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ABOVE: Aishatou is relieved to see her daughter Fatima recovering at the MSF intensive therapeutic feeding center in Gwange, Borno State, Nigeria. MSF’s therapeutic feeding program is designed to reduce the mortality rate of severely malnourished individuals. © Jean Christophe Nougaret/MSF
Dear Friends,

As I write this letter, we are confronting massive humanitarian emergencies on all sides. MSF has scaled up its response to help hundreds of thousands of Rohingya refugees in Bangladesh. We are calling for lifesaving medical aid to Syria’s besieged eastern Ghouta—where 15 health facilities supported by Doctors Without Borders/Médecins Sans Frontières (MSF) were hit by bombing and shelling during an escalation in late February. We continue to provide urgently needed medical care to people suffering the consequences of the war and blockade in Yemen. We offer essential health services to people in Central African Republic, one of the world’s most underreported conflicts. (You can find the latest updates about our work at doctorswithoutborders.org, where you can also sign up for our monthly e-newsletter.)

In the context of so much upheaval, humanitarian aid organizations must constantly adapt and seek new ways to meet growing needs. This issue of Alert looks at how innovation—defined as a new idea, method, or device—drives our work to deliver high-quality medical care to patients around the world.

MSF is well known for providing essential medical care in austere settings, but it may be surprising to some that we are also engaged in pioneering medical research and innovation. In fact, conditions in the field frequently require new and creative approaches in order to treat our patients effectively.

One of the first innovative developments in MSF’s history was the use of standardized kits for medical equipment and supplies to enable the quick and consistent delivery of health services in the field. The larger scale adoption of this principle led to the creation of Logistique in 1986, MSF’s first satellite entity.

In 1987, as the volume of MSF’s clinical work and experience was becoming more substantial, we established Epicentre, our epidemiological research center. This development has made MSF uniquely poised to conduct medical research and analysis of the needs in crisis situations. Last year MSF published the results of a clinical trial initiated by Epicentre in Niger demonstrating that a new, heat-stable vaccine against rotavirus could help prevent large numbers of children from dying of severe diarrhea—a potential game-changer.

Many of the diseases we treat are largely ignored by a system of medical research and development that invests little in diseases that affect the world’s poorest people. In 2003, MSF cofounded the Drugs for Neglected Diseases initiative, an independent nonprofit drug research and development foundation that is expanding treatment options.

Within MSF-USA, one of our most exciting avenues for innovation is adapting the use of ultrasound to meet the needs of our field projects. Ultrasound has tremendous potential as a mainstay diagnostic tool because it can be housed in a unit that is both durable and portable. Additionally, ultrasound images can be transmitted remotely, allowing for second reading of studies by practitioners anywhere in the world. In South Sudan, we are launching a training program to use point-of-care ultrasound (POCUS) to assist with the diagnosis of common pulmonary diseases, among other conditions.

Beginning in January 2018, I had the privilege of working in a pediatric hospital in Monrovia, Liberia, for almost six weeks. During this time, our clinical team introduced the use of ultrasound in diagnosing pediatric surgical patients. Utilizing ultrasound, we confirmed that a child was suffering from an abdominal emergency known as intussusception, a telescoping of the intestine inside of itself. Another child was found to have a large abscess inside his liver. We performed successful surgeries on both children.

The pediatric program in Liberia represents another innovation arm of MSF’s activities, namely the introduction of more formal training and education within the scope of our work. Since the end of the Ebola epidemic in Liberia in 2015, we have provided training for nursing personnel in pediatrics at the Bardnesville Junction Hospital (BJH) in Monrovia. The intent is to expand the educational emphasis in pediatric anesthesia and perioperative care to nursing students as well as surgical residents within Liberian training programs—helping to strengthen the capacity of care providers in this region in the future.

We hope you enjoy reading about some of the many ways that MSF is testing new ground to bring the best medical care possible to those who need it most. Thank you for encouraging us to push forward.

Sincerely,

John P. Lawrence, MD
President, MSF-USA Board of Directors
HEALING WOUNDS OF WAR IN THE MIDDLE EAST
Madhor was sitting under an olive tree with his seven children in rural Hama governorate, Syria, when a barrel bomb hit, killing two of the children. He lost an eye and his left leg was left bloody and broken. Multiple operations and intensive physiotherapy at MSF’s hospital in Amman have had positive results: Though it remains painful, Madhor can now walk with crutches. © Alessio Mamo
Ahmed was 14 years old when he lost his left arm. “I had gone out to press olives,” remembers the young Syrian. “We were on our way home. A plane flew by and dropped a barrel bomb that exploded, and shrapnel hit my hand. It felt like there was something dripping on my leg. I looked at my arm. It was completely torn off. There was one thread that held my arm to my body. I asked myself, ‘What’s going to happen to me now? It’s finished. I’m dead.’”

Ahmed was eventually taken to a hospital run by Doctors Without Borders/Médecins Sans Frontières (MSF) in Amman, Jordan. Through the hospital’s reconstructive surgery program, Ahmed was among the first patients to receive a custom-designed prosthetic arm created by a 3-D printer. The multi-part device was printed layer by layer, from shoulder socket to fingertips, to fit the teenager’s body and personal requirements. The new arm also goes through an iterative process of testing and refinement to make sure it works well.

For Ahmed, it’s a step towards a future he once thought had been robbed from him. “When I grow up, I would love to become an engineer and build a house,” he said. “Just as soon as I go home to our country. I want to live a proper life. A beautiful life. That’s it.”

MSF’s reconstructive surgery program in Amman responds to the mounting needs across the Middle East, as thousands of people have suffered grievous war-related injuries in the course of the region’s widening spirals of violence. In Syria, Iraq, Yemen, and the Occupied Palestinian Territories (OPT), where years of conflict and political unrest have overwhelmed local health systems, war wounds tend to go untreated and can worsen as a result. Caring for patients whose lives have been shattered by bullets, shrapnel, or severe burns is often a long and complex process.

