-sized sections are chosen for testing to include a case-specific piece and pieces for quality controls. For positive quality controls, drug standards containing drugs/drug metabolites are added to pieces that appear stain free and allowed to dry. For negative quality controls, a section of the material that appears stain free and a clean piece of material unrelated to the case are processed. All pieces are cut into smaller pieces (size) and placed into appropriately labeled containers. All containers are filled with methanol and repeatedly vortexed at room temperature for several hours. The methanolic extracts are then pipetted from each container, transferred to appropriately labeled test tubes, and evaporated to dryness at 36°C. Samples are immediately reconstituted with phosphate-buffered saline prior to undergoing further sample preparation for screen and confirmation testing. Upon completion of analytical testing, data are evaluated to determine whether positive findings are from the biological on the material or are perhaps due to other pre-analytical variables such as surface contamination.

Positive findings from cases employing this approach include illicit, prescribed, and over-the-counter medications such as cocaine, d-methamphetamine, codeine, diazepam, zolpidem, doxylamine, and diphenhydramine. A series of cases will be presented to demonstrate the utility of this procedure and to show the variables and factors that are taken into consideration when interpreting results.

P32 Designer Benzodiazepines: A Death from Flubromazolam Toxicity

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Designer benzodiazepines' initial development can be traced to 20th century pharmaceutical research. Though most are not approved for human consumption, many are now available for purchase online in several formulations. We present what we believe is the first published case of fatal flubromazolam toxicity. Flubromazolam is a relatively new designer benzodiazepine and is one among a rapidly expanding list of novel psychoactive substances (NPS).

The decedent was an 18-year-old female who was found unresponsive in her bed and pronounced dead shortly thereafter. A purse containing a Juul e-cigarette device with cartridges, an acetaminophen/hydrocodone (325 mg/7.5 mg) tablet, and an albuterol inhaler was on the bed. Medical history was significant only for well-controlled asthma. The night prior, she was out with friends and reportedly ingested two diphenhydramine tablets and used an albuterol inhaler. Postmortem examination was remarkable for frothy fluid in the decedent's nostrils; no injuries or significant natural disease was observed. Screening of urine by enzyme multiplied immunoassay technique detected hydrocodone (36 ng/mL), dihydrocodeine (<25 ng/mL), and flubromazolam (37 ng/mL). The cause of death in this case was certified as flubromazolam and hydrocodone toxicity with the manner of death being

accident.

The Georgia Poison Control Center reported a 330% increase in designer benzodiazepine exposures from 2014-2017 from data obtained from the National Poison Data System. Ingestion is the most common route of administration. The clinical manifestations of designer benzodiazepine exposure mirrors typical clinical effects of benzodiazepines including drowsiness and lethargy. In general, benzodiazepines are safe drugs with low risk for toxicity, except when present in combination with other central nervous system depressants like alcohol or opioids, as in this case. Little is known about the potency of many designer benzodiazepines including flubromazolam, though flubromazolam is considered by many to be highly potent. Individuals on recreational drug Internet forums have reported heavy sedation at doses as low as 0.5 mg. A pharmacokinetic study after controlled ingestion of a 0.5 mg capsule of flubromazolam revealed flubromazolam and its monohydroxylated metabolite detectable in urine by liquid chromatography-tandem mass spectrometry up to 6.5 and 8 days, respectively, a peak serum concentration as low as 8 ng/mL (8 hours post ingestion), and a half-life estimated to be about 10-20 hours. This case demonstrates the diversity and continual emergence of NPS like flubromazolam that can cause fatal overdoses and emphasizes laboratories' continued attention to detection of NPS.

P33 Postmortem Rapid Urine Drug Screen Analysis Compared to Standard Drug Screen

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Toxicology can be an essential part of determining the cause of death in medical examiner offices. However, comprehensive drug testing can be costly. An initial inexpensive drug screening test would be useful in some circumstances to determine whether additional, more extensive, and costly testing is necessary. This study utilized an inexpensive clinical, commercial, multi-drug dip card test on postmortem urine samples followed by standard laboratory immunoassay (EIA) and gas chromatography-mass spectrometry (GC-MS) urine drug screen. The two-class binary classification results were then analyzed in a simple confusion matrix and a receiver operating characteristic (ROC) curve to estimate the prediction accuracy of the multi-drug dip card test.

Sixty-six urine specimens were collected and tested with a 1-Step Direct Multi-Drug Dip Card test WDOA-6125. These cards tested for ten different drugs in the urine. Six out of the ten drugs showed positive results and robust predictability in order of strength for cocaine, methadone, methamphetamine, oxycodone, amphetamine, and morphine. Benzodiazepine, THC, buprenorphine and MDMA drugs require additional testing to determine the validity between the dip card tests and a standard laboratory drug screen. A more significant statistical correlation and explanatory variance in predictability may be found with more dip card tests and EIA/GC-MS test results above the limitation of 66 valid urine specimens.

P34 Evaluation of Pedestrian-Train Fatalities in the State of Maryland: a Five-Year Retrospective Study of Forensic Autopsy Cases

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Few studies have been done on the incidences of train-related pedestrian fatalities throughout the United States, with no previous studies reported in the State of Maryland. A retrospective study was conducted at the statewide medical examiner's office in Maryland to evaluate the characteristics of train-related pedestrian fatalities in the past five years from 2014 to 2018.

The aim of the study was to analyze circumstances of deaths through the medicolegal death investigation and postmortem examination findings, including toxicological study, and to help identify future safety measures.

A total of 48 cases were identified. Of the 48 deaths, 21 deaths (43.7%) were determined to be accident, 20 deaths (41.7%) were suicide, and seven deaths (14.6%) whose manner of death could not be determined. Of the 21 accidental victims, 17 were males and 4, female (M:F ratio= 4.3:1), 15 (71.4%) were white and 6 (28.6%) African-American, with age ranging from 16 to 58 years (mean age = 35). While the 20 suicide victims, 17 were males and three, females (M: F ratio = 5.7:1), 18 (90%) were White and two (10%), African-American, with age ranging from 22 to 60 years (mean age: 40). The majority of accidents occurred during weekday evening rush hours between 4:00 pm and 7:00 pm while the suicides showed no specific time frames. No specific peak for seasons of year was found in suicides nor accidents. Postmortem toxicological study showed that accidental victims were 57.1% (12/21 cases) positive for alcohol and the suicide victims were 30% (6/20 cases) positive for alcohol. Manner of death could not be determined in seven cases because unclear circumstances of death. Thorough death scene investigation and complete postmortem examination including comprehensive toxicological testing is very important in all train-related pedestrian fatalities to accurately determine the manner of death because accident versus suicide can directly affect the outcome of civil litigation and dispersal of insurance benefits. The characteristic profiles of train-related pedestrian fatalities can also assist effective preventive measures on railway suicides and accidents.

