Value-added Opportunistic Screening:

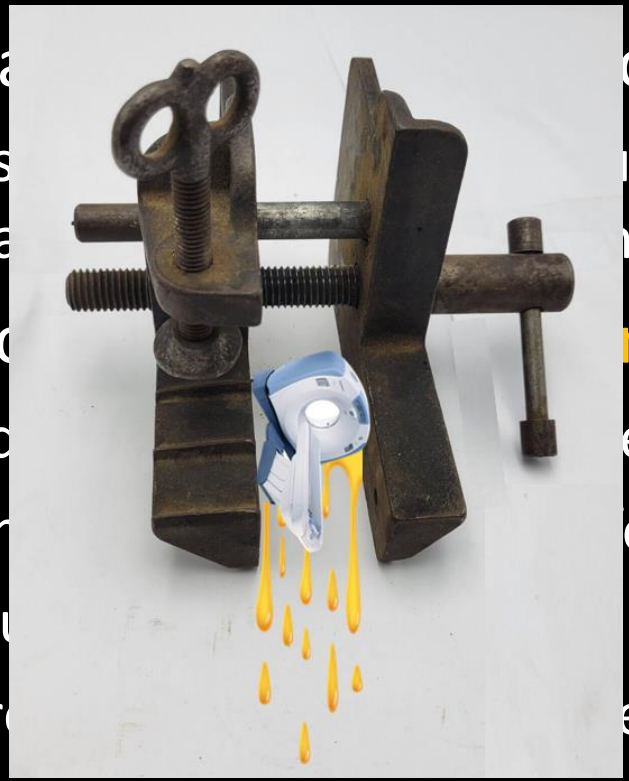
What are the potential benefits & harms of this approach?

Perry J. Pickhardt, MD

UW School of Medicine & Public Health

Opportunistic CT Screening

- Leveraging CT da clinical indication
  - Alternate terms s, incidental, serendipitous, a ning
- Current relevanc nce of factors:
  - The objective, c e nature of CT imaging
  - The large volum ormed in adults
  - Emergence of fu ble AI solutions
  - Emphasis on pr e-added initiatives

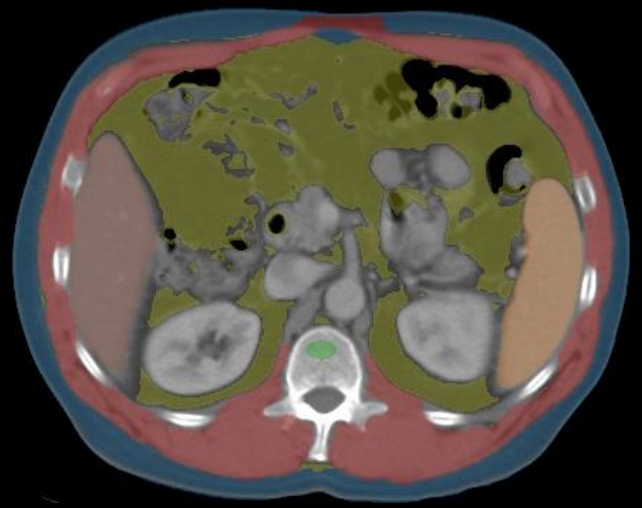


Opportunistic CT Screening

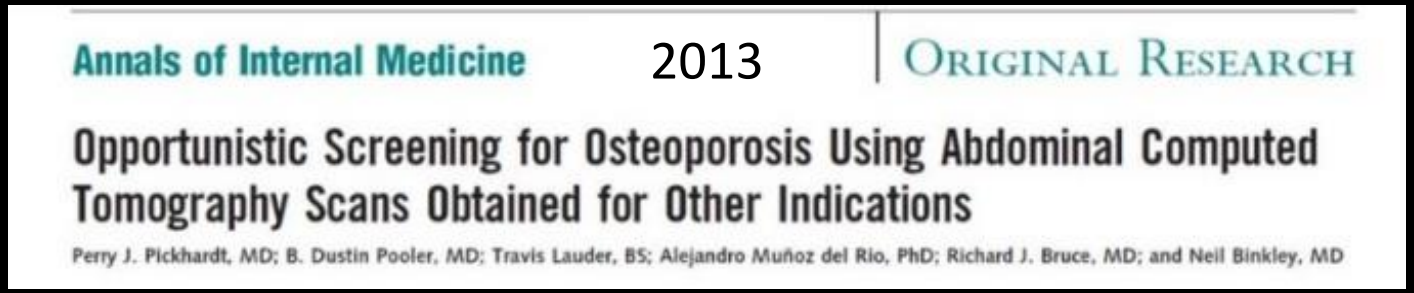
- Robust body composition data embedded within all CT scans
- Analogous manual, semi-, and fully-automated measures