The reconstructive surgery program was established in 2006 to treat victims of the Iraq war. Now, more than ten years later, the program is housed in an independent hospital that provides care to war-wounded patients from across the region. The eight-story hospital has 148 beds, an operating theater with three
IN SYRIA, IRAQ, YEMEN, AND THE OCCUPIED PALESTINIAN TERRITORIES, WHERE YEARS OF CONFLICT AND POLITICAL UNREST HAVE OVERWHELMED LOCAL HEALTH SYSTEMS, WAR WOUNDS TEND TO GO UNTREATED AND CAN WORSEN AS A RESULT. CARING FOR PATIENTS WHOSE LIVES HAVE BEEN SHATTERED BY BULLETS, SHRAPNEL, OR SEVERE BURNS IS OFTEN A LONG AND COMPLEX PROCESS.

TESTING 3-D PRINTED PROSTHETICS

Off-the-shelf prosthetics can be prohibitively expensive and are generally one-size-fits-all. But no two patients are alike—from lifestyle to skin tone to aspirations, each has different needs when it comes to the prosthetic design that will benefit them most. This is where 3-D printing comes in. Using digital imaging techniques and software, the MSF team at the Amman hospital can quickly and inexpensively design customized prosthetics for patients undergoing treatment for war wounds. Using a combination of plastics, 3-D printers fabricate modular prosthetics tailored to a patient’s anatomy and needs. Where traditional prosthetics can cost hundreds of dollars and require extensive maintenance, custom prosthetics can be 3-D printed for as little as $30 and fabricated in 24 hours.

surgery rooms, physiotherapy and psychosocial departments, and a microbiology lab. In 2017, the MSF Foundation introduced the 3-D printing project to develop prosthetics. Over the past decade, the hospital has become a hub for medical innovation, offering a holistic package of services and cutting-edge solutions to the extraordinary medical challenges facing its patients.

FACING PAGE: Ahmed [left] during a consultation for his new prosthetic arm. © Economist Films

ABOVE: Haidar, 42, arrived at the Amman hospital in early 2017 with his right forearm amputated and left leg severely injured and infected following a car bomb explosion in Baghdad. Six months and eight operations later, Haidar is walking independently and able to move his arm without pain. © Florian Seriex/MSF
“The goal is to increase access to prosthetics,” explained Safa Herfat, a biomedical engineer and technical coordinator of the 3-D prosthetics project. The focus is mainly on upper-limb prosthetics, for which there are few other available options. Herfat works alongside a physiotherapist to explore solutions geared to the individual. “For each patient we sit down and interview them to determine their current condition and the specific activities they would like to return to in their lives—such as driving a car, working in the field, or working at home.”

Herfat and the team work with the Irbid Fab Lab to test scanning and modeling software programs, configure and calibrate the printers, and optimize biocompatible materials for the prosthetics. “We are looking to design devices ... that can be delivered to patients in austere environments or areas where there is limited or no access to prosthetic care,” said Herfat. The initiative is still a work in progress but will hopefully expand to meet the needs of other MSF projects in the future.

A HOLISTIC APPROACH

Of course, patients need much more than prosthetics: they need comprehensive solutions and support to help them rebuild their lives. Since the program opened, the hospital’s Iraqi and Lebanese doctors—a team including four orthopedic surgeons, a maxillofacial surgeon, and a plastic surgeon—have performed more than 10,000 surgeries for more than 4,500 patients. Now with a decade of experience, the surgical team is uniquely equipped to treat complicated war wounds.

The orthopedic surgeons specialize in the complex techniques necessary to manage both bone and soft-tissue injuries, especially the delicate operations needed to treat damaged nerves and tendons. Plastic surgery aims to repair skin and joint problems resulting from burns and bombings that can impede a patient’s ability to move, eat, or speak. And patients who arrive at the hospital with maxillofacial injuries undergo intricate operations for neck, face, or jaw wounds, often including reconfiguration of the mouth or jaw with plates and skin grafts.

Surgery is just the first step in the path to recovery—physiotherapy and psychosocial care are also core elements of the process. After undergoing reconstructive surgery, patients begin personalized
2011
ARAB SPRING & SYRIA WAR

2011
The RSP now takes in patients from across the region, including Syria and Yemen

2012
In response to the escalation of the Syrian conflict, the RSP admits 162 patients from Syria over the year

2013
The RSP admits 611 patients, the most it has ever treated in a year, including 236 Syrians, 185 Iraqis, and 133 Yemenis

2015
YEMEN WAR

2015
MSF opens an independent, eight-floor hospital in Amman—including a microbiology lab to combat the high levels of drug-resistant infections in war-wounded patients

2016
The RSP is 10 years old, highlighting the long-term consequences of war across the region and the lack of appropriate healthcare in the affected areas

2017
The RSP has received over 4,500 admissions from across the region and has performed more than 10,000 surgeries
“WHEN I ARRIVED, I WAS IN A WHEELCHAIR—I WAS COMPLETELY DEPENDENT ON MY SON TO FEED ME, DRESS ME, AND BATHE ME,” FALEEHA SAID. “SINCE THE SURGERIES AND PHYSIOTHERAPY, I CAN DO EVERYTHING MYSELF. . . . I AM HOPING THAT WITH MORE PHYSIOTHERAPY I CAN RETURN TO MY HOME IN IRAQ WALKING INDEPENDENTLY.”

