

MAGAZINE
2017

creating
**ADDED
VALUE**



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creating
**ADDED
VALUE**

THE WORLD IS CONSTANTLY CHANGING. THE POPULATION IS CONTINUING TO GROW AND AGE. THIS CALLS FOR NEW SOLUTIONS IN HEALTH CARE, TOO.

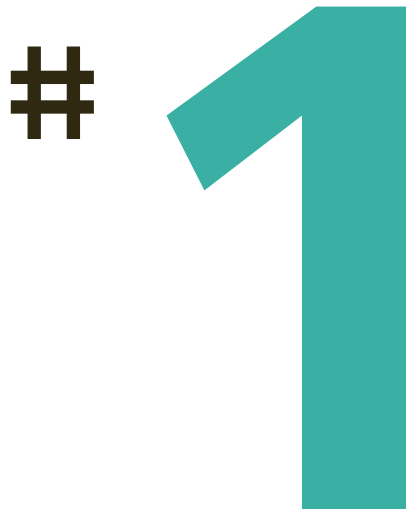
AT FRESENIUS MEDICAL CARE, WE ARE EMBRACING THESE OPPORTUNITIES, PRESENTING NEW SOLUTIONS AND EVOLVING CONTINUOUSLY IN LINE WITH THE REQUIREMENTS OF OUR MARKETS – FROM A PROVIDER OF INDIVIDUAL DIALYSIS PRODUCTS TO A PARTNER THAT OFFERS HOLISTIC PATIENT CARE. THIS ALLOWS US TO CREATE ADDED VALUE FOR OUR OVERARCHING GOAL: TO PERMANENTLY IMPROVE OUR PATIENTS' QUALITY OF LIFE.

One IS OUR GREATEST VALUE



Around the world, 3.2 million people with chronic kidney disease currently rely on dialysis because their own kidneys are no longer able to cleanse their blood. As the leading provider of dialysis products and services, we set new standards in therapy for patients with chronic kidney failure. Our aim is not only to offer treatment; helping patients to lead a rewarding life despite dialysis is what motivates us in our work around the world every single day.

4

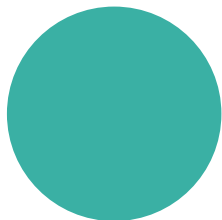


AMONG
ALL PROVIDERS



TOTAL REVENUE

65%
DIALYSIS SERVICES

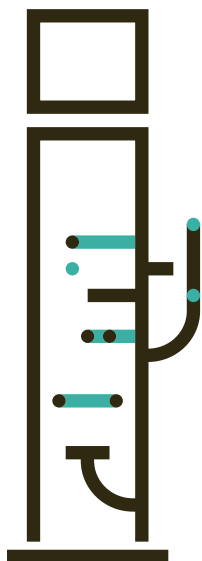


17%
CARE COORDINATION



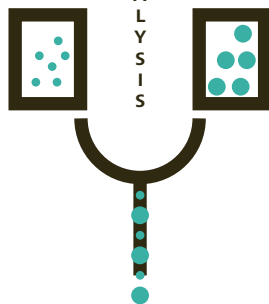
18%
HEALTH CARE PRODUCTS

H E M O D I A L Y S I S



Hemodialysis is the most common procedure in renal replacement therapy. It is used to treat 89% of dialysis patients, primarily at specialized dialysis centers.

P E R I T O N E A L D I A L Y S I S



Peritoneal dialysis is used to treat 11% of dialysis patients. It is typically administered several times a day by patients themselves at home, at work, or at night while sleeping.

A C U T E D I A L Y S I S



In intensive care units acute dialysis can save the lives of patients with acute kidney failure and protect them from long-term damage. Unlike chronic kidney failure, which is treated using hemodialysis or peritoneal dialysis, acute dialysis usually results in the regeneration of the kidney function without the need for further dialysis treatment.

We offer a broad range of products for our dialysis patients, from dialysis machines to filters. But above all, our local employees ensure that patients receive the best possible care. We run the world's largest network of dialysis clinics, where we provide our patients with a high number of individual treatments.

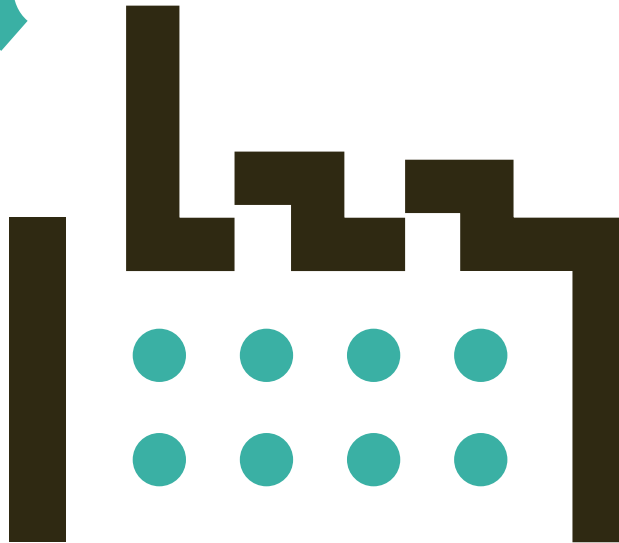
However, we see dialysis treatment as just part of a bigger picture. Care Coordination allows us to assist patients with their wider health issues by actively supporting them in organizing their medical care. In doing so, we always give our patients' welfare top priority.

Added Value

FOR A BETTER QUALITY OF LIFE

Patients who suffer from chronic kidney failure should not have to accept any compromises when it comes to their treatment.

Thanks to our comprehensive range of products and services, we can offer the right treatment for all patients and help them to lead a life worth living, despite dialysis.



