

UC San Diego

SCHOOL OF MEDICINE

Department of
BioMedical Informatics

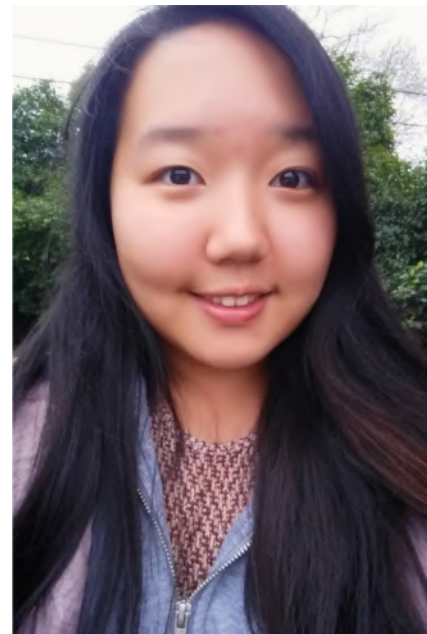
Yoon Kang

Data Abstraction for Hepatorenal Syndrome Risk Prediction Model Validation

This research was supported by grant T15LM011271

About Me

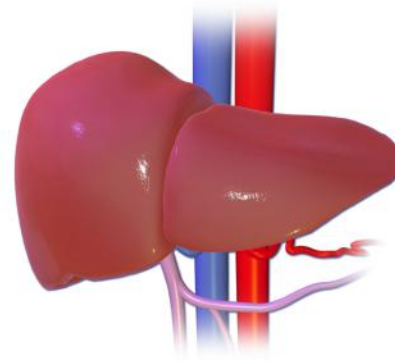
- Upcoming 4th Year UCSD Undergraduate
- Biology with specialization in Bioinformatics
- Neuroscience Lab
- Interests in law, photography



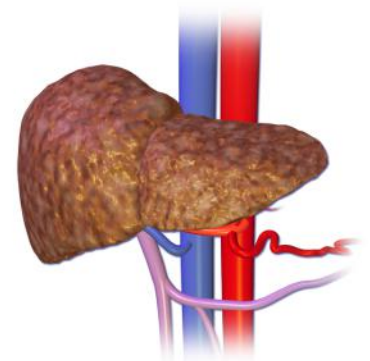
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Clinical Background

- Cirrhosis
- Hepatorenal Syndrome (HRS)
- Current Diagnosis Method
 - Exclusion
 - Time period of 48 hours
- Treatment Options
 - Why not just jump into treatment?
 - Temporizing measures
- Faster alternative to accurately diagnose HRS?



Normal Liver



Liver Cirrhosis

The Model

- Risk Prediction Model
 - 10 Variables
 - Identification of HRS patients
 - Clinical decision-making
- Motivation:
 - Faster diagnosis for faster treatment

HRS Risk Prediction Model: 10 Variables

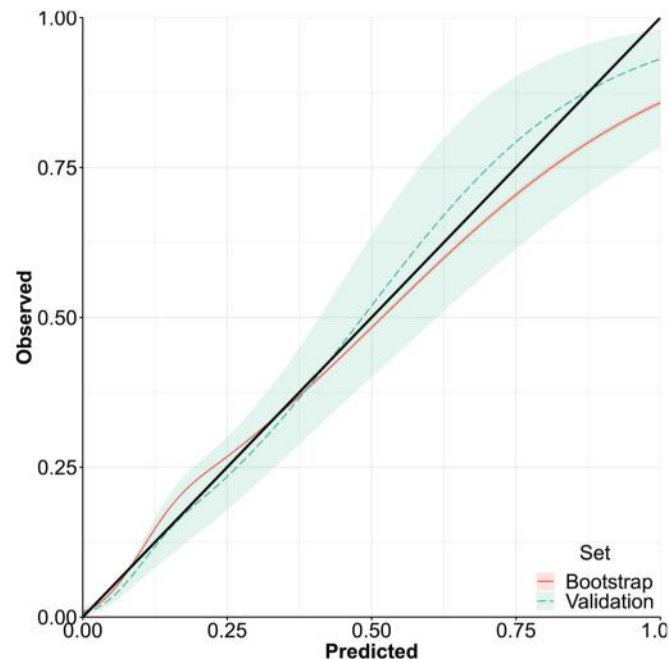
Lab Values
<ul style="list-style-type: none">● Sodium, mmol/L● Serum Bicarbonate, mmol/L● Blood Urea Nitrogen, mg/dL● Mean Corpuscular Hemoglobin Concentration, g/dL● Serum Albumin, g/dL● Total Bilirubin, mg/dL● Urine Sodium, mmol/L
Score-based Value
<ul style="list-style-type: none">● Model for End-Stage Liver Disease Score (MELD)
Diagnosis
<ul style="list-style-type: none">● Spontaneous Bacterial Peritonitis on Admit (SBP)
Procedure
<ul style="list-style-type: none">● # Paracenteses in past 90 days

Project Goal

- **Model Performance**
 - US Department of Veterans Affairs patient data
 - Area Under Curve of 0.87
 - Brier Score of 0.05 (0 is perfect performance)
 - Slope of 1.10
 - Intercept of 0.04
- **Need for further validation**
 - UCSD patient data
- **Tools to collect data essential to the model**



VA | U.S. Department
of Veterans Affairs



Observed-to-expected calibration curve plot for model building and validation sets.