The 3-D prosthetics project in Amman is managed and financed by the MSF Foundation, an innovation lab that leverages new technologies to tackle challenges faced by MSF teams in the field. To learn more, visit fondation.msf.fr/en.
MSF RECONSTRUCTIVE SURGERY PROGRAM
Amman, Jordan
LEFT: After undergoing multiple rounds of maxillofacial and plastic surgery, Ibrahim, a young boy from Yemen, is able to open his mouth again for the first time in two years. © Tom Barnes

CENTER: Qatadar, 33, was injured by a land mine in Aden, Yemen. After receiving prosthetic legs, he is working with a physiotherapist to learn to walk again. © Faris Al-Jawad/MSF

BOTTOM, LEFT: Wael suffered from severe burn injuries following protests in Taiz, Yemen. After 28 rounds of surgery, he is able to move his face and use his hands again. © Tom Barnes

BOTTOM, RIGHT: In addition to supporting patients’ reconstructive rehabilitation, Dr. Felix Machleidt (left) provided expertise in internal medicine. © Faris Al-Jawad/MSF
physiotherapy regimens to rebuild strength and regain functionality. A large space at the hospital is dedicated to physiotherapy equipment, including a parallel bar, exercise bike, and treadmill. The psychosocial care unit provides support to patients—many of whom have experienced deep emotional trauma in addition to their injuries. Teams offer mental health care, occupational therapy, and music and art classes. In 2016 alone, the reconstructive surgery program conducted more than 3,500 physiotherapy sessions and 3,000 psychosocial consultations.

One patient, Faleeha, lost one of her legs and suffered terrible injuries to her hands when she stepped on a land mine while working in her garden outside of Baghdad. At the MSF hospital in Amman, she underwent surgery for her hands to repair damaged nerves and elongate the tendons to restore mobility. She was also referred to a prosthetics specialist to be fitted with an artificial leg. Now she is working with the physiotherapy team, learning to walk again and use her hands for daily tasks. “When I arrived, I was in a wheelchair—I was completely dependent on my son to feed me, dress me, and bathe me,” Faleeha said. “Since the surgeries and physiotherapy, I can do everything myself…. I am hoping that with more physiotherapy I can return to my home in Iraq walking independently.”

### CONFRONTING THE THREAT OF ANTIMICROBIAL RESISTANCE

More than 50 percent of patients arrive at the Amman hospital with chronic infections, and more than 60 percent of these are multidrug-resistant. Drug-resistant infections can pose a deadly threat to patients already suffering from complex injuries.

The high level of drug resistance stems in large part from the collapse of sterilization, hygiene, and infection control measures in the strained health systems of countries gripped by conflict and from the improper use of antibiotics. “When people are wounded, they are likely to develop skin and bone infections, and this leads to an increase in antibiotic consumption,” said Dr. Conor Bowman, who works on the antibiotic stewardship program at the Amman hospital, in a February interview with Al Arabiya. “In unstable places, where there are no resources to test the bacteria for resistance, antibiotics are essentially selected without knowing whether they will work or not.”

MSF launched the antibiotic stewardship program at the Amman hospital to help promote the safe use of antibiotics and fight the growing global threat of drug resistance. The hospital also features a microbiology lab to test for antibiotic resistance and inform treatment options. “In the lab we test bone and tissue samples from the operating theater for infection and provide an antibiogram to the doctors so they can appropriately target the infection without causing more resistance,” said Kate Baldwin, who was on assignment as the microbiology lab manager last year.

MSF physicians and pharmacists work together to tailor drug regimens to individual patient needs and follow up to ensure drug effectiveness. The team promotes the “Four Ds” of antibiotic stewardship: correct drug, correct dose, correct duration, and de-escalation of antibiotic therapy. This stewardship program serves as a model for both regional medical providers and MSF hospitals around the world with high levels of antibiotic use and resistance.

What began as a trauma project more than a decade ago has evolved into something much bigger. As conflict continues across the Middle East, the dedicated team and innovative approaches pioneered at the reconstructive surgery program will only become more important. “Every day here, the patients are supported,” said Marc Schakal, MSF head of mission at the Amman hospital. "Month after month, sometimes for years, we are helping them recover functionality, movement, and dignity."
IT’S A MUST: Providing Emergency Surgery on the Go

As fighting flared in Mosul, Iraq, in late 2016, MSF project coordinator Arnaud Badinier was asked if he could build a mobile surgical facility that could move quickly with the shifting front lines. He had two weeks to come up with the design. Working with a team that included two other experienced logisticians and a nurse, they designed the MUST—a Mobile Unit Surgical Trailer.
Within months, the MUST was built and deployed to a village just south of Mosul, making it the closest surgical facility to the front line. The first patients were treated on February 16, 2017.

The mobile unit gives MSF staff the flexibility to quickly reach people in need of lifesaving trauma surgery while ensuring hygienic, temperature-controlled conditions in war zones and places hit by natural disasters.

The MUST was designed to be an operating theater on wheels, said Badinier. “The benefit of this project is the mobility. It’s easier to reach patients in really complex situations, and that gives the team the ability to deploy a full set of tools quickly and efficiently.”

The MUST deployed in Mosul comprised five trailers containing tents and other supplies—including modules that serve as operating theaters, intensive care units, pharmacies, and storage containers. These elements form a medical complex that offers emergency triage, surgery, and general medical care. Getting the space ready to treat patients takes less than three hours.

This innovative design enables staff to mobilize quickly. Teams can evacuate if security becomes a concern and then return to an area without having to spend hours or days unpacking and setting up facilities.

“The MUST gives MSF the flexibility and capacity to work close to the front line in a conflict area. In emergency situations, it’s really important to be as close and flexible as possible,” said Anne Khoudiacoff, MSF’s tactical referent for emergency response.