WORLDWIDE
8,396
PATENTS

1
IN
2

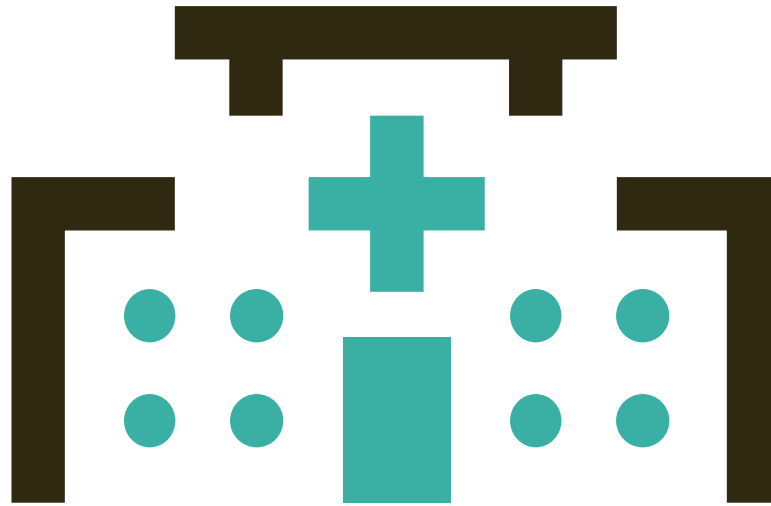
DIALYSIS MACHINES
WORLDWIDE IS MADE BY
FRESENIUS MEDICAL CARE

41

PRODUCTION SITES

3,752

DIALYSIS CENTERS



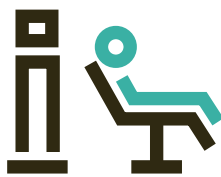
IN AROUND

50

COUNTRIES

320,960

PATIENTS



EVERY

0.7

SECONDS



WE PROVIDE A
DIALYSIS
TREATMENT

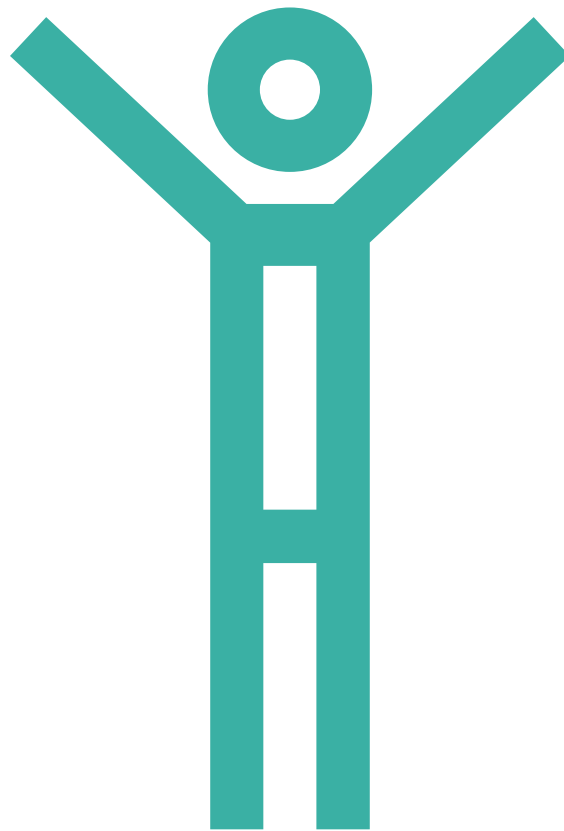
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To provide patient care at the very highest level, we systematically advance the development of new products and therapies. We are the only company in the world to offer dialysis products and dialysis

services as complete solutions for the treatment of patients with chronic kidney failure. From research and development to in-house production and treatment, we are the single point of contact in all matters relating to dialysis.

A Valuable Perspective **ON THE BIG PICTURE**

Health is our most valuable asset. At Fresenius Medical Care, we take a holistic approach to maintaining people's health. This is why, in addition to dialysis, we provide extensive support for a number of key health-related issues, enabling us to offer comprehensive, coordinated care.



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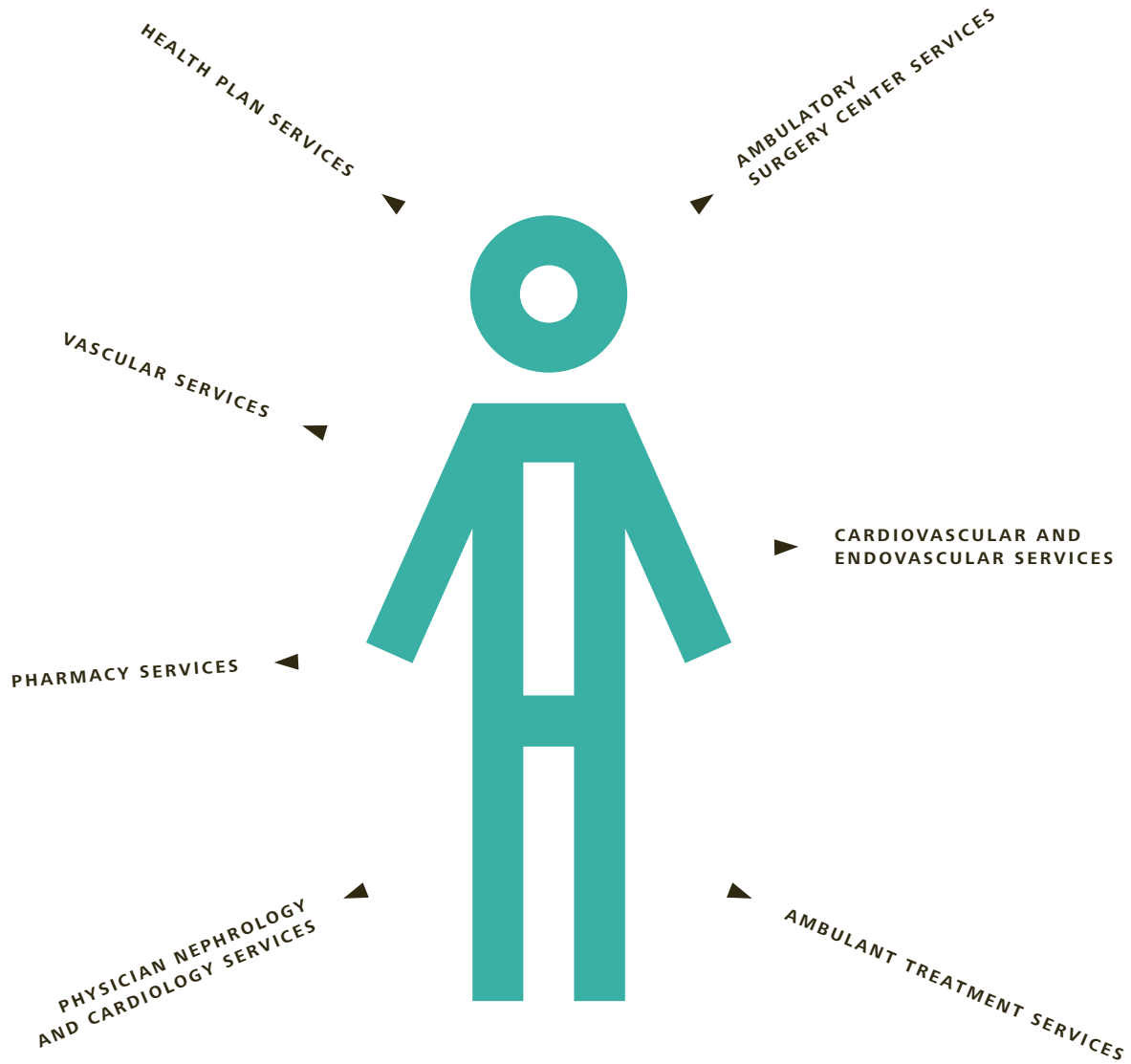
CARE

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**GENERAL
WELL-BEING**

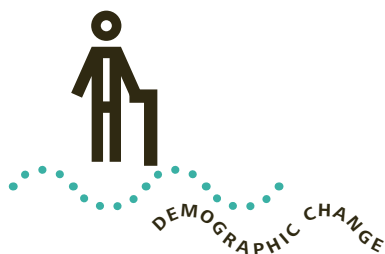
PATIENT FIRST



Our patients are at the heart of everything we do. Offering them the best possible treatment is our primary objective. We achieve this by coordinating their holistic care. We use our extensive expertise to continuously expand and improve patient care. This benefits the entire health care system, but above all our patients with their individual needs.

Seeing the Value IN CHANGE

The health care industry is constantly changing. We observe the global trends in health care so that we can play an active part in shaping the industry. We always see new challenges as an opportunity to make significant advances in our products and treatments, both now and in the future.



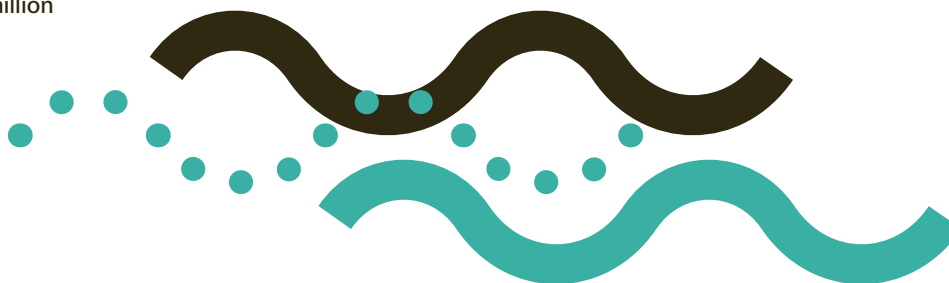
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People are living longer than ever before, but kidney function typically declines in old age. Consequently, the number of dialysis patients is expected to increase from 3.2 million in 2017 to 4.9 million in 2025.

