

Health (In)Equity in Stroke Care.

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Conflict of Interest

- None

Mitigating Potential Bias

- The Provincial Stroke Rounds Committee mitigated bias by ensuring there was no Industry involvement in planning or education content.

Health (In)Equity in Stroke Care.

Objectives:

1. Inequity in stroke care in North America. Is it even real?
2. Impact of geographic stroke inequity and potential solutions.
3. Racial & Socio-Economic Disparities in stroke and potential answers to the problem.

Background

- Stroke is the leading cause of death and disability (#5) in North America.
- Less than 15% of stroke patients get acute treatment, mostly because of arrival delays.
- Health Canada reported list of costly diseases: cardiovascular diseases (\$21-22 billion), musculoskeletal \$18 billion, cancer \$16 billion. Stroke is 2.7% of total costs of healthcare in Ontario.
- Emerging endovascular treatment, and lack of neuro (read neuro specialists, infrastructure, imaging) access, are major factors of inequity in stroke care.

Health (In)Equity in Stroke Care.

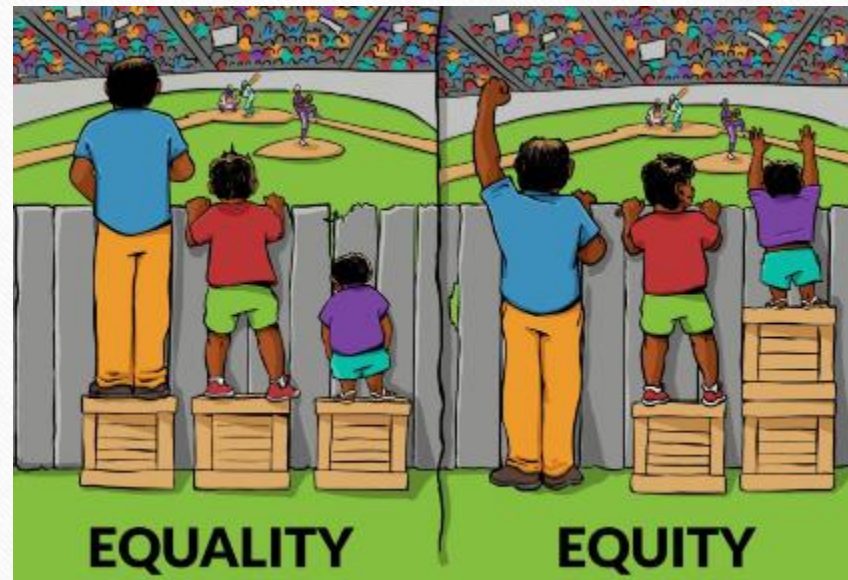


Image: Interaction Institute for Social Change | Artist: Angus Maguire. Available @ [madewithangus.com](https://www.madewithangus.com).

Health (In)Equity in Stroke Care.

- We will discuss the inequity in stroke care at the very basic level by:
 - reviewing excerpts from recent papers on inequity in stroke and its risk factors.
 - sharing some of the work my colleagues and I have done.

Health (In)Equity in Stroke Care.

- The THREE most relevant areas of (in)equity in stroke care:
 - Geographic (In)equity
 - Racial (In)equity
 - Socio-economic (In)equity

Health Inequity in Stroke

(Recent Publications)

-
- **Socioeconomic Status And Acute Stroke Care: Has The Inequality Gap Been Closed?**
 - Dr. Søgaard and team, Denmark. [Clin Epidemiol](#). 2019
 - Individual patient data from 2004-2014
 - Compared with high family income, low income was negatively associated with the guideline-recommended stroke care.... Low family income was negatively associated with fulfillment of 14 of the 16 performance measures.

Health Inequity in Stroke

(Recent Publications)

- Socioeconomic disparities in first stroke incidence, quality of care, and survival: a nationwide registry-based cohort study of 44 million adults in England.
- Dr. Bray and team, UCLondon, UK. *Lancet Public Health*. 2018
- Nationwide registry data from 2013-2016
- Patients from the lowest socioeconomic groups had first stroke a median of 7 years earlier than those from the highest ... were less likely to receive five of 12 care processes ... was associated with a 26% higher adjusted risk of 1-year mortality...

