

CARE AND LIVE

MAGAZINE
2018



FRESENIUS
MEDICAL CARE

04

WHO WE ARE

06

WHAT WE DO

AND CHANCES AND CHANGE

A market in
motion



08

AND VISION AND INNOVATION

Regenerative Medicine:
The road to healing



18

DEDICATION AND COURAGE

When Maria struck:
One year after the hurricane



24

AND JOY AND KNOWLEDGE

A superhero wins
over Asia-Pacific



36

AND ART AND TECHNOLOGY

Blue makes a
difference



40

CARE AND LIVE

At Fresenius Medical Care, we have the vision to create a future worth living, for patients, world-wide, every day. We are working towards this vision in various ways – by developing leading technologies, exploring innovative therapies and providing reliable care for our patients, even in extreme situations. We are also using our know-how for enhanced products, raising awareness of kidney diseases and bringing strong partners on board.

Our patients wish to lead lives in which they do not have to give up their own dreams, desires and hopes. We are also responsible for these hopes.

At Fresenius Medical Care, we unite this vision and this wish by improving quality of life for people with kidney diseases today and in the future. And by making every day as worth living as possible.

WE ARE WHO

DECADES OF EXPERIENCE,
INNOVATIVE RESEARCH,
THE NUMBER ONE
DIALYSIS PROVIDER
WORLDWIDE

Fresenius Medical Care is the world's leading provider of dialysis products and services. We care for people with chronic kidney failure, of whom around 3.4 million worldwide depend on dialysis treatment. Thanks to our decades of experience in dialysis, our innovative research and our value-based care approach, we can help them to enjoy the very best quality of life.

04

42
PRODUCTION
SITES

MORE THAN
112,600
EMPLOYEES

RIO DE JANEIRO
B R

WALTHAM
U. S.

150
COUNTRIES

PRODUCTS AND
TREATMENTS
IN AROUND



WE DON'T
CREATING A FUTURE
WORTH LIVING.
FOR PATIENTS.
WORLDWIDE.
EVERY DAY.

*We care for over 333,000 dialysis patients.
Their well-being always comes first.
Our top priority is to offer them the best
possible treatment. To this end, our
portfolio encompasses a comprehensive
range of high-quality health care products
and services as well as various dialysis
treatment options for both in-center and
home dialysis that are individually
tailored to our patients' needs.*

HEALTH CARE SERVICES

Urgent care services

End Stage Renal
Disease-related treatments

Pharmacy services

Ambulant treatment services

Acute dialysis services

Physician nephrology and cardiology services

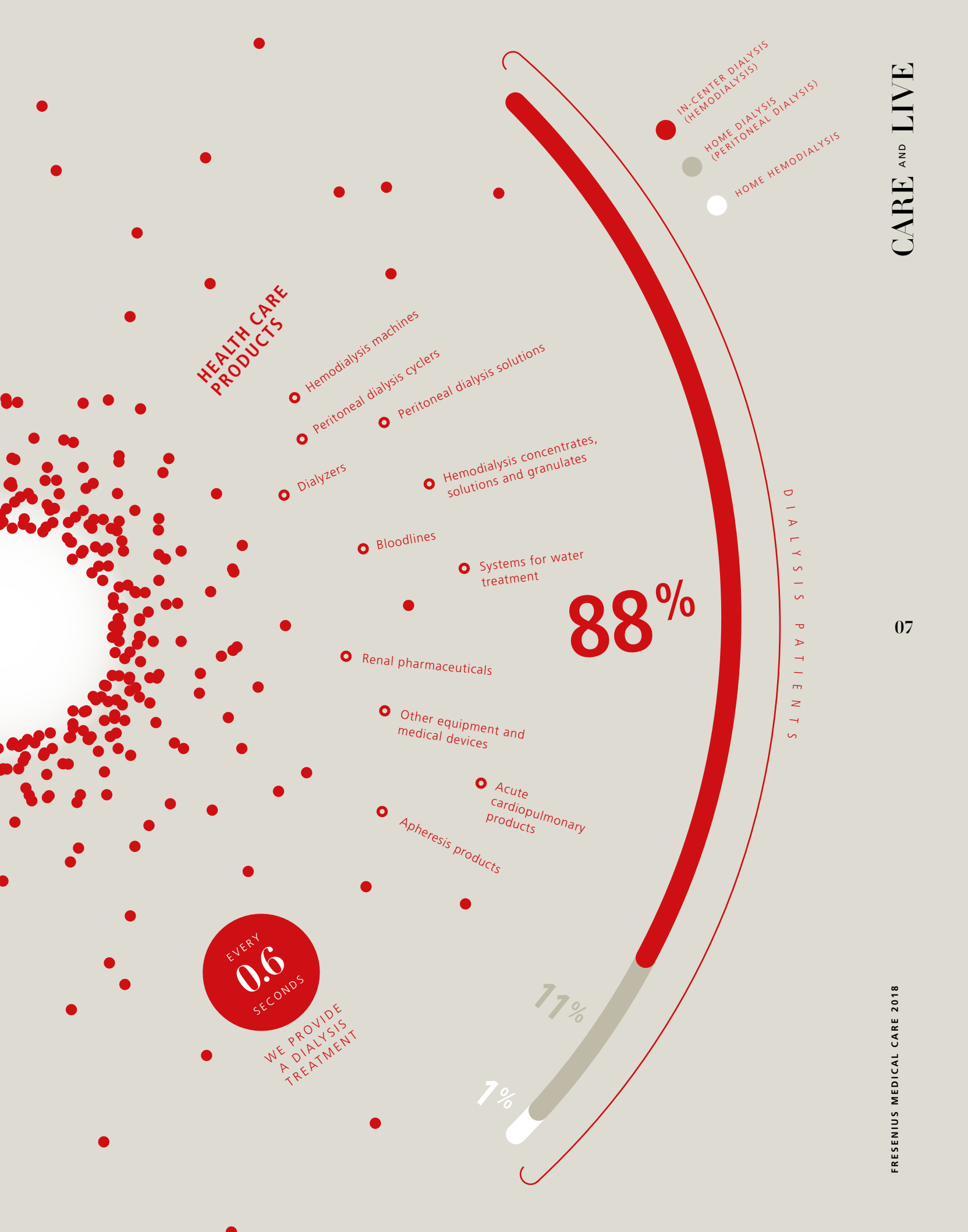
Vascular, cardiovascular and endovascular specialty services

Ambulatory surgery center services

End Stage Renal
Disease-related laboratory testing services

Health plan services

MORE THAN
333,000
PATIENTS



CHANGE

HARRY DE WIT

*Member of the Management Board
of Fresenius Medical Care,
responsible for the region Asia-Pacific*

08



ANCES

HAN XIONG

*Dialysis patient from
Urumqi, China*

A MARKET IN MOTION

*As the global leader for
dialysis products and services,
Fresenius Medical Care
provides care for people with
chronic kidney failure in
around 150 countries.
One market that is growing at
a remarkable rate is China.
We give some insights into
a country where everything
appears to be in motion.*

CARE AND LIVE

09

FRESENIUS MEDICAL CARE 2018



HAN XIONG

*feels great gratitude
to her doctors and nurses,
she says.*

H

Han Xiong still remembers the day, ten years ago, when her doctors told her that she would need regular dialysis treatment for the rest of her life. "That is certainly a dramatic moment for any patient, and I was no exception," says the 53-year-old English teacher from Urumqi. "At first, it felt as if the sky above me had gone dark. But I am lucky to live in a time when China is opening up, and more and more costs are being assumed by the health care system.

Today, I am happy to say that I feel fine. I have gotten used to the fact that Monday, Wednesday and Friday involve trips to the clinic – and that I can live my life to the fullest." For Han Xiong, that means starting each day with tai chi, then studying new dance choreographies and going shopping with her friends. In other words, being a person, not a patient. Doing the things she enjoys, things that motivate her, things that matter to her. And living the life of a completely normal, fun-loving resident of a major city in the north-west of the country, some 3,000 kilometers from Beijing.

“

I have gotten used to the fact that Monday, Wednesday and Friday involve trips to the clinic – and that I can live my life to the fullest.”

