The Scope and Likely Clinical Impact of Race-correction in Algorithms

Who Gets Health Care and Why: AI, Race and Health Equity

NIHCM Foundation

28 September 2021

David S. Jones, M.D., Ph.D.
Should we provide different medical care to people of different races and ethnicities…

… because of their races and ethnicities?
Race (and racism) is pervasive in medical practice:

- Race adjustment
- Race correction
- Race norming
- Risk calculators
- Treatment guidelines

... though much of this is unique to medicine in the United States
A new clinical rule predicts the presence of uncomplicated kidney stones.

There is concern about excessive radiation related to routine computed tomography scanning for patients with suspected ureteral colic. Researchers retrospectively derived and prospectively validated a clinical prediction rule for uncomplicated ureteral stones in adults with flank pain. Patients with infection, trauma, known malignancy, renal disease, or prior urologic procedures were excluded.

The derivation cohort comprised 1040 adult patients with flank pain undergoing CT without contrast in the emergency department; the validation cohort comprised 491 such patients. Using multivariate logistic regression, the top five factors associated with ureteral stones — male sex, short pain duration, non-black race, nausea or vomiting, and microscopic hematuria — were each assigned 0–3 points, which were summed to create a 0–13 point STONE score (see table). For patients in the validation cohort with low (0–5 points), moderate, (6–9 points), and high (10–13 points) scores, the probability of stones was 9%, 51%, and 89%, respectively. Findings were similar in the derivation cohort. Clinically relevant alternative diagnoses (e.g., diverticulitis, appendicitis, malignancy, cholecystitis, aortic aneurysm) were present in 2% of the validation cohort with high scores.

A 13 point scale
High score = High risk
Development of a Nomogram for Prediction of Vaginal Birth After Cesarean Delivery

William A. Grobman, MD, MBA, Yingjie Lai, PhD, Mark B. Landon, MD, Catherine Y. Spong, MD, Kenneth J. Levine, MD, Dwight J. Rouse, MD, MSc, Michael W. Varner, MD, Atef H. Moawad, MD, Steve N. Caritis, MD, Margaret Harper, MD, Ronald J. Watkins, MD, Yoram Sorokin, MD, Menachem Miodovnik, MD, Marshall Carpenter, MD, Mary J. O’Sullivan, MD, Baha M. Sibai, MD, Oded Langer, MD, John M. Thorp, MD, Susan M. Ramin, MD, and Brian M. Mercer, MD, for the National Institute of Child Health and Human Development (NICHD) Maternal–Fetal Medicine Units Network (MFMU)*

OBJECTIVE: To develop a model based on factors available at the first prenatal visit that predicts success of vaginal birth after cesarean delivery (VBAC) for women who undergo a trial of labor.

METHODS: A logistic regression model for prediction of vaginal birth after cesarean delivery, the occurrence of a VBAC, and the potential for success of a VBAC was developed. Seven thousand six hundred sixty pregnant women who had a prior cesarean delivery were identified from a concurrently collected database of deliveries at 19 academic centers during a 4-year period. Using factors identifiable at the first prenatal visit, we analyzed different classification techniques in an effort to develop a meaningful prediction model for VBAC success after development and cross-validation, the model was represented by a graphic nomogram.

RESULTS: Seven-thousand six hundred sixty women were available for analysis. The prediction model is based on a multivariable logistic regression, including the variables of maternal age, body mass index, ethnicity, prior vaginal delivery, the occurrence of a VBAC, and a potential recurrent indication for the cesarean delivery. After analyzing the model with cross-validation techniques, it was found to be both accurate and discriminating.

CONCLUSION: A predictive nomogram, which incorporates various easily ascertainable factors, has been developed that allows the determination of whether to attempt a trial of labor. To this point in time, physicians have had several potential strategies that could be used to counsel a woman about her probability of having a VBAC if she undergoes a trial of labor. The simplest strategy uses the reported success rate, or range of rates, for VBAC for each individual woman. To this point in time, physicians have had several potential strategies that could be used to counsel a woman about her probability of having a VBAC if she undergoes a trial of labor. The simplest strategy uses the reported success rate, or range of rates, for VBAC for each individual woman.

DISCUSSION

The authors thank the following core committee members: Frances Johnson, BSN, and Julia McCampbell, RN (protocol development and coordination between clinical research centers); Elizabeth Thon, PhD (protocol/data management and statistical analysis); and Alan M. Perelman, MD (protocol development and oversight).