Health Inequity in Stroke

(Recent Publications)

- *Urban-Rural Inequities in Acute Stroke Care and In-Hospital Mortality.*
- Dr. Maddox and team, WUSL, USA. Stroke 2020.
- NIS registry data from 2012-2017.
- Rural patients with stroke were less likely to receive intravenous thrombolysis or endovascular therapy and had higher in-hospital mortality than their urban counterparts.

Health Inequity in Stroke

(Recent Publications)

- **Disparities in Cardiovascular Disease Risk in the United States.**
- Garth Graham, USA. *Current Cardiol Rev.* 2015
- Comprehensive review of racial differences wrt risk factors
- African Americans twice as likely to have a stroke. Vascular risk factors higher in all minorities. Dietary and obesity related issues more prevalent.

Real-life experience...

- As the lead for a stroke program, my team & I were getting frustrated with stroke transfers from underserved areas...
- So we looked at our small sample size and realized that the seven minority patients (out of a cohort of 35) had many of the quality metrics of transfers and in-house procedural care sub-optimal compared to routine transfers...

My real-life experience...

- **“Outcomes of Mechanical Thrombectomy for Acute Ischemic Stroke in Native American Population: A Preliminary Study”.**
- Presented at Society of Neuro-Interventional Surgery (SNIS) 2020
- Prevalence of vascular risk factors in NA was noticeably higher. Native American patients had similar functional and neurological outcomes for thrombectomy.

My real-life experience...

- **“Outcomes of Mechanical Thrombectomy for Acute Ischemic Stroke in Native American Population: A Preliminary Study”.**
- There was no statistical difference in the two groups with regards to median time interval from last known well (LKW) to groin puncture, and from LKW to reperfusion. The mortality was 14% in NA group and 4% in the comparison group.

Health (In)Equity in Stroke Care.

- **Prevalence of Modifiable Risk Factors for Ischemic Stroke over Time across Race: Analysis of a National EMR Database. Zafar et al.**
- CERNER Health Facts Database (600 US hospitals and is comprised of more than 62 million unique patient records).
- 18 years and above; 2009-2016
- CV Risk factors analyzed over time.

Health (In)Equity in Stroke Care.

- **Prevalence of Modifiable Risk Factors for Ischemic Stroke over Time across Race: Analysis of a National EMR Database.**
- 525,668 with nearly 2 million controls.
- Uptrend in majority of the cerebrovascular risk factors; statistically significant.
- Although all races have shown increments in the last 4 years, Indigenous, AA & Hispanics are showing exponential increase compared to Caucasians.

Health (In)Equity in Stroke Care.