Koola, Jejo D., Guanhua Chen, Bradley A. Malin, Daniel Fabbri, Edward D. Siew, Samuel B. Ho, Olga V. Patterson, and Michael E. Matheny. "A clinical risk prediction model to identify patients with hepatorenal syndrome at hospital admission - Koola - - International Journal of Clinical Practice - Wiley Online Library." *International Journal of Clinical Practice*. 07 Aug. 2019. John Wiley & Sons, Ltd (10.1111). 22 Aug. 2019 <<https://onlinelibrary.wiley.com/doi/10.1111/ijcp.13393>>.

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Data Abstraction

- Five Instruments on REDCap
- Patient Identification
- Cohort selection criteria:
 - Must have cirrhosis
 - Must have acute kidney injury (AKI)
- Hepatorenal Syndrome Diagnosis
- Hepatorenal Syndrome 10 Variables
- Patient Data from EPIC
 - Lab tests
 - Physical Observations
 - Dates



Hepatorenal Syndrome: 10 Variables

Project Home | Project Setup | Online Designer | Data Dictionary

Create snapshot of Instruments | VIDEO: How

Last snapshot: 08/21/2019 11:22am ?

The Online Designer will allow you to make project modifications to fields and data collection instruments very easily in a web browser. NOTE: While in development status, all field changes will take effect immediately in real time.

Add new instrument:

Data Collection Instruments

- [Create](#) a new instrument from scratch
- [Import](#) a new instrument from the official [REDCap Shared Library](#)
- [Upload](#) instrument ZIP file from another project/user or [external libraries](#)


Instrument name	Fields	View PDF	Instrument actions
Patient Identification	5		Choose action
Cirrhosis Diagnosis	21		Choose action
Acute Kidney Injury (AKI)	12		Choose action
HRS Diagnosis	13		Choose action
Hrs Variables	18		Choose action

Instrument 1

- Patient Identification
 - Medical Record Number
 - Contact Serial Number
 - Admission
 - Discharge

Current instrument: **Patient Identification**





[Preview instrument](#)

 Variable: record_id

Record ID





NOTE: The field above is the record ID field and thus cannot be deleted or moved. It can only be edited.

[Add Field](#) [Add Matrix of Fields](#)

    Variable: mrn





Patient MRN


[Add Field](#) [Add Matrix of Fields](#)

    Variable: csn





Patient CSN


[Add Field](#) [Add Matrix of Fields](#)

    Variable: admission

Admission Time  M-D-Y:HM

[Add Field](#) [Add Matrix of Fields](#)

    Variable: discharge

Discharge Time  M-D-Y:HM

[Add Field](#) [Add Matrix of Fields](#)

Instrument 2

- Cohort Selection: Must have cirrhosis
- Cirrhosis Diagnosis
 - Medical History
 - Physical Examination
 - Laboratory Testing
 - Radiology
 - Calculated Scores
 - Fib-4
 - APRI
 - REDCap Branching Logic

Current instrument: **Cirrhosis Diagnosis** [Return to edit view](#)

NOTE: Please be aware that branching logic and calculated fields will not function on this page. They only work on the survey pages and data entry forms.

Does this patient have cirrhosis based on pathology or clinical criteria? Yes No [reset](#)

Medical History

Medical History (choose all that apply)

- Hepatitis B
- Hepatitis C
- Alcohol Use Disorder
- NAFLD
- Unclear / Unable to Ascertain
- Other

If other, please specify:

Physical Examination

	Yes	No
Liver firm or abnormal to the touch	<input type="radio"/>	<input type="radio"/>
Ascites present prior to or on admission	<input type="radio"/>	<input type="radio"/>

[reset](#)

Spider angiomata present (>3)

Laboratory Testing

Thrombocytopenia

Hypoalbuminemia

INR > 1.2

Hyperbilirubinemia

Radiology

	Yes	No
CT Scan	<input type="radio"/>	<input type="radio"/>
MRI	<input type="radio"/>	<input type="radio"/>
Abdominal Ultrasound	<input type="radio"/>	<input type="radio"/>

Based on Fib4 (we will calculate)? Yes No [reset](#)

Based on APRI (we will calculate)? Yes No [reset](#)

Patient Age

Please enter the AST measurement

Please enter the ALT measurement

Please enter the platelet count (10⁹/L)

Fib-4 Score: [View equation](#)

APRI Score: [View equation](#)



Instrument 3

- Cohort Selection: Must have Acute Kidney Injury
- Acute Kidney Injury (AKI)
 - Kidney Disease Improving Global Outcomes (KDIGO) guidelines
 - New initiation of dialysis
 - Significant rise in creatinine values

Current instrument: **Acute Kidney Injury (AKI)**

[Return to edit view](#)

NOTE: Please be aware that branching logic and calculated fields will not function on this page. They only work on the survey pages and data entry forms.

