Ted Talks – Clinical Informatics Fellows Edition - 2018

• Artificial Intelligence and Blockchain, for Medical Imaging
  – Alaa Alsadi, MD, Clinical Informatics Fellow, University of Illinois at Chicago

• Clinical Informatics: Understand People and Process
  – Viper Bodar, MD, Clinical Informatics Fellow, University of New Mexico

• A Brave New World
  – Reza Sadeghian, MD, Clinical Informatics Fellow, University of Washington
Blockchain to Accelerate Artificial Intelligence in Medical Imaging; the “Diagnosis Protocol”

AMDIS TEDx Talk: Clinical Informatics Fellow Edition

Alaa Alsadi, MD.
University of Illinois at Chicago (UIC)
Roger Boodoo, MD.
US Navy- Defense Health Agency (DHA)
6/21/ 2018
Disclosure

• Diagnosis Protocol (co-founder equity)

• Next Gen Miners (partner equity)
Proposed Use Cases of Blockchain in Pathology AI Imaging Datasets: a MESS
A People Problem

Global Collaboration Needed to Build AI
A Solution: Blockchain

• Incentivize data structuring

• Guarantee quality of data
A Word about Blockchain

- The technology for replacing intermediaries
- Ultimate audit trail, asset tracking, and security
- Direct, digital connection, between an activity and a value (Smart Contracts)
Smart Contracts; an Example

- Bitcoin is the prototypical Blockchain 1.0; currency/ money transactions
- Ethereum is the prototypical Blockchain 2.0; VALUE transactions
- Made available via SMART CONTRACTS
Blockchain > Importance

The Future of Value Exchange

Information Exchange

Value Exchange

Diagnosis Protocol: an Image Annotation Blockchain

RADIOLOGIST VIEW
Specialty Agnostic Pathologist Whole Slide View
Smart Contracts: Annotation ➔ Reward

Doctor # 1; zones 5&6
Doctor # 2; zones 5&6
Doctor # 3; zones 5&6
Smart contracts: Data Quality

Doctor #1; zones 5&6
Doctor #2; zones 5&6
Doctor #3; zone 16
Annotated Medical Imaging Datasets
Token Economy

Developers

(Imaging, AI/Tech, Device Manufacturer, etc.) Companies

Researchers

DxP

Wallet

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Blockchain Audit Trail

Metadata stored on blockchain
Proof images were worked on; Verifiable by anyone

Regulatory requirements?
Cybersecurity in Deep Learning

• Adversarial examples are inputs to machine learning models that an attacker has intentionally designed to cause the model to make a mistake

![Image of intact model, pixel 'white noise', and compromised model with different diagnoses and confidence levels.](https://arxiv.org/abs/1804.05296)
Cybersecurity in Deep Learning

- The image and associated metadata should be hashed to ensure that the data has not been altered by bad actors.

- Furthermore, the hash of many hashes (Merkle tree) can represent the entire dataset. One can verify that work was performed on the entire dataset prior to purchasing.
Diagnosis Protocol at SIIM
Proposed Use Cases of Blockchain in Pathology

UIC CI Fellowship Program

K. Kochendorfer
CHIO

F. Behm
Chairman, Pathology

T. Patel

Shane Borkowsky
and CHIO team

Didactics
Projects
Rotations

• One of the first ACGME accredited programs in the country (9/2014)

• 4 Core Components (2 years)
Thank You!

Updates at AMIA Annual Symposium
San Francisco Nov 3 - 7

Blockchain Fundamentals for the Healthcare Professional:
Realities, Use-cases, and Future Implications.
Boodoo R MD, Diaz M MD, Taylor J MD, Alsadi A MD
Clinical Informatics: Understand People and Process

Viper Bodar, MD,
Clinical Informatics Fellow
University of New Mexico
Goal

( ⬅️ + 💻 ) ⩾ ⬅️

NOT Goal

*From Chuck Friedman*
(大脑 + 计算机) < 大脑
LOCAL TITLE: DIABETIC TELERETINAL READER CONSULT REPORT
STANDARD TITLE: DIABETOLOGY NOTE
DATE OF NOTE: MAR 30, 2018@07:25 ENTRY DATE: MAR 30, 2018@07:25:34
AUTHOR: CRAMER, ROBERT J EXP COSIGNER: 
URGENCY: 
STATUS: COMPLETED

IMAGE QUALITY ASSESSMENT:
- Image quality inadequate due to:
- Missing field

DIABETIC SURVEILLANCE ASSESSMENT:
- Type 2 Diabetic Patient
- RIGHT RETINAL IMAGES:
  - Retinopathy Assessment:
  - Macula Assessment:
    - Image not adequate to determine
  - Optic Nerve Assessment:
    - Image not adequate to determine
People and Processes

Technology

Information
A Brave New World

June 21, 2018
Reza Sadeghian, MD, MBA, MSc
James Metz, MD, MPH
Darren Migita, MD
Carlos Villavicencio, MD, MMI
Michael Leu, MD, MS, MHS
Case

- Sept 2015
- 17 m/o male brought to the ED by parents due to concerns of sexual abuse by a friend of the family
- Bruises on face and leg
- Sent home with family for follow up with PCP
- 2-weeks later was pronounced dead at home, found to have multiple rib fractures, clavicle fracture and severe abdominal trauma
Epidemiology of Child Abuse

- 20,000 American kids killed in their own homes in the last 10 years
- 80% of child fatalities involve at least 1 parent
- 1,670-1,740 kids die each year
- 5 kids are murdered each day

https://americanspcc.org/child-abuse-statistics/
Problem: Despite good evidence on bruising as sentinel injuries of abuse, there is no standard workup among ED physicians on bruises found on children.