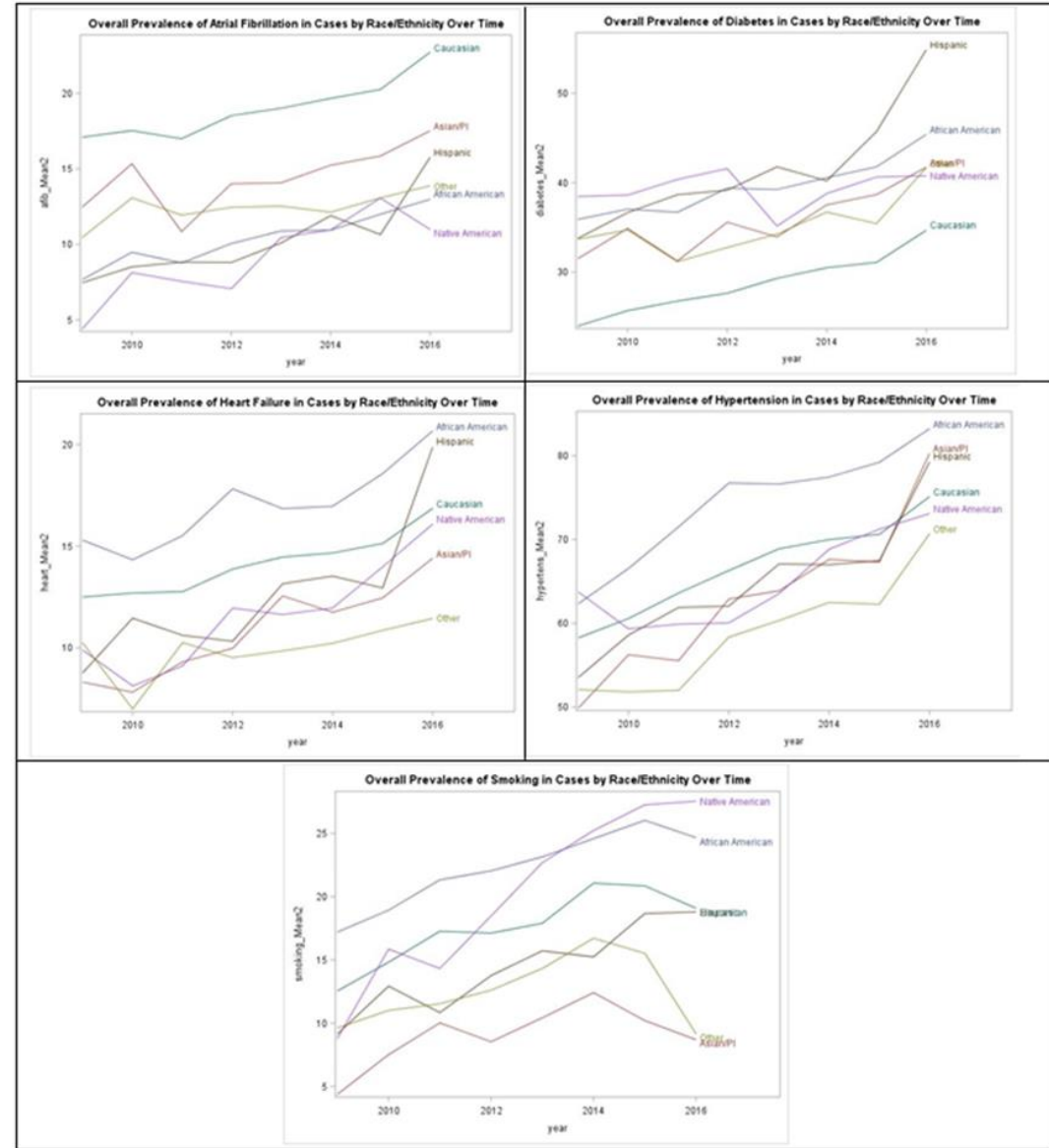
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Health (In)Equity in Stroke Care.

- **Prevalence of Modifiable Risk Factors for Ischemic Stroke over Time across Race: Analysis of a National EMR Database.**
- Limitations: The Cerner Health Facts Database does not contain weighted variables. Without weighting these results cannot be adequately applied to the general population. EMR's categorization of ethnicity

Health (In)Equity in Stroke Care.

Prevalence of Modifiable Risk Factors for Ischemic Stroke over Time across Race: Analysis of a National EMR Database.



Health (In)Equity in Stroke Care.

Prevalence of Modifiable Risk Factors for Ischemic Stroke over Time across Race: Analysis of a National EMR Database.

	Odds Ratio of Stroke by Race/Ethnicity in Risk Factor Compared to Non-Risk Factor														
	White			Hispanic			Black			Native American			Asian/PI		
	Adj OR	95% CI	P-Value	Adj OR	95% CI	P-Value	Adj OR	95% CI	P-Value	Adj OR	95% CI	P-Value	Adj OR	95% CI	P-Value
<i>Smoking</i>	3.12	3.08 - 3.15	<.0001	4.23	3.85-4.64	<.0001	3.53	3.43 - 3.62	<.0001	3.21	2.89 - 3.57	<.0001	3.52	3.20-3.87	<.0001
<i>Diabetes</i>	2.174	2.153 - 2.196	<.0001	3.064*	2.871 - 3.270	<.0001	2.499	2.445 - 2.553	<.0001	2.226*	2.043 - 2.426	<.0001	2.605	2.467 - 2.750	<.0001
<i>Heart Failure</i>	1.728	1.706 - 1.750	<.0001	2.507	2.266 - 2.774	<.0001	2.314	2.247 - 2.384	<.0001	2.161*	1.891 - 2.470	<.0001	2.433	2.235 - 2.649	<.0001
<i>Hypertension</i>	3.201	3.173 - 3.230	<.0001	3.944*	3.704 - 4.199	<.0001	4.14	4.05 - 4.23	<.0001	3.776	3.473 - 4.106	<.0001	3.86	3.664 - 4.067	<.0001
<i>Atrial Fibrillation</i>	2.167	2.142 - 2.193	<.0001	3.075*	2.738 - 3.455	<.0001	2.45	2.359 - 2.544	<.0001	2.522	2.156 - 2.951	<.0001	3.225*	2.974 - 3.497	<.0001

Table 2: Adjusted Odds Ratios and 95% CI obtained using multiple logistic regressions. Values denoted with * are the adjusted logit OR despite a non-significant Breslow-Day Test for homogeneity.