P35 Drowned in His Own Blood: Accidental Mechanical Asphyxia Due to a Massive Bleeding With Airway Obstruction

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A 33-year-old man was admitted to the emergency department for a ground-level fall associated with convulsions and facial trauma. The patient was conscious and cooperative with nasal tumefaction, massive epistaxis, tongue biting injury, and hand tremors. Medical history was silent for epilepsy and medication, and positive for alcohol addiction. The blood analysis showed thrombocytopenia (platelets $73 \times 10^9/L$), elevated liver enzymes, and a blood-alcohol concentration of 19 mg/dL. After a few hours, the patient got out of bed and fell on the floor, hitting his face. This resulted in severe bilateral epistaxis and seizures were reported by healthcare personnel. Due to the massive hemorrhage blocking the upper airways, orotracheal intubation was required, but during the procedure the patient had a cardiac arrest. After 30 minutes of ACLS, the death was pronounced. At the autopsy, these findings were lacerated-bruised wounds above the glabella with an underlying suffusion of blood, on the *dorsum nasi*, on upper lip mucosa and on the body of the tongue; blood in the trachea, bronchial tree and peripheral lung tissue; lung edema with abundant frothy; multi-organ vascular congestion; and increased hepatic volume. Histologic findings included ulceration of the tongue with hemorrhagic suffusion, granulocytic inflammation, and abscesses in the deeper layers; multiple areas with abundant red blood cells in the alveoli; and severe hepatic steatosis. The cause of death was the mechanical asphyxia due to massive epistaxis with airway obstruction as a result of accidental head trauma and due to bleeding from tongue wounds in a thrombocytopenic individual. Although the patient was not diagnosed with epilepsy, alcohol withdrawal syndrome can determine convulsions similar to epileptic seizures, including the biting of the tongue (*morsus*). In the reported case, the evidence of granulocytic inflammation with abscesses in the tongue was suggestive of a previous subacute traumatic episode, while the hemorrhagic suffusion was attributable to the final lethal acute event. Seizure-related deaths are commonly investigated by forensic pathologists; a detailed inspection of the tongue through a careful dissection may provide invaluable information. Indeed, the uncontrollable bleeding even from small vessels due to biting of the tongue can lead to airway obstruction and death by asphyxiation.

P36 Nonfirearm Related Homicides at the Medical University of South Carolina, 2013-2019

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After high-profile events involving firearms, gun violence often becomes the center stage of public discourse with resultant exuberant national media attention, overshadowing less common causes of homicidal deaths, such as sharp force injury, blunt trauma, asphyxia, and neglect. A retrospective analysis of all cases referred for medicolegal autopsy to the Medical and Forensic Autopsy Division of the Department of Pathology and Laboratory Medicine at the Medical University of South Carolina (MUSC) from 2013 to 2019 documented approximately 1000 deaths that were classified as homicides. Of these, almost 25% of the deaths were caused by nonfirearm-inflicted injuries. Nonfirearm homicides were further categorized by method and weapon, demographic data including decedent age, race, and gender, and other variables such as incident site, decedent relationship status to the alleged perpetrator, number of other fatalities associated with a homicide, in-custody death, gross and/or microscopic autopsy findings pertinent to the death, and the presence of drugs and alcohol. Data accrued in this review will be compared to national statistics published by the Centers for Disease Control and Prevention and to the overall MUSC firearm-related homicide statistics for this same time period. Findings will augment existing information available regarding nonfirearm related homicides and may be valuable in contributing to the ongoing public and political debate regarding firearm and nonfirearm fatalities.

P37 Putting the Pieces Together Again: A Case of Dismemberment Using a Circular Saw

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Introduction: Dismembered bodies offer a unique challenge in evaluation of injuries and the method of dismemberment, none of which may be obvious initially. One retrospective study showed that most dismemberments occur in a generally symmetrical manner, and the authors present a similar case in which a man died from gunshot wounds and then was dismembered somewhat symmetrically at the neck, femora, humeri, and wrists. The following will be an exploration of the means of identifying and matching the various body parts for identification, and also the means of examining the toolmarks used in the dismemberment process.

Case History: A 67-year-old man and his stepson were engaged in an argument about property. As the argument escalated, he was shot by his stepson, who subsequently dismembered and concealed parts of the body in 55-gallon barrel while burying the remainder elsewhere. A few days later a missing person report was made to the Sheriff's office. Subsequently, the decedent's body was recovered with the aid of the anthropologists.

Results: A postmortem examination was performed at the Office of the Medical Investigator in Albuquerque, NM. The portions of the body recovered from two separate locations were paired with their matching counterparts using comparison of shape, angle of cuts, and evaluation of markings of the bones. All portions revealed moderate decomposition and multiple gunshot wounds involving the head, torso, and extremities. The femora demonstrated linear grooves (kerfs) near the site of dismemberment and the cut surfaces revealed linear to curvilinear markings. An anthropology consultation demonstrated bone trauma without evidence of healing located at the various sites of dismemberment, all of which were consistent in their characteristics. Markings on the femur demonstrated a W-shaped kerf floor and the kerf widths were of similar measurement. No V-shaped cut marks were identified. The patterns of bony injury and kerf marks were compatible with the alleged tool used; an electric circular saw.

Discussion: This case demonstrates the importance of using an organized, methodical approach when evaluating such deaths and also highlights the utility of interdisciplinary teamwork. Pairing of dismembered body parts can be accomplished by analyzing the cut angles and toolmarkings as they occur on a bone, given the appropriate investigative circumstances and information. The shape and features of the kerf, can offer important information in identifying a weapon or tool used. The dismemberment pattern was relatively symmetric, as described in a prior study.

P38 Exsanguination via a Right Radial Artery Posttraumatic Pseudoaneurysm Secondary to Dog Bite: A Case Report

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Pseudoaneurysms occur from defects in arterial walls commonly as the result of iatrogenic causes or trauma. They differ from true aneurysms due to a lack of involvement of one of the layers of the vessel wall. Due to this lack of involvement, pseudoaneurysms are much more likely to rupture. This case report from the Office of the Chief Medical Examiner of San Francisco describes the unusual death of a 91-year-old woman with dementia who, following a dog bite on her right wrist, did not seek medical intervention for the wound. Three to four weeks following the initial trauma, the decedent was found down in her home with significant blood splatter at the scene and evidence of an open scab on the right wrist. At autopsy, the scab was discovered to communicate with a 3 cm defect of the right radial artery. Histologic sections of the defect supported the diagnosis of a disrupted right radial pseudoaneurysm. This presentation will discuss the pathology of pseudoaneurysms, the factors contributing to the death in this case, and a review of relevant literature surrounding traumatic pseudoaneurysms.

P39 Wall Falls: Blunt Trauma Sustained from Border Wall Crossings

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Introduction:

Originally constructed in the early 1990s, the Mexico-United States barrier, known as the border wall, serves as a deterrent to illegal immigration into the United States. This wall consists of a discontinuous series of physical walls up to 27 feet high alternating with areas of virtual fencing and has recently garnered increased attention due to discussion of federal expansion.

We report two cases of fatal blunt force trauma sustained from attempts at crossing the physical portion of the border wall into the state of New Mexico and compare blunt force trauma sustained from these falls to those sustained from ground-level and from great heights.

