Disparities in Access to Care

Social determinants of health related to interventional radiology overall, access to liver-directed therapies and transplantation, and the role of artificial intelligence.

WITH LAURA FINDEISS, MD, FSIR, FAHA; RESMI CHARALEL, MD, MPH; SARAH B. WHITE, MD, MS, FSIR; VERONICA M. LOY, DO; AND JULIUS CHAPIRO, MD, PHD

Geographic Disparities in Access to Interventional Radiology: A Call to Action

With Laura Findeiss, MD, FSIR, FAHA

What are some of the differences in access to interventional radiology (IR) care and possible solutions?

As interventional radiologists have innovated novel solutions to complex problems and as imaging guidance and interventional device technology have advanced, the therapies that interventional radiologists offer have become standard of care for many common and serious medical problems. Over the course of several generations, physicians and other clinical providers in training have been exposed to the benefits of IR and, in many cases, have learned to rely on interventional radiologists to provide what have become standard-of-care therapies for patients in their care.

The upside of this for many patients and for the specialty of IR is that specialists and generalists alike know that they need to have an interventional radiologist in their community to provide quality care. Patients in many communities are receiving timely, minimally invasive, consultative procedural care, benefitting from faster recovery and improved quality of life. On the flip side, we know from our evaluation of the care landscape in America that although many communities may have an abundance of interventional radiologists, there are thousands of communities in which interventional radiologists (and the procedural care at which they are expert) are not available.

What we now consider to be basic services were, in fact, major advances in care. Small catheters can now be placed for drainage using imaging guidance instead of performing open abdominal washout for abscess, and we can now provide the equivalent of vascular bypass and fully internal aneurysm repairs without big incisions instead of fileting open a leg or clamping the aorta. Minimally invasive targeted therapies can be administered through incisions slightly larger than a needle puncture instead of resecting large hepatic tumors. Instead of watching, waiting, transfusing, and ultimately guessing what part of the intestine to remove for gastrointestinal bleeding, we can navigate a catheter directly to the site of bleeding and plug the hole. And, instead of emergently removing a woman's uterus for uncontrollable bleeding after delivery (which could ultimately fail), we can now identify and stop the source using a small catheter for targeted therapy, saving the uterus and the woman's life. The improvements in care afforded by the innovations of IR pioneers have been recent enough that many of us can recall the morbidity and mortality of the prior era.

These advances are taken for granted in many parts of my city and in many parts of many cities in America. In addition, these advances are not available in large IR deserts across the country—rural, suburban, and even urban. At best, because of these disparities in access,

patients are substantially inconvenienced and harmed and hospitals and medical communities are undermined when there is a need to travel outside of communities for care. Palliative services, chronic disease care, and follow-up are rendered inadequate and quality of life and health are diminished. At worst, patients are subject to loss of life or substantial increased morbidity when these critical, standard-of-care services are not available.

Why is access to IR care essential both currently and in the future?

As we think about innovation in our specialty, addressing the challenges in access to modern standards of medical care is the next frontier. Creative solutions are the hallmark of what interventional radiologists bring to the table, and we have successfully applied them to some of the most challenging disease states. We have succeeded in advancing care paradigms that have benefited so many, but the luck of one's zip code remains a barrier to equity in health outcomes that we should now strive to overcome.

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Access to Liver Cancer Therapies

With Resmi Charalel, MD, MPH

Why is research into social determinants and disparities in access to care important for interventional oncology (IO) and IR overall?

Social determinants of health affect outcomes across the board for all specialties of medicine, not just in IO or IR procedures. As responsible physicians, it's important for us to take those social determinants into account and make sure that we are doing everything we can to try to address any inequities and treat our patients as best we can so that we can optimize their outcomes.

What do you hope to learn specifically with your current grant on social determinants in early liver cancer and hepatocellular carcinoma (HCC) treatments?

Our grant is focused on looking at overall outcomes following ablation, surgical resection, and liver transplant for small HCC treatment. We are specifically trying to understand which treatment is most effective and if there is equivalency to understand differences in complications, resource utilization, and general costs of care. As part of that, a major goal is to understand how social determinants of health and access to care measures affect overall and disease-free survival. The reason for this focus is to tease out whether factors such as race are important in determining outcome or whether there are other underlying confounding factors that can better explain differences in previously reported work. So, we're looking to see whether there are modifiable factors or factors that we can change to help improve outcomes for individuals who may be initially at a disadvantage.

At present, we are pretty far into the data analysis and manuscript preparation phase. The study used a United States population-based database, so we are hopeful that the study can inform practice, is applicable to everyday practice, and can help with clinical decision-making moving forward.

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Changes in UNOS Criteria and Access to Liver Transplantation

With Sarah B. White, MD, MS, FSIR, and Veronica M. Loy, DO


How do changes to the UNOS criteria affect transplant access from the perspective of social determinants of health?