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- **Vascular Risk Factor Prevalence and Trends in Native Americans With Ischemic Stroke - A National Inpatient Sample Analysis.** (Presented ISC 2019; Submitted in BMJ)
- NIS Database; 2000 - 2016.
- To explore the prevalence of risk factors among hospitalized ischemic stroke patients.
- ICD-9/10 codes.
- Six time periods: 2000-02, 2003-05, 2006-08, 2009-11, 2012-14, and 2015-16

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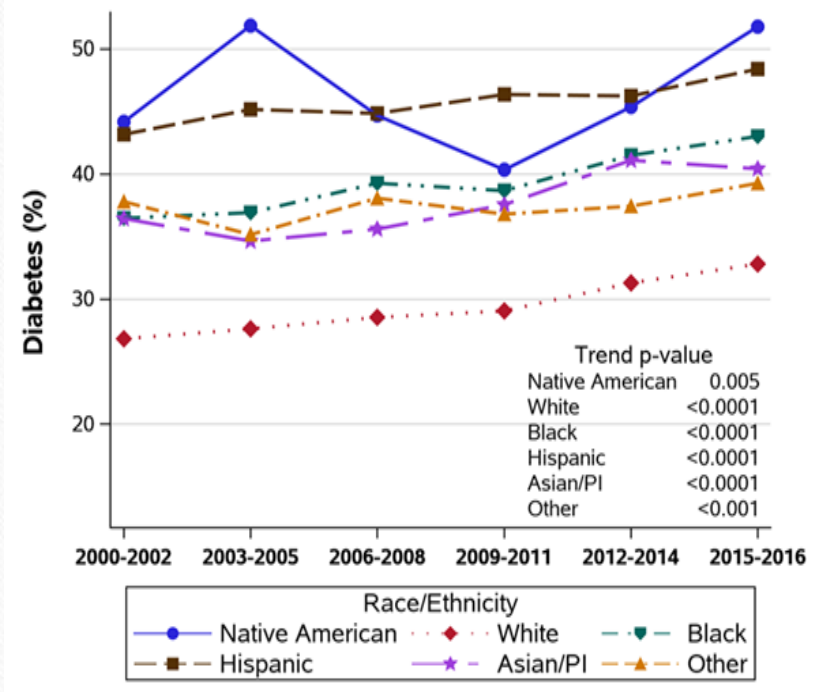
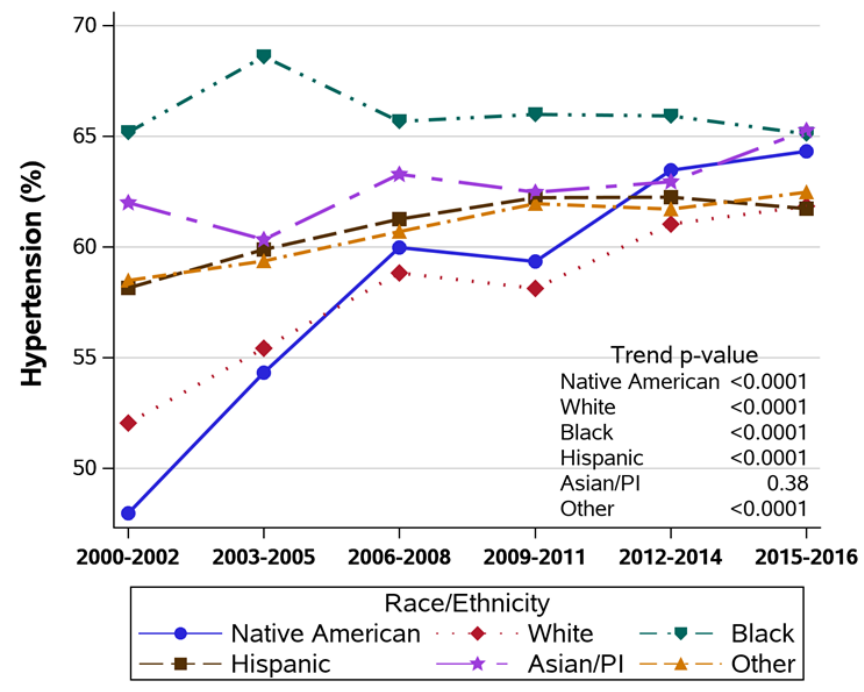
- **Vascular Risk Factor Prevalence and Trends in Native Americans With Ischemic Stroke - A National Inpatient Sample Analysis. (Presented ISC 2019)**
- 5472 of the 1,278,784 ischemic stroke patients were NA
- Prevalence of all risk factors, except Coronary Artery Disease (CAD) showed increment.
- Similar upward trends of several risk factors were noted across other race-ethnic groups.