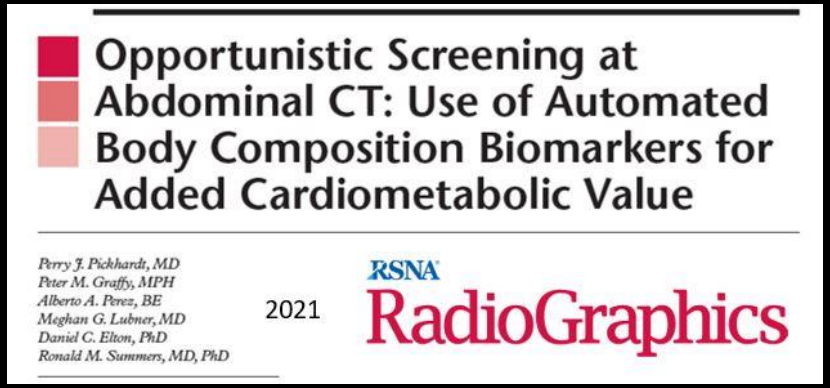
Opportunistic CT Screening

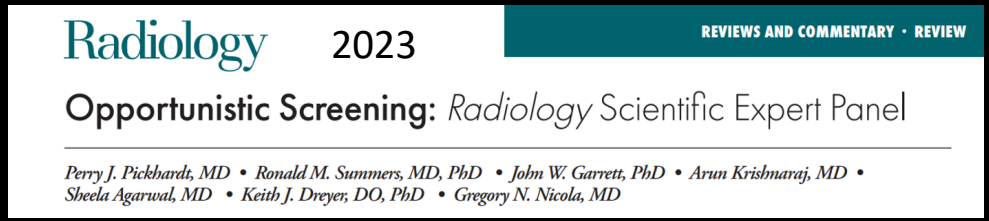
- Osteoporosis
- Cardiovascular disease
- Sarcopenia
- Metabolic syndrome
- Hepatic steatosis & fibrosis
- Organomegaly
- Unsuspected masses, cancers, etc
- Undisclosed genetic conditions



Opportunistic CT Screening

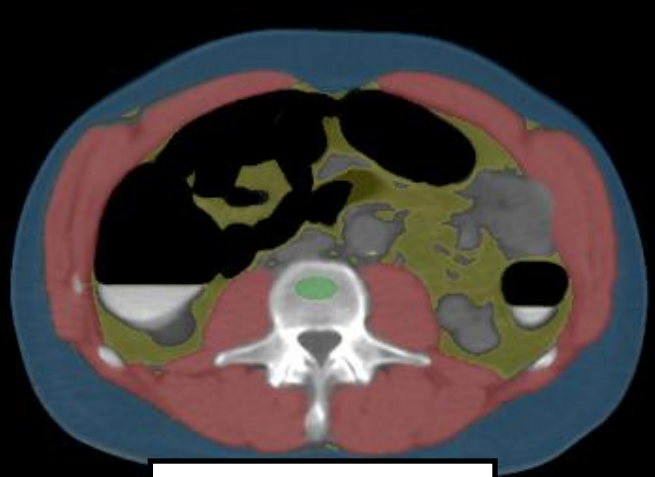






Opportunistic CT Screening

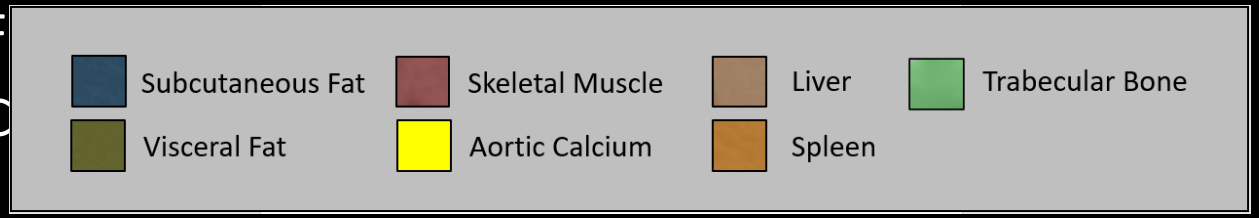
L1 Level



L3 Level

Cor MIP

- F
- C



THE LANCET Digital Health

Automated CT biomarkers for opportunistic prediction of future cardiovascular events and mortality in an asymptomatic screening population: a retrospective cohort study

Perry J Pickhardt, Peter M Graffy, Ryan Zea, Scott J Lee, Jiamin Liu, Veit Sandfort, Ronald M Summers