Past and current changes in UNOS (United Network of Organ Sharing) criteria for transplant have aimed to reduce disparities in liver transplant access. The recent changes include converting the regional review boards to a national review board and allocating livers to within 500 nautical miles of transplant centers instead of organs remaining within selected regions. Although the new organ allocation system attempts to equalize median MELD (model for end-stage liver disease) at transplant (MMaT) based on geography, it does not address the large social determinants in gaining access to the liver transplant waiting list. For example, being Black is an independent risk factor for decreased referral for liver transplant evaluation.[1,2] Black patients are referred for transplantation at higher MELD scores, suggesting delayed referral.[1,3] This holds true for referrals for Hispanic patients. In addition, patients in geographically isolated, rural areas and those without access to subspecialty care are less likely to be referred for liver transplant evaluation,[4] whereas patients with private or commercially held insurance have higher rates of transplant evaluation.[5]

Once referred to a transplant center, social determinants continue to impact one's chance of receiving a transplant. Women have an 8.6% increased risk of death while on the wait list.[6] This is thought to be secondary to the MELD score's underestimation of disease severity in women. Additionally, donor size mismatch could be another reason that women disproportionally die while on the list. Recent modeling has shown that the UNOS criteria change regarding geography and organ allocation will not improve rates of death for those with small stature on the wait list.

Given the changes to the UNOS criteria, what are the implications for IR?

Liver transplantation for HCC continues to evolve in the MELD era of transplantation. After the MELD score was initially implemented, HCC patients were disadvantaged and those with stage 2 HCC had a 30% rate of developing progressive disease, making them ineligible for transplant. The use of MELD exception points was an attempt to make transplantation more equitable among HCC patients. The most recent variation for HCC includes 28 MELD exception points after a 6-month waiting period, and for every additional 3 months on the list, patients receive an additional 10%, with a MELD cap of 34. Because of regional variation of MMaT, wait times for transplant for patients with HCC were wide-ranging depending on the region. The new allocation system assigns all HCC patients the local MMaT minus 3 to help minimize geographic disparities. Some regions will see longer wait times for patients with HCC, and because of this, interventional radiologists will need to be more aggressive to keep patients within Milan criteria for longer periods of time. More attention will need to be given to liver-directed therapies that result in the longer progression-free survival times, such as what has been seen with radioembolization, ablation, and combination therapies with transarterial embolization and ablation. Time will tell if the pendulum has once again swung, leaving patients with HCC at a disadvantage.

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The Role of Artificial Intelligence

With Julius Chapiro, MD, PhD

How might artificial intelligence (AI) affect health care disparities in the future?

As with every new technology, we are facing an unknown. There is increasing consensus that AI-based technologies will primarily be used to augment and enhance our practice while reducing some of the redundant tasks we currently have. In IR, the primary applications will involve preprocedural patient triage, treatment planning, outcome prediction, allocation of therapy, and tumor board support as well as assistance with intraprocedural image guidance, risk management, and workflow optimization. These technologies may help us ensure and improve the quality of patient care. It is widely understood that any AI-based algorithm and future products are only as good as the training, testing, and validation data that were used to develop it, and that includes accuracy and level of expert annotation. In addition, the FDA proposes—and will likely mandate—that all such products undergo clinical trials and iterative testing with continued learning from new data they are exposed to.

Obermeyer et al highlighted the risk of racial bias in health algorithms as a function of data the automated system is exposed to.[1] The authors strongly caution that effective proxies for ground truth be defined such that inherent bias of data would be taken into account. The conclusion of this article kicked off an ongoing conversation in the AI community about possible ways to proactively prevent such bias from transpiring into clinical practice. To prevent something, one first must define the problem. Bias comes in different forms: it can originate in existing disparities within the initial training data set or be perpetuated using exposure to biased health care data and practice over time and after an algorithm goes live.

DeCamp and Lindvall highlighted three possible sources for "latent bias"[2]:

1. An initially equitable algorithm can adapt to biased real-life data in a health care system over time and associate gender, race, preexisting conditions, and even insurance status with, for example, outcome predictions or treatment recommendations that can then perpetuate future decision-making and tilt decision support systems toward favoring privileged patient cohorts.
2. An AI system may learn from inherently biased human decisions to then perpetuate those disparities by providing biased decision support, and this scenario may be further aggravated by the so-called "automation bias" where physicians no longer question the AI model output while falsely believing that a computer is infallible.
3. AI models engineered with wrong outputs and impractical surrogate outcomes may perpetuate and generate bias where no bias existed in the first place.

What are the potential solutions to increase equitable care via AI?

Vigilance will be of utmost importance to identify such bias, and our community, along with the FDA, will have to look for ways to proactively eliminate it from occurring. It should be clear to all—including to our industry partners—that missing that benchmark is not an option. Negligence will result in AI perpetuating and deepening existing disparities and further impeding equitable access to care. The crux is to understand how data-driven learning works. Deep learning networks generate thousands of connections between data points and provide an output that seems logical to the observer but likely aggravates biased patterns in the analyzed data. Making the output of every clinical AI system explainable and interpretable should be a fundamental requirement for approval. Systems that use black box decision-making to arrive at conclusions may no longer be acceptable if equitable care is the goal of AI-based data analytics.

If the annotation of data is used to train a machine learning system in a supervised fashion, we should also pay great attention to the labels we apply. Not all raw data that we generate can be balanced equally to account for gender, racial, or social biases, but algorithms can be engineered to weigh certain data points in proportion to the inherent bias. Transparency about existing and unavoidable bias of raw data, which are used to train an algorithm, should be included in

product descriptions the same way ingredients are listed on food labels in the supermarket. Once all these precautionary measures are in place, we will be able to use AI as a great equalizer and make care more affordable and fairer. ■

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Recommended Reading
Kahn CE Jr. Bias in AI: selected readings. Radiology: Artificial Intelligence. Published August 12, 2020. Accessed August 14, 2020. https://pubs.rsna.org/page/ai/blog/2020/8/ryai_editorsblog0812

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