Corresponding author: William A. Grobman, MD, MBA, 333 East Superior Street, Suite 410, Chicago, IL 60611; e-mail: w-grobman@northwestern.edu

© 2007 by The American College of Obstetricians and Gynecologists. Published in Lippincott Williams & Wilkins.

ISSN: 0020-7844/07

Logistic Regression Equation for Prediction of Achieving VBAC After a Trial of Labor

Predicted probability of successful VBAC = \exp(w)/[1 + \exp(w)]

where w = 3.766 – 0.039(age) – 0.060(prepregnant body mass index) – 0.671(African-American race) – 0.683(Hispanic race) + 0.888(any prior vaginal delivery) + 1.003(vaginal delivery after prior cesarean) – 0.632(recurring indication for cesarean)
Physicians still lack consensus on the meaning of race. When the Journal took up the topic in 2003 with a debate about the role of race in medicine, even that racial and ethnic categories reflected underlying population genetics and could be clinically useful. Others held that any small benefit was outweighed by potential harms that arose from the long, rooted history of racism in medicine. Weighing the two sides, the accompanying Perspective article concluded that though the concept of race was "fraught with sensitivities and fueled by past abuses and the potential for future abuses," it seemed unwise to abandon the practice of recording race and that race-based medicine still had potential: "it seems unlikely that a patient can be expected to undergo surgery or receive treatment if his or her race is included on the wrong side of an equation of risk and benefit." We have compiled a partial list of race-adjusted algorithms (Table 1). We explore several of them in detail here. Given their potential to perpetuate or even amplify race-based health inequities, they merit thorough scrutiny.

The next year, a randomized trial showed that a combination of hydralazine and isosorbide dinitrate reduced mortality due to heart failure, which is used to predict viability of potential kidney donors.

Cardiology

The American Heart Association’s Get with the Guidelines—Heart Failure (https://mycalc.org/guthf-heart-failure-risk-score) predicts in-hospital mortality in patients with acute heart failure. Clinicians are advised to use this risk stratification to guide decisions regarding initiating medical therapy.

Cardiac surgery

The Society of Thoracic Surgeons Short Term Risk Calculator (https://riskcalc.sts.org/stswbriskcalc) calculates a patient’s risks of complications and death with the most common cardiac surgeries. Considers >60 variables, some of which are listed here.

Nephrology

Estimated glomerular filtration rate (eGFR)

MDRD and CKD-EPI equations (https://uk.renally.org/nephrology-resources/egfr-calculator) estimate glomerular filtration rate on the basis of a measurement of serum creatinine.

The American Heart Association (AHA) Get with the Guidelines—Heart Failure Risk Score predicts the risk of death in patients admitted to the hospital. It assigns three additional points to any patient identified as "nonblack," thereby categorizing all black patients as being at lower risk. The AHA does not provide a rationale for this adjustment.

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (1.018 if female). This correction is larger than the risk adjustment for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.

Cardiology

Systolic blood pressure

Blood urea nitrogen

Sodium

Age

Heart rate

History of COPD

Race: black or nonblack

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Nephrology

Sodium

Serum creatinine

Age and sex

Race: black vs. white or other

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.

Cardiology

Systolic blood pressure

Blood urea nitrogen

Sodium

Age

Heart rate

History of COPD

Race: black or nonblack

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Nephrology

Sodium

Serum creatinine

Age and sex

Race: black vs. white or other

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.

Cardiology

Systolic blood pressure

Blood urea nitrogen

Sodium

Age

Heart rate

History of COPD

Race: black or nonblack

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Nephrology

Sodium

Serum creatinine

Age and sex

Race: black vs. white or other

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.

Cardiology

Systolic blood pressure

Blood urea nitrogen

Sodium

Age

Heart rate

History of COPD

Race: black or nonblack

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Nephrology

Sodium

Serum creatinine

Age and sex

Race: black vs. white or other

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.

Cardiology

Systolic blood pressure

Blood urea nitrogen

Sodium

Age

Heart rate

History of COPD

Race: black or nonblack

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Nephrology

Sodium

Serum creatinine

Age and sex

Race: black vs. white or other

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.

Cardiology

Systolic blood pressure

Blood urea nitrogen

Sodium

Age

Heart rate

History of COPD

Race: black or nonblack

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Nephrology

Sodium

Serum creatinine

Age and sex

Race: black vs. white or other

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.