Based on feedback from staff in Mosul, MSF adapted the design and has now made the MUST2, a 16-module unit. The MUST2, currently waiting to be sent to the field, has much greater capacity—with expanded spaces to give doctors more room to operate and more trailers to double the number of operating theaters and intensive care units. Additionally, the MUST2 is designed in a way that makes it easier to keep the facilities as clean as possible and reduce the spread of infections. The modules themselves are wider, and internal corridors connect the spaces between trailers to improve the flow of care.

MSF teams also increased the amount of time the MUST can conduct surgeries without the need to restock water, electricity, and supplies from a little over 24 hours to one week.

In its first five weeks of service alone, the MUST in Mosul treated more than 1,800 patients, including 1,200 in need of surgery. This unit ran on a surgical team of four, plus four nurses. The larger MUST2 can see 800 patients per week, including 100 in need of surgery, and would ideally have a surgical team of 4 to 16—depending if one or both operating theaters are running—plus 15 nurses.

The MUSTs can be attached to existing hospitals or MSF projects, or stand alone. Either way, staff are in communication with the closest hospitals in the region to determine where patients can be sent if they need longer-term care.

“We are not changing how we provide care. We have the same equipment and provide the same health care. We are only changing how we go to the field to provide that same quality care regardless of the environment around us,” said Olivier Delbaeve, project coordinator for the 16-module MUST2. “Now we can be completely autonomous. Now MSF is able to reach patients everywhere in the world—by road, by boat, by air.”

IN ITS FIRST FIVE WEEKS OF SERVICE ALONE, THE MUST IN MOSUL TREATED MORE THAN 1,800 PATIENTS, INCLUDING 1,200 IN NEED OF SURGERY.
In 1981, starting in refugee camps in Thailand, MSF began developing ready-to-use medical kits custom-designed for specific emergencies, geographic conditions, and climates as well as standardized medical guidelines to streamline delivery of care. In 1988, the World Health Organization (WHO) adopted the concept with its “emergency health kit.”

MSF now employs medical and logistics kits for a wide range of crisis situations, from quickly setting up an operating room to launching a mass vaccination campaign.

ABOVE: MSF team members unload mobile clinic supplies in Port-à-Piment, Haiti. © Jeanty Junior Augustin
LOGISTIQUE

This MSF purchasing and supply center, created in 1986, ensures that MSF teams on the ground have the materials, transportation, and logistical support they need to quickly and efficiently respond where they’re needed most. The creation of this satellite changed the way MSF operates in the field, making it more self-sufficient. It also meant doctors and nurses could spend more time with patients and less time procuring medications and tracking supplies and equipment. In 1989 a second logistics center, MSF Supply, was opened in Belgium, and in 2008 Logistique opened a subsidiary facility in Dubai, United Arab Emirates.

EPICENTRE

This nonprofit organization was founded by MSF in 1987 to carry out epidemiological research in humanitarian settings, including refugee crises and epidemic outbreaks. Epicentre conducts research, clinical trials, and training—and also regularly publishes findings in scientific journals to share important data and perspectives on humanitarian medicine. In 1996, Epicentre was named a World Health Organization collaborating center for research in epidemiology and response to emerging diseases.

CHOLERA TREATMENT

In 1988, MSF employed cholera treatment centers (CTCs) in Malawi to address an epidemic among refugees from Mozambique. The CTC model, designed to provide rapid medical care to large numbers of patients while also isolating them to prevent further spread of the disease, is MSF’s most significant contribution to cholera epidemic response. In the 1990s, the model was adapted for use on a massive scale to address epidemics in camps inhabited by hundreds of thousands of people.

MALARIA TREATMENT

MSF first began using artemisinin-based combination therapy (ACT) to treat malaria in trials in refugee settings in Thailand in 1996. In 2002, based on studies conducted in Burundi and other countries that showed high levels of resistance to chloroquine and other classical anti-malaria drugs, MSF recommended ACT be used to treat malaria in all its projects. In 2006, WHO changed its guidelines on malaria treatment, calling for ACT to be integrated into national protocols.
**DNDi**

In 2003 MSF helped found the Drugs for Neglected Diseases initiative, a patient-needs driven, not-for-profit research and development organization that develops safe, effective, and affordable treatments for neglected diseases. DNDi developed the first new treatment for sleeping sickness in a quarter century, nifurtimox-eflornithine combination therapy (NECT)—a game-changing regimen that replaced an old therapy that killed one in 20 patients. Learn more at dndi.org.

**INFLATABLE HOSPITALS**

MSF first used an inflatable hospital—comprising nine tents, four operating theaters, an emergency room, an intensive care unit, and 120 beds—in response to the 2005 earthquake in Pakistan. Since then such hospitals have become a staple in MSF’s projects, especially in places where medical infrastructure has been damaged by conflict or natural disasters.

**HIV CARE**

First piloted in Tete, Mozambique, in 2008, community antiretroviral (ARV) groups (CAGs) are a key example of innovation in low-resource settings. Under this model of care, HIV/AIDS patients in rural regions far from clinics form community groups and take turns picking up ARV drugs for other group members and providing support for adherence to treatment. CAGs have improved adherence rates and are now widely adopted.

**TELEMEDICINE**

MSF first piloted the use of telemedicine in 2009 and consolidated multiple platforms in different languages in 2013 to create a more secure and accessible system. MSF’s platform allows doctors and nurses in the field to easily consult with both MSF and non-MSF experts and specialists anywhere in the world by posting text and images, including X-rays. The site is built to serve the needs of staff in remote locations with inconsistent Internet connectivity and low bandwidth, and so does not support video at this time. Staff receive a cell phone alert when their questions are answered by experts around the world.
DRUG-RESISTANT TUBERCULOSIS
In 2013, MSF began implementation of a shortened treatment course for drug-resistant tuberculosis (DR-TB) in Uzbekistan. In 2016, after a number of observation studies conducted by MSF and others, WHO recommended that countries move toward shorter treatment regimens—rather than the typical 24-month courses—for some people with DR-TB. These new treatment regimens are revolutionizing care for patients who would otherwise be forced to stick to the old options, which often mean taking nearly 15,000 pills over two years and possibly experiencing side effects ranging from deafness to psychosis.

