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GLOBAL SURGICAL EDUCATION: A STAMP IN THE PASSPORT TO ACADEMIC PURSUIT

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About Notable Grand Rounds

These assembled papers are edited transcripts of didactic lectures given by mainly senior residents, but also some distinguished attending and guests, at the Grand Rounds of the Michael and Marian Ilitch Department of Surgery at the Wayne State University School of Medicine.

Every week, approximately 50 faculty attending surgeons and surgical residents meet to conduct postmortems on cases that did not go well. That "Mortality and Morbidity" conference is followed immediately by Grand Rounds.

This collection is not intended as a scholarly journal, but in a significant way it is a peer reviewed publication by virtue of the fact that every presentation is examined in great detail by those 50 or so surgeons.

It serves to honor the presenters for their effort, to potentially serve as first draft for an article for submission to a medical journal, to let residents and potential residents see the high standard achieved by their peers and expected of them, and by no means least, to contribute to better patient care.

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Global Surgical Education: A Stamp in the Passport to Academic Pursuit

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Disclosures

Please note that although this paper presents a Sub-Saharan African focus, there are many areas in our own cities and communities in the United States, as well as across the globe, that qualify as under-resourced. Much of this paper is more broadly applicable than just Sub-Saharan Africa.

I believe we are all called to care for our neighbors. In some way, we are all global surgeons, and we all have a responsibility to increase capacity for high-level surgical care, both within our borders and beyond.



Introduction

This paper discusses:

- 1. The landscape of global surgery and how it fits into the global health agenda.
- 2. The history of global surgical education and how global surgery has become a recognized academic pursuit.
- 3. The future of global surgery in terms of partnerships.

The Story of Ashley Judd

In February 2021, Ashley Judd (Fig. 1) was part of an expedition researching apes in the Democratic Republic of Congo. While hiking in a remote area, she tripped over a fallen branch and shattered her right leg. She lay on the ground for five hours in excruciating pain, biting on a stick until she and her companion were found. Her bones were readjusted as best as could be done on the spot, and six men carried her on a hammock slung on a pole for the six-hour walk to the nearest road, which was unpaved and rutted. There she was taken on the back of a motorbike for another six hours to a town large enough to have a small plane fly her out to South Africa.

It was 55 hours from the moment of her injury to when she actually accessed a hospital with the personnel and resources able to address her shattered leg. She was stabilized in South Africa before being flown to the United States. Reflecting on her experience, Ashley realized that she was one of the lucky ones with very good evacuation insurance. In the Congo, most people do not have any access to trained physicians who could



Fig. 1. Ashley Judd

address something as simple as a broken leg.

The Global Surgery Landscape

The lack of access to surgical care is the "forgotten stepchild" of public health-a global issue that was only added to the global health agenda in 2015, when the Lancet Commission published their commission on global surgery.¹ That commission called for access to safe and affordable surgical and anesthetic care when necessary, stating that all people should have access to such care. They laid out their plans for how to get from where we are today to the lofty goal of access for all, across the multiple domains required to provide good surgical care. The goal was to meet those milestones by the year 2030.

The Core of Global Surgery

At its core, global surgery is a field that seeks to improve health and health

¹ https://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2815%2960160-X/fulltext



equity for everyone affected by surgical disease or who needs surgical care, with a particular focus on underserved populations in countries of all income levels. Whether in urban settings, rural settings, high-income countries, or low-income countries, there are vulnerable populations who don't have equitable access to care. The Commission specifically focused on those populations in crisis, including those experiencing conflict, displacement, or disaster.

The facts are stark:

- **5 billion** people do not have access to emergency surgical care if needed (e.g., appendectomies, emergency C-sections, first-line trauma care).
- **90%** of the world's poor lack access to safe and affordable surgical care.
- **30%** of worldwide diseases need to be addressed by surgery or require the direct care of a surgeon.
- \$12 trillion in lost economic output is suffered by low and middle-income countries (LMICs) due to lack of access to surgery.
- The number of surgically avoidable deaths is **6x** greater HIV, malaria, and tuberculosis combined.

Disability-Adjusted Life Year (DALY)

DALY is a way of quantifying overall disease burden. It is expressed as the number of years lost either to illness, disability, or early death. It was developed in the 1990s as a way of comparing the overall health of nations and the life expectancy in different countries.