Did the patient die within 24 hours of hospitalization?	<input type="radio"/> Yes	
	<input type="radio"/> No	reset
Patient on dialysis prior to admission?	<input type="radio"/> Yes	
	<input type="radio"/> No	reset
New initiation of dialysis on patient?	<input type="radio"/> Yes	
	<input type="radio"/> No	reset
Most recent creatinine value (mg/dL) prior to ER admission	<input type="text"/>	
What is the date of this creatinine measurement?	<input type="text"/>  Today M-D-Y	
Is this creatinine value representative of the patient's baseline creatinine?	<input type="radio"/> Yes	
	<input type="radio"/> No	reset
Alternative creatinine value (mg/dL) representative of the baseline?	<input type="text"/>	
What is the date of this creatinine measurement?	<input type="text"/>  Today M-D-Y	
Does the patient have an admission creatinine measurement?	<input type="radio"/> Yes	
	<input type="radio"/> No	reset
First creatinine value upon admission to the ER (mg/dL)	<input type="text"/>	
Absolute Change in Creatinine	<input type="text"/>	View equation
Relative Change in Creatinine	<input type="text"/>	View equation


Instrument 4

- Hepatorenal Syndrome Diagnosis
 - Diagnosis based on:
 - Presence of Cirrhosis
 - Lab values
 - Exclusion of other kidney injury
 - Date of Diagnosis

Current instrument: **HRS Diagnosis**

[Return to edit view](#)

NOTE: Please be aware that branching logic and calculated fields will not function on this page. They only work on the survey pages and data entry forms.

Did the patient have cirrhosis with ascites?	<input type="radio"/> Yes <input type="radio"/> No	reset
Is the patient's serum creatinine >133 mmol/l (1.5 mg/dl)?	<input type="radio"/> Yes <input type="radio"/> No	reset
Did the patient's serum creatinine decrease to a level of 133 mmol/l or 1.5 mg/dl after at least 2 days of diuretic withdrawal and volume expansion with albumin?	<input type="radio"/> Yes <input type="radio"/> No	reset
Exclude other causes of kidney injury		
Did the patient experience shock?	<input type="radio"/> Yes <input type="radio"/> No	reset
Has the patient with been treated or is currently being treated with nephrotoxic drugs?	<input type="radio"/> Yes <input type="radio"/> No	reset
Indications of primary kidney disease		
Proteinuria > 500 mg/day	<input type="radio"/> Yes <input type="radio"/> No	reset
Microhematuria > 50 rbc/hpf	<input type="radio"/> Yes <input type="radio"/> No	reset
Foley placement?	<input type="radio"/> Yes <input type="radio"/> No	reset
Does the patient have abnormal renal ultrasonography?	<input type="radio"/> Yes <input type="radio"/> No	reset
Is there a non-HRS kidney condition more representative of these results?	<input type="radio"/> Yes <input type="radio"/> No	reset
Please specify the condition	<input type="text"/>	
Does the patient have Hepatorenal Syndrome?	<input type="radio"/> Yes <input type="radio"/> No	reset
Date of diagnosis	<input type="text"/>  Today M-D-Y	reset

Instrument 5

- Hepatorenal Syndrome Variables

- Laboratory Values
- Spontaneous Bacterial Peritonitis on Admit
- Number of Paracenteses
- MELD Score Calculation

Current instrument: **Hrs Variables**

[Return to edit view](#)

NOTE: Please be aware that branching logic and calculated fields will not function on this page. They only work on the survey pages and data entry forms.

1. Sodium (mmol/L)	<input type="text"/>
2. Serum Bicarbonate (mmol/L)	<input type="text"/>
3. Blood Urea Nitrogen (mg/dL)	<input type="text"/>
4. Mean Corpuscular Hemoglobin Concentration (g/dL)	<input type="text"/>
5. Serum Albumin (g/dL)	<input type="text"/>
6. Total Bilirubin (mg/dL)	<input type="text"/>
Urine Sodium (mmol/L)	<input type="text"/>
7. log(Urine Sodium)	<input type="text"/> View equation
8. Spontaneous Bacterial Peritonitis on Admit	<input type="radio"/> Yes <input type="radio"/> No
SBP Diagnosis Method	<input type="text"/> reset
#Paracenteses in past 90 days	<input type="text"/>
9. log(#Paracenteses)	<input type="text"/> View equation
Serum Creatinine (mg/dL)	<input type="text"/>
In(Serum Creatinine)	<input type="text"/> View equation
INR	<input type="text"/>
In(INR)	<input type="text"/> View equation
In(Total Bilirubin)	<input type="text"/> View equation
10. MELD score	<input type="text"/> View equation

Next Steps

- Collect patient data and enter data into model
- Test with other patient data
 - Strength of REDCap
- Thinking long-term:
 - Clinical Trial
 - Prospective Study

What I learned

- What is Hepatorenal Syndrome?
- Challenges in Diagnosis
- Risk Prediction
- Flow of a research study
- Responsibility with Data

Questions?

Acknowledgements

- Dr. Jejo Koola
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