READY-TO-USE THERAPEUTIC FOODS
In 2005, MSF treated 60,000 children suffering from severe acute malnutrition in Niger by providing ready-to-use therapeutic food (RUTF)—a fortified milk paste rich in vitamins and minerals. The project resulted in a cure rate of more than 80 percent, proving that RUTF could be used to treat patients at scale and paving the way for the Nigerien Ministry of Health to revise its national treatment protocol for severe acute malnutrition. Nutrition programs including RUTF, and later ready-to-use supplementary food (RUSF), enabled most malnourished children to be treated at home, decreasing the pressures on families to remain with children during their rehabilitation and reducing the children’s risk of acquiring infections during inpatient care.

In 2006, the treatment of malnutrition was integrated into Niger’s national action plan against food insecurity for the first time. RUTF has had a substantial impact on how governments, humanitarian organizations, and other groups treat children with severe malnutrition.

UNMANNED AERIAL VEHICLES
In 2014, MSF experimented with the use of unmanned aerial vehicles (UAVs), or drones, in Papua New Guinea to transport sputum samples from patients with suspected TB from remote health centers to a hospital for testing. The trial was one of the early uses of UAVs to help provide medical assistance. This year, MSF’s innovation unit in Tokyo is planning to test better and more affordable drones for humanitarian aid delivery.
POCUS:
Bringing the Revolutionary Potential of Ultrasound to South Sudan
Aweil General Hospital, in a remote corner of South Sudan, serves some 1.5 million people who would otherwise have very little access to quality health care. But a lack of trained medical professionals and basic diagnostic tools complicates matters. Medical personnel generally rely on observed and reported symptoms—and a certain amount of educated guesswork—to make a diagnosis.

“Pneumonias are one of the leading causes of mortality worldwide, especially in children. But because of a lack of useful diagnostic tests, we use a broad definition to avoid missing any patients with this illness,” said Adi Nadimpalli, former MSF-USA Board vice president and a physician with wide-ranging experience working on MSF projects from South Sudan to Syria. “So currently, most children with a cough or difficulty breathing are diagnosed and treated as having pneumonia, even though there are multiple diseases which can present similarly.”

If an X-ray is needed at the hospital in Aweil, it’s a bumpy 15-minute drive along an unpaved road to the nearest working machine. “The risk of transporting an unstable child is frequently too high, even if it can get us additional clinical information to guide the proper treatment,” said Nadimpalli.

A “TECHNOLOGY REVOLUTION”

To address these limitations, MSF’s Transformational Investment Capacity (TIC) initiative is funding a project to implement point-of-care ultrasound (POCUS) in the field. “There has been a POCUS technology revolution over the last decade,” says Nadimpalli, project coordinator for the grant at MSF-USA.

Older ultrasound machines were large, expensive, and complex, meaning only experts like radiologists, cardiologists, and obstetricians were trained to use them. But newer models are highly portable, affordable devices that can be connected to tablets to display images. Just as importantly, the simplification of medical algorithms [the steps and criteria for evaluating POCUS images] means that general clinicians at all levels can learn basic ultrasound skills. This potent combination of factors now makes it possible to deploy POCUS technology in the most remote locations.

The project launched at the start of 2017 with a feasibility study in Aweil hospital, where MSF runs the pediatric and maternity departments in cooperation with the Min-
EMPOWERING LOCAL STAFF

The feasibility study was successful and Nadimpalli returned to Aweil earlier this year for the second stage of implementation. “Now we are going back to basics: basic ultrasound skills, basic obstetrics, basic trauma, abscesses, and, for those with advanced skills, basic cardiac ultrasound,” said Mayronne. POCUS can help sharpen the diagnosis of basic trauma injuries too.

“The POCUS initiative is specifically focused on increasing clinicians’ ability to make bedside diagnoses,” said Nadimpalli. Without POCUS, a clinician would normally use finger-percussion to determine where the fluid was and then insert a needle at that spot to remove this fluid. “You tap the chest wall to see if you can ‘hear’ where the fluid is—it has been done like this for decades,” he said. Using POCUS has been shown to improve safety and decrease errors for this procedure.

TRANSFORMATIONAL INVESTMENT CAPACITY

MSF launched the Transformational Investment Capacity initiative (TIC) to more effectively address the needs of people living in crisis around the world. Through the initiative, MSF invests funds, intellectual capital, and human resources in innovative projects that have the potential to improve its ability to deliver urgent lifesaving care. The majority of funding is targeted for large-scale project proposals requesting investments of more than $300,000, however additional funding is set aside for smaller “incubator ideas” that have the potential to scale to major transformational projects. Learn more about TIC at msf-transformation.org.
Continuing education will be an important component to the success of POCUS. “As we train our staff, we want to make sure they continue to develop their skills and that they are properly updated on new protocols,” said Nadimpalli. “We are promoting key people in each project who can be ultrasound leaders.” The project will also use telemedicine to stay connected with the team in South Sudan, help develop skills, and rapidly identify any deficiencies that may require additional training.

FAR-REACHING EFFECTS

The use of POCUS in Aweil is already having an impact. “One of our maternity patients was admitted with shortness of breath,” said Nadimpalli. “We needed to send her ultrasound to telemedicine, where a cardiologist diagnosed her with mitral stenosis.” Mitral stenosis, a heart disease that is incredibly dangerous for women, has a mortality rate of 50 to 60 percent. That rate increases with each pregnancy.