INCREASE IN LIFESTYLE DISEASES



Lifestyle diseases such as high blood pressure and diabetes are on the rise globally. They can also impair the kidney function in the long term.



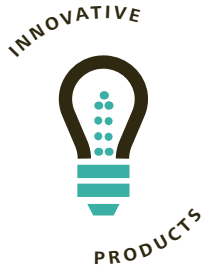
IMPROVED ACCESS TO MEDICAL CARE

More and more countries are investing in sustainable health care systems, opening up the possibility of dialysis treatment to a growing number of patients around the world.



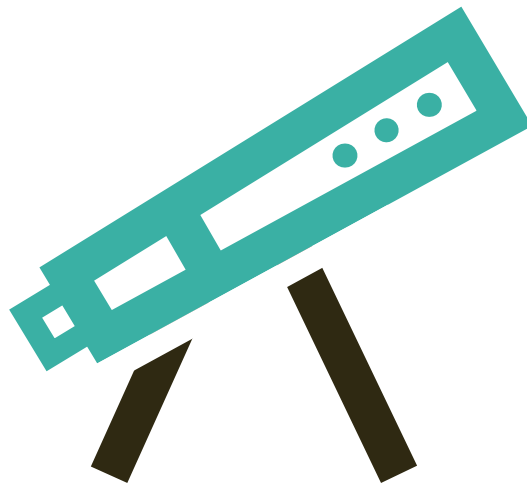
CHANGES IN THE HEALTH CARE INDUSTRY

Changes within the health care industry are also leading to a shift in demand, with a growing focus on holistic care for chronically ill patients.



The number of dialysis patients is rising. To meet this growing demand, we are also improving our products and treatment options. We evaluate alternative methods of treatment and analyze the new opportunities presented by value-adding technologies in order to continuously strengthen our technological leadership in the field of dialysis.

We are driving the standardization of dialysis therapies and processes in the interest of our patients. We can do this thanks to decades of experience in the treatment of patients with kidney failure. This is why one thing never changes: the high quality of our treatments.

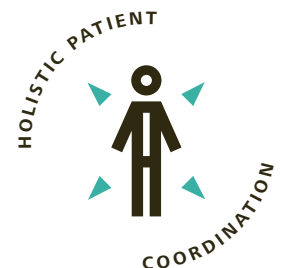


Creating **THE FUTURE**



We use the experience gained from our work at 3,752 clinics in around 50 countries to continually expand our network of outpatient facilities. These allow us to contribute our expertise in emerging countries with less well-developed health care systems.

We utilize our knowledge about our patients and the state of their health to act with foresight. Our aim is to guide them better through the health care system while strengthening relationships with the respective payers, achieving better clinical outcomes and reducing the number and duration of hospital stays.



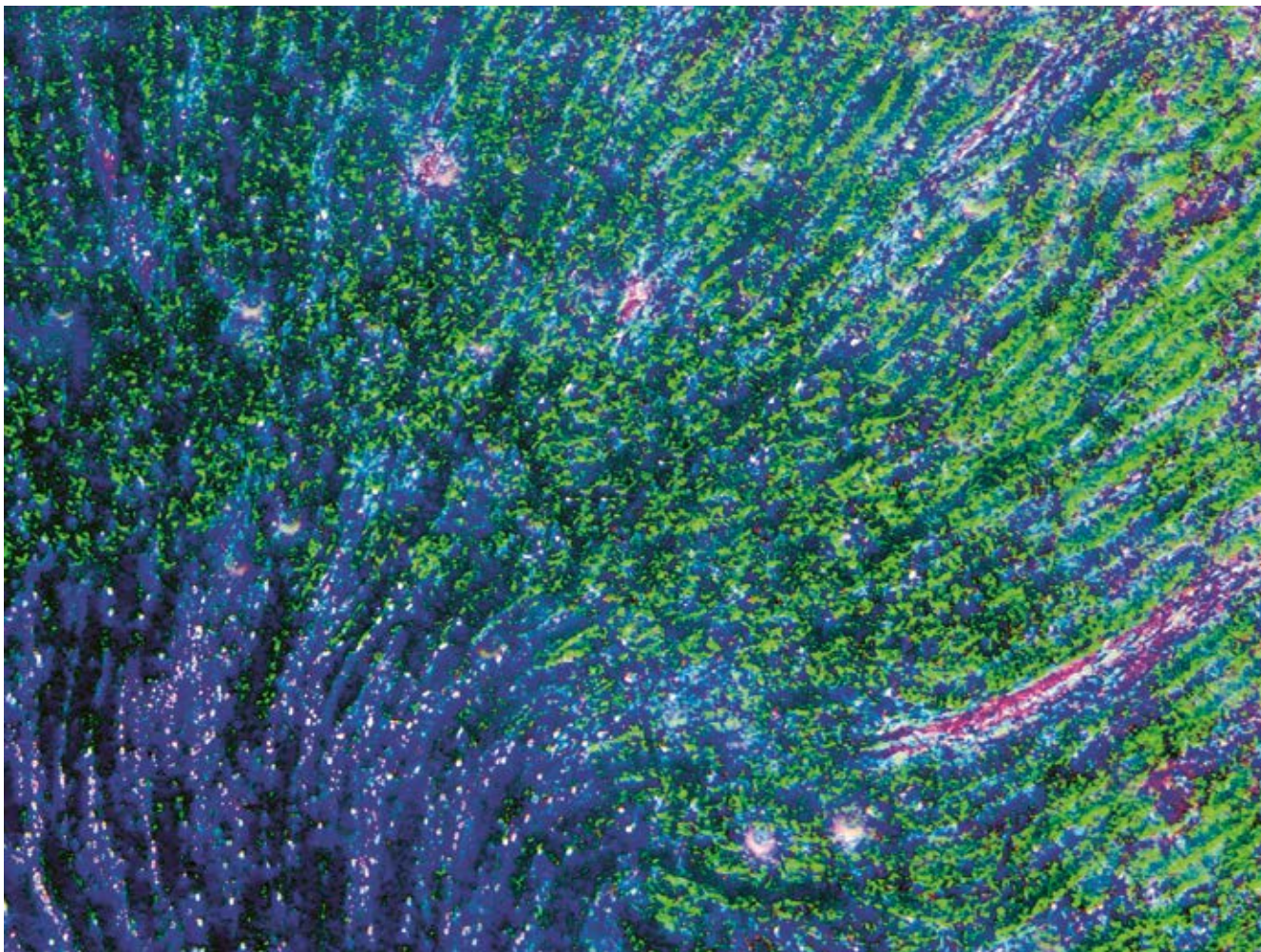
ADDED
VALUE
knowledge

THE *value* OF KIDNEYS

THE VALUE OF KIDNEYS

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PRESENTIUS MEDICAL CARE 2017