DALY essentially condenses morbidity and mortality into one metric. Countries with high DALYs have worse population health outcomes—more people either die young or live with illness or disability. The DALY measure can thus be used to assess the cost-effectiveness of public health intervention such as HIV antiretroviral therapy, which costs \$300 to \$500 to prevent one DALY. In contrast, \$11-\$33-worth of basic surgical care is enough to prevent one early death—to decrease the DALY by one.

Because surgery is clearly so cost-effective, it is now part of the World Health Organization (WHO)'s global health agenda, and improving surgical capacity is one of the WHO's priorities in order to improve global public health.

Other Key Metrics

Two other key metrics to remember are (1) operations per year per 100,000 people and (2) surgery, anesthesia, and obstetric providers per 100,000 people. Once a country attains **5,000** operations per year per 100,000 people and **20** surgery, anesthesia, and obstetric providers per 100,000 people, mortality has been shown to decrease.

In 2004, there were **281** operations performed per year per 100,000 people in the eastern Sub-Saharan region of Africa. By 2017, that number had increased to **595** per year per 100,000. An improvement, certainly; but at that growth rate it will take 100 years to get to the goal metric of 5,000 operations per year per 100,000.

The United States has, on average, **55** trained surgical and anesthetic providers per 100,000 of its population. By contrast, low-income countries and lowmiddle-income countries have less than **10** providers per 100,000, on average (Fig. 2). Moreover, the distribution of those providers is inequitable in that many are located in the capital cities, leaving huge swaths of the population in





Fig. 2. Specialist surgical workforce (per 100,000 population). *Source*: https://blogs.worldbank.org/en/open-data/surgical-care-overlooked-entity-health-systems?cid=ECR.

rural areas unable to access a single trained provider.

Figure 3 is a sort-of "heat map" illustrating the deficit of surgical providers below the goal metric of 20. The red areas are those that are 19 short of the target 20, including much of Sub-Saharan Africa. Southeast Asia is also behind with a 10-15 provider deficit from the target of 20 per 100,000 people.



Fig. 3. Change in surgical workforce density needed for specialist SAO-only model to meet 20 SAO providers per 100 000 population by 2030'54. Assumes retirement is at a rate of 1% per year. (SAO=Surgeons, Anesthesiologists, Obstetricians). *Source*: Figure 10 in FMeara JG, Leather AJM, Hagander L, et al. (2015) Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. Lancet. doi: 10.1016/S0140-6736(15)60160-X



Kenya is the bright spot but some countries have less than half of a trained surgeon per 100,000 people.² Not only that: Sub-Saharan Africa, with only 3-4% of the world's healthcare workforce, carries 24% of the global burden of surgical disease.³ There is currently a shortage of 7.2 million healthcare workers in Africa, which will rise to a deficit of 12.9 million by 2035.

It is worth mentioning that high-income countries can have pockets of inequality, too. The United States has an overall ratio of 55 surgeons per 100,000 people but some socioeconomically depressed areas (primarily rural) currently have only 7-10 surgeons per 100,000 people. General surgeons are particularly in short supply. Even in areas that have enough surgeons, the allocation of those resources is not always equitable due to barriers to accessing timely care and access to screening.⁴

Addressing the Challenge

As F. Scott Fitzgerald said: "The mark of a true intellect is the ability to keep two conflicting things in mind."⁵ On the one hand, this does seem an impossible situation in global surgery, but on the other, there is a plan to solve it.

The picture at Figure 4 (featuring residents from a Kenyan hospital) nicely illustrates both the issue and its solution. LMIC surgeons and their patients are



Fig, 4. The need for sharing the burden. Source: Photo courtesy of Russ White, MD.

bearing the burden, like the lone figure holding up one end of the log. They need more help from the resources (people + expertise) holding up the other end of the log. Some of those resources need to be redistributed to the other end.

Academic Global Surgery

Global health and global surgery have historically been characterized by shortterm medical missions or the provision of humanitarian aid to LMICs. While these strategies are very well-intentioned, it can be argued that ultimately, they disadvantage the very communities they are intended to help because they don't necessarily improve surgical capacity in the community. They simply provide a band-aid to cover a problem that really can't be fixed with something so simple.