Methods: The Office of the Medical Investigator's electronic database was queried for all deaths occurring in New Mexico's "international zone" between January 1, 2017 and March 31, 2020. Data were then cleaned in Excel based on inclusion and exclusion criteria. Inclusion criteria consisted of decedents with border wall-related blunt trauma. Excluded from analysis were deaths from blunt trauma acquired by other means. Postmortem computed tomography was used to help identify injuries at the time of autopsy examination.

Results: Two cases were identified, each located near an 18-foot high portion of the border wall. Case 1 was a 26-year-old man with significant injuries that included left periorbital ecchymosis, bilateral pneumothoraces, pneumomediastinum, left tibia and fibula fractures, left ankle contusion, and finger lacerations. Case 2 was a 55-year-old woman with significant injuries

that included periorbital ecchymoses, left face and subscalpular soft tissue hematoma, a gaping scalp laceration, calvarial fractures extending into the basilar skull, patchy subarachnoid hemorrhage, trace pneumocephalus, bilateral fractures of ribs 2-10, liver laceration, lung lacerations, trace pneumothorax, small bilateral hemothoraces, right ventricular laceration with hemopericardium, anterior mediastinal hemorrhage, and left clavicular fracture.

Both cases were certified as blunt trauma and accidental for cause and manner of death.

Discussion: The trauma sustained in these two cases was intermediary between injuries sustained in falls from standing and those from great heights. As compared with fatal falls from ground level, these decedents were generally younger and lacked resultant subdural hemorrhage and/or hip fracture. Compared with falls from great heights, injuries sustained were less severe and more confined to the side of impact. Lacking were aortic, neck, and more extensive head injuries. While this series is modest, as the border wall expands there may be an expected increase in these types of deaths.

P40 Analysis of Air Gun Parameters and Wounding Potential

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Air guns fire projectiles using the expanded forces of compressed air or gas. Ammunition varies by caliber, weight, shape, and composition. The ability to purchase an air gun is dependent upon state and local laws, and regulations may vary based upon factors such as bore, muzzle velocity, and projectile type. From a forensic investigation perspective, air guns differ from conventional gunpowder firearms in several ways. Due to the lack of propellant or primer, they leave no gunpowder residue, often making range of fire determinations not possible. Some air weapons are capable of achieving muzzle velocities similar to those of firearms, but traditionally are considered to generate less kinetic energy and have a lower wounding potential. Only a handful of case reports in the United States describe homicides with an air gun, and of these even fewer involve entrance wounds to the thoracic region, with ocular and cranial injuries being far more common. This presentation will provide an overview of air guns, range of fire capabilities, wounding potentials, and ballistic significance. A case of a 38-year-old man who shot himself using a Gamo Hunter Sport air rifle with a .177 caliber pellet to his chest, whose cause of death was due to perforation of his heart, will be used as a practical example.

P41 Sickle Cell Trait and Cold Induced Death: A Case Report

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Introduction: Sickle cell disease (SCD) and sickle cell trait (SCT) are examples of heritable hemoglobinopathies that exist due to single point mutation in the beta globin chain of hemoglobin, referred to as hemoglobin S (HbS). Inheritance of one copy is a carrier status, SCT, which is typically not regarded as a disease state because complications are rare or mild. However, under unusual circumstances serious morbidity or mortality can result from polymerization of deoxy-HbS even in individuals with SCT.

Case Report: The decedent was a 13-year-old Black male with no previously known medical history who was found deceased at home during the winter months. Scene investigators noted he was laying supine across a bed and partially dressed in underwear and thick socks with two pieces of clothing laid across him like a blanket. The house and bedroom had scattered trash, leftover food, no heat, and sparse furnishings. The indoor

temperature was measured at 28°F (-2.2°C). There was no sign of trauma or evidence of foul play. The investigator and police impression was that of a natural death complicated by child abuse/neglect.

Results: Decedent was a normally developed and nourished Black 13-year-old male with numerous well-healed scars on the anterior legs, but otherwise unremarkable. Internal autopsy exam was remarkable only for dark red lung parenchyma with scattered foci of atelectasis. Microscopic examination showed moderate erythrocyte sickling in the liver and spleen with some sickling seen in other vascular beds, such as the lungs, brain, and heart. Postmortem hemoglobin electrophoresis (HE) and confirmatory high-performance liquid chromatography (HPLC) showed a HbS concentration of approximately 30-36%, consistent with SCT. The cause of death (COD) was determined to be sickling crisis due to hypothermia; the manner of death was certified as accident.

Discussion: We present a case of a previously healthy Black male who was found to have SCT via utilization of postmortem hemoglobin fractionization. It is well known that pathologic processes that cause hypoxia, acidosis, dehydration, hyperosmolality, or elevated erythrocyte 2,3-DPG can increase morbidity and mortality of SCT. To our knowledge, this is the first reported case of environmental hypothermia resulting in death from sickling complications in a healthy child. Exposure to extreme cold in the residence is tantamount to neglect and is reflective of a failure by the caregivers to provide adequate clothing, shelter, and medical care for the decedent.

P42 Don't Frack Yourself Over: Death Due to Electrocution from Fractal Wood Burning

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Pyrography is an art form that creates designs in wood with a heat source. Fractal wood burning, also known as wood fracking, is a controversial method of pyrography where the use of high-voltage electricity is used to create a Lichtenberg ("tree branch") type pattern on a piece of wood that is saturated in an electrically conductive chemical solution. This process has reportedly resulted in rarely reported deaths upon review of online news reports and the literature. Presented here are the scene and autopsy findings of a death due to wood fracking.

The decedent was a 45-year-old White man who was discovered deceased in the driveway of his residence. He was a known fractal wood burning hobbyist with no professional training in electrical work. Near the decedent was a homemade high voltage wood burning device consisting of a wooden box, the top of which had a Lichtenberg pattern burned into the wood. Outside of the box was a power switch that was wired across the primary winding of a microwave oven transformer. The secondary winding of the transformer was connected to two alligator clips that were in the decedent's hands resting on his torso. The decedent was not wearing gloves.

At autopsy, the decedent had charring and fourth degree burns on the face, tongue, neck, and anterior torso with exposure of the underlying skeletal musculature, external genitalia, upper extremities including the hands and thighs. The right lower quadrant of the abdomen had exposure and protrusion of the underlying small intestines, which were also charred. The manubrium, upper portion of the sternum, and bilateral first and second ribs were charred through. Thermal changes involved the lungs, liver, and heart. The fingers of the right hand were traumatically avulsed. The brain had epidural hemorrhage covering the occipital lobes and cerebral edema. The cause of death was electrocution with thermal burns. The manner of death was accident.

Fractal wood burning can be associated with life-threatening high-voltage electrical injuries and death. Forensic pathologists should be aware of this

emerging hobby to promote increased safety measures, as well as public education on the risks of this form of pyrography.