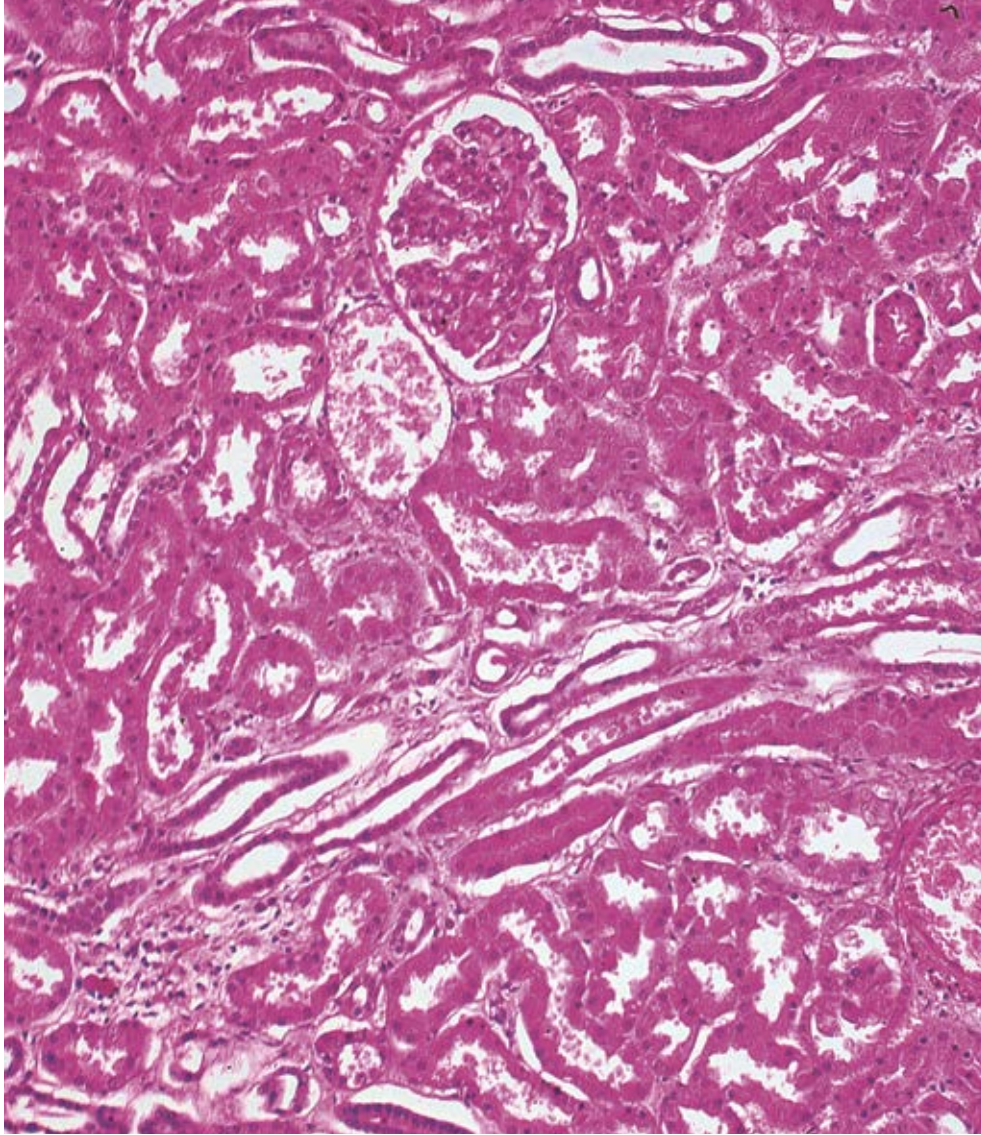
▲
 The renal cortex contains filtering units known as renal corpuscles – 1.4 to 1.5 million in total.

◀
 The kidneys are enclosed in a fibrous capsule comprising the renal medulla and the renal cortex. Every minute, a liter of blood passes through the kidneys, where it is filtered.

Kidneys are a miracle of the human body. Arranged in a pair below the ribs on both sides of the spine, their shape is reminiscent of two beans. But it is only when we take a closer look that their true fascination becomes apparent: Millions of filtering units known as renal corpuscles work tirelessly every day to filter out toxins that get into our blood through our food and are excreted via our urine.

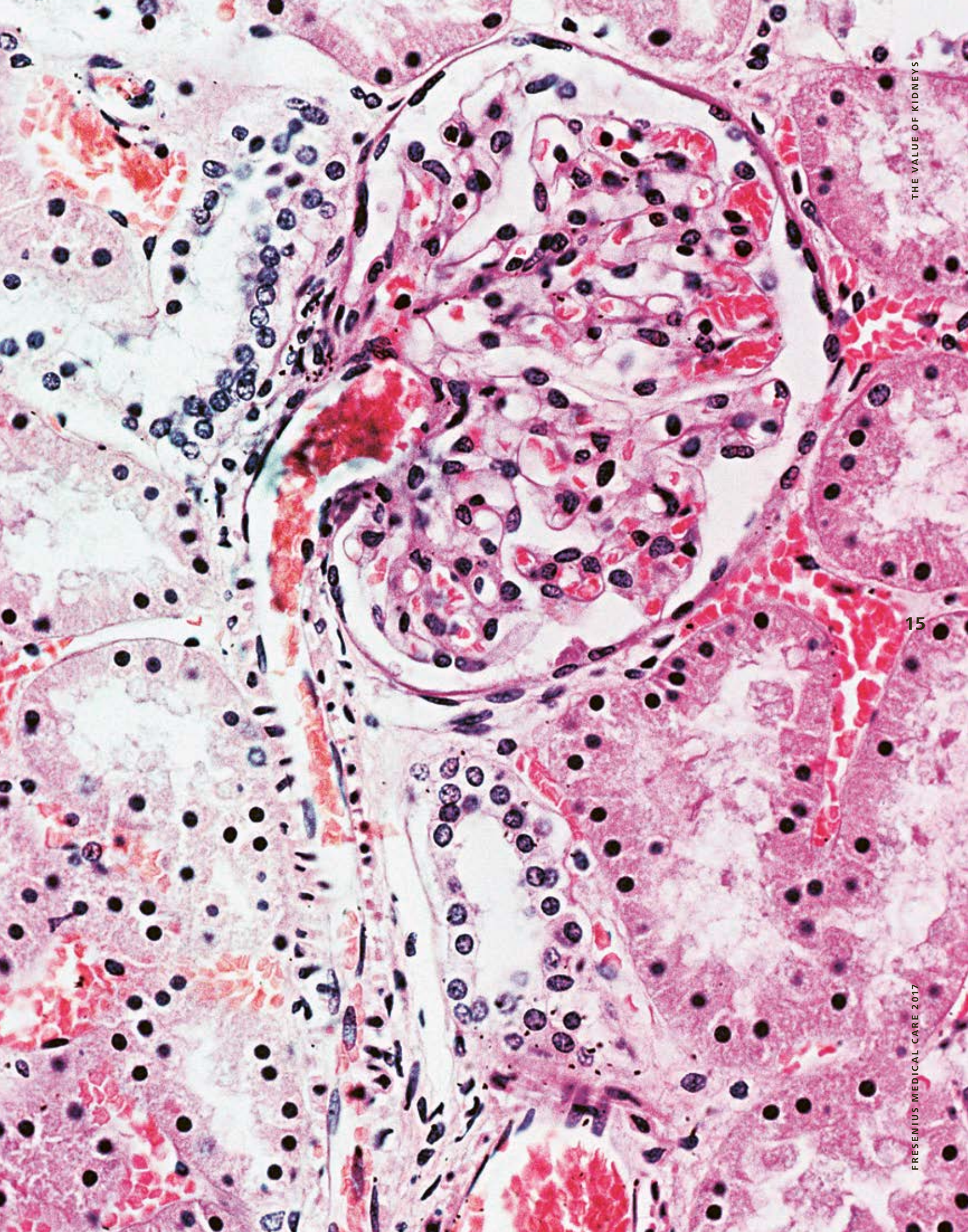
Two healthy kidneys are of inestimable value that is impossible to quantify. But their performance can be measured: Each day 1,500 liters of blood flow through the kidneys, and healthy kidneys cleanse the blood 300 times a day.