² Source: Chart at https://data.worldbank.org/indicator/SH.MED.SAOP.P5?locations=US&view=chart

O'Flynn E, Andrew J, Hutch A, Kelly C, Jani P, Kakande I, Derbew M, Tierney S, Mkandawire N, Erzingatsian K. The Specialist Surgeon Workforce in East, Central and Southern Africa: A Situation Analysis. World J Surg. 2016 Nov;40(11):2620-2627. doi: 10.1007/s00268-016-3601-3. PMID: 27283189.

⁴ Ellison EC, Pawlik TM, Way DP, Satiani B, Williams TE. Ten-year reassessment of the shortage of general surgeons: Increases in graduation numbers of general surgery residents are insufficient to meet the future demand for general surgeons. Surgery. 2018 Oct;164(4):726-732. doi: 10.1016/j.surg.2018.04.042. Epub 2018 Aug 8. PMID: 30098811.

⁵ F. Scott Fitzgerald (1936). "The Crack-Up: A desolately frank document from one for whom the salt of life has lost its savor." *Esquire,* February, p. 41.



Or, in terms of Figure 4, they are like giving the lone physician holding up one end of the log a short-acting steroid.

The focus now is on capacity building and equipping communities to address their own healthcare needs by partnering with organizations that have more resources, more personnel, and more expertise that can then be transferred to partners in lower-resource settings—to the lonely physician in Figure N.

Teaching to Build Capacity

In a previous Walt lecture in 2009, Dr. John Tarpley added to the old adage about giving a man a fish *vs.* teaching a man to fish.⁶ He said: If you teach a man to teach a man to fish, then he can teach the whole community to fish. Academic global surgery is now positioned to address the burden of global surgical disease by addressing the needs across four key domains.

- 1. **Education**, including curriculum development and partnering with organizations and hospitals in low-resource settings to build, train, or start training programs.
- 2. **Research**, including partnering with LMIC surgeons to ask applicable research questions that will impact and improve the health of their own community, and then equipping them to do the research, track the outcomes, and improve the qualityof care in their community.
- 3. **Advocacy**, including advocating for funding for global surgery and for the recognition that surgery is a public health problem, deserving a place in

the same global agenda as HIV, malaria, and AIDS.

4. **Clinical Care**, including both shortterm experiences and (hopefully more often) sustainable partnerships over time.

In his Presidential Address to the Association for Academic Surgery on February 14, 2008, Dr. Fiemu Nwariaku rightly said: "Perhaps the most important thing we can do with our careers is to improve surgical delivery in low-income countries... ...and the most efficient way to do so is through technical and intellectual expertise transfer."⁷

Global surgery was once looked down upon as a "hobby" for a few wealthy first-world surgeons, but no more. Global surgery is promoted and practiced by many faith-based organizations and nonprofits and is even coming to be seen as a moral imperative for surgeons everywhere, as can be discerned from a groundswell of interest among medical students, residency trainees, and faculty who see the problem and want to be involved. It is fair to say that today, global surgery really is an academic pursuit.

Academic Partnerships

The many examples of academic partnerships in global surgery include Vanderbilt's partnership with Kijabe Hospital in Kenya, the University of Washington's work to build trauma capacity in Ghana, and Memorial Sloan Kettering's very active program in Nigeria to address colon cancer through screening, diagnostics, and care.

To succeed, academic global surgery partnerships must have these attributes:

⁶ Personal knowledge.

⁷ Nwariaku F.E. (2009). Mind the gap: workforce disparities and global health. J Surg Res. 2009; 154: 304-311



- · Cultural sensitivity
- Leadership at the local and global level
- Frequent needs assessment and reassessment, as relationships and needs change over time
- · Formal structure and sustainability

To illustrate, below are two specific case studies in academic global surgery partnerships; one at an institutional level, and the other at a national level.

Case Study #1. Vanderbilt-Kijabe

Vanderbilt's 15-year partnership with Kijabe Hospital in Kenya aims to provide:

- a. Resident training for African residents and for residents at Vanderbilt.
- b. Building capacity for subspecialty surgical training.
- c. Faculty development.