Mean	20.8	29.4

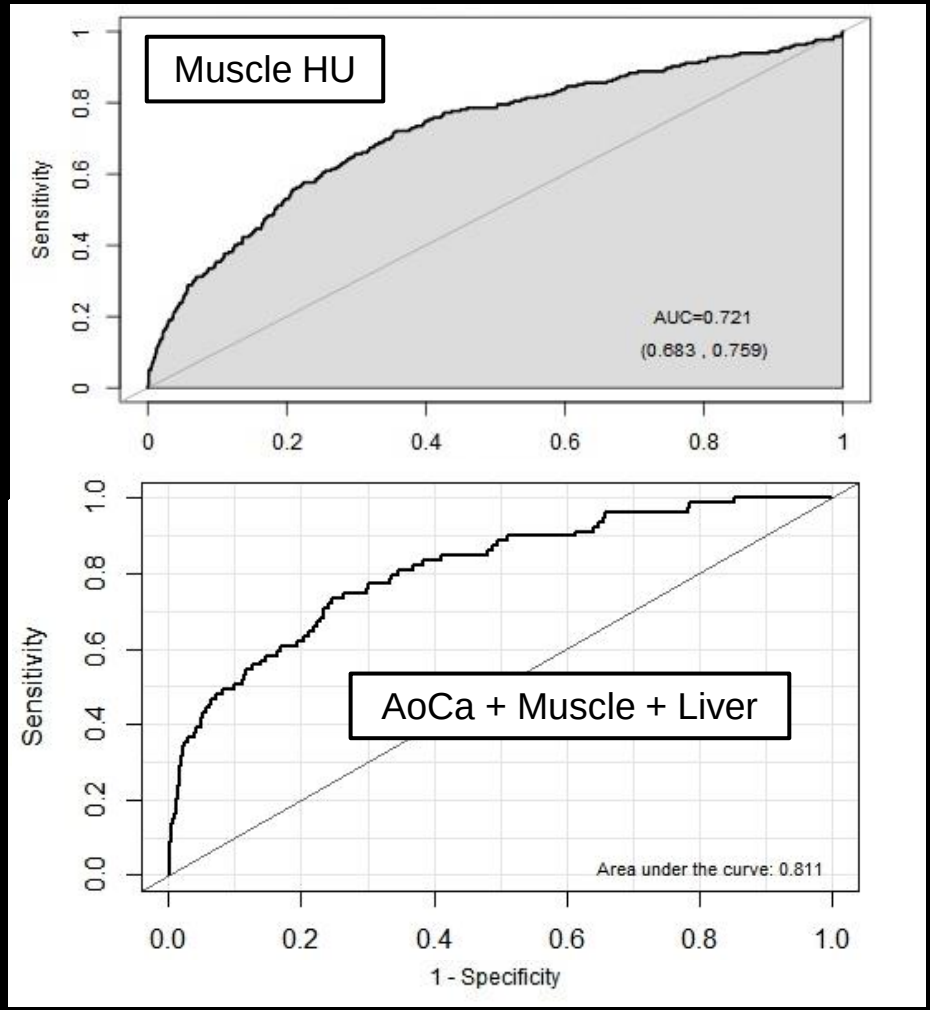
Radiology

ORIGINAL RESEARCH • COMPUTER APPLICATIONS

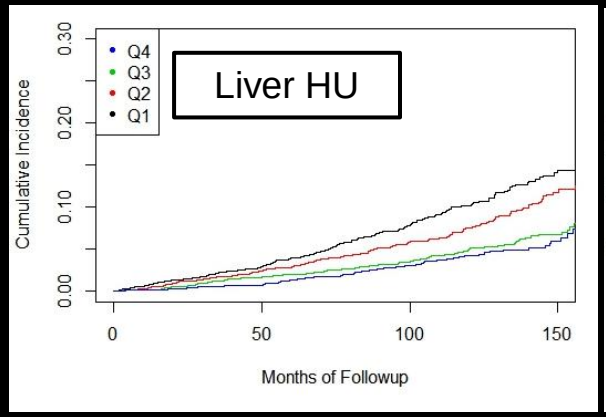
Automated Abdominal CT Imaging Biomarkers for Opportunistic Prediction of Future Major Osteoporotic Fractures in Asymptomatic Adults

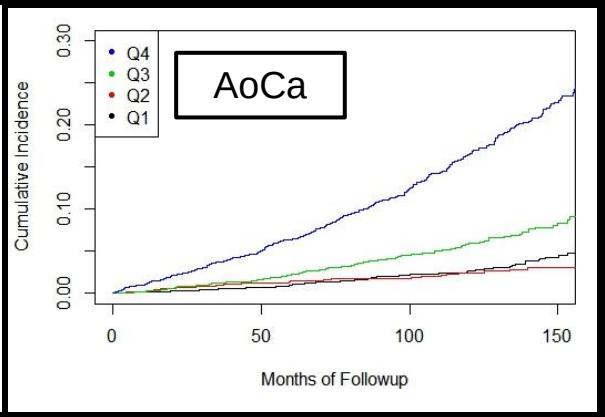
Perry J. Pickhardt, MD • Peter M. Graffy, MPH • Ryan Zea, MS • Scott J. Lee, MD • Jiamin Liu, PhD • Veit Sandfort, MD • Ronald M. Summers, MD, PhD

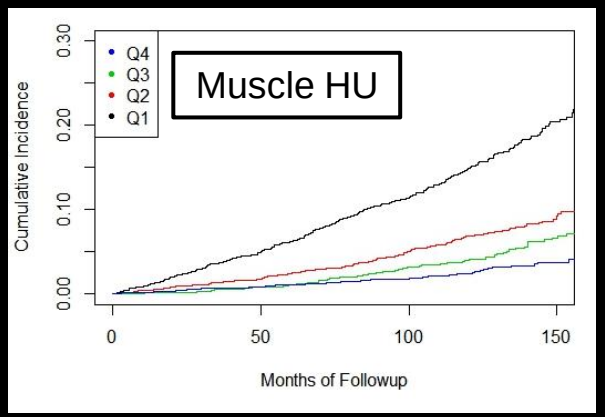
Diagnostic Performance for Predicting Death				
	2-year AUROC (n=7849)	5-year AUROC (n=6891)	10-year AUROC (n=4029)	Cox PH Model Concordance
Clinical Parameters				
FRS	0.700	0.688	0.693	0.681
FRAX	0.653	0.653	0664	0.657
BMI	0.546	0.499	0.533	0.520
Automated CT Biomarkers				
Univariate				
AoCa (Ag)	0.746	0.743	0.746	0.735
Muscle HU	0.736	0.721	0.717	0.700
V/S Fat Ratio	0.685	0.661	0.656	0.648
Liver HU	0.644	0.619	0.628	0.602
L1 HU	0.627	0.646	0.640	0.637
Multivariate				
AoCa + Muscle	0.780	0.768	0.768	0.772
AoCa + Muscle + Liver	0.811	0.782	0.777	0.778
AoCa + Muscle + Liver + V/S	0.817	0.789	0.780	0.780