HAN XIONG

*Dialysis patient from
Urumqi, China*



TAI CHI

Regular exercise does not only strengthen the body. According to Han Xiong, it also makes people happy and gives more energy.



According to research conducted by the Chinese Society of Nephrology, not every patient with end-stage renal disease registered in China is currently receiving dialysis treatment.

Han Xiong stood on the stage at the start of an endurance run along the Great Wall of China in 2018 to tell people about her experience and talk about kidney disease, the changes taking place in China, and the opportunities emerging as a result. She wanted to get people's attention. Not for herself, but for her cause. That desire is also close to the heart of Harry de Wit, member of the Management Board of Fresenius Medical Care responsible for the Asia-Pacific region. "Our vision is to ensure that people around the world have the same access to the best possible treatment. In China, a major part of this is raising awareness. Awareness is essential when it comes to big changes."

“

Our vision is to ensure that people around the world have the same access to the best possible treatment.”

12

HARRY DE WIT

Member of the Management Board of Fresenius Medical Care, responsible for the region Asia-Pacific

"For a highly developed company like Fresenius Medical Care, enhancements to products typically involve significant opportunities," explains de Wit. "In China, things are a little different. Here is demand in all areas, from the local infrastructure and the question of how to provide the best possible care for patients, even in remote areas, to the scalability of products and services in the face of steadily growing demand." After all, the number of patients with chronic kidney failure in China is rising particularly fast, even compared to other Asian countries, at over ten percent per year.

Harry de Wit is from the Netherlands but has spent the past decade working in Asia. He never fails to be impressed by the pace in China, a country where constant change has become a permanent feature in many aspects of everyday life. "In the last ten years,

**No.1**

China is the country with the most dialysis patients in the world.



China has probably made greater progress in dialysis care than the rest of the world put together. That, combined with a steadily growing middle class, gives us good reason to look to the future with optimism. We benefit from the population's growing demands on the health care system in their country and the fact that more and more people not only want access to better health care provision, but can also afford it."

When David Grier and Andrew Stuart, two South African endurance athletes, were planning their 4,200-kilometer run along the Great Wall of China, Fresenius Medical Care came on board as a partner. It seemed like an ideal opportunity to draw attention to the topic of kidney health over a period of several weeks. And it paid off: The run became a nationwide event, reaching more than 300 million people, above all thanks to social media. This resounding success was the result of the two charity runners' many years of experience and extremely close cooperation with local experts from Fresenius Medical Care, also in the planning phase. During the run, the two athletes visited numerous clinics, met patients in treatment, and helped to promote local running events over shorter distances to get people in different parts of the country involved. "Shortly before the end of the long-distance run, they asked me if I would like to accompany them for the last hour. It was a real honor to do so," says de Wit. "The run is a positive story. And people in China love positive stories. That's why we managed to reach so many of them."

LACK OF CAPACITIES OUTSIDE MAJOR CITIES

Only a small proportion of kidney patients in China can be treated at present. "We are talking about around 45 percent of people with chronic kidney failure. The reason is not only the current shortage of doctors and nurses, but also the fact that there is room for improvement when it comes to access to affordable products and services," says de Wit, adding that affordability is an important factor in establishing provision in all regions. Furthermore, in many remote areas of the country people are not aware just how well kidney failure can be treated – although the Chinese

KIDNEY CARE
CAMPAIGN

BACK TO THE WALL

David Grier and Andrew Stuart began their journey to run the entire route of the Great Wall of China at the end of March 2018. Beginning in Shanhaiguan, the pair ran an average of 61 kilometers a day, accumulating to 4,200 kilometers in total. After running the more than 4.5 million steps over three months, the extreme adventurers and philanthropists arrived at their final destination in Jiayuguan on July 3, 2018.



FINISH
Jiayuguan

START
Shanhaiguan

4,200 km
total distance

government is going to great lengths to change this. Outside the major cities, there is little capacity for treatment. This is why Fresenius Medical Care is focusing on investing in tier 2 and tier 3 cities – large and medium-sized cities with a population between 150,000 and 15 million, like Kunming or Quanzhou. “The biggest cities already have good provision. That is why we can count on the authorities’ support when we invest in other regions,” explains de Wit. “This is our great advantage not only as a provider of the right products, but also one that guarantees the best treatment as well as setting up and operating clinics. These are cities with a population of over a million we are referring to, of which there are several hundred throughout China.”

China is undergoing a process of profound change. The country is opening up in the health care sector also to foreign companies. In the past two years, Fresenius Medical Care has achieved several milestones in China. In late 2017, the first renal hospital specializing in

chronic-disease management and hemodialysis was opened as a joint venture. Shortly afterwards, Fresenius Medical Care announced the acquisition of its first independent dialysis center in Quanzhou. The port city in southeastern China has almost twelve million inhabitants and is the country’s third-largest city. This was followed by further acquisitions in 2018, including two 70 percent stakes in hospitals in Sichuan Province and the addition of several renal hospitals and dialysis centers. The pipeline is well filled with more than 20 sites – for good reason: “We expect the Chinese government to issue a further 500 approvals for renal hospitals and dialysis centers over the coming years, and have prepared ourselves for this development,” explains de Wit. Fresenius Medical Care is also focusing on expanding its research and development activities. In 2015, it established a proprietary “China Design Center” in Shanghai, which supplements the development work of the production site in Changshu that the Company acquired in 2007 and

4

5

%

Only 45 percent of Chinese patients with chronic kidney failure currently have access to treatment.

2,500

Fresenius Medical Care already has 2,500 employees in China.

2018

Fresenius Medical Care’s first independent dialysis center opened in 2018.



120 M

China is home to 120 million people with chronic kidney failure.



is in close contact with the product development team in Schweinfurt. However, Fresenius Medical Care's China strategy also includes setting up new production sites. A plant in Beijing that manufactures dialysis concentrates began operations in August 2018. In late 2018, Fresenius Medical Care presented its first dialysis machine in India that has been developed specifically for the requirements of emerging markets. The machine, which the Company also intends to roll out in China, is characterized by particularly robust materials and lower production costs. "We are focusing on reducing production costs as a way of reaching as many patients as possible who cannot currently obtain treatment," says de Wit.

Fresenius Medical
Care's network
of clinics now
covers

10

of China's

32

provinces.

5
3
5
0
0
0

There were
around 535,000
dialysis patients
in China in
2018.



100000

More than 100,000 Chinese patients were treated with Fresenius Medical Care's dialysis products and services in 2018.

No.2

China is Fresenius Medical Care's second-largest product market.

GROWING EXPECTATIONS IN CHINA – ALSO IN TERMS OF PATIENT CARE

Reliability and high quality combined with market-specific solutions and needs-driven product innovations are key factors when it comes to successfully tapping attractive growth markets like China. "Of course there are challenges, such as varying bureaucratic requirements in the different regions and the need to adapt our product range to a health care system that is unlike any other in the world. Needless to say, we are experiencing a lot of new things along the way. But the outlook for the market is extremely promising. China is already our most important Asian market by some distance, and we believe there are considerable opportunities to press ahead with our positive expansion."

For de Wit, it is only a matter of time before China accounts for more than half of all products sold by Fresenius Medical Care. "After all, the country is home to 1.4 billion people, and its middle class is gaining in importance practically every day. As a result, expectations in terms of patient care are also rising."

With more than hundred thousand patients supplied with dialysis products and services every year in China, the country is already Fresenius Medical Care's second-largest product market globally. "The sales figures are set to grow significantly over the coming years," says de Wit. Business with dialysis products is currently considerably larger than that with treatment-related services. "Demand for dialysis services is currently picking up, and the response from the market and patients has been extremely positive. However, it will take some years before our product and service businesses are comparable in terms of volume. Product business will remain the most important area of the Chinese market in the immediate future."

For Han Xiong, the combination of dialysis products and treatment-related services is already the key to a better quality of life. Part of this is having enough time to talk to medical staff like head nurse Li Yufang, who has long become an important figure in Han Xiong's life. "I know her and every member of the team at the dialysis center in Urumqi personally. They always have time for my questions or even just a chat, which is something I really appreciate as a patient."