For background context, the East African country of Kenya (known as "a lovely country in a not-so-good neighborhood") is the third largest economy in Sub-Saharan Africa, after Nigeria and South Africa. Because it was a British protectorate for many years, English is an official language (alongside Swahili), making it fairly easy for US surgeons to work there. Compared to the United States, Kenyans' 55 years of life expectancy is low, but still better than that of many other African nations.

Other disparities are more stark. The state of Tennessee has approx. 985 registered licensed surgeons and over 1,000 anesthesiologists to care for 6.8 million people. At the time of writing, Kenya has 515 surgeons (most of whom are in the capital city, Nairobi) and 255 trained anesthesiologists to serve a population of over 50 million. Notice that there are very few anesthesiologists compared to surgeons, and imagine—if you can—having to perform surgery without anesthetic support.

Uniquely, Kijabe Hospital is located in a rural area about a 60-90 minute drive from Nairobi. Most training programs in Sub-Saharan Africa are located in capital city hospitals, making it difficult for rural populations to access them.

Kijabe Hospital is a faith-based tertiary referral center and training hospital. It was established by a surgeon in the early 1900s as a missionary primary healthcare outpost. In 1980, Kijabe established a school of nursing, and in 1995 began an internship program for medical and clinical officers (similar to physician extenders in the United States).

Since 2009, Kijabe has expanded considerably as an academic medical center in its own right. It has established residency training programs across multiple disciplines. In partnership with Vanderbilt's Department of Anesthesia, it has established a simulation center and has also expanded to other sites in even more rural areas to help provide first-line surgical care for patients who live within about a 2-hour driving radius.

Capacity building through education and training of African surgeons is a key component for developing a sustainable workforce. [Figure N: A group of residents at Kijabe Hospital.] Kijabe Hospital is an accredited general surgery training site. The Pan-African Association of Christian Surgeons (PAACS) accredits their surgical training program, as does COSECSA, the College of Surgeons of East, Central, and Southern Africa. COSECSA is similar to the American College of Surgeons but also performs duties like those of the American Board of





Fig. 5. Dr. Irungu (L), Dr. Nthumba (R) trained at Kijabe Hospital, where they remain on faculty. Dr. Irungu is a general and urologic surgeon and Dr. Nthumba is a general and plastic surgeon. Both work with visiting Vanderbilt residents.

Surgery, accrediting and certifying new graduates.

PAACS started in the early 2000s with a goal of training 100 African surgeons who would stay in Africa by 2020. As of 2016, they had trained 67 general surgeons with a further 74 in training. The goal of 100 by 2020 was achieved and 98% of the surgeons stayed in Africa—retention being a crucial goal of the training programs.

Vanderbilt International Surgery's partnership with Kijabe started in 2011. It began as a PGY4 rotation, but is now a PGY3 rotation. In addition to surgery residents, Vanderbilt sends anesthesia, OB-GYN, orthopedic surgery, and plastic surgery residents to Kijabe Hospital for rotations as part of their formal residency program. To date, 52 Vanderbilt general surgery residents have gone to Kijabe for a four-week rotation since 2011.

There, they integrate into the clinical teams—rotating, rounding, helping with educational conferences, and operating. We conducted a formal survey of these residents in 2017, aiming to understand how the experience changed their perspective on medicine and how it may have impacted their future career. We found that the rotation was very well received. They reported very high satisfaction with the time they spent in Kijabe and felt it improved their teaching skills. For many, it was their first time traveling outside the United States, and four weeks seemed to them sufficient time to have an impact, assimilate into the teams, and get a good taste of what it is like practicing in a severely resource-limited setting.

A more rigorous long-term follow-up survey aiming to assess how an experience in a low-resource setting impacted future career decisions found that a third continued to participate in global surgery efforts. Some were short-term trips, others involving research or providing education tended to be longer. The time devoted ranged from 10 to 25% of respondents' faculty effort-a considerable contribution, and respondents were divided evenly in terms of serving the needs of LMICs and the needs of people suffering from health inequity within the United States (an important aspect of the Vanderbilt program.)