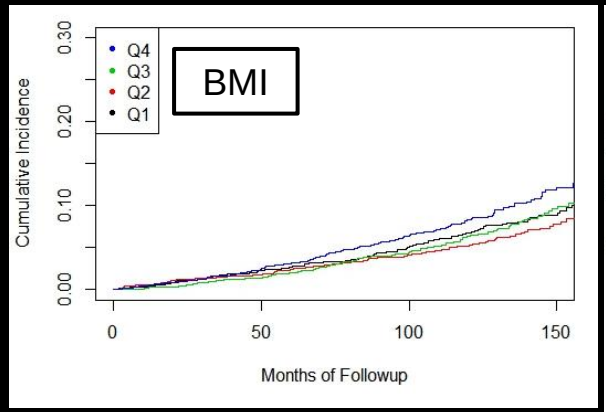


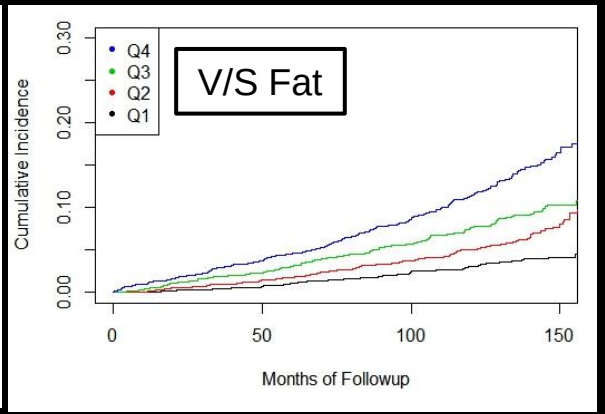
- *Time-to-Event Plots by Quartile for Predicting **Death**:*