After discussion with MSF obstetric and anesthesiology referents in Paris, it was determined that the patient should have a Caesarean section and a tubal ligation for permanent contraception. However, this was only her second pregnancy, and not being able to have more children is a difficult decision in South Sudan, where large families are the norm. “Because of the ultrasound, we could confidently discuss with the patient, her husband, and her father the need for surgery and contraception—explaining that she may not survive another pregnancy,” said Nadimpalli. “In this instance, the use of ultrasound was truly lifesaving.”

Based on the experiences and lessons learned in South Sudan, MSF hopes to rapidly expand the technology and training to other projects around the world.
SMARTPHONES FOR SMARTER AID DELIVERY

You can use your smartphone to connect with MSF’s work in the field! Scan this QR code to watch our latest 360 video “We Left Home Empty-Handed”: Displaced in South Sudan.
Smartphones are changing modern life in countless ways, and they are revolutionizing how MSF delivers medical humanitarian aid to people in need. From creating maps to collecting diagnostics, here are four innovative ways that smartphones are making a difference for our teams and patients.

**PUTTING PATIENTS ON THE MAP**

To deliver food, shelter, medical care, and other lifesaving services in a humanitarian crisis, you need to know where to find the people most in need. But the homes of millions of people around the world are not represented on any accessible map. For MSF teams, this means a lack of available information to draw on when planning aid efforts.

That’s why the Missing Maps Project, a partnership between MSF and other humanitarian organizations formed to map the most vulnerable places in the developing world, created the MapSwipe mobile app. This free app for Android and iOS lets users search satellite imagery for features like houses and roads, identifying population centers so that groups like MSF can plan humanitarian responses.

“We knew we needed better diagnostics at the bedside—a simple tool that would help us identify malarial retinopathy,” said Estrella Lasry, MSF tropical medicines advisor. “When one of our pediatricians heard about PEEK, we realized that this could be just what we were looking for.”

**MODERNIZING HEALTH SURVEILLANCE**

Collecting detailed information about people’s health needs in emergency situations is a perennial problem for humanitarian organizations. To solve it, MSF teams have started using a new health surveillance program that collects data quickly and accurately and allows it to be shared in real time.

In northeastern Nigeria, MSF teams tracking rates of childhood malnutrition house-to-house previously had no choice but to rely on clipboards and paper spreadsheets, collating collected data by hand at the end of each day. Now, thanks to smartphones, teams can collect and collate data in real time, sharing it instantly with headquarters to plan medical responses. And in the Middle East, teams use similar technology to carry out broader health surveillance among refugees.

“This means we can make sure people receive the right type of assistance—whether it’s medical care, food, clean drinking water, or the materials to build a weatherproof shelter,” said MSF doctor Ghassan Aziz.

**MICROSCOPIC PHOTOGRAPHY**

Imagine you’re an MSF doctor. You’re working in a basic hospital in a remote location and a patient arrives with a dangerously high fever. Over the next few days you try all the most likely treatment options, but nothing seems to work. Their lab tests show results that no one at the hospital has seen before. What do you do?

Until recently, biomedical scientists in MSF projects had to pick up a phone and describe the images seen through microscopes to get advice from colleagues overseas. To solve this problem, MSF is testing adapters that will enable medical staff in the field to use their smartphone cameras to capture high-quality photomicrographs—images of specimen slides as seen through a microscope. Using telemedicine, these photos can be shared with MSF staff and other experts around the world for quick and effective consultations to benefit our patients.

FACING PAGE: An MSF doctor uses a smartphone to examine a patient’s throat at the Batill refugee camp in South Sudan. © Shannon Jensen
FIGHTING THE SPREAD OF CHOLERA WITH A VACCINE

When cholera broke out in the Zambian capital of Lusaka in February 2016, it seemed like a disaster foretold. Around 1.2 million people live in crowded urban settlements prone to flooding and the spread of disease. That year, the rainy season arrived late, causing boreholes to dry up and pushing people to draw water from shallow wells. When the rains finally did come, floodwaters mixed with overflowing pit latrines, creating rivers and lakes of contaminated water across the settlements. This was the ideal environment for a large-scale cholera outbreak.

Cholera causes acute watery diarrhea and vomiting, and can be fatal if left untreated. The disease is most common in densely populated areas where there is poor sanitation and inadequate access to clean water.

Faced with the threat of a major cholera epidemic, the Zambian Ministry of Health requested assistance from MSF to halt the spread of disease. Working with the World Health Organization (WHO), MSF helped plan a massive campaign aiming to vaccinate some half a million people in Lusaka. However, at the time, the global emergency stockpile of the oral cholera vaccine was too limited to provide such a large at-risk population with the standard two doses. MSF recommended providing a single dose of the vaccine to ensure maximum coverage immediately, and to deliver a second dose later when more supplies became available. Earlier evidence indicated that a single dose delivered to twice as many people would quickly maximize so-called “herd immunity” and curb the epidemic.

The emergency strategy worked. Over a two-week period in April, MSF helped carry out one of the largest cholera vaccination campaigns ever—vaccinating 423,000 people in Lusaka. More than 100 MSF and Ministry of Health staff worked with 1,700 volunteers to implement the vaccination campaign. The health ministry also continued to provide care for patients at cholera treatment centers and worked to improve sanitation.
and hygiene. Thanks to these coordinated and timely efforts, the outbreak was successfully brought under control.

This February, we published the results of a comprehensive study undertaken by MSF’s research arm Epicentre, the Zambian Ministry of Health, the Pasteur Institute, and the WHO examining the impact of the emergency intervention. The study found that the single dose campaign was nearly 90 percent effective for providing short-term protection during the outbreak. “According to these results, people vaccinated can be protected against cholera a few days after receiving one dose,” said Dr. Francisco Luquero, a medical epidemiologist at Epicentre. “This is important in outbreaks when we need to protect people quickly.”