Cardiology

Systolic blood pressure

Blood urea nitrogen

Sodium

Age

Heart rate

History of COPD

Race: black or nonblack

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Nephrology

Sodium

Serum creatinine

Age and sex

Race: black vs. white or other

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.

Cardiology

Systolic blood pressure

Blood urea nitrogen

Sodium

Age

Heart rate

History of COPD

Race: black or nonblack

Cardiac surgeons also consider race. The Society of Thoracic Surgeons Short Term Risk Calculator also adjusts for sex (0.742 if female). The AHA does not provide a rationale for this adjustment.

Nephrology

Sodium

Serum creatinine

Age and sex

Race: black vs. white or other

Organ Procurement and Transplantation

Network: Kidney Donor Risk Index (KDRI) (https://optn.transplant.hrsa.gov/resources/allocation-calculator/kdpsi-calculator) estimates predicted risk of donor kidney graft failure, which is used to predict viability of potential kidney donor.

Use of this tool may reduce the pool of African-American kidney donors in the United States. Since African-American patients are more likely to come forward as African-American donors, by reducing the pool of available kidneys, the KDRI could exacerbate this racial inequity in access to kidneys for transplantation.
IN A SERIES OF LETTERS, NEAL CALLS ON PROFESSIONAL MEDICAL SOCIETIES TO PUSH RACIAL HEALTH EQUITY AGENDA FORWARD

Sep 3, 2020 | Press Release

SPRINGFIELD, MA—Today, House Ways and Means Committee Chairman Richard E. Neal (D-MA) called on the leaders of the Accreditation Council for Graduate Medical Education, the American College of Cardiology, the American College of Obstetricians and Gynecologists, the American Heart Association, the American Medical Association, the American Society of Nephrology, and the American Thoracic Society to partner with the Ways and Means Committee in addressing the longstanding racial inequities in our society. The letters to the professional societies describe how racism has influenced the use of race in medicine, science, and research, and call for a new path forward where medicine considers race as a tool to measure racism, not biological differences. Neal detailed the relevant work of each professional society and asked for their perspectives on a series of questions related to their unique medical expertise.

“COVID-19 has illuminated and exacerbated longstanding racial inequities in our health care system that we must correct,” Chairman Neal said. “As clinicians, health equity scholars, and medical professional societies continue to work toward eliminating racial health inequities, the consequences to health and the perpetuation of unequal outcomes make this work more urgent than ever. We must redouble our efforts. I look forward to the leadership of professional societies, who have been strong partners of government, to push this racial health equity agenda forward.”

In the letters, Neal wrote: “The United States (U.S.) has some of the most dramatic racial health inequities in the world despite its overall wealth and modern health care and research systems. I am deeply concerned about the research findings published in The New England Journal of Medicine (NEJM) on June 17, 2020 that demonstrated racial bias in tools used by physicians and other providers to make clinical decisions...Medical professional societies should take a clear stand against the misuse of race and ethnicity in clinical algorithms and issue new guidance to correct this practice.”

FEEDBACK FROM PROFESSIONAL SOCIETIES AND RFI RESPONDENTS ON THE MISUSE OF RACE WITHIN CLINICAL CARE

Jan 12, 2021 | Press Release

WASHINGTON, DC—On September 17, 2020, Ways and Means Committee Chairman Richard E. Neal (D-MA) announced a Request for Information (RFI) soliciting input from stakeholders in the medical community on the misuse of race within clinical care.

Responses to the Chairman’s letters are included here:

- Accreditation Council for Graduate Medical Education (ACGME)
- American College of Cardiology (ACC)
- American Heart Association (AHA)
- American College of Obstetricians and Gynecologists (ACOG)
- American Medical Association (AMA)
- American Society of Nephrology (ASN)
- American Thoracic Society (ATS)
- The Endocrine Society (ES)
- Society of Thoracic Surgeons (STS)
- United Network for Organ Sharing (UNOS)
- American College of Emergency Physicians (ACEP)
- American Society of Clinical Oncology (ASCO)
- American Society of Transplant Surgeons (ASTS)
This is not a call for race-blind medicine.

We need to be race-conscious without making things worse.

Since 2007, obstetricians have counseled patients planning to give birth after a previous C-section with help from a simple calculator designed to determine the likelihood of having a successful vaginal birth after cesarean, or VBAC.