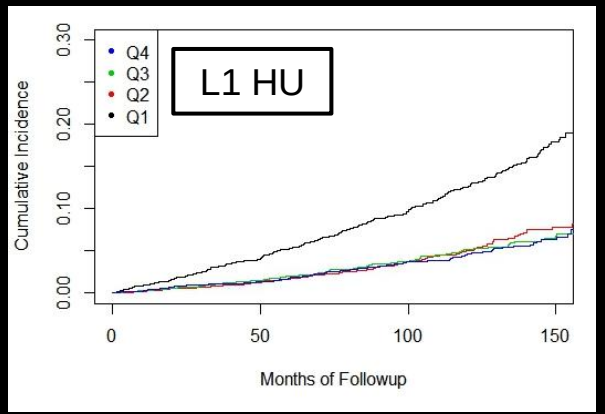




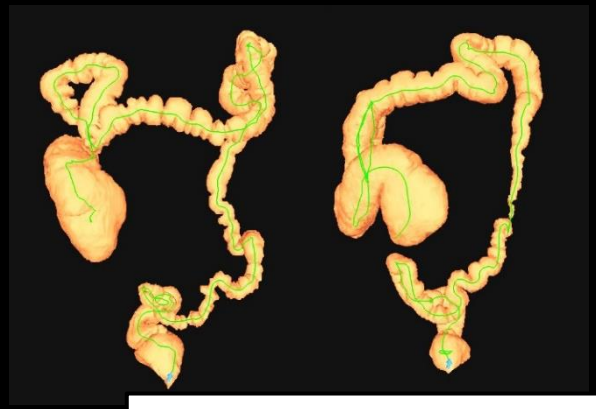




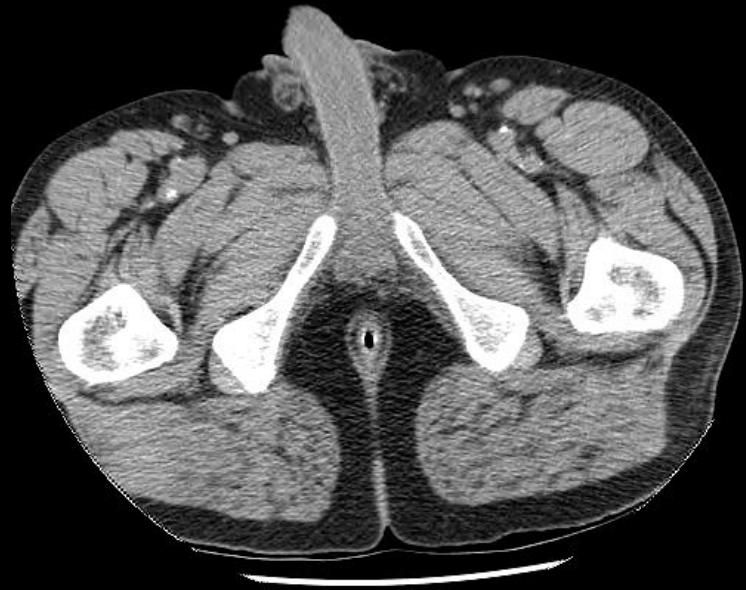


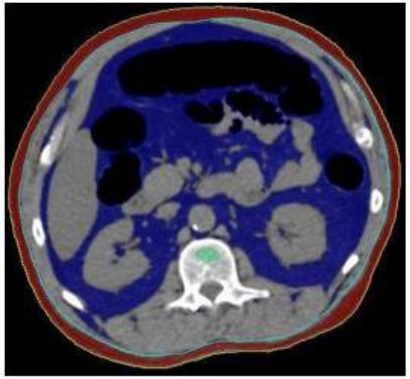


52M

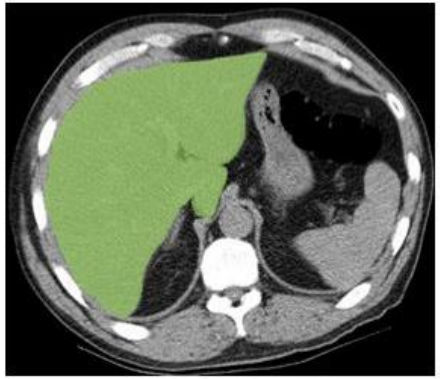


CTC 2005: “negative” (no polyps)





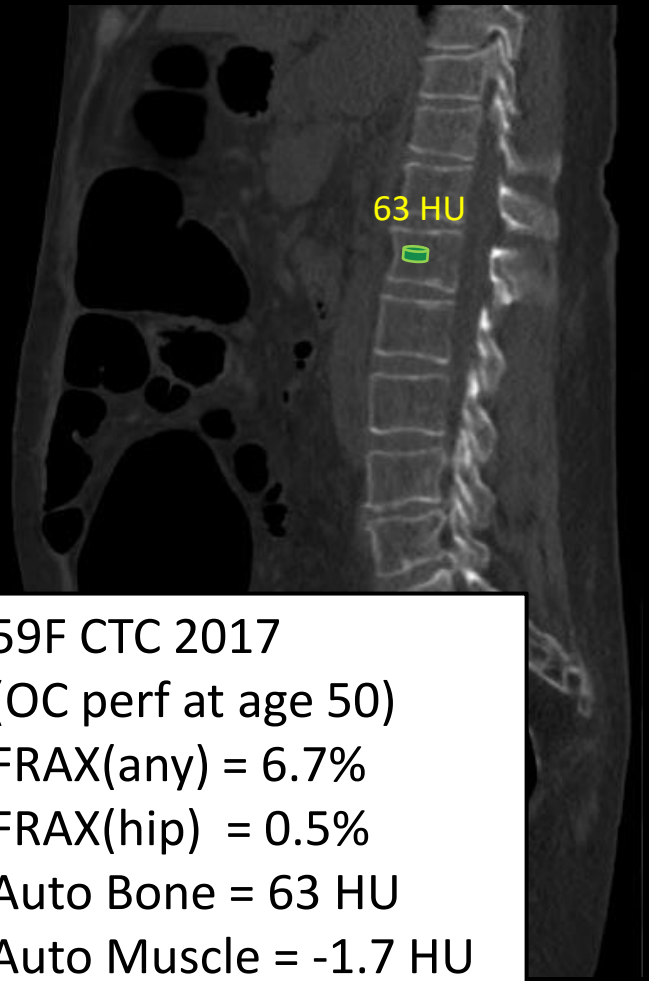
V/S Ratio = 3.1
(99th percentile)



Liver Density = 28 HU
(97th percentile)

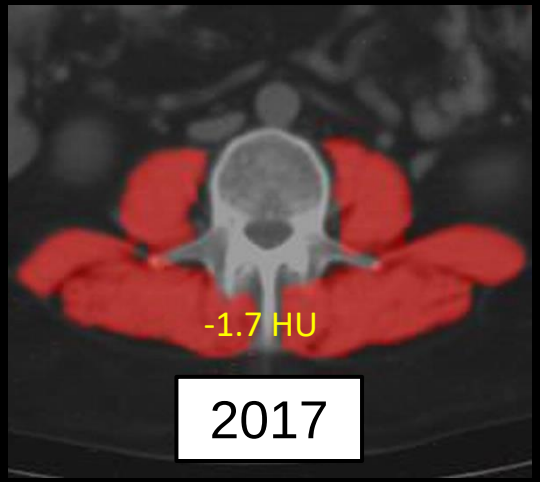
Agatston Score = 5070
(97th percentile)

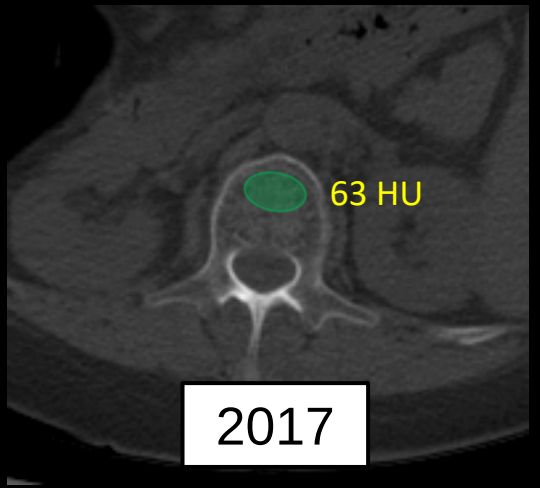
2005: FRS=5% (low), BMI=27.3
2008: Acute MI
2013: CVA
2017: Death (Age 64)
Chronological age = 52 years
CT Biological Age = 72 years