Health (In)Equity in Stroke Care.

- **Vascular Risk Factor Prevalence and Trends in Native Americans With Ischemic Stroke - A National Inpatient Sample Analysis. (Presented ISC 2019)**
- By the year 2015-2016, Native Americans had the highest overall prevalence of diabetes, coronary artery disease, smoking, and alcohol among all the race-ethnic groups.
- Significantly larger increases in the prevalence of hypertension and smoking were seen in Native Americans compared to other groups in most of the six time periods.

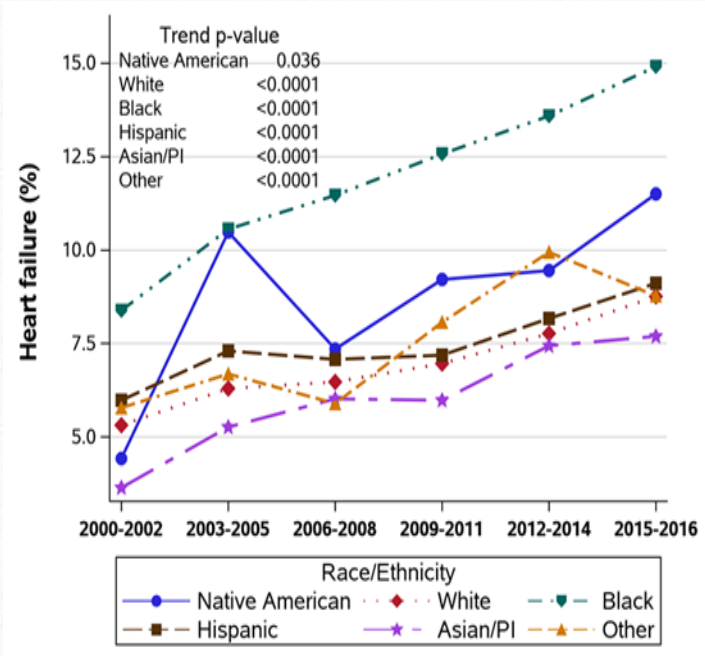
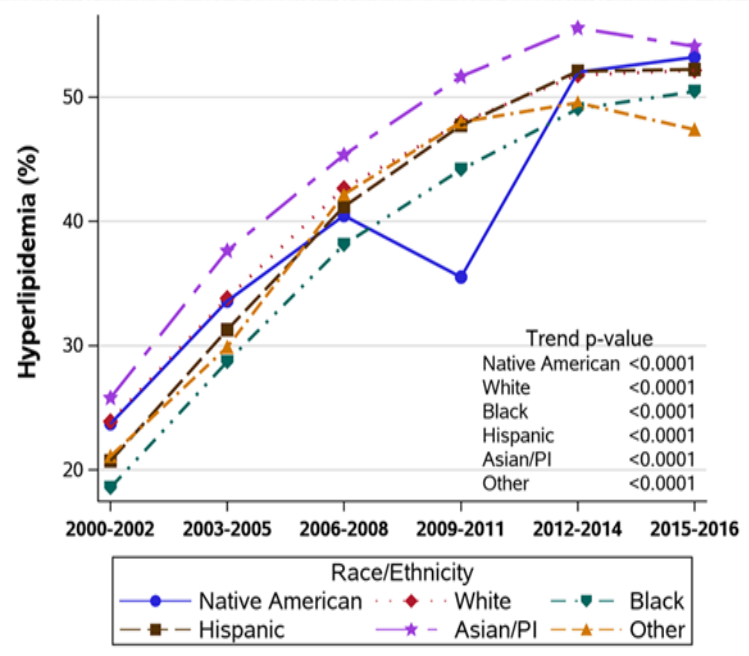
Vascular Risk Factor Prevalence and Trends in Native Americans(NA) With Ischemic Stroke - A National Inpatient Sample Analysis.