The tool takes into account a patient's age, height, weight, and their history of vaginal and cesarean delivery. It also asks two yes-or-no questions: "African-American?" "Hispanic?" The answers can predict a drastically lower chance of success for patients of color. But now, after years of work by researchers, advocates, and clinicians, that racialized calculator has been replaced by a newly validated version that is the same in almost every way — except for eliminating race and ethnicity as a risk factor.
Genes mirror geography within Europe

John Novembre1,2, Toby Johnson3,4, Katarzyna Bryc1, Zoltán Kutalik1, Adam R. Boyko4, Adam Auton3, Amit Indap1, Karen S. King5, Sven Bergmann5, Matthew R. Nelson6, Matthew Stephens5 and Carlos D. Bustamante7

1Department of Ecology and Evolutionary Biology, Interdepartmental Program in Bioinformatics, University of California, Irvine, CA 92697, USA. 2Department of Genetics, University of California, Berkeley, CA 94720, USA. 3GlaxoSmithKline, Research Triangle Park, North Carolina 27709, USA. 4Department of Statistics, University of Chicago, Chicago, Illinois 60637, USA. 5Department of Medical Genetics, University of California, San Francisco, California 94143, USA. 6Department of Computer Science, University of Freiburg, Freiburg, Germany. 7Department of Anthropology, University of California, Berkeley, California 94720, USA.
For the common causes of death, illness, ED visits, etc., how much do genetic variants matter, especially those with a known “racial” distribution?

The risks: miscategorization, reification, and distraction.
Harm #1: Miscategorization

What do the US race/ethnicity categories really mean?
Proposal:

Race is a useful proxy for racism in medical data

Is it?

To the Editor:

While many agree that there is very little evidence to support a biologic explanation for race based differences in health outcomes, racism has proven indisputable negative impacts on health. Currently, race is the only available placeholder for racism, which needs to be accounted for. The absence of ‘proof’ for some of the observed differences in outcomes by race is tied to the absence of science which has not yet developed any consistent measurement for racism – an important mechanism via which race generates poor outcomes. When race is included in models that predict higher risk, and that higher risk is then used to design and deliver interventions, including race ensures that treatment is appropriately matched to outcomes. Underprediction of risk in these instances has been associated with harm and has disproportionately impacted socially vulnerable populations, who due to structural racism are disproportionately black.1-3 Hopefully one day the beta for race will be zero. Until then, there are instances in which including race is crucial to ensure equitable care delivery.
Harm #2: Reification

What is race?

Is race a natural kind?

What are the risks of saying that it is?
Harm #3: Distraction

Does our preoccupation with race distract us from other, more important, factors?
We need to consider race (and racism) – but how?

- Continue to map the genetic structure of human variations.
- Develop better categories of human difference (or adequate ancestry informative markers), though this might be an intractable problem.
- Be wary of the use of race in predictive tools.

We need to do a much better job with SES – but how?

- Markers that describe multiple aspects of lived experience.
- Longitudinal datasets that allow the integration of exposures over a lifetime.
- Sophisticated analyses that can discern cause and effect in complex, multi-dimensional datasets.
AI algorithms must be designed deliberately to avoid recapitulating the problems of race and racism.
Dissecting racial bias in an algorithm used to manage the health of populations

Ziad Obermeyer1,2,*, Brian Powers3, Christine Vogeli4, Sendhil Mullainathan5,†

Health systems rely on commercial prediction algorithms to identify and help patients with complex health needs. We show that a widely used algorithm, typical of this industry-wide approach and affecting millions of patients, exhibits significant racial bias: At a given risk score, Black patients are considerably sicker than White patients, as evidenced by signs of uncontrolled illnesses. Remediying this disparity would increase the percentage of Black patients receiving additional help from 17.7 to 46.5%. The bias arises because the algorithm predicts health care costs rather than illness, but unequal access to care means that we spend less money caring for Black patients than for White patients. Thus, despite health care cost appearing to be an effective proxy for health by some measures of predictive accuracy, large racial biases arise. We suggest that the choice of convenient, seemingly effective proxies for ground truth can be an important source of algorithmic bias in many contexts.
Yes, this will be difficult, but:

- Science and technology have accomplished an enormous amount
- We have a resourceful and well-resourced scientific establishment
- If we want to do this, we can
- Our patients deserve better