P43 Undiagnosed, Unknown, and Unexpected: A Case Series of Lymphomas Discovered Postmortem

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Lymphomas, Hodgkin and non-Hodgkin, account for approximately 21,000 deaths each year. While over half of these patients are diagnosed at age 65 or older, a significant number are below the age of 50 at the time of death. A subset of these decedents have no diagnosis at the time of death. In these instances, further investigation and examination are critical in properly certifying the cause and manner of death. Here, we present three anecdotal cases in which full autopsy was necessary for each, in order to accurately determine the cause and manner of death.

Case 1: An 18-year-old male with no prior documented medical history presented to a local hospital with a two-week history of vague abdominal symptoms. Initial lab tests demonstrated elevated liver enzymes. Drug ingestion, specifically acetaminophen or acetylsalicylic acid, was initially considered. Urine drug screen testing was negative. The patient rapidly progressed to fulminant liver failure. Before diagnosis via liver biopsy could be made, the patient died. Autopsy revealed hepatic involvement of nodular lymphocyte predominant Hodgkin lymphoma as the cause of the patient's liver failure.

Case 2: A 48-year-old female with no prior documented medical history was found within her secured residence with a note of intention to commit suicide. In front of her were two pill bottles, one of which contained the sertraline with which she intended to take her life. However, upon specific toxicology testing for sertraline, no evidence of the drug was found in her system. Instead, autopsy revealed a previously undiagnosed acute T-lymphoblastic lymphoma was found throughout her kidneys, heart, lungs, and thymus.

Case 3: A 25-year-old male with a history of schizophrenia and bipolar disorder was found within his secured residence. No evidence of drug use was present at the scene. Toxicology performed on the peripheral blood was negative for drugs of abuse and synthetic cannabinoids. Autopsy and microscopic evaluation revealed multiple pulmonary and renal masses and severe acute pneumonia complicated by Hodgkin lymphoma present in bilateral lungs, heart, and right kidney.

P44 A Fatal Case of Metastatic Gastric Adenocarcinoma Mimicking Cirrhosis

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Pseudocirrhosis is a rare entity that closely mimics cirrhosis clinically and radiographically but lacks the histopathologic features of cirrhosis. It is most commonly described in metastatic breast carcinoma; however, it has been reported with other metastatic malignancies. We report a case of a 71-year-old man who presented for liver transplant evaluation due to decompensated cirrhosis of unknown etiology. The clinical course was complicated by hepatic encephalopathy and large volume ascites with concern for spontaneous bacterial peritonitis. He continued to decline clinically and died shortly after transition to palliative care.

Autopsy revealed capsular nodularity of the enlarged liver with marked replacement of hepatic parenchyma by desmoplasia on cut surface. Additionally, there was a 2.5 cm indurated, plaque-like mass centered

below the gastroesophageal (GE) junction. Microscopic sections of the GE junction mass showed poorly differentiated adenocarcinoma with neuroendocrine and signet ring features. Histologic examination of the liver showed marked replacement of the liver parenchyma by metastatic adenocarcinoma without evidence of background fibrosis or hepatitis. Furthermore, metastatic adenocarcinoma was present in the lungs, thoracic and abdominal lymph nodes, and gallbladder wall. Thus, the cause of death was liver failure due to metastatic gastric adenocarcinoma.

Malignant pseudocirrhosis is described in the literature as being most commonly associated with metastatic breast carcinoma and associated chemotherapeutic regimens, although it has also been reported in metastatic carcinomas of other origins including metastatic esophageal squamous cell carcinoma and gastric adenocarcinoma following chemotherapy. It is associated with significant morbidity and mortality, even after initiation of appropriate treatment. The autopsy findings of this unusual and clinically challenging case are discussed, and recent literature is reviewed.

P45 Ruptured Ectopic Pregnancy in a Morbidly Obese Female

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Ectopic pregnancies are associated with significant morbidity and remain the leading cause of maternal death in the first trimester of pregnancy, accounting for 4% of all pregnancy related deaths despite recent advancements in diagnosis and treatment. We present a case of a 34-year-old woman who presented to the emergency department after one week of abdominal pain and heavy vaginal bleeding with clots. There was marked anemia, with a hemoglobin on admission of 4.7 g/dL. Shortly after her presentation to the emergency room, she became unresponsive, requiring a full code. Following resuscitation and intubation, she was transferred to the intensive care unit where an ultrasound and human chorionic gonadotropin (hCG) concentration suggested a ruptured ectopic pregnancy. The decedent subsequently went into ventricular fibrillation and expired before additional testing could be performed.

At autopsy, the decedent was found to be morbidly obese (BMI 52.61 kg/m²) and had over 3000 mL of blood in the peritoneal cavity. A 5.3 gram fetus within an intact gestational sac was found free-floating within the peritoneal cavity, and a full-thickness rupture was located in the interstitial portion of the left fallopian tube. Microscopic sections of the rupture site and adjacent soft tissue of the posterior cul-de-sac showed immature chorionic villi. Toxicology was positive for tetrahydrocannabinol and drugs related to resuscitation efforts. The cause of death was determined to be due to acute hemoperitoneum associated with ruptured ectopic pregnancy. The decedent's pregnancy was complicated only by her obesity and advanced maternal age. However, she also had a history of chronic daily marijuana use. Recent studies have documented a possible association between marijuana use and abnormal cannabinoid signaling that results in impaired oviductal transport of embryos, with a possible link to ectopic pregnancies.

P46 Double Suicide Due to the Ingestion of Levamisole-Adulterated Cocaine: Case Report and Review of the Literature

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Suicide is a significant public health issue. A combination of individual and social factors contributes to the risk of suicide. Older adults may be more

prone to self-harm behavior because of the higher prevalence of many elements including physical and mental illnesses, social isolation, dependence, financial issues.

A 73-year-old man and his 62-year-old wife were found dead in the living room of their apartment. There was no evidence of forced entry into the house. On the scene, an open plastic bottle was observed, partially filled with a transparent fluid with a pungent odor. A suicide note written by the woman was found. The woman had a history of major depression and the man suffered from diabetes, hypertension, gambling addiction, and had a recent depressive episode. At autopsy, both the subjects showed pulmonary and brain edema. Significant myocardial fibrosis, coronary atherosclerosis, and nephrosclerosis were also observed. Toxicological analyses performed on the liquid from the bottle showed cocaine (35.9 mg/mL) and levamisole. The blood specimens collected from the bodies were positive for cocaine (16.8 µg/mL for the man and 65.5 µg/mL for the woman), cocaine metabolites, and levamisole. Toxicological results and graphs will be shown. The cause of death for both the subjects was acute cocaine toxicity, and the manner of death was determined to be suicide.

Double suicides are rare compared to single suicides, representing 1% of all suicide deaths. People choosing this modality tend to be older, married, and prefer nonviolent suicide methods (predominantly carbon monoxide toxicity and less commonly, drug intoxication). In general, self-poisoning by drugs is a rarely chosen method to commit suicide, as the majority of these acts actually represent attention seeking behaviors. Among the various drugs, cocaine is infrequently selected, especially by older subjects, who tend to prefer prescription medications. Another interesting feature of this case was the administration of levamisole-adulterated cocaine. Levamisole is an anthelmintic drug used in veterinary medicine, which has been recently observed as an illicit cocaine adulterant.