Thirty percent said their interest in global surgery would have been very low if they had not spent time in Kenya. All participants expressed a desire to continue their involvement in building surgical capacity as they progressed through their post-training careers. This impact on global surgical capacity extends beyond just sending residents abroad. For example:

 Angi Wall, now a transplant surgeon in Texas, wrote a book on global health ethics based on her experiences in Kenya and elsewhere. Her book is



considered one of the premier textbooks on global health ethics.⁸

 Nick Carter, a trauma surgeon in Florida, helped write the educational curriculum for COSECSA's breast modules,⁹ making a significant impact in education.

At the 10-year anniversary of the partnership, we mirrored that survey in Kijabe, asking program trainees and faculty about the impacts of the program in order to assess it and make changes to it if necessary. The study involved 43 surgical personnel, including faculty and trainees, and used a methodology of grounded theory qualitative analysis with semi-structured interviews.

Overall, respondents felt that the experience was beneficial to their hospital and to themselves. The opportunity to interact with peers from different healthcare settings abroad provided a different perspective on education, with valuable crosstalk and sharing of experiences. However, there were also challenges, such as difficulty some American residents had in assimilating into the Kenyan culture, with cultural differences leading to personality conflicts on occasion. They also thought a month was too short, and requested longer stays. Additionally, they expressed a strong desire for opportunities for Kijabe residents and trainees to come to Vanderbilt for the same program. They specifically requested additional cultural training prior to departure and emphasized the need for bilateral exchange.

The commitment to global health that has now permeated Vanderbilt's residency culture has led to life-changing and career-changing decisions for some residents. For example, three Vanderbilt former residents are now serving in Kenya and one each in Niger, Nigeria, and Haiti.

Training and Equipping Residents for Global Health Careers

This groundswell of interest among residents who had spent time abroad and wanted to make Global Surgery a part of their career led to the establishment of the GME-approved Vanderbilt Global Health Equity and Access Leadership in Surgery (Global HEALS) Program, which provides high-level global health training during residency and a certificate in global surgery.

The program has six core components:

- Collaborative for Global Health Equity: This is a flipped classroom model course that runs over one year, held once a month. It includes trainees from across seven different subspecialties—surgery, anesthesia, OB/ GYN, neurosurgery, internal medicine, emergency medicine, and global psychiatry.
- 2. **Simulation Workshop**: This workshop takes residents through simulated scenarios of working in resource-limited settings. They include a trauma resuscitation where the lights go out, there is no working monitor, and no CT scan. Residents have to work through how uncomfortable it feels to be out of their element, in a system they may be unfamiliar with, and use their training

⁸ Anji E. Wall (2012). *Ethics for International Medicine: A Practical Guide for Aid Workers in Developing Countries (Geisel Series in Global Health and Medicine)*. Hanover, NH: Dartmouth College Press.

⁹ The modules are password protected and require a COSECSA username and password. There are accessed at schoolforsurgeons.net.



to triage patients and determine who needs to go to the OR.

- 3. **Subspecialty Training**: Recognizing that many global surgeons have to perform procedures outside the normal scope of general surgery, the program provides training in plastics, burn care, neurosurgery, and emergency orthopedic fixation.
- 4. **Research Component**: Vanderbilt residents partner with Kijabe Hospital residents to conduct research projects related to Kijabe's community. Concurrently, a research course offered virtually using the Impact Africa platform (impactafricaproject.com) trains Kijabe residents in surgical research.
- 5. **Grant Submission Process**: The program assists residents in finding funding for global surgery projects, especially those who spend time in the lab.
- 6. Local Partnerships: Vanderbilt partners with several local organizations to

provide free surgical clinics to uninsured patients in Nashville.

Given the huge burden of surgical disease in Sub-Saharan Africa and too few surgeons, especially subspecialty surgeons, Kijabe has started training programs in orthopedic surgery, general surgery, and anesthesia. The programs are a direct result of the partnership with Vanderbilt, which provides faculty and resident support.

Building capacity requires training at every level, from surgeons to support staff and infrastructure. Figure 6 encapsulates how training happens in Sub-Saharan Africa: Dr. Hansen, a pediatric surgeon, is training a scrub tech from Kenya, a pediatric surgery fellow from Tanzania, an anesthesia fellow from Rwanda, a CRNA student from Kenya, a second-year pediatric surgery fellow from Cameroon, a pediatric resident from Kijabe, a scrub tech from Kenya, and a PGY-3 general surgery resident from Palestine.