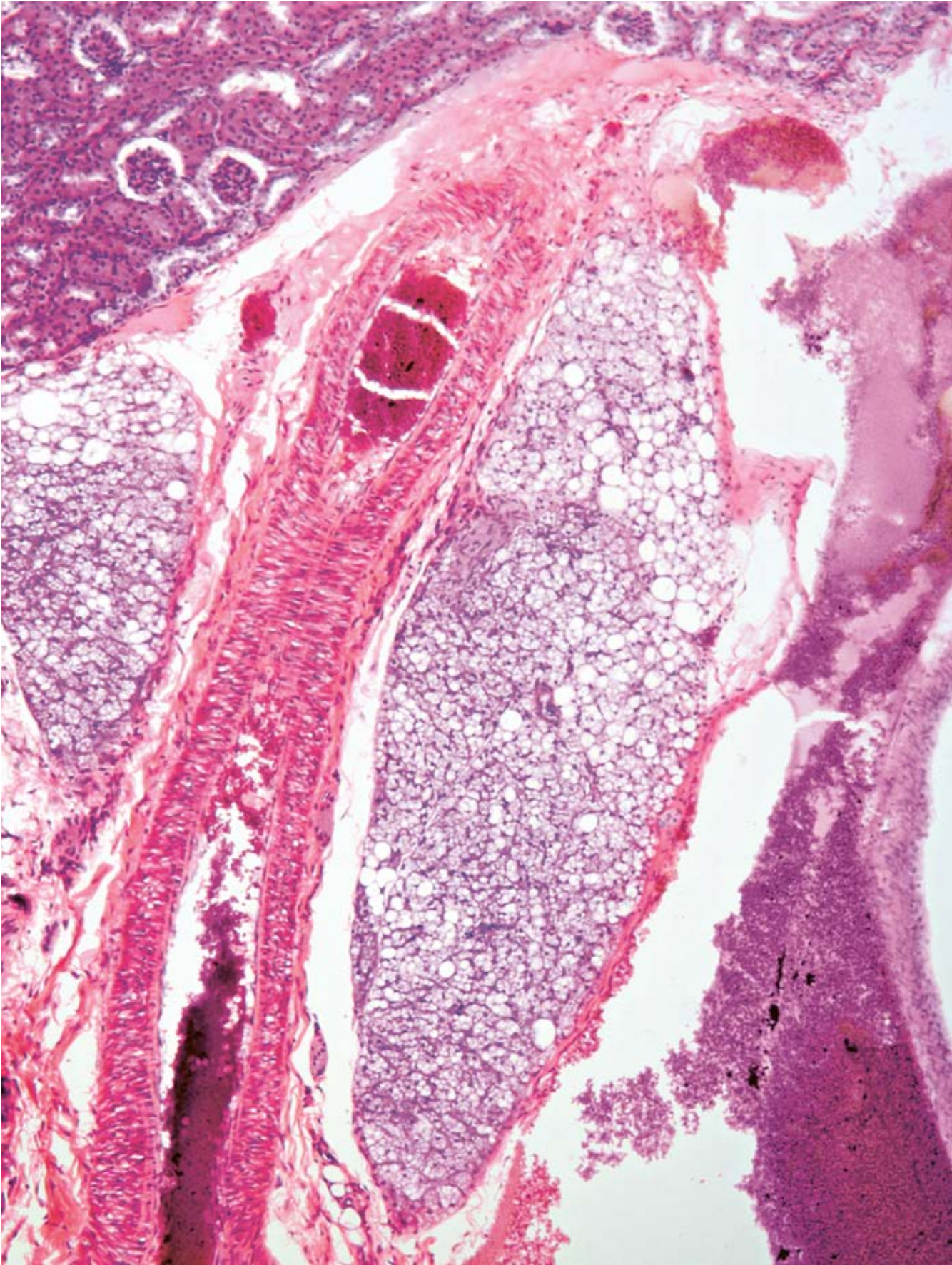
▶ The tiny blood vessels in the renal corpuscles have water-permeable pores. Toxins pass through these into the renal corpuscles, where they are filtered out, while proteins, vitamins, and larger blood cells remain in the body.



▲ A renal corpuscle is around 0.2 millimeters in size. It consists of a capillary glomerulus surrounded by a capsule known as the Bowman's capsule.

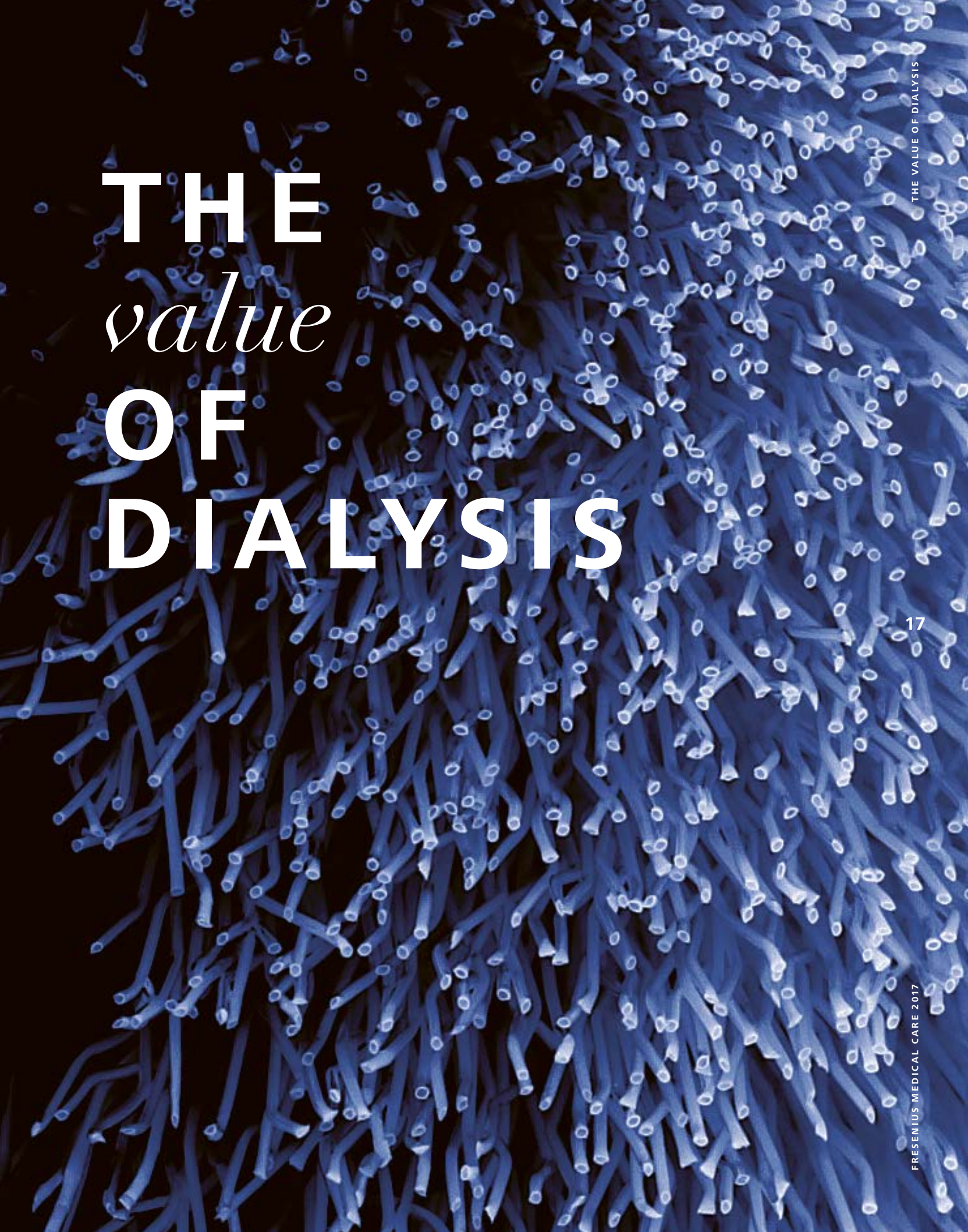
Cleansing blood is not the only thing kidneys do. They are responsible for a variety of vital tasks in the body: They regulate the body's water levels, maintain its acid-base balance, control mineral levels, and produce important hormones for regulating blood pressure and blood formation. Every single little renal corpuscle achieves great things.