The choice of committing a double suicide, the method selected (self-poisoning), and the drug administered (cocaine) are events rarely encountered in the forensic pathology practice, especially not in combination. In this presentation, we will review the literature regarding the features of these methods of suicide. An overview of the mechanism of action of levamisole is also provided, highlighting the importance of including this substance and its metabolites in the routine toxicological analyses for cocaine deaths.

P47 WITHDRAWN

P48 Death Due to Adrenal Crisis: Case Report and Review of the Literature

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Adrenal crisis is a life-threatening acute adrenal insufficiency. The most common cause of primary adrenal insufficiency is Addison disease, most frequently resulting from autoimmune destruction of the adrenal glands. Patients with Addison disease progressively lack cortisol, which is the hormone that helps the body responding to physiologic stress, and aldosterone. As a result, stress does not cause a cortisol increase, and adrenal crisis occurs, particularly if a stress-dose of steroids is not administered in the acute phase. Due to nonspecific clinical findings (hypoglycemia, hypotension, hypovolemia), adrenal crisis can frequently be misdiagnosed clinically or can present as sudden death.

A 42-year-old White female with a medical history of Addison disease on chronic steroid therapy was admitted to the emergency department due to sustained episodes of cardiopulmonary arrest. Before the admission, the patient had nausea, vomiting, and diarrhea and progressively became

confused, developing a high fever and shortness of breath. The cortisol concentration in a blood sample drawn at 5 pm was <0.2 µg/dL (reference range: 2.7-10.5 µg/dL). She was resuscitated, but she developed multi-organ failure and hypotension and eventually died.

Autopsy examination showed a morbidly obese female (BMI = 45.6 kg/m²). Vitiligo was observed over the face, trunk, and limbs. There was evidence of multi-organ failure with anasarca, diffuse hepatic necrosis, pleural effusions, ascites, and diffuse edema of the brain. Consolidations involving both lungs were also seen. No definitive adrenal gland tissue was grossly identified, but minimal adrenal tissue was detected microscopically. Histology of the adrenals showed areas of adrenal medulla with patchy chronic inflammation. Medullary adrenal tissue was confirmed by chromogranin A staining. No gross or microscopic abnormalities were observed in the pituitary gland using hematoxylin and eosin and ACTH stains. The cause of death was determined to be complications of adrenal/Addisonian crisis.

The diagnosis of adrenal crisis can be challenging in the forensic pathology setting. A review of the literature showed only a few autopsy studies regarding deaths due to adrenal crisis. Forensic pathologists should include the adrenal crisis in the differential diagnosis in subjects with evidence of hypoglycemia, hypotension, and with a known history of Addison disease who had been treated with long term corticosteroid therapy. Deaths due to adrenal crisis should be corroborated by the medical history, laboratory, and autopsy findings. In the absence of medical history, postmortem laboratory analyses should be done to support the adrenal crisis as the cause of death.

P49 Train-Related Suicidal Decapitation

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Manner of death determination is an important aspect of many forensic death investigations. Suicides are unfortunately common in most jurisdictions, with firearms-, asphyxia (suffocation)-, and toxicology (poisoning)-related deaths being the most frequent types of suicide cases within the United States. Suicide by decapitation as a primary method is not commonly described. When decapitation does occur in association with suicide, it may be a secondary consequence of the primary method of suicide, for example, massive blunt force trauma, or hanging with a significant drop; however, primary suicidal decapitation has been described specifically in the context of railway incidents wherein victims lie across railroad tracks in front of oncoming trains. Herein we report the unique case of a 49-year-old male who was decapitated with a complete transection between C2 and C3 after lying down with his neck atop a railroad track in a railroad stockyard. He was subsequently run over by a train as it began to move to leave the stockyard. The head was found between the tracks while the rest of the body was found prone immediately adjacent to the rail. There were no significant signs of trauma below or above the transection site. Postmortem urine and blood drug screens were negative. This is a unique case of train-assisted suicide, in contrast to the more common modality of suicide by train wherein victims stand or jump in front of a moving train or lay their body across the railroad tracks in order to be struck by an oncoming train.

P50 An Unusual Case of Water Intoxication

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We present the case of a 20-year-old incarcerated male who was discovered dead in his cell. Prior to his death, the decedent was witnessed

to drink copious amounts of water, roughly 300 3-4oz cups, over a two-hour time period. During the event, the decedent had one episode of watery, bilious emesis. This was his first incarceration and there was suspicion he had been sexually assaulted by another inmate, which prompted the decedent to "act out" to secure a single cell. Further investigation revealed the man had no significant past medical history, history of head injury, seizure disorders, psychogenic polydipsia, and took no medications, although the possibility of illicit drug use was suspected.

At autopsy, pertinent findings included moderate cerebral edema with mild cerebellar tonsillar herniation, pulmonary edema and congestion, and hemorrhagic pancreatitis. Vitreous fluid results revealed a sodium of 102 mmol/L (reference range 130-135 mmol/L) and chloride of 101mmol/L (reference range 105-135 mmol/L). Vitreous urea nitrogen, potassium, and glucose were within normal limits. These values align with the diagnosis of severe hyponatremia (<120 mmol/L) secondary to acute water intoxication. Acute water intoxication induces a profound electrolyte imbalance that results in a rapid decrease in serum sodium concentrations. Dilutional hyponatremia is associated with hyposmolality and promotes the movement of water into cells, including the brain, inducing cerebral edema and neurological symptoms. The severity of symptoms reflects the degree of cerebral edema and can be mild with nausea and malaise. This can progress to lethargy, obtundation, seizures, coma, and respiratory arrest if sodium concentrations fall below 120 mmol/L. The autopsy findings of cerebral edema and cerebellar tonsillar herniation, along with pulmonary edema and congestion, were reflective of the severity of the decedent's hyponatremia, an unusual and intoxicating death indeed.

P51 Cocaine-Associated Acute Esophageal Necrosis Seen at Postmortem Examination

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Acute esophageal necrosis (AEN), also known as black esophagus, is characterized by circumferential black discoloration of the esophageal mucosa, typically affecting the distal esophagus with sharp demarcation at the gastroesophageal junction and preservation of the gastric cardia. Incidence varies from 0.01% to 0.28% on endoscopy and up to 0.2% on postmortem examination. Acute esophageal necrosis is traditionally associated with multiple comorbidities, such as diabetes mellitus, chronic kidney disease, and cardiovascular disease. Associated mortality is approximately 32%, although the cause of death is rarely due to AEN but rather, the underlying medical conditions. While the exact etiology is unclear, it has been theorized to be multifactorial. In case reports, acute esophageal necrosis has been associated with broad spectrum antibiotic use, fungal, viral, and bacterial infections, gastric volvulus, a paraesophageal hernia, hyperglycemia, diabetic ketoacidosis, underlying malignancy, Stevens-Johnson syndrome, prolonged vomiting following alcohol binging, alcoholic hepatitis, and aortic dissection. A "two-hit" hypothesis predicts that an initial hypotensive state creates a mucosal environment vulnerable to severe topical injury such as reflux, resulting in direct injury and necrosis. Cocaine use has previously been associated with acute esophageal necrosis (five cases). Cocaine is known to cause significant vasoconstrictive effects creating a low-blood flow state that may precipitate mucosal injury. We present a case of a 49-year-old White female with history of chronic obstructive pulmonary disease and no known prior diabetes, gastrointestinal disease or symptoms. Postmortem examination revealed black discoloration of the distal two-thirds of the esophagus with sharp demarcation at the gastroesophageal junction. There was significant cardiomegaly with left ventricular hypertrophy and arterionephrosclerosis consistent with hypertensive cardiovascular disease. Postmortem toxicology performed on the decedent's peripheral blood revealed benzoyllecgonine, a metabolite of cocaine establishing cocaine as a

cardiovascular insult associated with the development of AEN. This is only the sixth reported case in literature of this unusual association.