Fresenius Medical Care intends to open another 100 renal hospitals and dialysis centers in China over the next five years. This is an important first step toward establishing a comprehensive care network. However, as the figures also show, there is no such thing as a small step in China – change is always dynamic. And that is good news for patients like Han Xiong.



4,000

Fresenius Medical Care has provided products and services to more than 4,000 dialysis centers and renal hospitals in China by 2018.

17



100

Fresenius Medical Care intends to open 100 renal hospitals and dialysis centers in China over the next five years.

DR. OLAF SCHERMEIER

*Member of the Management Board
of Fresenius Medical Care,
responsible for Research and
Development*

VISION

INNOVATION

DR. JEFFREY LAWSON

*CEO
Humacyte, Inc.*

18

REGENERATIVE MEDICINE: THE ROAD TO HEALING

*What is the aim of regenerative medicine –
and how can regenerative therapies help
kidney patients in the future? Dr. Olaf Schermeier,
member of the Management Board responsible
for Research and Development at Fresenius
Medical Care, and Dr. Jeffrey Lawson, CEO of
Humacyte, Inc., a biotechnology and regenerative
medicine company, answer these questions.*



ON

I

Imagine you could simply replace body parts that are injured or damaged, whether from old age, illness, or an accident! A new kidney, a functioning blood vessel, a healthy liver from the lab? It's a great idea – but deemed to be far from reality. Meanwhile, researchers all over the world are advancing the development of regenerative medicine.

"At present, chronic conditions are primarily treated with therapeutic approaches that aim to contain the illness or the symptoms," explains Dr. Olaf Schermeier, member of the Management Board responsible for Research and Development at Fresenius Medical Care. However, the vision of regenerative medicine is not only to treat medical symptoms, but to actually combat and heal their cause. "Regenerative medicine aims to permanently restore the physiological functions of the organ or body part," Schermeier sums up.

CLEAR FOCUS ON KIDNEY DISEASE

Fresenius Medical Care has been quick to see the potential of regenerative medicine. In-house scientists work together with research institutions and biotech companies to develop areas of application for regenerative medicine. "Our main focus is naturally on therapy options for kidney patients as well as concomitant diseases," says Schermeier. "We want to be at the forefront when technologies of this kind make the breakthrough."

The potential uses in nephrology are wide-ranging: Regenerative medicine techniques could restrict the progress of kidney diseases; for instance, in diabetic patients whose kidneys have been damaged over many years due to poorly adjusted blood glucose levels. There are also promising approaches to restoring kidney function quickly in the case of acute kidney failure, avoiding long-term kidney damage.

STRATEGIC INVESTMENT: A WIN-WIN SITUATION

To identify and assess trends in regenerative medicine at an early stage, Fresenius Medical Care relies on a combination of in-house research and external investment. Cooperation with innovative start-ups is a key element of this strategy. To this end, the Company established Fresenius Medical Care Ventures in 2016, a venture capital fund that has set its strategic focus on investments in the regenerative medicine sector.

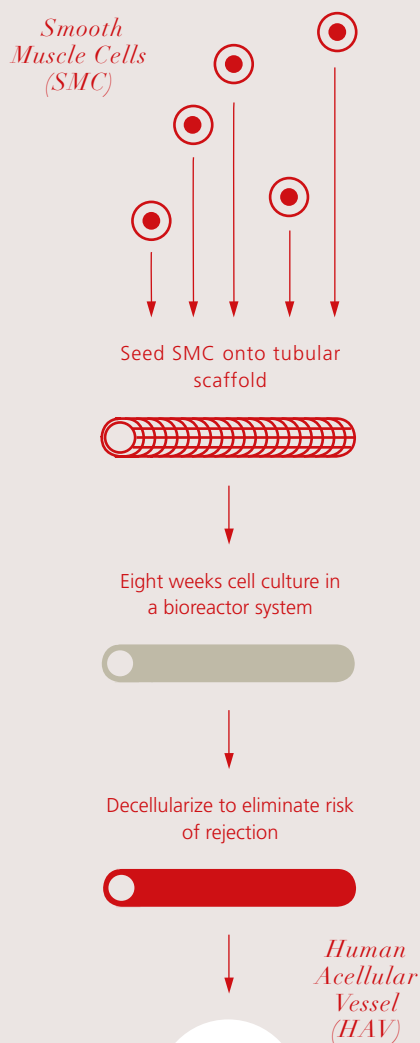
“

We want to be at the forefront when technologies of this kind make the breakthrough.”

DR. OLAF SCHERMEIER

Member of the Management Board of Fresenius Medical Care, responsible for Research and Development

THE HUMAN ACELLULAR VESSEL



Both sides benefit from these strategic investments and alliances: Whereas the start-ups bring fresh ideas, agile structures and innovative technologies to the table, Fresenius Medical Care contributes its experience in the health care industry, global relationships, and market access. “We know how to bring new products successfully to market in the different health care systems,” says Schermeier. “In addition, we have a great deal of experience when it comes to developing a prototype through to series production.”

BLOOD VESSELS FROM THE BIOREACTOR

One example of a promising strategic partnership is the Company’s collaboration with Humacyte, Inc. The U.S.-based biotechnology and regenerative medicine start-up has developed a revolutionary technology: Humacyte grows blood vessels from donated



In the future, our blood vessels could potentially offer hemodialysis patients a safer and more durable vascular access.”

DR. JEFFREY LAWSON

*CEO
Humacyte, Inc.*

smooth muscle cells in a bioreactor. Dr. Jeffrey Lawson, CEO of Humacyte and a vascular surgeon, describes the benefits for dialysis patients: “Because our human acellular vessel no longer contains human cells, this vessel can be implanted in the patient without the risk of rejection.” Compared to synthetic transplants, the technology is expected to result in fewer complications, infections, and fewer surgical procedures. “In the future, our blood vessels could potentially offer hemodialysis patients a safer and more durable vascular access, as well as a shorter catheter contact time depending upon the outcome of our investigation trials,” says Lawson.

In 2018, Fresenius Medical Care acquired a 19 percent stake in Humacyte as well as the global exclusive rights to market the biotechnologically manufactured blood vessel "Humacyl" for a combined investment of 150 million U.S. dollars. "We were immediately impressed by the technology," says Schermeier, explaining what lies behind the investment. The Company aims to further develop the invention and bring it to global markets. Humacyl is currently in phase III clinical trials in the U.S., Europe and Israel. Once these trials have been completed, the company intends to apply for regulatory approval in the U.S. and Europe. The strategic partnership is a win for both companies: "Fresenius Medical Care gets new technology from us that will allow them to help improve vascular access for dialysis patients even further in the future," says Lawson. "We at Humacyte have the opportunity of early and direct market entry."

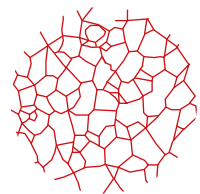
ABOUT REGENERATIVE MEDICINE

Regenerative medicine is all about healing rather than repairing. The aim is to fully restore body functions that have been lost as a result of an accident or illness. It might even enable us to slow down our aging process.

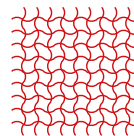
The new technologies include lab-grown biomaterials, tissue engineering, and stem cell or gene therapies. The goal is always the same: to permanently restore the healthy, functional, original state of affected tissue as far as possible.

A BRIDGE BETWEEN RESEARCH AND THERAPY

Fresenius Medical Care Ventures is constantly on the lookout for promising partners and investment opportunities. Fresenius Medical Care has also pooled its research activities in the field of regenerative medicine internally. In 2016, Fresenius Medical Care unveiled a new subsidiary, Unicyte AG, the result of long-term collaboration with the University of Turin in Italy. It was born from the idea that pioneering research results should not only be published in scientific publications, but also benefit patients as quickly as possible. "We wanted to build a bridge from academic research to developing actual therapies quickly," says Schermeier.



Biomaterials



*Tissue
Engineering*



*Stem cell or
gene therapies*

“

It will be a very gradual evolution that will improve our patients' lives in the long term.”