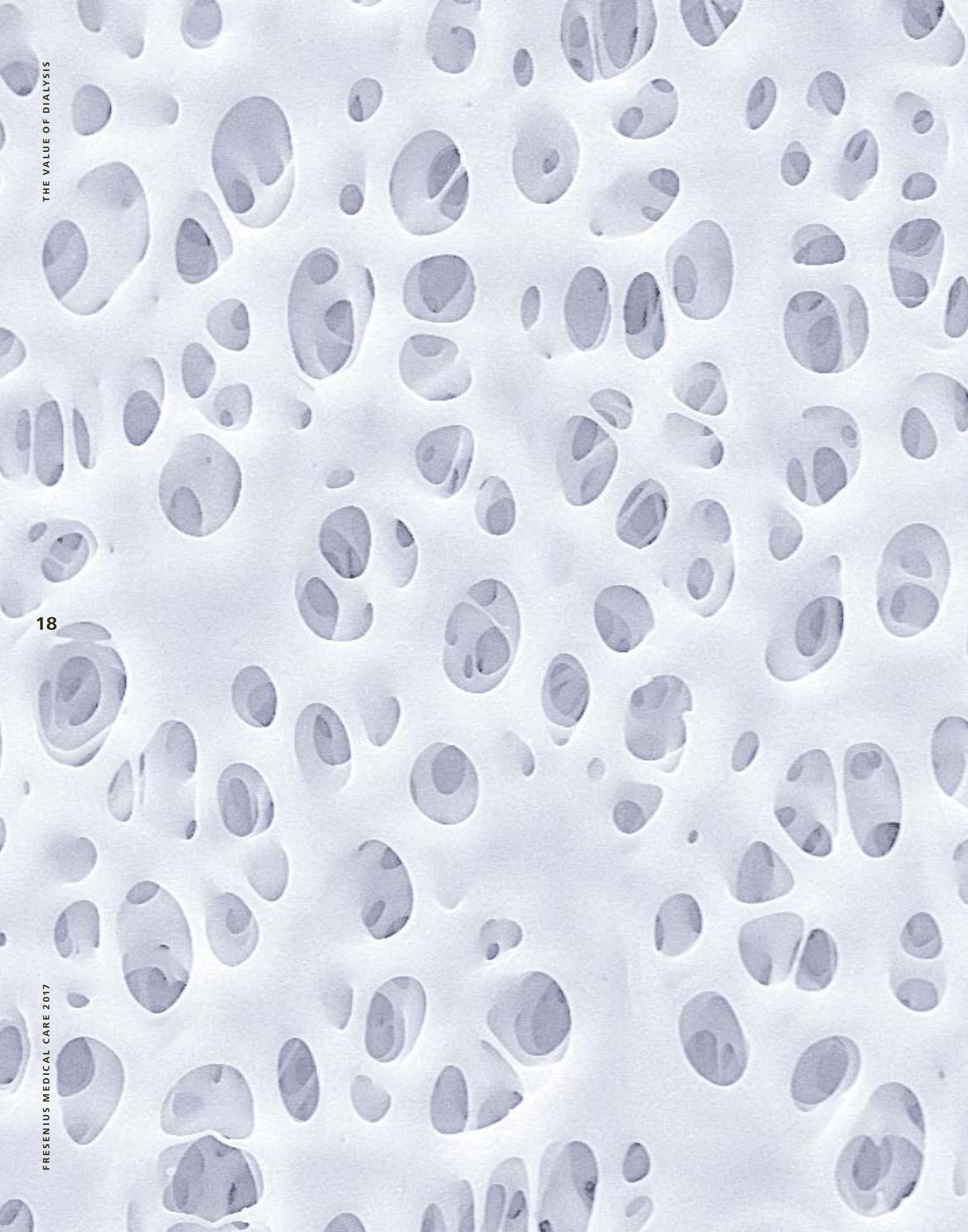


▲
Sectional view of the renal medulla and renal cortex. The kidneys are twelve centimeters long and weigh 120 to 200 grams on average.

▶
In the dialyzer, the blood is filtered through around 20,000 hollow fibers, each measuring 30 centimeters in length and 0.2 millimeters in diameter.



THE
value
OF
DIALYSIS



One square millimeter of the hollow fiber membrane contains more than 100 million pores. Toxins are removed from the blood through each individual hollow fiber, while vital molecules remain in the blood.



In peritoneal dialysis, the peritoneum performs the kidneys' cleansing function. The dialysis solution binds the toxins and transports them out of the body.

When the kidneys fail, dialysis therapy can assume their vital functions. "Dialysis" is Greek and means "separation". Two treatment methods achieve what the kidney otherwise does: separating harmful substances from good ones.

Hemodialysis is the preferred form of therapy used by 2.81 million patients worldwide. It involves cleansing the patient's blood outside the body by means of an artificial kidney called the dialyzer in conjunction with a dialysis machine. Around 20,000 plastic fibers inside the dialyzer filter out toxins and cleanse the blood. In every dialysis treatment, around 120 liters of blood pass through these fibers. A miracle – made by humans.

In peritoneal dialysis, the blood is cleansed within the body via the peritoneum. The peritoneum is one-and-a-half to two square meters large, well supplied with blood, and ideal as a substitute membrane for the filtering process. To this end, the abdominal cavity is filled with a dialysis solution through an implanted catheter. The dialysis solution absorbs the toxins via the peritoneum. Around 349,000 patients worldwide are currently undergoing this treatment method.

Alternatively, patients can get a kidney transplant. However, availability of donor organs is limited. There are currently more than 760,000 kidney patients living with a donated kidney.



ADDED
VALUE
flexibility

SMART COMPANION



21

Smart **COMPANION**

He loves to go on long bike rides and grows his own vegetables: Despite suffering from severe kidney disease and undergoing regular dialysis, Laurentiu Oancea feels fit and lives life to the full. He is able to lead this active lifestyle partly thanks to the smartphone app "My Companion".

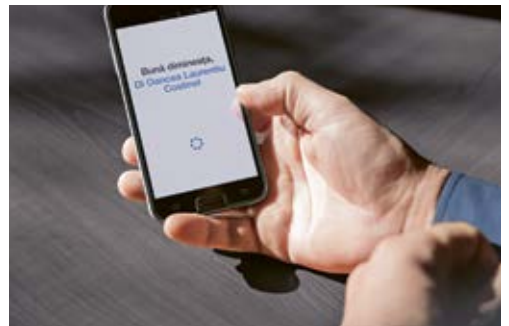
FRESENIUS MEDICAL CARE 2017



a



b



c

a Laurentiu Oancea talks with a nurse — b He records his blood pressure levels and his current weight in the “My Companion” app regularly — c The cell phone is his constant companion — d It makes his treatment much more transparent for him — e He also has his phone with him on his long bike rides



e



d

Just as Laurentiu Oancea is about to put on his sports jacket, his smartphone beeps. Probably his most important digital aid, the NephroCare “My Companion” app from Fresenius Medical Care, reminds him that he hasn’t taken his medication yet today. The 40-year-old thinks for a moment. Outside, the sun is shining, the snow-capped peaks of the nearby Southern Carpathians are glistening in the morning light, and his mountain bike is all set for the ride. But after hesitating briefly, he goes back into the kitchen, takes his medication, and, while he is at it, attaches himself to the blood pressure device. Once the measurement is completed and the current levels appear on the display, he enters them in the app and quickly scrolls to another section, where a tip tells him: “Physical exercise keeps your body fit.” Laurentiu Oancea smiles. Exactly, he thinks, as he leaves the house and hops onto his bike.