P52 Metastatic Melanoma with Aberrant Smooth Muscle Differentiation Diagnosed at Autopsy: A Case Report

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Metastatic melanoma with heterogeneous histomorphology, aberrant smooth muscle differentiation, and end-stage presentation are infrequent co-occurrences. A 66-year-old man presented to the emergency department with cough and shortness of breath. An electrocardiogram noted concern for myocardial infarction, he underwent emergent heart catheterization, and progressively deteriorated. A computed tomography scan revealed an anterior bulging of the left and right ventricles suspicious for ventricular aneurysm versus infiltrative mass, innumerable pulmonary nodules, and mediastinal and hilar lymphadenopathy. Six days after admission, a heart catheterization and cardiac mass biopsy demonstrated spindle cell proliferations with robust reactivity against smooth muscle actin (SMA), weak focal reactivity against S100, and equivocal staining to pan-melanoma markers. The morphological and immunohistochemical findings support the diagnosis of a malignant neoplasm with smooth muscle differentiation (leiomyosarcoma) on expert consultation at that time.

The patient subsequently died 14 days after admission. Autopsy revealed a tan, firm cardiac mass (12.5 cm) (heart weight, 960 g), involving the apex, left ventricle, right ventricle, interventricular septum, and soft tissue surrounding the aortic root and pulmonary artery. The mass replaces a significant portion of full-thickness ventricle walls. Metastatic disease involved bilateral lungs, bilateral kidneys, liver, small intestine, spleen, periaortic and mesenteric lymph nodes.

Extensive sampling of the cardiac mass at autopsy demonstrated a biphenotypic neoplasm with two populations of spindled and epithelioid cells. The spindled cells show elongated nuclei and eosinophilic cytoplasm arranged in fascicles separated by fibrous septa. The epithelioid cell population contains cells with round to oval nuclei, clear or eosinophilic cytoplasm, prominent nuclei, and perinuclear vacuoles. Areas of the tumor showed melanocytic pigment as well as robust reactivity of those areas to antibodies directed against melanocytic markers, including S100, SOX10, and HMB45. Smooth muscle actin expression was observed throughout the section. This immunophenotype, combined with histopathology demonstrating abundant melanin pigment, is most consistent with a final diagnosis of metastatic malignant melanoma. The SMA expression is a rare and peculiar feature of a subset of malignant melanomas. Thorough examination of the patient's skin, nails and mucosa at autopsy did not identify obvious atypical pigmented lesions.

This case highlights aberrant SMA expression in melanoma, histopathological heterogeneity, and melanoma without a known primary site. Patients may present with occult primaries in unusual places, including the nailbed, retina, and bowel, or the primary melanoma can undergo regression. This is an example of the value of the hospital autopsy in complicated or rare cases even when a preliminary diagnosis has been rendered.

P53 A Rare Complication of Fetal Alcohol Syndrome Revealed at Autopsy

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Fetal alcohol syndrome (FAS) is considered the most severe condition within fetal alcohol spectrum disorders (FASDs), a group of diagnoses related to teratogenic exposure of a fetus to ethanol during pregnancy. Although limited, data from the United States (U.S.) and some Western European countries indicates that one to five percent of schoolchildren are affected by FASD. The incidence of FAS is 1.9 per 1,000 live births in the U.S. Fetal alcohol syndrome predominantly affects the brain and is also associated with certain congenital heart defects. Although other organ systems are presumably affected by *in utero* ethanol exposure, these associations are largely inconclusive in the literature. Cases of FAS or its complications are uncommonly encountered in a forensic setting.

We present a case of a 36-year-old male with FAS with history of recurrent bowel obstructions of indeterminate etiology. He had severe neurocognitive deficits and had been a ward of the state since childhood. While in his group home, he indicated discomfort to staff and was given juice to quell what was thought to be feeding complaints. He then suffered a sudden collapse following ingestion of the juice that was witnessed by his caretakers. He was pronounced dead upon arrival to a local emergency department.

External examination at autopsy revealed a well-nourished adult male with dysmorphic facies prototypical of FAS. Internal examination revealed compressed intrathoracic organs due to a large hiatal hernia. The diaphragm had patchy bilateral hemorrhages posteriorly and had a markedly thinned left crus in the region of herniation. Other significant findings included marked gastrointestinal tract distension without distinct associated obstructions or masses. Histologic examination of the heart revealed cardiac myocytes with dysmorphic nuclear features and hypertrophic-like changes.

Hiatal hernias can develop in the setting of increased intra-abdominal pressure and are not considered a type of congenital hernia. Of note, FASD has been associated with enteric neuropathy which presents in infancy as intestinal pseudo-obstruction, a contractile motility disorder characterized by abdominal pain and constipation. A recent retrospective data analysis found that hiatal hernias have been reported in approximately ten percent of FAS patients. As such, the decedent's hiatal hernia was deemed to be likely related to FAS. This case presented a unique and unexpected etiology of the decedent's sudden collapse discovered postmortem.

P54 WITHDRAWN

P55 Primary Cardiac Angiosarcoma Resulting in Tamponade and Sudden Death

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Primary cardiac tumors are rare, and when present, are generally benign neoplasms that do not cause sudden death. Even more rare are primary malignant cardiac tumors. We present a 52-year-old male witnessed to have fallen from his tractor trailer while at work after reportedly not feeling well one week prior. Autopsy revealed a 1.5 L hemopericardium with associated right atrial polypoid masses measuring up to 1.5 cm extending from the epicardial surface into the endocardial surface. Additionally, multifocal tan lesions were present in the liver measuring up to 0.7 cm and a bright yellow, circumscribed mass was identified in the right kidney. Histologically, the right atrial mass revealed spindled, pleomorphic cells weakly forming vascular channels with significant background hemorrhage

and necrosis. The immunohistochemical stain CD31 strongly stained the neoplastic cells, confirming the diagnosis of angiosarcoma. The liver lesions showed benign bile duct hamartomas and the renal mass showed incidental clear cell renal cell carcinoma. Although exceedingly rare, when present, primary cardiac angiosarcomas are the most common primary malignant tumors found in the heart and typically occur in the right atrium, as demonstrated by this case. The gross liver and renal lesions initially proved red herrings, as metastatic lesions are 30 to 40 times more common in the heart than primary benign and malignant heart neoplasms. The case illustrates an interesting presentation of a rare entity that may be diagnosed on the basis of location, histologic morphology, and limited ancillary studies.