Dinesh V. Jillella, MD; Sara Crawford, PhD ; Rocio Lopez, MS; Atif Zafar, MD; Anne S. Tang, MS; Ken Uchino, MD



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- Limitations: Coding errors in NIS database. Racial information was missing in about 17% of the ischemic stroke patients.
- *Socio-economic* and *geographic* factors were not incorporated in this study.

Health Inequity in Stroke

- Objective 1: Inequity in stroke care in North America. Is it even real?
- Objective 2: Is there an impact of geography (urban/rural) in stroke equity?
- Objective 3: Racial & Socio-economic disparities impact stroke care?

YES, YES, YES.

Inequity in Stroke Care is a dire Problem.

- Do we have the answers?

Health (In)Equity in Stroke Care.

- The Specifics:
 - Geographic and urban-rural inequity (thrombectomy and tPA patients transfer to comprehensive sites versus building local capacity)
 - slow transfers or missed Large Vessel Occlusion (LVO) suffer bad outcomes.
 - Dedicated Stroke Units and Neurocritical expertise improves outcome.
 - Inequity of resources (CT Angio and CT perfusion access)

Inequity in Stroke Care is a dire Problem.

Scenarios:

- If I was living a little outside the GTA, the chances that I'll get equitable acute stroke treatment are not guaranteed?
- If I am financially challenged (including homeless), the chances that I'll get equitable pre-stroke and post-stroke management are worse than grim?

Inequity in Stroke Care is a dire Problem.

Scenarios:

- If I am an Indigenous or African American, the chances that the ED I go to will have CT angio or Ill make it to the nearest tertiary stroke center on time?
- If I am disabled or I speak a different language (and need an interpreter), will my stroke care will be compromised?

Inequity in Stroke Care is a dire Problem.

- It is published that higher volume centers with dedicated stroke & neurocritical care units improve stroke outcome. (does this make provision of equitable care challenging?)
- Hospitals with neurologists and stroke resources (stroke teaching, CT and CTA) are better prepared to manage acute stroke patients.
- We also know that patients in rural areas often are farthest from these tertiary centers.
- Same is the case for access to prevention clinics.

Health (In)Equity in Stroke Care.

- Potential Solution(s) for Equitable Acute Stroke Care:
 - Geographically planned stroke sites (Primary & Tertiary) which have the ability and capacity to build volume and provide expertise.
 - These planned sites in future can be robotically managed by high-volume centers. Additionally, coverage model via tele or in-person be incorporated.
 - High-volume centers provide coverage to these outreach sites (resource allocation)
 - Mobile copters/ambulances with angio-suites and infusion suites would be stationed in strategic areas (including low socioeconomic areas).

Health (In)Equity in Stroke Care.

- Potential Solution(s) for Equitable Acute Stroke Care:
 - CT and CTA with ASPECT scoring along with NIHSS scoring should be a prerequisite to be a primary stroke site. (This is the least minimum skill-set required).
 - Implementation of tele-neurology.

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- Potential Solution for Equitable Stroke Prevention:
 - Creating a network of physicians that include family doctors, geriatricians, internists and neurologists whose main focus is to provide access to patients on equitable basis.
 - As a second step, this same group will be able to identify (via smart devices, apps, integrated EMR AI models, innovative education/awareness programs) patients who are more likely to have a stroke. Those patients, then, become part of the stroke primary prevention program.

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- Potential Solution for Equitable Stroke Recovery:
 - Rehabilitation access – direct cost – has to become equitable.
 - The indirect expense to the province from the disability arising as a result of stroke, should be accounted for more so in a healthcare system such as ours in Ontario.
 - It takes 3-4 week of waiting before a stroke patient (who can't afford out of pocket access to physiotherapy) can participate in outpatient rehab. Early rehab access has shown improved post-stroke recovery.
 - Access to post-stroke clinics in an equitable fashion.