DR. OLAF SCHERMEIER

Member of the Management Board of Fresenius Medical Care, responsible for Research and Development

GRADUAL EVOLUTION

The first research results from Unicyte AG are promising: In a pre-clinical model with mice suffering from rapidly advancing kidney disease, their kidney function was almost fully restored. Particles derived from stem cells, so-called nanoscale extracellular vesicles, prevented scarring of the mice's kidney tissue. In another project, insulin-producing islet cells were grown in the laboratory. “We see this as a promising field for treating diabetes in the future,” says Schermeier.

So how close is the vision of regenerative medicine? “We could see therapy options that will enable us to fully restore our patients' kidney function in as little as twenty years,” according to Schermeier. However, he believes that a sudden revolution is unlikely. “It will be a very gradual evolution that will improve our patients' lives in the long term, and hopefully extend them, too.”



**FRESENIUS
MEDICAL CARE**

Ventures

FRESENIUS MEDICAL CARE VENTURES

Fresenius Medical Care Ventures was established in 2016 as part of Fresenius Medical Care's innovation strategy to enable targeted investments in start-ups in the health care industry.



UNICYTE AG

Unicyte AG is an independent subsidiary of Fresenius Medical Care. The Swiss-based biotech company operates in the field of regenerative medicine, focusing on kidney and liver diseases as well as oncology and diabetes.



WHEN MARIA STRUCK: ONE YEAR AFTER THE HURRICANE

*Well-prepared
and ready to deal
swiftly with all
eventualities to
save patients' lives –
survivors recount
the days and weeks
after Hurricane
Maria hit
Puerto Rico.*



IVONNE RAMIREZ

*Clinic Manager
Fresenius Medical Care*

DEDICATION

BOB LOEPER

*Vice President Operations
Support and Business Continuity
Fresenius Medical Care*



Ivonne Ramirez had experienced a few hurricanes in her life, but nothing prepared the Puerto Rican for the sheer destructive force of Maria that struck her island in the early morning of September 20, 2017 as a Category 4 hurricane. She had prepared at home by installing special windows that would withstand the lashing winds and by stocking up on supplies and water to last her a few days. When the power supply failed late the Tuesday night before, she huddled together with her family in the darkness, waiting for the storm to hit and hoping it would spare her house in the island's capital of San Juan.

"Around midnight we heard a loud bang and a pop. My son started screaming, and I ran to find out what had happened. It was like a scene from a horror movie," recalls the 57-year-old more than a year after the terrifying events. A large tree next to her house had been toppled by the storm and crashed onto her roof, breaking a window and burying her car under one of its branches. "We felt as if this hurricane wanted to wipe us off the island."

As a gray and wet morning dawned, the full extent of the storm's devastation became clear to Ramirez. The roads in her gated community were mostly impassable, blocked by trees and downed power lines. The whole island was without telephone or electricity, and she had no way of getting in touch with her parents, who live in the mountainous hinterlands.

After quickly surveying her home, Ramirez knew what to do next – she had to get to Los Paseos, the island's largest dialysis clinic operated by Fresenius

Medical Care, where she worked, as quickly as possible to check for any damage. As clinic manager at the facility, she knew that her patients' survival depended on her ability to get things sorted out immediately.

READY TO WELCOME PATIENTS AFTER JUST 24 HOURS

"We had gotten ready as best as we could – giving patients the necessary resources like an emergency diet list, treatment orders and the support hotline number. We had covered all the machines and secured the unit. But we had not expected this amount of devastation, and I wanted to get the place up and running again."

Ramirez was able to free her car from under a massive branch and carefully made the 30-minute drive across town to the clinic. Fortunately, it is located close to a main highway that

had already been cleared by emergency crews. As she discovered once she got there, Maria had felled a tree outside the building, which had only narrowly missed the backup diesel generator. This was still functioning, providing crucial electricity. The clinic's water supply was also intact. She ran down her list of contacts for maintenance and clinic staff and managed to get in touch with them. By the morning of September 21, Los Paseos

was the only clinic on the island ready to receive dialysis patients.

"It was quite a sight," Ramirez says, describing the scene that Thursday morning. "More than 200 people were waiting to receive treatment. Most of them were not even our patients, but my staff and I rocked it. Luckily, we have 60 seats so we were able to give every person who was waiting a three-hour treatment. We started at around 8 A.M. and worked through until 3 A.M. the next day," she says with a touch of pride in her voice. "Our lobby became the focal point for most dialysis patients on the island."

The story of Los Paseos and how it saved the day by providing life-saving



A fallen tree outside the Los Paseos Dialysis Clinic narrowly missed the generator.

“

*Our lobby became the
focal point for most
dialysis patients on
the island.”*

IVONNE RAMIREZ
*Clinic Manager
Fresenius Medical Care*

medical care to dialysis patients not only represented a rare beacon of hope in the grim aftermath of Hurricane Maria, but also points to the importance of having a well-laid-out disaster response plan in place. As Puerto Rico struggled to get back on its feet, Fresenius Medical Care experts arrived on chartered planes to help respond to the disaster. They brought with them pallets of food and vital supplies, and worked with local staff like Ivonne Ramirez around the clock to ensure water and fuel deliveries for the 28 clinics on the island.

ENSURING FUEL AND WATER SUPPLIES

"The first ten days after the storm were touch and go. At least one clinic had to shut down every day because of a lack of fuel or water. The hardest thing to deal with was the total collapse of communications," says Bob Loeper, Vice President for Operations Support and Business Continuity at Fresenius Medical Care, who arrived on Puerto Rico the following Monday. "It's the one thing that took us by surprise."

He had previously worked as Regional Vice President on the island and therefore knew the geography, its clinics and many of the staff members and doctors. What struck him as he stepped off the plane from Miami was



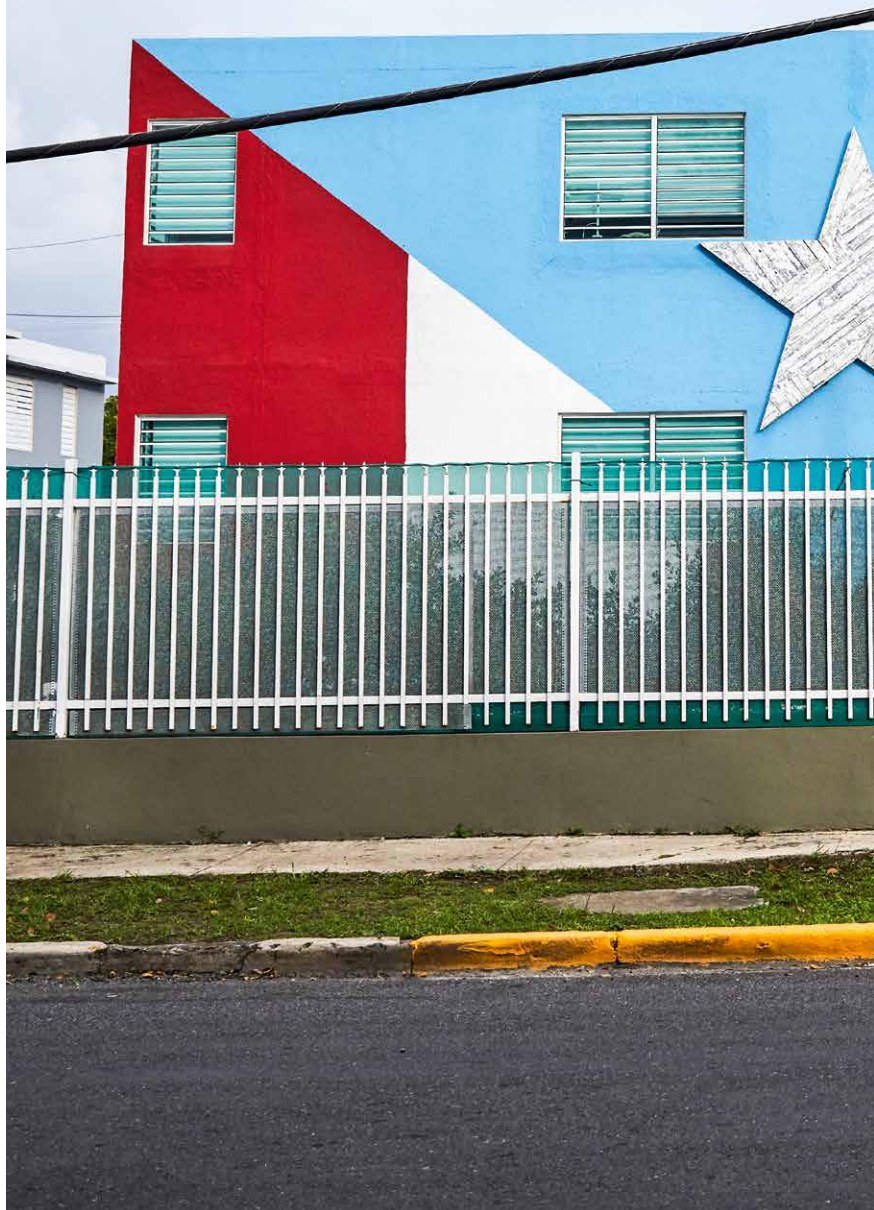
Bob Loeper and a colleague stacking food and vital supplies at a Fresenius Medical Care warehouse.