Laurentiu is a man with an athletic figure: 1.90 meters tall, upright posture, well-toned – if you met the Romanian, you would never guess that he is seriously ill. And yet, his kidney function gradually deteriorated over several years due to malignant hypertension until his kidneys eventually failed completely. As a result, he has relied on regular dialysis since 2015. And so the next day, he is lying on a bed at the Fresenius Medical Care dialysis clinic in Pitești, Romania. Laurentiu comes here three times a week for four hours. He is not alone – other patients are being treated at the same time in the dialysis room. They have got to know each other, but don’t talk much. While he is connected to his dialysis machine, Laurentiu usually remains silent, too. He prefers to watch a soccer match on TV in the center during his treatment.

Valuable INFORMATION

23

After treatment, Laurentiu meets the physician at the dialysis clinic. The conversation between the two has changed significantly since he started using the “My Companion” app: As well as going through the latest test results and discussing the progress of his therapy, they take a look at the data in the app on his smartphone. Because Laurentiu records his blood pressure levels in the app every day and always enters his current weight, for example, the physician can gain valuable additional information on the state of her patient’s health. And the app has made Laurentiu Oancea’s treatment much more transparent for him. He can ask more specific questions now and better assess what the individual data mean.

This is good, because for Laurentiu, it is important that he feels in control despite his illness. As a professional soldier, he was sent on many dangerous assignments in war zones in various countries. He can grit his teeth and prefers to deal with things himself before asking others. This strength helps him to get through his therapy. With regard to his illness, he believes that giving up is not an option. “When I found out about my illness, I initially thought it would just be a temporary thing,” he says. “But I now know that it is part of my life. That’s why I have learned to cope with it as I wait for a kidney transplant. I make the best out of it.”



f



g

24

f Three times a week, Laurentiu Oancea sets off to the dialysis clinic — g Romania is one of the first countries in which Fresenius Medical Care has introduced the app — h Not only the patients benefit from this — i The nurses also can use the information provided by the app to gain additional information on the patient's health state

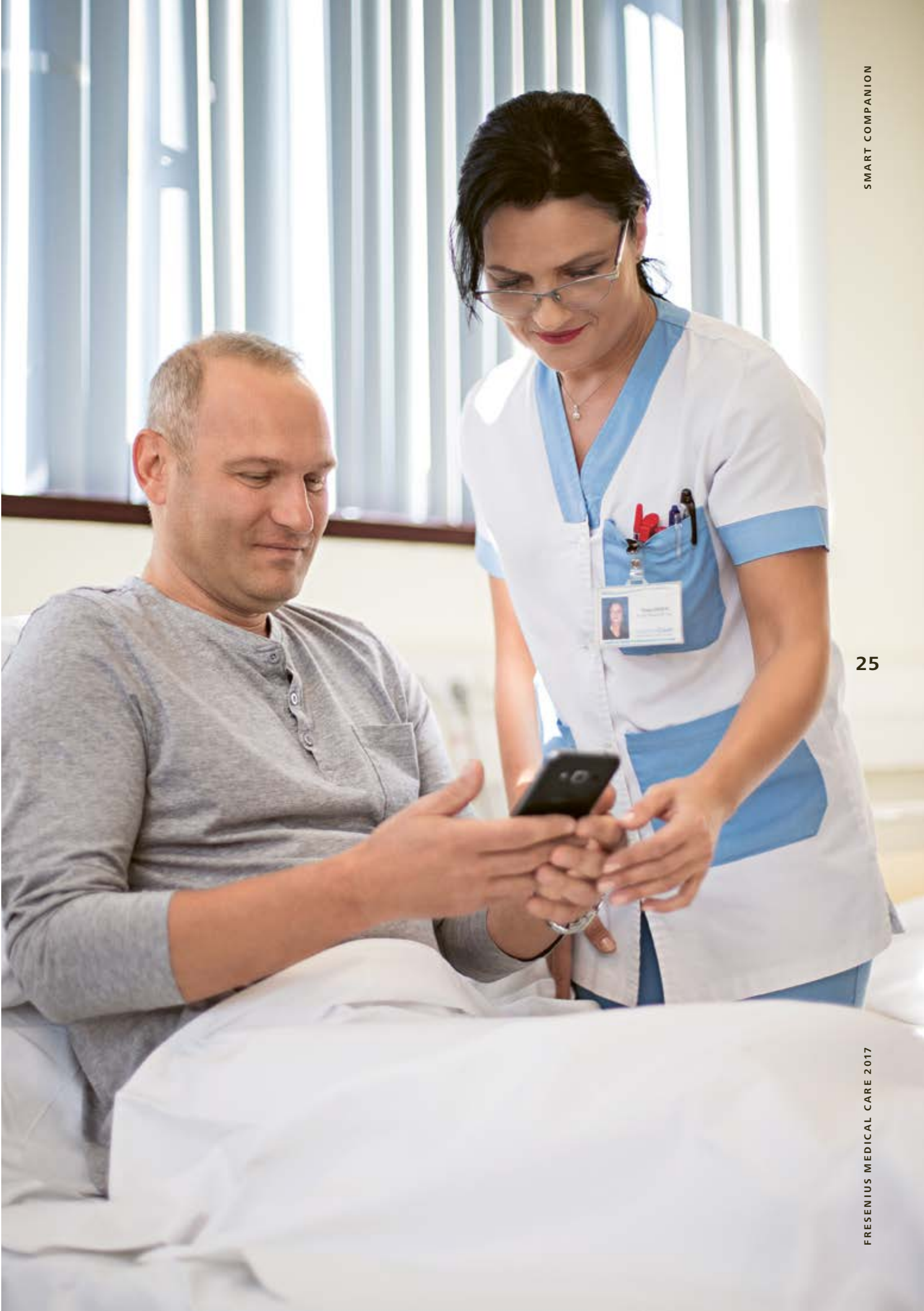


h

Knowledge GIVES STRENGTH

The app enables patients like Laurentiu to contribute actively to their therapy, and motivates them to apply the necessary self-discipline. "I find the app useful as a daily helper," says Laurentiu. "What's more, I like discovering new things, and I really enjoy playing around with it." Because the therapy data in the app is updated promptly and regularly, patients always have a good overview of the state of their health. An incorrect diet or even insufficient physical exercise can be reflected in some parameters shown in the app. Consequently, patients like Laurentiu can request a consultation with their physician, dialysis nurse or dietitian in order to take long-term countermeasures.

"I've always done a lot of sports, and still do," says Laurentiu. Cycling is one of his favorite leisure activities. He often goes on long rides through the countryside. As well as being good for his fitness, going out on his bike also helps him to clear his head. "I find it important to think about other things than my dialysis therapy. To avoid getting hung up mentally on this whole situation, I keep myself busy and pursue my hobbies."



j



k



26

j Laurentiu Oancea lives in rural Capul Pislului — k He shares the garden with his mother — l He rarely goes into the capital Bucharest — m He prefers to explore the countryside on his bike — n Or he takes care of the vegetable patch in his own garden

l



Positive **THINKING**

In his home village of Capul Piscului, Laurentiu lives next door to his parents and shares a lovely garden full of old fruit trees and vegetable patches with them. A couple of hens and a rooster are pecking away at a handful of corn kernels on the ground. Since falling ill, Laurentiu has started paying more attention to a healthy diet. After getting back from the strenuous dialysis, he sits down at the kitchen table and prepares a salad with cucumber, onions and a little tomato – all home grown. The app also gives him dietary tips. "If I'm going to get to grips with my treatment, it has to be in a purposeful and forward-looking way," Laurentiu explains. The fact that he has learnt to deal with his illness so well has obviously partly to do with his therapy at the clinic, but also the positive feeling of being able to play his own part. Laurentiu Oancea is optimistic about the future. He points to the wall in the kitchen, where several medals he received during military service are hanging. "I really want to work again," says Laurentiu, "I feel fit."



m



n



ADDED
VALUE
holistic care

Health in numbers



WILLIAM MCKINNEY
President of Fresenius Medical Care North America's
Integrated Care Group



DR. FRANK MADDUX
Chief Medical Officer and Executive Vice President for Clinical and
Scientific Affairs of Fresenius Medical Care North America

Charting
our course in renal
patient care

Every time we check the weather forecast, click an online shopping tip or follow a recommendation on social media, we are relying on predictive analytics. But what do these and other intelligent, user-centric services have in common? They are built on the incredible explosion in the number of available data we are currently experiencing. The predictive power of big data is also having a tremendous impact on health care.