59F CTC 2017
(OC perf at age 50)
FRAX(any) = 6.7%
FRAX(hip) = 0.5%
Auto Bone = 63 HU
Auto Muscle = -1.7 HU


R
PB


-1.7 HU
2017


63 HU
2017

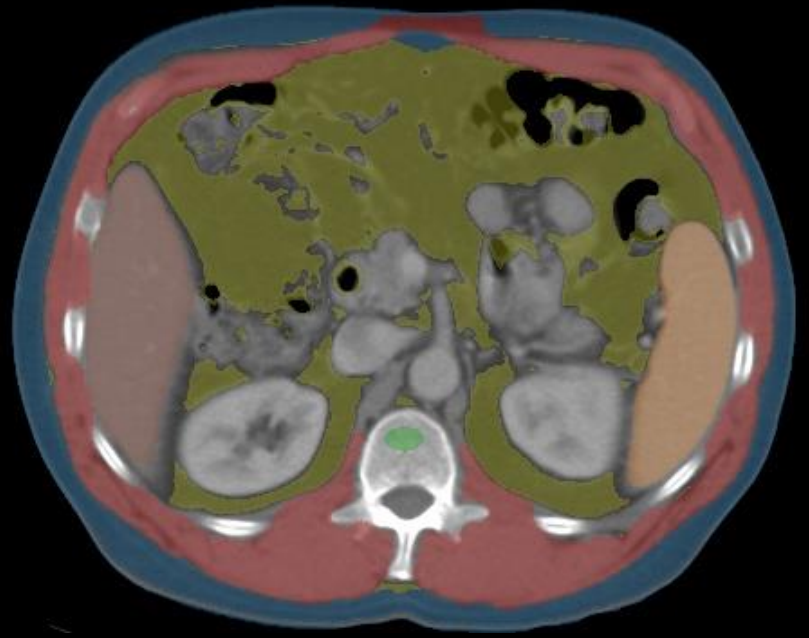
Future Directions

- Expanded study cohorts:
  - Broader population-based mixed CT cohort at UW (>150k)
  - Expansion to multi-center collaboration: OSCAR (>1M)

  - What about *intended* (vs. opportunistic) CT screening?

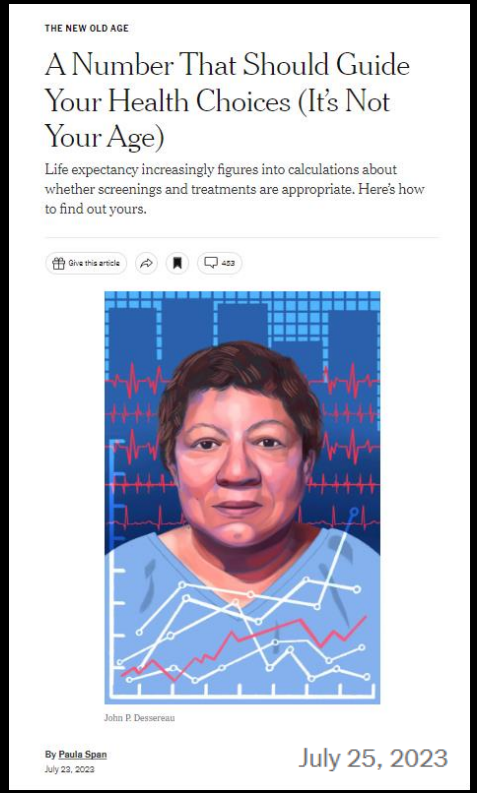
Value-added Clinical Use Scenarios

- Cardiovascular disease
- Osteoporosis
- Diffuse liver diseases
- Cancer frailty
- Organomegaly
- Diabetes/Metabolic Sx
- Overall survival (Biological age)



CT Biological Age

- A “biophysical profile” for adults
  - Analogous to US-based fetal assessment
- Increasing relevance of “life expectancy”
  - Driving many healthcare decisions
- CT-based biological age
  - Based on our body composition biomarkers
  - May outperform existing calculators



THE NEW OLD AGE

A Number That Should Guide Your Health Choices (It’s Not Your Age)

Life expectancy increasingly figures into calculations about whether screenings and treatments are appropriate. Here’s how to find out yours.