how eerie everything looked: "The trees didn't have a single leaf left on them. Everything had been wiped out. On leaving the airport, I wondered why so many people were parked on a bridge. It turned out they were trying to get a signal from one of the few cell towers still working."



SHOW THE FLAG

The Puerto Rican flag can often be spotted in the streets of the nation's capital, San Juan.





FACTS AND FIGURES

HURRICANE MARIA'S IMPACT

No.1

The longest sustained domestic air mission of food and water response in U.S. history

No.1

The largest disaster commodity distribution mission in U.S. history

No.1

The largest sea-bridge operation of federal disaster aid in U.S. history

20%

On the day after Maria only 20 percent of the water service was available.

95%

95 percent of cellular sites were knocked out.

0%

Puerto Rico's entire electrical grid failed.

30

41,000
LANDSLIDES

41,000 landslides shut down all but 400 miles of Puerto Rico's 16,700 miles of roads.

172 mph

peak intensity with a minimum pressure of 908 mb (millibars)



Maria knocked down 80 percent of Puerto Rico's utility poles and all transmission lines, resulting in the loss of power to essentially all of the island's 3.4 million residents.

No.3

Maria is the third costliest hurricane in U.S. history.



Approximately 6,000 patients, who needed dialysis to survive, lived on Puerto Rico in 2017.



The first plane chartered following Hurricane Maria had 14 pallets of food and supplies for patients, employees, and their families, and the process continued for four to five weeks.

Once on the ground, Loeper worked with the official Emergency Operations Center (EOC) where he requested water and fuel supplies for the Fresenius Medical Care clinics. "We had to go back and ask for supplies every day. Meanwhile the price of diesel had soared from three to six u.s. dollars a gallon, and any tanker trucks you could find driving around would only take cash," the emergency response expert says. "It was like the Wild West. You saw a truck coming and had to purchase the goods right there and then or somebody else would get them."

Loeper's team faced two main challenges in the aftermath of the storm: On the one hand, they had to make sure the clinics were operational to provide life-sustaining dialysis treatments. On the other, this required running generators and replenishing water supplies.

When Maria struck, there were a total of 6,000 dialysis patients living on Puerto Rico, 4,200 of whom were treated by Fresenius Medical Care. The authorities had to evacuate an additional 89 patients from St. Thomas, one of the u.s. Virgin Islands, to escape Hurricane Irma, adding to the workload at Los Paseos.

KEEPING IN TOUCH BY SATELLITE

While the clinic ensured the smooth provision of medical care, emergency crews were trying to get to victims of the storm, clear roads and restore at least some power and phone connections. According to official estimates, Maria had triggered 41,000 landslides that had blocked all but some 644 kilometers (400 miles) of Puerto Rico's 27,000 kilometers (16,700 miles) of roads. The Federal Emergency Management Administration (FEMA), the u.s. agency in charge of handling natural disasters, reported that the island's entire population of 3.4 million was without power the day after and that 95 percent of all cell towers were knocked out by the storm, not to mention land lines.

“

*We live by a simple motto.
We take care of our staff
so they can take care of our
patients.”*

BOB LOEPER

*Vice President Operations
Support and Business Continuity
Fresenius Medical Care*

To get around the blackout, Loeper had brought a dozen satellite phones with him to distribute to clinic managers and medical directors. But these high-tech devices were not without challenges, either. "You have to be outside, flip up the antenna to get a signal, and the other party has to be expecting your call." In the end, Fresenius Medical Care staff were able to communicate with clinics and staff members by various means, including instant messaging apps to share pictures of damaged equipment.

Equally urgent, though, was the need to help the 1,000 or so Fresenius Medical Care employees on the island and their families. Many had suffered wind or water damage to their homes or even lost them in the storm. Nevertheless, they eagerly reported to work every day to save lives. The Company flew in a total of seven charter cargo jets with dialysis supplies, water, food and scrubs. "We delivered all the things they needed to keep everyone fed," says Loeper: "Beans, rice, chicken, tuna, steam tables to prepare food, even utensils. Every clinic was given a pallet of food so the staff could take some home and also cook meals at work."

Guaranteeing food and shelter had a positive knock-on effect. "Our staff felt taken care of and even brought their kids to work," says Ramirez. "That way, our kitchen quickly became a kind of daycare center. It gave everybody a sense of security – and that sense of calm also rubbed off on our patients, who felt they were in good hands." She points out that Fresenius Medical Care went to great lengths to resolve the many major and minor problems that make dealing with the aftermath of a natural disaster so grueling.

To clean the scrubs used during dialysis, the Company bought washers and dryers for each clinic. Employees could also use them to do their own laundry while their homes remained without electricity and water. "Fresenius Medical Care truly excelled in its response to Maria," Ramirez says, looking back.

Based on the experience gained during Hurricane Maria, Fresenius Medical Care increased the number of personal generators on the island from around 100 to 370 units to supply power to the employees' homes, and shipped





2017'S

DEADLY HURRICANE SEASON

The U.S. government's National Oceanic and Atmospheric Administration (NOAA) is used to tracking natural disasters, but even by its standards, the hurricane season of 2017 stands out as the most damaging in history. Meteorologists recorded a total of 17 major storms between June 1 and November 30, six of which were classified as Category 3 or stronger – equivalent to winds measuring at least 178 km/h (111 mph).

That year, three tropical hurricanes – Harvey, Irma and Maria – hit the city of Houston, Texas, and various Caribbean islands, including the unincorporated U.S. territory of Puerto Rico, in quick succession. Classified as Category 4 and 5 storms, they reached maximum wind speeds of close to 300 km/h (186 mph). Images of entire neighborhoods that had been flattened and submerged as well as hundreds of thousands of people without electricity, shelter or food made headlines around the world.

According to NOAA's list of worst storms on record, Hurricane Harvey with damages totalling 125 billion U.S. dollars ranks second after Katrina (160 billion U.S. dollars) in 2005, followed by Hurricane Maria (90 billion U.S. dollars), and Irma in fifth place with damages of around 50 billion U.S. dollars. The mere dollar figures, though, mask the prolonged suffering by the affected population and huge number of casualties.

The island of Puerto Rico experienced the worst natural disaster in its history when Hurricane Maria roared ashore in the early morning of September 20. In a study commissioned by the island's governor, experts at the Milken Institute of Public Health at George Washington University pegged the death toll during the six months following Maria through February 2018 at 2,975. That makes Maria more lethal than Hurricane Katrina, which battered and flooded the city of New Orleans and its surroundings in 2005.



Ivonne Ramirez and her patient share memories of the disaster one year after the hurricane.



A large cross rises in a park above the Los Paseos Dialysis Clinic.

in two backup clinic generators on trailers. All dialysis facilities on Puerto Rico are required to have backup generators. However, as this was the first time the Company had to run them non-stop for weeks, it was decided to have backups on hand in case of generator failure. The Company also set up guarded gas cylinders throughout the island that hold around 350 gallons (1,300 liters) each so that staff can refill their cars and generator gas cans without having to wait for hours at the pumps. "We live by a simple motto," Loeper explains. "We take care of our staff, so they can take care of our patients."