P56 A New Fad in Teenage Suicide? Sodium Nitrate/Nitrite as a Possible Emerging Methodology in Adolescents

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Accidental ingestion of excessive amounts of the meat preservative, sodium nitrite (NaNO_2), has been reported in the medical literature as far back as 1932, while ingestion with lethal intent is more modern and less frequent. Sodium nitrate (NaNO_3), a similar compound also used in meat preservation, has also rarely been implicated in suicide attempts. Herein, we present two cases of teenage suicide by ingestion of these compounds. These cases occurred within four months of each other in the state of New Hampshire. The first case is an 18-year-old Caucasian female with a history of depression and suicidal ideation, who was found unresponsive in bed by her mother. The autopsy was notable for deep chocolate-brown blood, pulmonary edema, and cerebral edema. Postmortem methemoglobinemia was 33%, and initial toxicology was negative for substances of forensic significance. Upon discussion with the mother, a bottle of sodium nitrate was found in the decedent's backpack. Subsequent testing was positive for 4,000 mcM of nitrate/nitrite. The second case is a 13-year-old Asian female with a past medical history of a partially resected suprasellar astrocytoma with recent onset seizures, anxiety, and depression, and two prior suicide attempts. She was found unresponsive in her bedroom by her parents. The autopsy was notable for deep chocolate-brown blood, and postmortem methemoglobinemia was >28.0%. Testing was positive for 5,800 mcM of nitrate/nitrite. Upon discussion with the father, a bottle of sodium nitrate was found in the decedent's bathroom, purchased by the decedent under the guise of needing it for a school science experiment. Nitrate/nitrite concentrations are still pending at time of abstract submission. A review of New Hampshire OCME records from January 1995 to date revealed only one additional case of sodium nitrite poisoning in an adult female. A review of the medical literature found the last published case of attempted suicide by intentional ingestion of sodium nitrate/nitrite in an adolescent was in 1977, with all subsequent reports in adults. The rapid succession of these two adolescent cases raises concerns about its potentially favored use among the teen population. A combination of online information, ease of access, and reportedly "peaceful" death may underlie these two recent cases in New Hampshire. Sodium nitrate and nitrite may continue to increase in popularity among suicidal adolescents.

P57 It Could Be A Perfect Murder

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In July 2016, a 48-year-old woman was found dead inside her home by her son. The corpse, already decomposed, was lying on the floor next to the bed. Several deep cuts were observed on the internal surface of the right forearm. There was a pool of blood consistent with the position of the

corpse. A cutter was present near the body. The woman was affected by depression, pharmacologically treated, and chronic alcohol abuse.

The autopsy confirmed the presence on the right wrist of four deep cut wounds, with a direction parallel to the limb, involving the underlying venous vessels with macroscopic blood infiltration of surrounding soft tissues (confirmed by the following histological examination); the autopsy also showed the presence of a contusion at the left temporoparietal area. No defense injuries or signs of struggle were found.

Toxicological examination of vitreous humor revealed ethyl alcohol (0.93g/kg) and low concentrations of sertraline; zolpidem and high ethylglucuronide concentrations were detected in hair. Comprehensively, toxicological findings did not suggest a relevant psychophysical alteration. The case was dismissed as likely suicide, in consideration of the absence of elements in contrast with this hypothesis.

In July 2018, the woman's ex-husband went to the police, confessing that he had killed his ex-wife. According to the man's declarations, the couple consumed a bottle of wine and then the man compressed the anterior region of the woman's neck and the woman lost consciousness. The man was aware of the presence of an extremely sensitive point that can cause a sudden cardiac arrest. Subsequently, the man, not perceiving the radial pulse, understood that the woman was dead. Then, he moved the body in the bedroom, where, using a cutter, he practiced some cuts on the woman's right wrist, in order to stage a suicide.

Following the confession, a new evaluation of the structures of the neck (preserved in formalin) was carried out, without any evidence of blood infiltration in the soft tissues here represented.

In conclusion, the present case is extremely instructional, showing that sharp force injuries can generate surrounding blood infiltration even if produced *in limine vitae* or shortly after death. Moreover, it is worth noting that in some cases, the distinction between homicide and suicide is extremely difficult and sometimes impossible. Therefore, it is important to deal with every case of violent death as it is homicide until proven otherwise.

P58 Sudden Death of an Inmate on Suicide Watch: Accident or Suicide?

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In adults, foreign body (FB) ingestion is most often accidental. Some groups, such as prisoners and patients with severe mental illness, are more likely to intentionally ingest foreign bodies as a form of self harm. Within the prison population, FB ingestion is often intentional to achieve hospitalization.

We present a case of a 37-year-old male inmate with a history of bipolar disorder, posttraumatic stress disorder, narcissistic personality disorder, and substance abuse who was found unresponsive in custody in his single cell by staff. He was placed on suicide watch, with an antisuicide smock and fifteen minute checks three days prior due to "bizarre" behavior. He was last seen by staff sleeping fifteen minutes prior.

Autopsy revealed a well-developed, well-nourished male with no evidence of trauma. The abdomen was firm and protuberant. Internally, there was ascites with approximately 4500 mL of purulent fluid. There was a 1.5 cm perforation of the proximal duodenum with the end of the handle of an intact plastic spoon penetrating through the duodenal serosa. Postmortem toxicology was negative. The cause of death was determined to be peritonitis due to duodenal perforation resulting from the ingestion of a plastic spoon. Given the decedent's extensive mental health history and

recent bizarre behavior, it is unknown whether the spoon was ingested intentionally and the manner of death was classified as undetermined.

Foreign body ingestion amongst inmates is augmented with mental health disorders. Complications associated with foreign body ingestions include bowel obstruction or perforation, hemorrhage, abscess formation, sepsis, or distant embolization. In one study, it was found that intentional ingestion of foreign objects is seven times more likely in male prisoners than females. Prisoners typically ingest small, sharp, metallic objects and are more likely to do so within sixty days of incarceration. In this case, the ingestion of a plastic spoon is unusual.

This case of a sudden death in a prisoner from foreign body ingestion resulting in duodenal perforation and peritonitis, represents a complex case for the determination of manner of death. While prisoners are more likely to intentionally ingest objects in order to result in admission to the hospital, the decedent's psychiatric history, placement on suicide watch, and recent bizarre behavior makes it difficult to clearly determine intent. Therefore, we believe the manner of death is best classified as undetermined.