- Lack of Knowledge
- Inadequate process
- Lack of leveraging technology
Identifying The Root Cause Analysis And Counter Measures

Root Causes

• Lack of Knowledge
• Inadequate process
• Lack of leveraging technology

Root Cause Analysis Process

Counter Measures

• Create a clinical standard pathway algorithm
• Create a standard screening power form and process for RN-
• Track the metrics to ensure the standards are followed and improved upon
Clinical Standard Work (CSW): 3 components

- Documented approach to management and treatment
  - Based on evidence – extensive lit review
  - Team consensus when evidence not available
- Care is hard-wired
- Outcomes are measured, and *owned by someone* to assure the continual improvement of the care for this condition
Bruising Pathway Goals

• Increase recognition of bruising as a sentinel injury for abuse

• Standardize the approach to identifying and working up bruises in the emergency department

• Reduce the number of missed cases of abuse

• Improve collaboration between ED and Child Protection Team
Pathway Algorithm

ED Bruising v2.1: Screening/Work-up

PHASE I (E.D.)

Inclusion Criteria
- <48 months old
- Any patient with clinical concern for abusive bruising
- Genital bruising

Exclusion Criteria
- Other non-accidental trauma (NAT) without bruising
- Sexual assault with or without bruising

High Risk Screening (to be completed by RN)
- <6 months full body skin exam
- 6 months – 4 years (48 months) skin exam in TEN (torso, ears, neck) region
- Torso includes back and front of abdomen and genital/buttock region. Genital/buttock exam to be done by MD in children over 6 months

<4 years old

Positive High Risk RN Screen
- Yes

Routine ED Visit (consider other high risk populations*)
- No

Notify Attending/Fellow MD to confirm high risk bruise

Bruise(s) concerning for abuse identified
- Yes

Off Pathway

Urgent Care Transfer Recommendations
If concerned for neglected or abuse (including bruising) consult SCAN and transfer to the ED for further work-up

See "Suspected Child Abuse & Neglect" job aid for transfer recommendations* (for SCH only)
Order set required P/E fields to be filled out by the RN in Cerner.

- Skin Assessment Norms Met
  - BP
  - No breakdown
  - No redness
  - No swelling
  - Pink or usual for ethnicity

- Skin Turgor
  - Elastic
  - Turgid
  - Other

- Skin Color
  - Pink, or usual for ethnicity
  - Ashen
  - Ruddy
  - Hairpin color change
  - Jaundice
  - Macerated stained
  - Pale

- Skin Temperature
  - Hot
  - Warm
  - Cold

Assess for bruising for patients under 40 months in the TEN region: torso (chest, abdomen, back, hip) - ears, neck. For babies under 6 months, assess the entire body.

High Risk RN Brusing Screen
- No bruising present in TEN region
- Bruising present in TEN region
- Unable to assess at this time
- Urgent Care Patient - screening not required

Skin Abnormality
- Skin Abnormality Location
- Skin Abnormality Description

This varies based on age of child (if <6 months, bruising anywhere on the child).
## EMR Updates – ED White Board

### Enhanced Tracking

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<th>L. LOS</th>
<th>Name</th>
<th>A/S</th>
<th>Psy</th>
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<th>RN</th>
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<td>3</td>
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<td>9 ye</td>
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<td>Height/ decreased</td>
<td>flu, f/o dehydration</td>
<td>CEB</td>
<td>EMT</td>
<td>Mac</td>
<td>PCF</td>
<td>0°</td>
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28,472 children screened since implementation (18 months)
Screening rate ~88%
• Out of 28,000 cases, 402 children (1%) screened positive for high risk bruise since go live.
Summary

- Child abuse is a significant problem and it is under recognized by physicians

- Informatics can be used for screening to improve the recognition of child abuse

- Analytics can help track our Clinical pathways to ensure standards are being followed and to measure clinical effectiveness
Be Brave!

Thank You

James Metz, MD, MPH
Child Abuse Expert
Pediatric Hospital Medicine

Darren S. Migita, MD
Medical Director Clinical Standard Work
Pediatric Hospital Medicine

Carlos E. Villavicencio, MD, MS
Clinical Standard Work
Pediatric Hospital Medicine

Michael G. Leu, MD, MS
Clinical Informatics Fellowship Program Director
Pediatric Hospital Medicine

Reza Sadeghian MD, M.B.A, MSc
Clinical Informatics Fellow
General Pediatrics

#StopChildAbuse
Ted Talks – Clinical Informatics Fellows Edition - 2018

• Artificial Intelligence and Blockchain, for Medical Imaging
  – Alaa Alsadi, MD, Clinical Informatics Fellow, University of Illinois at Chicago

• Clinical Informatics: Understand People and Process
  – Viper Bodar, MD, Clinical Informatics Fellow, University of New Mexico

• A Brave New World
  – Reza Sadeghian, MD, Clinical Informatics Fellow, University of Washington