Loeper has also been working hard to ensure that the clinics are better prepared in case of a complete breakdown of communications networks. Besides satellite phones, Fresenius Medical Care facilities on Puerto Rico now have half a dozen amateur radio stations and staff are being trained to become licensed radio operators.

SHARING BEST PRACTICES GLOBALLY

Finally, Fresenius Medical Care has been sharing insights and best practices from Puerto Rico with its global team. "We have set up a Worldwide Pandemic Planning Team with members from Europe, North and South America and Asia-Pacific," says Loeper. "It's become a forum for sharing our experience of general disaster response throughout Fresenius Medical Care."

Rebuilding Puerto Rico will take a long time. FEMA has allocated 1.6 billion U.S. dollars for emergency home repairs and another 1.4 billion U.S. dollars for grants to homeowners to repair or rebuild their houses and cover the cost of temporary housing. However, on the first anniversary of the storm in September 2018, power outages outside the capital were still a common occurrence, and nearly 60,000 homes had only temporary roofs that would not withstand even a Category 1 hurricane.

For Ivonne Ramirez, whose house and clinic survived largely unscathed, this latest hurricane to hit her island was one too many. During the first chaotic weeks of rebuilding operations, she frequently

visited a park with a large crucifix above the Los Paseos clinic to think things over. "I strongly believe we were protected and saved from greater damage by a higher power."

In July 2018, she made the decision to leave Puerto Rico and take up a new job as a Fresenius Medical Care clinic manager in Miami. "I realized that personally, I couldn't go through another situation like this again," she says. "But I learned a lot in those weeks and months after Maria and I saw the happy faces of the people we helped. Nobody can take those memories away from me."

DISASTER RESPONSE AND PREPAREDNESS

Fresenius Medical Care has developed a detailed program to prepare for natural disasters, which it is continuously enhancing. This comprehensive approach ensures that dialysis patients receive the life-sustaining care they need and that employees are safe and supported. A Disaster Response Team (DRT) maintains relationships with key local, regional and national entities to ensure that critical supplies are at hand. Training exercises are conducted regularly to make sure that operations run as smoothly as possible.

Dialysis patients have access to a 24-hour toll-free emergency hotline and are given various resources to help them prepare. These include detailed checklists for putting together emergency kits, stocking up on supplies as well as recommendations for meal planning.

Once a disaster strikes, mobilizing a local command center is the backbone of DRT operations. Daily update calls with representatives from departments across the Company help to ensure that staff are empowered to take care of patients quickly and effectively. In the case of Hurricanes Irma and Maria, those calls were continuous for 90 days.

Fresenius Medical Care brings in Company leadership from outside the impacted area to run an Incident Command Center that allows local leaders to focus on clinic operations. Command Center staff take care of logistics, including accounting for all patients and employees and arranging for the distribution of food, water, fuel, personal generators and other necessary supplies.

JIA-HONG WU
Student
Qiao-De Elementary School
Taiwan

IRENE FENG
Managing Director
Provider Business
Fresenius Medical Care
Taiwan

A
SUPERHERO
WINS OVER
ASIA-PACIFIC





T

The Kidney Kid shows school-children what superpowers the kidneys have – and how they can protect these valuable organs: Before Jia-Hong Wu can go and chase after his classmates, he has to stand still for a moment and wait for his turn to have his blue cape tied with a bow by Irene Feng. Then the nine-year-old can run off, straighten his red mask and join the other students of Qiao-De Elementary School in Fangliao Township in Pingtung County in the south of Taiwan, who are being treated with an extra-special lesson today. For an hour and a half, they will all be transformed into The Kidney Kid, the hero with the super kidneys.

All kinds of adventures are waiting for the students. First, they will get to see a video of their new superhero, before solving some tasks in an adventure book, competing against each other in a quiz and doing some gymnastics. By the end, thanks to The Kidney Kid, several hundred children will have gained a basic knowledge of how the kidneys work through play. “We learned that we can protect our kidneys by drinking more water, exercising more and eating more fruit and vegetables,” says Jia-Hong Wu after meeting the superhero.

The idea for the character came from Dr. Alexandra Villar, Senior Director Marketing & Communications in Asia-Pacific, to reach children all over Asia and inform them about their kidney health, regardless of their cultural or social background. The entire campaign has become a matter close to the heart and was driven and realized within Fresenius Medical Care – with great success.



The Kidney Kid is in the hearts of children.



Symbolic connection: Irene Feng ties a student's cape with a bow.

"This event is a real breakthrough in terms of prevention among Taiwanese children," says Irene Feng, Managing Director of Provider Business at Fresenius Medical Care in Taiwan. She explains that prevention and education are particularly important in Taiwan, as chronic kidney failure is more common there than anywhere else in the world. One of the reasons is people's lifestyle. "40 percent of Taiwanese drink too little water, 60 percent prefer sweet carbonated beverages, and half don't do any sports," says Irene Feng, citing a result of a recent online survey. That is why she believes it is particularly important to take action here.

EVERYONE IS IMMEDIATELY ENTHUSIASTIC

Fresenius Medical Care employees have been active in Taiwan since 2017 and have visited eight schools in total with The Kidney Kid. Half of Fresenius Medical Care's staff in Taiwan have already taken part in the events voluntarily. Irene Feng

has been to four schools and wants to keep on doing her bit to help. "This campaign is not only aimed at raising awareness of healthy lifestyles. The project intends to inspire students in rural areas to discover the different possibilities outside their own environment. This makes me feel like I am doing something good and valuable for society," she says.

Between 20 and 40 Fresenius Medical Care employees set out early in the morning, as most of the schools they visit are in remote regions of Taiwan. Once they arrive, they carefully prepare for the event. Every child receives a cape, a mask, stickers, an adventure book and information material, as well as fresh fruit and a bottle of mineral water. Tying the bow on the children's capes is a first symbolic act to establish a bond between Fresenius Medical Care's staff and the schoolchildren. Next, the volunteers navigate through the activities with the children. The boys and girls are instantly captivated, as superheroes are hugely popular role models throughout Asia.



"I'll appreciate my kidneys more now!" or "Thank you Kidney Kid for teaching us to protect our kidneys!" – such messages leave the schoolchildren on small pieces of paper to their superhero after the event.