Give this article 453

John P. Dessereau

By Paula Span

July 23, 2023

July 25, 2023

Challenges to Implementation

- Widespread availability of AI algorithms
- AI acceptance by radiologists, referring providers, & pts
- Generalize results to more diverse patient cohorts
- Appropriate referral networks for patients

Radiology

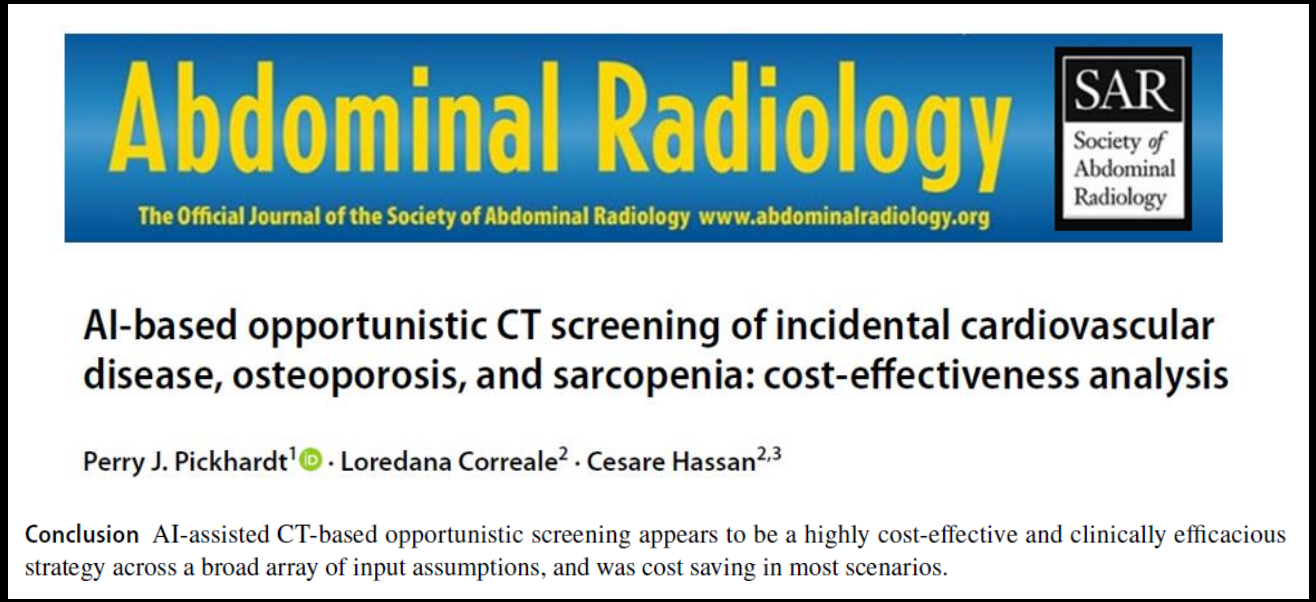
REVIEWS AND COMMENTARY • REVIEW

Opportunistic Screening: *Radiology* Scientific Expert Panel

Perry J. Pickhardt, MD • Ronald M. Summers, MD, PhD • John W. Garrett, PhD • Arun Krishnaraj, MD • Sheela Agarwal, MD • Keith J. Dreyer, DO, PhD • Gregory N. Nicola, MD

Potential Harms?

- Radiologist and referring provider workload concerns
- Programmatic costs and resource utilization



Abdominal Radiology
The Official Journal of the Society of Abdominal Radiology www.abdominalradiology.org
SAR Society of Abdominal Radiology

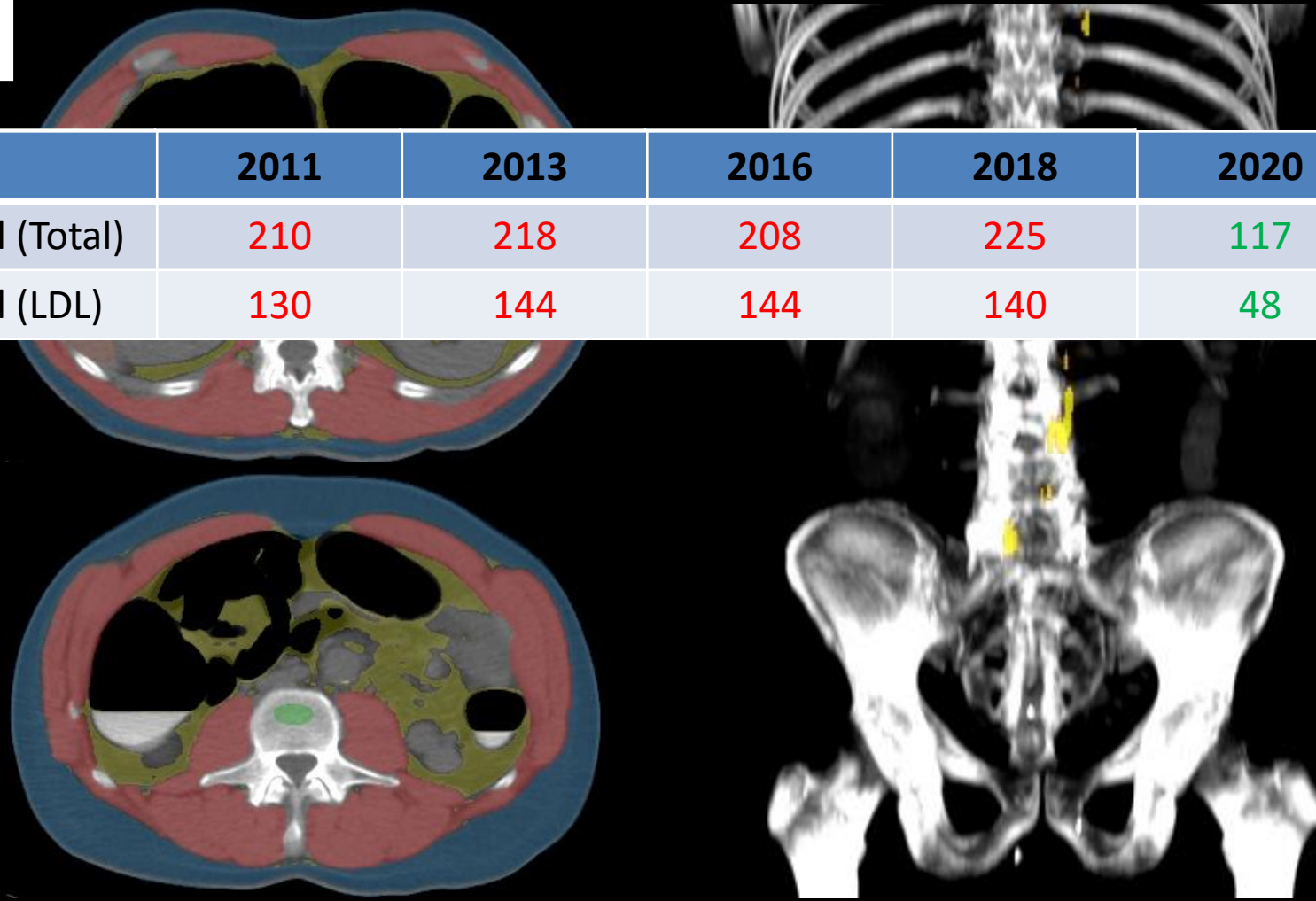
AI-based opportunistic CT screening of incidental cardiovascular disease, osteoporosis, and sarcopenia: cost-effectiveness analysis