The results are extremely hopeful, indicating that a limited supply of oral cholera vaccine can be stretched when necessary to save lives. “While the availability of vaccines has improved in recent years, the number is still far from being sufficient to tackle the large-scale outbreaks we are currently seeing, such as those currently ongoing in the Democratic Republic of Congo or Yemen,” Luquero said. “We are extremely encouraged by these results, which will mean more people can be protected from this potentially deadly disease.”

MSF was a pioneer in using an oral cholera vaccine in field settings, carrying out a feasibility study in 1997 among 44,000 South Sudanese refugees in Uganda. The breakthrough came in April 2012, when MSF worked with the Ministry of Health in Guinea to respond to a cholera epidemic—administering 316,250 doses of the oral cholera vaccine over a six-week period. An influential study of the campaign by Epicentre, published in 2014, found that the vaccine was 86 percent effective in protecting individuals, lending support to its use in control of future outbreaks.

“Now we know that oral cholera vaccine confers a high level of protection in outbreak settings, and that vaccinating against this highly deadly disease can and should be one thing we do when we have a cholera epidemic on our hands, in addition to other preventive and control measures,” Luquero, principal investigator of the study, said at the time.

Meanwhile, in 2013, a global emergency stockpile of oral cholera vaccine was created under the supervision of the International Coordination Group on Vaccine Provision—which includes the WHO and MSF, among other partners—strengthening the capacity for action in emergency settings.

Today, the stockpile is attracting additional manufacturers, and Luquero thinks we are approaching a turning point.

“We are reaching an extremely important point where the scale of the campaigns may be sufficiently large to show impact in controlling the disease,” Luquero told Science magazine in a February interview.

As vaccine supplies increase, it may be possible to expand the use of large-scale cholera vaccine campaigns in at-risk regions to protect people and prevent outbreaks before they start. 

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FACING PAGE: A woman takes a single dose of the oral cholera vaccine as part of a massive vaccination campaign in Lusaka, Zambia, in April 2016. © Laurence Hoenig/MSF

RIGHT, TOP: A group of children show off their vaccination certificates at a site in Kanyama district, Lusaka, Zambia. © Laurence Hoenig/MSF

RIGHT, BOTTOM: Providing a single dose of the oral cholera vaccine to twice the number of people helped halt the spread of the epidemic in Zambia in 2016. © Laurence Hoenig/MSF
Some of the most revolutionary ideas start small and come from unexpected places. For a global humanitarian organization as large as MSF, finding and fostering these ideas from staff on the ground in more than 70 countries can be challenging. In 2003, MSF’s Manson Unit—a London-based team of specialists who provide medical, technical, and research support for MSF programs—founded the Sapling Nursery to help advance MSF’s most promising medical and logistical innovations.

The Sapling Nursery is a fund to develop and test new approaches to challenges in humanitarian aid. Accepting proposals from MSF staff working both in the field and in headquarters, the fund awards prizes of up to 50,000 euros (about $61,000) to staff to turn an innovative idea into reality.

“Sapling Nursery was started to cater to the more disruptive end of the innovation spectrum,” explains Pete Masters, MSF medical innovation advisor. “It’s for early-stage ideas; stuff we are willing to take risks on, things we aren’t totally sure will succeed—but even if we fail we’ll learn something important.”

Innovations can be big or small, high tech or surprisingly simple. “It can be a mobile operating theater or a pre-fabricated hospital,” said Masters. “But sometimes it takes changes in the detail of how we do things to make a massive difference for our patients.” In December 2017, the Sapling Nursery received 21 innovative proposals from MSF workers around the world. Here are just a few of the promising plans in the works.

An MSF nurse at the pharmacist workstation in the back of a vehicle in Malawi. A Sapling Nursery project seeks to develop hooks to hang bags of IV fluids inside MSF Land Cruisers, enabling rehydration on the go. © Luca Sola

FACING PAGE, TOP: Inside an MSF mobile clinic in Amaryat Fallujah, Iraq. © MSF

FACING PAGE, CENTER: A lab technician uses a microscope at Walikale hospital in North Kivu, Democratic Republic of Congo. © Gwenn Dubourthoumieu

FACING PAGE, BOTTOM: A young child is screened for severe malnutrition in Fori district, Maiduguri, Nigeria. © Ivan Muñoz/MSF
LEAN CHEMICAL WEAPONS DECONTAMINATION KIT

Working in areas where chemical weapons are a threat is stressful for medical teams. Personal decontamination kits can offer some protection in the event of exposure, but they are bulky and difficult to store in cramped conditions. This proposal, from an MSF logistician recently on assignment in Iraq, uses lean design principles to reduce waste and maximize value. He aims to develop a discrete, efficient, and foolproof decontamination kit to help keep staff safe and ensure they can focus their attention on what matters most: delivering the best care to patients.

SMARTPHONE-ENABLED PHOTOMICROGRAPHY

Telemedicine—treating patients and providing expert medical advice remotely through telecommunications technology—is an increasingly important tool for MSF’s medical teams. But taking photographs of slides through a microscope, often necessary for remote diagnosis, has historically involved the use of an expensive mounted camera and proprietary software, prohibitive requirements in many of the contexts where MSF works. This proposal aims to solve that problem through the development of a low-cost ($10–$80) adapter that would allow MSF medical staff members to use their smartphones to capture microscope images.