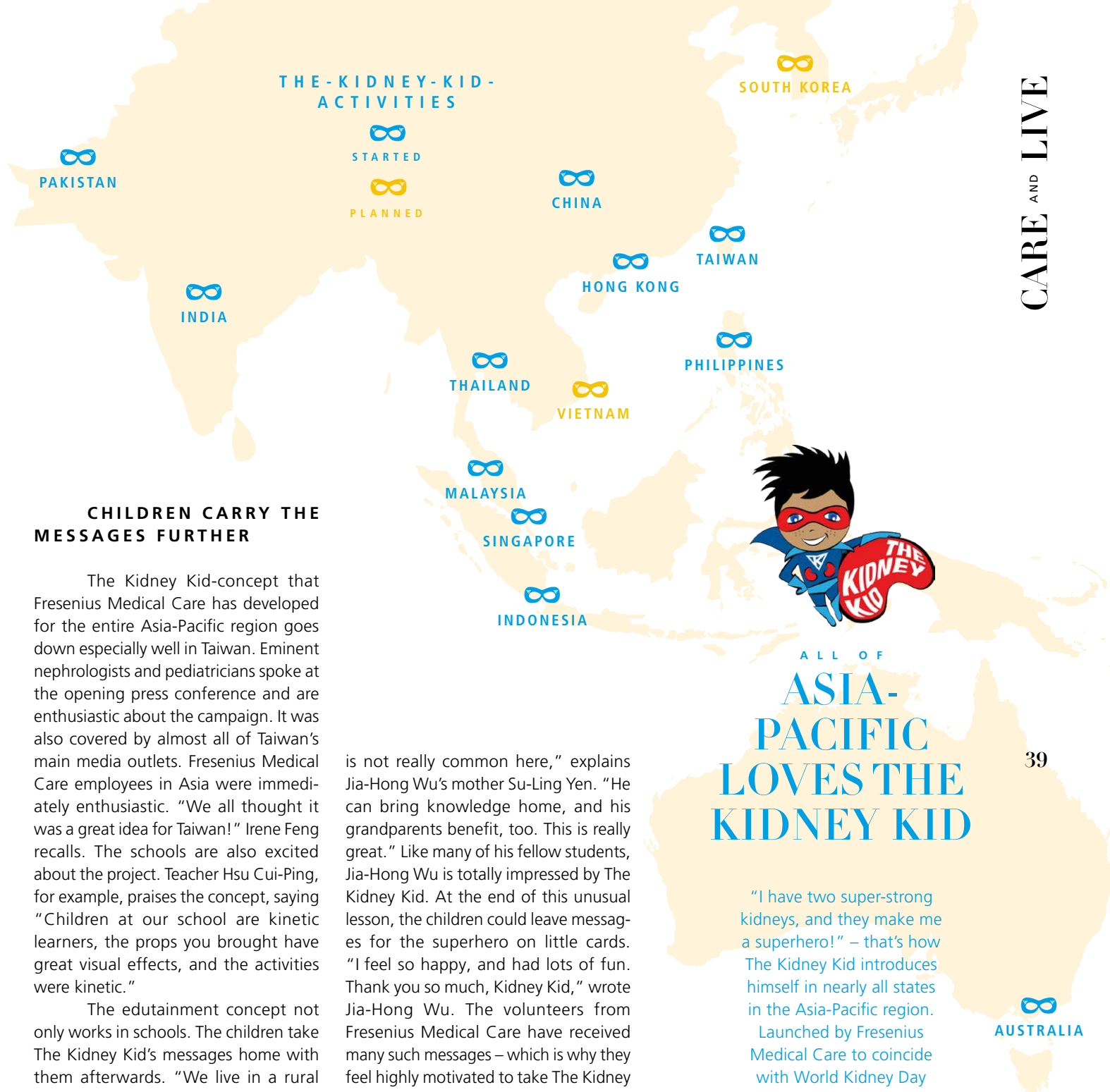
“

We live in a rural area, and knowledge about kidney care is not really common here.”

SU-LING YEN

Jia-Hong Wu's mother





CHILDREN CARRY THE MESSAGES FURTHER

The Kidney Kid-concept that Fresenius Medical Care has developed for the entire Asia-Pacific region goes down especially well in Taiwan. Eminent nephrologists and pediatricians spoke at the opening press conference and are enthusiastic about the campaign. It was also covered by almost all of Taiwan's main media outlets. Fresenius Medical Care employees in Asia were immediately enthusiastic. "We all thought it was a great idea for Taiwan!" Irene Feng recalls. The schools are also excited about the project. Teacher Hsu Cui-Ping, for example, praises the concept, saying "Children at our school are kinetic learners, the props you brought have great visual effects, and the activities were kinetic."

The edutainment concept not only works in schools. The children take The Kidney Kid's messages home with them afterwards. "We live in a rural area, and knowledge about kidney care

is not really common here," explains Jia-Hong Wu's mother Su-Ling Yen. "He can bring knowledge home, and his grandparents benefit, too. This is really great." Like many of his fellow students, Jia-Hong Wu is totally impressed by The Kidney Kid. At the end of this unusual lesson, the children could leave messages for the superhero on little cards. "I feel so happy, and had lots of fun. Thank you so much, Kidney Kid," wrote Jia-Hong Wu. The volunteers from Fresenius Medical Care have received many such messages – which is why they feel highly motivated to take The Kidney Kid to Taiwan's schools again in 2019.

With mask and cape: Girls and boys are fascinated by The Kidney Kid.



BLUE MAKES A DIFFERENCE

MORE THAN 500 MILLION
DIALYSIS TREATMENTS HAVE
BEEN CARRIED OUT USING
FX DIALYZERS FROM
FRESENIUS MEDICAL CARE SO
FAR. THE BLUE ART PROJECT
PROVIDES A NEW PERSPECTIVE
ON A PRODUCT WHOSE
DEVELOPMENT CAN BE SEEN
AS AN ART IN ITSELF.

ART

JOHANNES BRUNS

*Student communication design
RheinMain University of
Applied Sciences, Germany*

TECHNOLOGY

DR. JAMES
KENNEDY

*Senior Manager
Product Development
Dialyzers and Membranes
Fresenius Medical Care*



A

As Johannes Bruns stood in his room in his shared apartment in Wiesbaden, Germany, looking at the canvas, his acrylic paints and the dialyzer standing next to the easel, the young design student suddenly knew what to do next: "I need to crack this thing open." The 23-year-old wanted to understand exactly how the cylindrical filter with up to 20,000 ultra-thin hollow fibers and microscopically small pores worked. At least as far as was possible. After all, the around 100 million pores on the membrane surface of the fibers, which have the job of transporting the toxins out of the blood while retaining vital molecules, are only visible when magnified 10,000 times. "You can only create art if you actually study an object and begin to understand it," says Johannes Bruns at the start of the Blue Art Project. "Dialyzers are extremely complex – and even more fascinating when you factor in the human element. For my artwork, I wanted to get close to understanding what a dialyzer means for a patient and what role this medical product, which acts as their 'artificial kidney' three times a week, plays in a person's life."



FLOW 1

Johannes Bruns

The theme is the continuous flow of blood and life. The blue strap in the middle represents the uniform flow of blood and a continuously calm treatment. Dialysis is a life-giving stream that runs through the lives of those it affects. The abstract language of the form invites various interpretations.

Johannes Bruns is one of 20 students studying communication design at RheinMain University of Applied Sciences who participated in the Blue Art Project and applied their creativity to the FX dialyzers during the semester. The aim of the campaign initiated by Fresenius Medical Care was to get artists, designers and photographers to look at FX dialyzers from an entirely new angle and give them a new interpretation. The only specification was that the typical blue of the caps must be visible. A team from Fresenius Medical Care stayed in close contact with the students and explained the structure of the FX dialyzers and how they work, for example how transport of toxic molecules across the membrane is improved. Or why the three-dimensional microwave structure of the fibers enables optimum homogeneous distribution of the dialysis fluid. "The details were completely new territory for us – but very exciting," says Johannes Bruns.

HOLLOW FIBERS AS
HEROES

He can remember the first time he removed the two caps, cut open the dialyzer and held the hollow fibers in his hands. He immediately felt the desire to incorporate them into his art directly. Free-floating, they add a new dimension to his acrylic paintings. "For me, the hollow fibers are the heroes," Johannes Bruns explains.

“

*You can only create art
if you actually study
an object and begin to
understand it.”*

JOHANNES BRUNS

*Student communication design
RheinMain University of Applied
Sciences, Germany*



Almost half of all dialyzers around the world are made by Fresenius Medical Care. A Fresenius Medical Care spinning line produces around 18 million kilometers of hollow fibers per year. If all of the fibers produced in 2018 were laid out end to end, they would extend around 600 million kilometers in total – or 1,500 times the distance from the earth to the moon.

DEVELOPING IDEAS MEANS HELPING PEOPLE

Every day the experts at Fresenius Medical Care work on refining the details to continuously improve the dialyzers – a microscopically perfect system – and make the treatment they offer even more effective. Researcher and developer Dr. James Kennedy is one of them. “Because every improvement makes day-to-day life better for patients,” explains the 34-year-old. As the world’s leading provider, Fresenius Medical Care has been researching and manufacturing dialyzers for over 40 years. The state-of-the-art, high-specification FX dialyzers are the market leaders. That’s because employees like Kennedy continue to step up the pace of development. The American earned a doctorate in Biomedical Engineering and knew what motivated him from an early age: “I wanted to develop ideas that would help people.” Ever since a football injury to his leg as a 17-year-old led to doctors discovering a tumor, which was successfully removed, he has taken the patient’s perspective to heart.

“

*We need developers
who are prepared to take
new approaches.”*

DR. JAMES KENNEDY

*Senior Manager
Product Development
Dialyzers and Membranes
Fresenius Medical Care*

18.4

M KM

A Fresenius Medical Care spinning line produces 18.4 million kilometers of hollow fibers per year. To date, more than seven billion kilometers of hollow fibers have been produced from synthetic polysulfone for use in dialyzers.