Fig. 6. Global training. Photo courtesy of Dr. Erik Hansen.





Fig. 7. Pediatric surgery fellows trained at Kijabe.

Training the Trainer

COSECSA requires three faculty surgeons in any given subspecialty before a hospital can be approved as a training site. The map at Figure 7 shows the countries of origin for all pediatric surgery fellows trained at Kijabe Hospital since the fellowship started about a decade ago. Notably, Dr. Mehret, the third Ethiopian pediatric surgery fellow who trained at Kijabe, has returned to Addis Ababa. With three consultants. they can now apply for a COSECSA-approved pediatric surgery training program in Addis. This train-the-trainer model ensures that subspecialists return to their home countries to establish their own training programs.

Faculty Mentorship

Faculty development is also crucial. At Vanderbilt, the focus in this area has been on breast cancer care. Breast cancer is the most common cancer in Kenya and the second leading cause of cancer death. Non-communicable diseases are overtaking communicable diseases in terms of deaths in LMICs generally. It is estimated that by 2050, 70% of cancer patients will live in an LMIC. Therefore, there is a huge need to train faculty-level surgeons to address the cancer burden.

Figure 8 shows two faculty members currently being mentored. In Sub-Saharan



Fig. 8. Dr. Beryl Akinyi, a general surgeon with a primary focus in breast surgical oncology (L); Dr. Helena Musau, a medical oncologist and radiation oncologist (R(]



Africa, trainings are often combined due to the shortage of specialists. Three years ago, Vanderbilt and Kijabe Hospital, in partnership, were awarded a National Cancer Institute grant to study breast cancer. This grant is specifically to mentor early-career researchers in LMICs in conducting cancer research. These two faculty members are studying the barriers to accessing care for breast cancer in Kenya and advocating for better access in rural areas to the Ministry of Health.

Case Study #2: National-Level Partnership between ACS and COSECSA

COSECSA (the College of Surgeons of East, Central, and Southern Africa) has partnered with the American College of Surgeons (ACS) to address the growing challenges of providing general surgical care globally. COSECSA represents 14 member countries and seven partner countries. Sixty-four percent of COSEC-SA's training programs are in rural hospitals outside of capital cities. They have existing accredited training programs in various disciplines, with breast surgery recently added. (A breast surgery fellowship will start in Kigali, Rwanda, in January 2025.) Since its inception, COSEC-SA has successfully trained more than 800 surgeons across various subspecialties, with 93% of graduates retained within the COSECSA region.

ACS Leadership

In February 2016, the American College of Surgeons' Board of Regents sought to address the growing challenge of providing general surgical care globally. Policymakers, NGOs, and other institutions were investing in strengthening global surgical care, and the ACS took the initiative to lead and coordinate these disparate, siloed efforts. The ACS began dialogue about potential partnerships with a series of situational analysis surveys sent to 31 African institutions, with 16 responding. Hawassa University in Ethiopia was chosen as the first ACS-COSECSA hub in developing a sustainable, mutually beneficial partnership of global surgical departments, gaining insight into the region's surgical needs, and developing training programs to meet those needs.

Thirteen U.S.-based academic institutions now comprise the ACS hub in Hawassa, Ethiopia. Each institution commits to providing a faculty member for four weeks during the academic year, ensuring a U.S.-trained surgeon is in Hawassa at all times. The institutions have committed to supporting the partnership for five years, with the aim of developing a surgical training program and making Hawassa a center of excellence for laparoscopic skills training and trauma training.

Achievements and Expansion

The collaborative is based on the principles of a twinning partnership, with equal say and participation from both sides. Since 2017, the collaborative has implemented an M&M process, established a trauma registry, and trained Ethiopians to run ATLS training programs. Two additional training hubs have been added: one in Lusaka, Zambia, focusing on laparoscopic training, and the other in Kigali, Rwanda, focusing on cardiothoracic surgery, plastic surgery, and critical care.

Conclusion

The burden of global surgical disease is largely borne by surgeons and their patients—actual and potential—in LMICs. Despite this staggering burden, there is a great opportunity for US surgeons to make a significant, lasting impact. Paul



Farmer, one of the giants of global health, has emphasized that our most important achievements come from part-

nering with others. I challenge you to be part of the solution, whether in your own community or around the globe.

* * *