Perry J. Pickhardt[1] · Loredana Correale[2] · Cesare Hassan[2,3]

Conclusion AI-assisted CT-based opportunistic screening appears to be a highly cost-effective and clinically efficacious strategy across a broad array of input assumptions, and was cost saving in most scenarios.

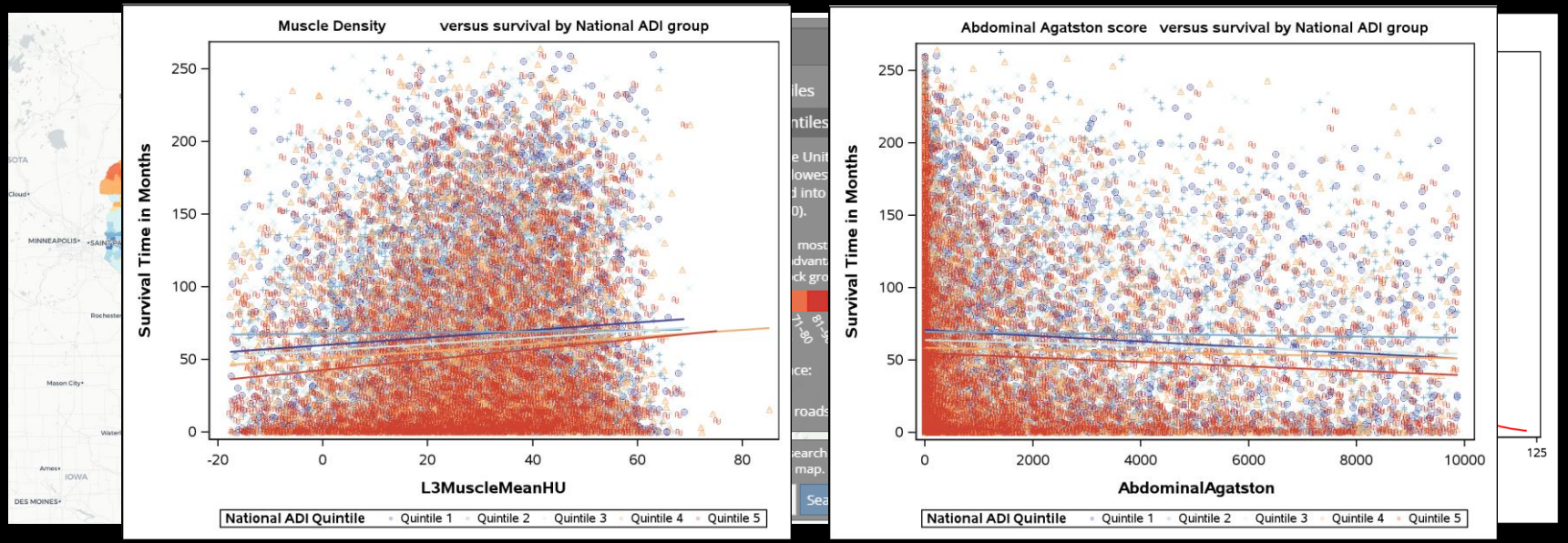
PJP

	2011	2013	2016	2018	2020
Chol (Total)	210	218	208	225	117
Chol (LDL)	130	144	144	140	48



ESG Connection?

- Area Deprivation Index (ADI): A measure of socio-economic disadvantage at the neighborhood level



Summary

- Abdominal CT is frequently performed for a wide variety of clinical indications
- Robust additional data often goes unused in practice
- These relevant measures of body composition can be automated for rapid & objective assessment
- Performance equals or exceeds clinical prediction
- Adding value to services we already provide is critical

Thank You