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- Potential Solution for Equitable Stroke Care:
 - We need more robust databases. More literature.
 - Literature that captures true racial, socio-economic, geographical information to better understand the true impact these factors have on stroke and cerebrovascular diseases.

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Conclusive remarks

- Urban-rural, racial and socio-economic inequities impact stroke care and outcome.
- Awareness among healthcare providers regarding equitable care for patients and advocating for equitable care is imperative.
- Strategic planning ensuring that equitable resource allocation is key.

Health (In)Equity in Stroke Care.

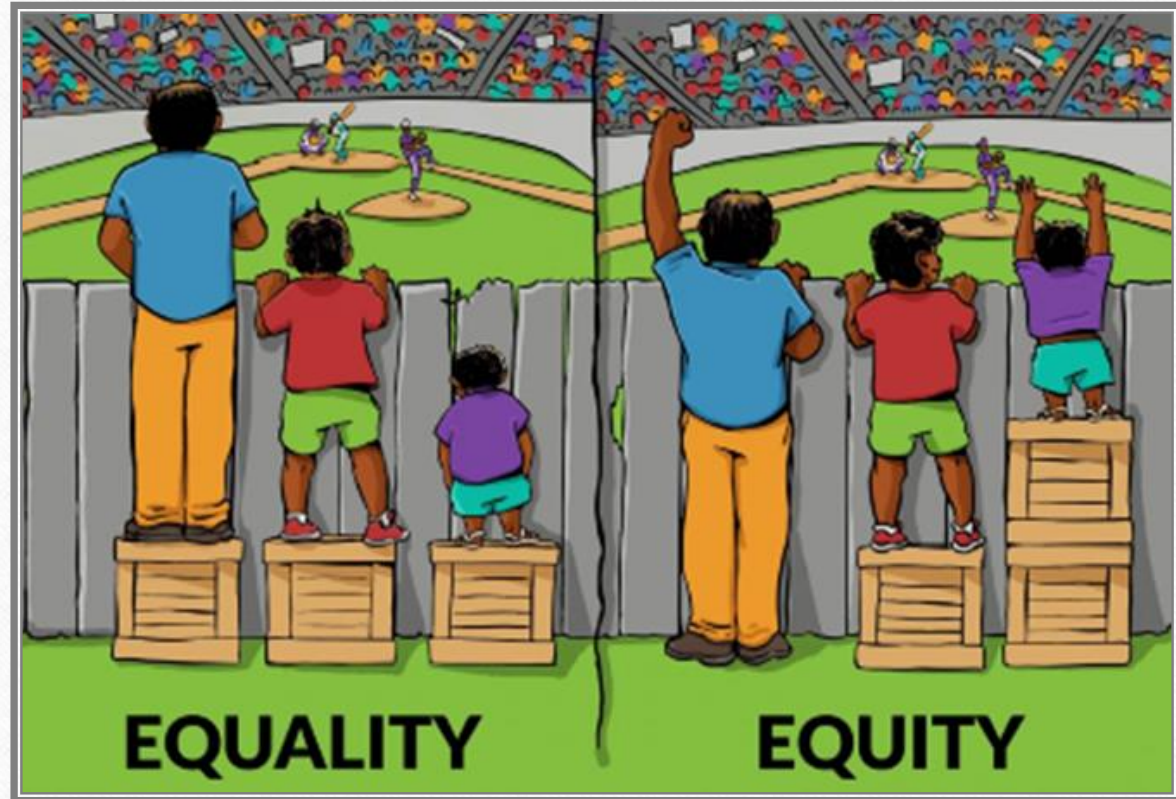
Conclusive remarks

- Instead of equal allocation to hospitals, equitable allocations should be considered based on geographic, socio-economic and racial population served by those hospitals or clinics.
- CT/CTA, NIHSS training should be considered the basic requirement for any or all hospitals dealing with acute stroke patients.

Health (In)Equity in Stroke Care.

Thank you for your attention.

My email: Atif.Zafar@Unityhealth.to



Evaluation

Please take 2 minutes to fill out the evaluation form,
either online or in the room.

Thank you!

<https://www.surveymonkey.com/r/NKFZGGC>