600

M KM

Last year, Fresenius Medical Care produced more than 160 million dialyzers. This required hollow fibers with a total length of around 600 million kilometers.

200,000

In St. Wendel (Germany) alone, around 200,000 dialyzers leave the factory – every day.

500

ML

On average, 500 milliliters of dialysate flow through a dialyzer every minute.

0.035

MM

20,000

A single dialyzer contains up to 20,000 hollow fibers.

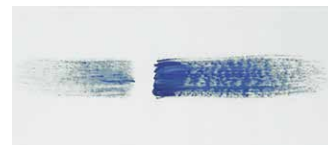
The walls of the hollow fibers are just 0.035 millimeters thick.



THE SCULPTURE

Julia Klos

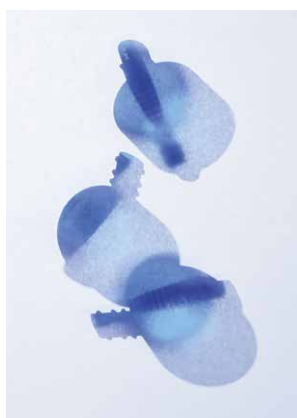
The artist arranges around 2,500 drinking straws of different lengths vertically, creating a three-dimensional wave structure. This symbolizes the wave-like arrangement of the hollow fibers in a FX dialyzer.



THE ACRYLIC PAINTING

Tassilo Borsch

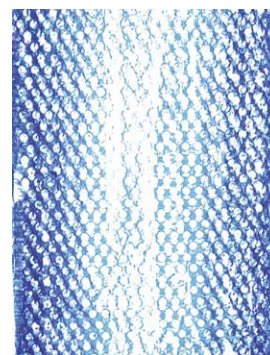
The painter convinces with a reduced symbolic juxtaposition of the blood flow: above the interrupted blood flow, below a continuous representation of the blood flow in the form of a sweeping curve.



THE PHOTOGRAPHY

Robert Lichtenberg

In this work, the renowned photographer Robert Lichtenberg focuses on the lightness and sustainability of the dialyzer material. These properties are represented by floating caps taken with a special lens.



THE METAL PAINTING

Anna Valerie Sixl

On a perforated metal plate, the depiction of a hollow fiber in close-up view – including the representation of the pores – develops a fascinating power and order.

The FX dialyzers are powerful, efficient, and tailored to patients' needs and to specific therapeutic areas. They have been perfected right down to the material of the casing, which is now made of polypropylene. And they are considerably lighter than their predecessors.

In Kennedy's department, abstract treatment and product improvements are turned into specific products or components. Once they reach the hands of doctors and medical staff, they make patients' lives easier. "Gentler treatments and improved cleansing performance means a better quality of life," says Kennedy. Creativity is a key factor in this: "We need developers who are prepared to take new approaches. Kidney failure is nothing new – but every advance we make in treatment can have a direct positive impact on patients."

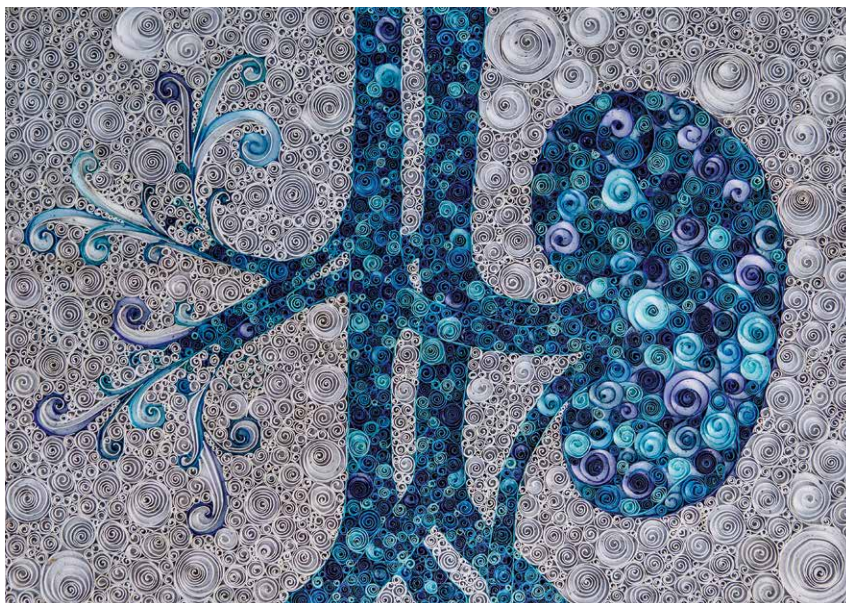
DESIGN DOWN TO THE MOLECULAR LEVEL

The way patients experience treatment is also affected by design. "Dialyzers should exude reliability and innovativeness. This is why we develop designs that fit into patients' everyday life as neatly as possible," says Kennedy. This begins with the choice of color for the caps and goes well beyond the inlets for the blood and dialysis fluid, which are placed horizontally to ensure optimal blood flow and minimize the risk of kinks in the tubing. After all, for Fresenius Medical Care, the concept of "design" applies right down to the microscopic level. "It even goes as far as the geometry of the fiber surfaces. To gain a better understanding of how a blood cell responds when it meets a fiber made by Fresenius Medical Care, we design and optimize our products at the molecular level, too," explains Kennedy.

The surprising aspect for the initiators of the Blue Art Project: The artists explored the FX dialyzers so thoroughly that new perspectives emerged on the core components of these "artificial kidneys". Some of the artworks dealt with the geometry of the fibers; magnified cross-sections illustrated the "heart" of the system and the walls of the hollow fibers, which are just 0.035 millimeters thick. "The continuous flow during treatment is a fascinating motif," says Johannes Bruns. His work focuses less on the filtering out of toxins and more on illustrating lifelines. By integrating the hollow fibers into his paintings, he creates new dimensions – new paths of life. "The calm and clarity of treatment made a great impression on me. I wanted to incorporate this in my work." "Life" and "Flow 1" are the names of his winning pictures that ultimately convinced an internal jury.

The artworks of the Blue Art Project were exhibited at a vernissage at the RheinMain University of Applied Sciences in Wiesbaden, Germany.

46



THE PAPER WORK

Katharina Wiesenecker

The artist has built a three-dimensional kidney landscape out of thousands of small paper spirals.



BLUE WORKS

"The art of research is to ask the right questions – and find the right solution to a problem." Kennedy notes that researchers and artists take a similar approach in this respect: "Artists have abstract concepts that they want to demonstrate in their work. We developers also have only a basic, abstract notion at the beginning of the process – the desire to improve patients' lives with a new idea. Then we do everything we can to turn our vision into a product or an application."

Today, the dialyzer that Johannes Bruns cut open is enjoying a second life on canvas. The fact that it could not be used by a patient is an acceptable sacrifice. After all, FX dialyzers are a success story, not just from the patient's perspective. In the near future, Fresenius Medical Care will celebrate a special milestone, when its two-billionth dialyzer rolls off the production line. The billionth dialyzer was produced as recently as 2013. Demand is growing rapidly.

The Blue Art Project-artworks were shown at a vernissage in October 2018 at the RheinMain University of Applied Sciences in Wiesbaden, Germany. Kennedy continues his work to optimize a fascinating design. Johannes Bruns will soon graduate. What does the color blue mean to them personally? Kennedy doesn't need to think for long: "Blue stands for the 'Care' in Fresenius Medical Care. It is the color of more than 112,600 employees with a shared goal: to improve patients' lives." As for Johannes Bruns: "For me, more than any other color, blue emanates two things in particular: serenity and calmness."



Common vision: The typical blue of the dialyzer caps became the connecting element of all Blue Art Project-artworks.



“
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DR. JAMES KENNEDY

*Senior Manager
Product Development
Dialyzers and Membranes
Fresenius Medical Care*

¡Gracias!

VIELEN
DANK!

谢谢

THANKS
A LOT!

感謝

*We would like to
thank our patients
and partners for
their confidence in
us and all employees
for their dedication
and commitment.*

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