MALNUTRITION SCREENING TOOLBOX FOR YOUNG CHILDREN

Treating child malnutrition is a major part of many MSF projects, but screening babies, especially under six months of age, can be difficult. The most common approach involves using cumbersome “measuring boards” to check a baby’s growth and then recording malnutrition levels on complicated paper forms. The process is so onerous and error-prone that malnutrition screening for children this young is not standard at many MSF projects. To address this gap, an MSF epidemiologist in India has proposed a kit with simplified tools including a digital device to measure a baby’s length and a Z-score calculator, an app developed by the World Health Organization to calculate nutrition based on weight and height readings. These tools will be evaluated in MSF projects to determine whether their use could help ensure that more young children are screened—and therefore treated—for malnutrition.
Donor Profile
JOAN BRIDGWOOD

When she and her husband emigrated from the south of England to South Carolina in 1981, Joan Bridgwood says she thought it would help that they already spoke the language. “At least we thought it was the same language,” she says, laughing.

It took a little while to understand the Southern accent (“It helps that it goes rather slowly”), but despite the unexpected challenge, she felt fortunate: her sister was already living in the United States, her husband had a job lined up teaching electrical engineering at Clemson University, and everyone—including her children, who were 9 and 11—was healthy.

Within a couple years, Joan joined her husband at Clemson, teaching Russian and Italian.

“We realized just how fortunate we were as immigrants and how unfortunate so many immigrants are,” Joan says. It’s one of the reasons she’s passionate about supporting MSF, particularly given the vital medical and mental health care being provided to refugees in and around Syria. “It’s important to me,” she says, “that MSF is non-partisan and goes where other organizations can’t or won’t.”

Joan has been supporting MSF since the 1970s—usually with small, occasional gifts. Now, after 30 years of teaching at Clemson, Joan just recently joined her husband in retirement. Their children are grown up and, after a lifetime of living frugally, she says it’s been a welcome surprise to feel a little less anxious about the future.

Both Joan and her husband recently invested in two charitable gift annuities (CGAs) to support MSF. After receiving information about CGAs in the mail, she requested a quote to learn more about what a specific investment amount would mean for their lives. “Once I learned about the tax deductions, what would come back to us, and how helpful the donation would be,” Joan says, “the decision was easy.”

In fact, after experiencing how straightforward the process was, she’s now considering an additional CGA. “It’s nice to know that our money is doing something useful rather than just sitting in the bank until we may need it,” she says. And it’s nice, too, to know that the investment can still help them in the future if their situation changes.

SET UP A GIFT ANNUITY WITH MSF

MSF’s charitable gift annuities make it easy to provide for our future as well as your own. When you set up a gift annuity with MSF, you will receive fixed payments for life and an immediate income tax deduction. Minimum age when payments begin is 65. We follow the ACGA suggested rates. For more information, including a personalized proposal showing how a gift annuity can work for you, please contact Beth Golden, planned giving officer, at (212) 655-3771 or plannedgiving@newyork.msf.org.

JOIN OUR LEGACY SOCIETY

MSF is able to provide independent, impartial assistance to those most in need thanks to the dedication, foresight, and generosity of our Legacy Society members. Every day, legacy gifts are helping us keep our commitment made more than 40 years ago to assist people in distress regardless of race, religion, creed, or political affiliation.

To learn more about joining the MSF Legacy Society by making a gift through your will or other legacy gift that will save lives for years to come, please contact Lauren Ford, planned giving officer, by phone at (212) 763-5750 or by email at lauren.ford@newyork.msf.org.

INCREASE YOUR IMPACT

Does your employer have a matching gift program? Many companies have matching gift programs that will double or even triple the impact of your gift. Companies will sometimes also...
match donations made by spouses, retirees, and board members. Because conditions and criteria for gift matching vary by employer, please check with your company’s human resources department for details. MSF-USA is happy to confirm your gift or to satisfy any other requirements your company may have.

If you or your company are interested in learning more about our work, or have any questions about our matching gift program, please email corporate.donations@newyork.msf.org or call (212) 763-5745.

THE MULTIYEAR INITIATIVE
MSF-USA would like to thank all of our donors who have made commitments towards the Multiyear Initiative. With annual commitments of $5,000 or more, these generous supporters help provide MSF with a predictable revenue stream that better serves our ability to respond rapidly to emergencies and ensure the continued operation of our programs. To date, we have received commitments totaling $33 million towards the initiative.

To find out how you can participate, please contact Mary Sexton, director of major gifts, at (212) 655-3781 or mary.sexton@newyork.msf.org, or visit doctorswithoutborders.org/multiyear.

STOCK DONATIONS
Did you know you can donate gifts of securities to MSF-USA? Making a stock gift is simple and offers a number of valuable financial benefits. You can donate appreciated stocks, bonds or mutual funds, and the total value of the stock upon transfer is tax-deductible. Also, there is no obligation to pay any capital gains taxes on the appreciation.

MSF-USA currently maintains an account with Morgan Stanley Smith Barney to offer donors an easy way to transfer securities hassle-free. For more information on how to make a security donation please visit our website doctorswithoutborders.org/support-us/other-ways-give.

You can also call (212) 679-6800 and ask to speak to our Donor Services department.

If you have any questions or comments, contact our Donor Services team:
Toll free: (888) 392-0392
Tel: (212) 763-5797
Email: donations@newyork.msf.org

Starting in March, Forced From Home, MSF’s interactive exhibition on the global refugee crisis, is back on the road in a new format. Our exhibition trailer offers visitors virtual reality documentaries that immerse viewers in the personal stories of displaced people around the world, a photography display, items from refugee camps and MSF hospitals, and the ability to interact with MSF aid workers and staff. Learn more and find upcoming locations at forcedfromhome.com.

WE’VE MOVED
In early 2018 MSF-USA moved to a new office at 40 Rector Street, 16th floor, New York, NY 10006. MSF-USA is grateful to the following companies for their support in making our office space possible:

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