P59 Blue in the Face: A Case Series of Suicidal Sodium Nitrite and Sodium Nitrate Ingestion

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Sodium nitrate is a colorless, odorless, crystallized white powder that is a substance used in the meat, cheese, and fish industry to preserve food, enhance color, and prevent the growth of bacteria. It is also used in the commercial industry to protect pipes by preventing corrosion. Sodium nitrate can directly oxidize hemoglobin from the ferrous (Fe²⁺) to the ferric (Fe³⁺) state, known as methemoglobin, which reduces the oxygen carrying capacity of blood. Sodium nitrite is a very similar substance to sodium nitrate, and can also cause methemoglobinemia; such toxicity is treated in a similar fashion. Symptoms include tachycardia, muscle weakness, and cyanosis.

We report six cases of sodium nitrate and sodium nitrite powder ingestion in suicides at the Harris County Institute of Forensic Sciences that occurred over a period of eight months from 2019-2020. The cases included four males and two females. Two of the people were Hispanic, one was African-American, one was Caucasian, and two were Asian; age ranged from 17 to 29 years old. One person was transported to the hospital and three people were found deceased at the scene. Bottles of sodium nitrite and/or sodium nitrate were discovered at the residences for all the cases. Significant autopsy findings included blue-gray cutaneous discoloration and brown discoloration of the blood and tissues. Specimens from each case were submitted to an outside laboratory and the concentrations of methemoglobin detected ranged from 16 to 47%. Five deaths were classified as toxic effects of sodium nitrite; and one death as toxic effects of sodium nitrate. All six cases were classified as suicides.

Reports of suicidal ingestion of sodium nitrate/sodium nitrite are rare in the literature. Recognition by clinicians is important due to prompt medical therapy such as hyperbaric oxygen, exchange transfusion, and administration of methylene blue may be lifesaving. Recognition of this entity is important within the forensic community so that appropriate testing may be ordered, given that most in-house laboratories may not offer testing for methemoglobin.

P60 Suicide via Elaborate Electrical Device: The DIY Electric Chair

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Electrocution is an uncommon cause of death in the United States, accounting for approximately 1,000 deaths annually; however, suicidal electrocutions are exceptionally rare occurrences. A review of the most recent literature shows that those with knowledge of electrical systems (e.g., electricians) are the most at risk of this mode of suicide. The average household outlet receives 120 volts at a residential current (generally 15-50 amps). Fatal ventricular fibrillation can occur with as little as 50 mAmps of current passing through the heart. The high voltage classification starts at 1,000 volts, with high voltage utility wires running at approximately 7700 volts. We present a unique case of a suicide using a homemade electric chair that was able to generate upwards of 20,000 volts of electricity. The decedent was a 69-year-old White male with prior HVAC repair experience and a history of mental illness with schizophrenic tendencies. The home was cluttered with old televisions and various components of aging electrical devices. The decedent was found unresponsive in the basement sitting on the self-made electrical device built from components of an old tube television set, metals pipes, metal panels, and various types of wiring. The device appeared to run electricity from the home power supply (120 volts at approximately 15-50 amps) through the flyback transformer, which can generate approximately 25,000 volts, to a pair of metal panels used as a chair. Self-made suicide devices result in seldom appreciated injury patterns that are of special academic value due to the rarity and unique nature of the circumstances.

P61 Multiple Shotgun Wound Suicide

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Suicide via multiple gunshot wound is an uncommonly encountered phenomenon. In a review of the autopsies performed at the Regional Autopsy Center at Wake Forest Baptist Medical Center over a 20-year period from 2000-2020, only four cases of multiple gunshot wound suicide were identified; however, no suicides involving multiple shotgun wounds were observed. The rarity of these entities is further evidenced by the lack of reported cases in the literature. Here we describe a case of a 20-year-old male with a history of depression and recent expression of suicidal ideation who was found deceased in a secure residence. A 12 gauge shotgun and two spent shells were identified at the scene in close proximity to the decedent; one shell was identified as a 16 gauge shell and the other was identified as a 20 gauge shell. Both shells appeared atypical, likely due to the mismatch between the weapon and ammunition types. Examination of the decedent's remains at autopsy revealed three contact range shotgun wounds. Wounds of the head and chest revealed no significant penetration of the soft tissues with marked soot deposition and cutaneous thermal injury. The head wound contained a single metallic pellet. The third wound was identified on the anterolateral aspect of the left neck and was determined to penetrate the soft tissues and structures of the neck. Multiple shotgun pellets, wadding, and a 20 gauge shotgun shell were recovered from the wound tract. The autopsy findings in conjunction with the investigative reports support the determination of suicide via multiple self-inflicted shotgun wounds, a unique example of suicide and ballistics.

P62 G2 Research Radically Invasive Projectile: The Importance of Recognizing Its Imaging and Autopsy Patterns

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Many fragmenting and frangible projectiles exist, with the attraction being a reduced risk of ricochet and risk to secondary targets. Also, ammunition is increasingly being constructed of materials other than lead—partially because of environmental and range contamination. Combining these two features, the G2 Research Company began producing the Radically Invasive Projectile (G2RIP) bullet in 2014. G2RIP ammunition is made of solid copper, which is machined into a base with up to eight “trocars”. These trocars are designed to disperse upon striking a target, causing multiple wound paths. Because the projectiles are copper and fragment, energy dissipates rapidly and reduces risk of collateral damage. G2RIP projectiles have unique imaging and autopsy patterns, which are important to recognize for both competence and safety. Below, we describe a decedent shot with G2RIP ammunition.

A 25-year-old female with multiple gunshot wounds was transported to the Coroner's Officer. Per protocol, she was radiographed within the secured body bag. Imaging revealed multiple clusters and occasional isolated radio-opaque fragments in multiple locations. The fragments appeared as slender, slightly curved singlets or doublets of similar sizes with well-demarcated edges and random orientation. One rectangular-appearing opacity was observed near a fragment cluster. Internal examination revealed that the fragments were trocars and the rectangular opacity was the projectile base—identified as G2RIP ammunition.

The fragmenting bullets create multiple wound paths, which makes trajectory analysis challenging. While variations exist, a single, perforating G2RIP projectile typically results in an entrance wound with multiple, variably sized, and clustered exit wounds created by the base and trocars. Several irregular re-entrance wounds were also noted, which can further complicate wound descriptions. As the decedent was shot multiple times with fragmenting rounds, assigning trajectories was difficult due to intersecting wound paths. Recovery of retained bases and trocars was time-consuming, but necessary, as some trocars may contain individual rifling characteristics. Of importance, forensic pathologists and autopsy technicians should be careful in the recovery of the sharp trocars.

In conclusion, wounds created by the G2RIP projectile have unique radiographic and autopsy findings. The wounds are remarkable for extensive projectile fragmentation and intersecting wound paths. With multiple closely approximated wounds, it may not be possible to assign all fragments and defects to individual wound paths. Familiarization with these findings is important to Forensic Pathologists in terms of case documentation, projectile recovery, and safety.

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NAME 2021

Interim Meeting

NAME Toxicology Committee Presents:

The Effects of Acute and Chronic Disease
on Organ Systems, Metabolism and
Elimination, Blood Concentrations
and Drug Tolerance

Program Chair:

Laura Labay,
Ph.D., F-ABFT, DABCC-TC

<https://www.thename.org/interim-meetings>



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Hilton West Palm Beach
West Palm Beach, Florida

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