Predictive analytics uses many techniques from the fields of data mining, statistics, modeling, machine learning and artificial intelligence. The goal is to create algorithms that analyze current data to make predictions about future events.

For us at Fresenius Medical Care North America, big data promises additional insights: We make every effort to actively take the opportunities it presents. Thanks to modern computer algorithms, for instance, we are already able to scan millions of patient records in seconds – something that would be impossible for humans to do in that short time. Predictive algorithms also help to reduce the frequency of hospital admissions, resulting in improved clinical outcomes and better patient care. Beyond that, we start taking responsibility not only for the quantity and duration of dialysis treatments, but also for medical outcomes and the cost of patient care overall.

In an interview with William McKinney, President of Fresenius Medical Care's Integrated Care Group, and Dr. Frank Maddux, Chief Medical Officer at Fresenius Medical Care North America, we talked about the potential of big data and predictive analytics to positively influence clinical outcomes, its impact on value-based care and why even major sporting events can affect coordinated care.

William, you are President of the Integrated Care Group at Fresenius Medical Care. This also includes Fresenius Health Partners. Can you please tell us a bit more about what Fresenius Health Partners does?

W. MCK. Fresenius Health Partners is the arm of Fresenius Medical Care North America that specializes in value-based contracting. We work with government payors, private health plans and Accountable Care Organizations to improve the health and outcomes of renal patients, while at the same time reducing the total cost of their medical care. Today, we do this through intensive care coordination and disease management for individuals with end-stage renal disease – known as ESRD. Big data is a key enabler for us.

Why? And what data do you rely on?

W. MCK. Like most health plans, we rely heavily on medical claims data to understand the cost and quality of the care we provide to our patients. The difference, however, is that we have the advantage of vast amounts of clinical data, much of which is available to us in near real time. Without access to that clinical data, we'd be stuck looking in the rear-view mirror most of the time – given the typical three-month or more "time lag" associated with medical claims data.

The most interesting aspect, however, is the possibility of combining clinical with claims data – and sometimes also with other, external data sources – to gain insights that neither data source would be able to supply by itself. Predictive analytics is the same concept taken to an extreme, with a heavy dose of data science behind it. Frank is the expert in that field.

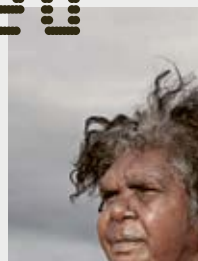
Predictive Analytics



Big Data



Value-based care



Holistic care

Frank, predictive analytics is on everybody's lips at the moment. But what does it mean exactly, especially for Fresenius Medical Care?

F. M. As William already mentioned, predictive analytics is a form of data science. In the health care business, it allows us to turn large volumes of patient and other information into a mathematical model that can give us valuable insights into a person's expected outcome and the nature of the care they may need. These models factor in past response to therapy and the conditions that could potentially affect patients' future health care needs. The opportunity to use predictive analytic modeling and advanced analytics allows us to identify patients with greater needs who might require more attention or specific interventions to optimize their health. As Fresenius Medical Care assumes responsibility for the total cost of health care for many of our patients, these insights help us to achieve better outcomes while lowering care costs.

How do you source your data for analytics?

F. M. We use a variety of sources, including internally generated clinical data as well as external data from public records, the federal government and other commercial sources. These data sources allow us to focus on four advanced analytical activities: predictive and real-time mathematical modeling, data science, risk stratification and in-silico physiologic modeling. We use these four categories to process the data and create electronic models of patients and their expected behavior, factoring in their personal characteristics and the environment in which they live.

How do you process the data?

F. M. We have various clinical, data science, research and mathematical experts who work together to look for ways to develop optimal computerized models that predict the clinical development of patients' conditions. These models are subsequently embedded in various electronic workflow tools used by clinicians to identify patients at risk. To build these capabilities, the models are "trained" to process and respond to the vast quantities of real-life data. Each predictive analytical model is then applied on a separate set of patients to determine how accurate the forecasts are. Obviously, we are aiming for the highest levels of predictive value.

And why is the predictive data Frank is generating also so important for you, William?

W. MCK. We serve a fairly unique population. Traditional "education-driven" disease management is unlikely to have a large impact on the outcomes of patients with ESRD. Improving outcomes for these patients requires a much stronger focus on removing barriers to care. Sometimes that involves education, but more often, it is a case of finding out what is happening to the patient right now that is likely to lead to a suboptimal health outcome. At the same time, we don't have the luxury of just focusing on the sickest 5%. We have to manage the entire population. In any given year, half of our patients will end up being admitted to hospital.

If you combine the two issues, you see that we need to intervene frequently in a large number of cases. That can be extremely expensive and inefficient. We need the highly precise predictive models Frank is talking about to help us target our efforts so that we engage with the right patients, at the right time.

Can you give us an example that uses predictive data?

W. MCK. While we have much more sophisticated examples, one is particularly easy to explain: our missed treatment report. We know that adherence to the prescribed dialysis treatment schedule is critical to the well-being of our patients. Our missed treatment report uses over sixty indicators – clinical, behavioral, demographic, and even sporting events and the weather – to predict whether a given patient is likely to skip treatment and the potential health impact if that were to happen. This lets us target those patients for proactive intervention.

F. M. Or think about the hospitalization risk for our patients. This is extremely important for us as our focus goes beyond "just" ensuring successful dialysis treatment, but to embrace the patient outcome as a whole – William already explained our value-based approach and the importance of data. As part of this evolution, our work to improve care and clinical outcomes has exposed how much of a cost driver hospitalization is. Improving clinical outcomes therefore has the potential to substantially reduce expenditures on these patients if the need for hospitalization can be reduced through more effective care models. Whenever we build these models, we are looking to connect better patient outcomes with greater resource efficiency and an improved patient experience.

From theoretical models to the real patient: How do you transfer your models or patient avatars to the clinics? How does clinical staff use the information you predict?

F. M. When we build an advanced analytical model, whether it be an electronic patient avatar that simulates the human physiology or a predictive model to try and identify patients with greater needs, our aim is always to embed it in the daily workflows of the clinical staff who actually care for patients. One example is the Care Navigation Unit used by William's team at Fresenius Health Partners.

W. MCK. Yes, our Care Navigation Unit embeds the missed treatment model and hospitalization risk predictive models into their daily operating dashboards. These dashboards enable clinical nurses to identify patients who have an increased risk of missing treatment or are at greater risk of being hospitalized. The nurses then proactively reach out to these individuals to see how we might help prevent their admission to hospital, for instance.

And how does the patient benefit from all of this?

F. M. Patients benefit from more personalized care. Consequently, patients who are at a higher risk of developing a predicted clinical problem can gain from the fact that our clinical staff can intervene earlier, when there is a greater chance that the patient will be able to avoid the negative progression. With that in mind, it is essential that patients participate in our clinical care program so that we can collect adequate data about their trends and responses to therapeutic efforts. This gives us the "ingredients" we need to build reliable models that perform well.

William, you use predictive analysis to offer or participate in programs run by public health care or private insurers. In these programs you are responsible not only for dialysis treatments, but for overall medical outcomes and cost of patient care. Isn't that an enormous responsibility?

W. MCK. We started testing value-based concepts as early as 2006, which gave us a very good sense of our ability to improve outcomes for patients with ESRD. So from our perspective, it was a case of waiting for the rest of the market to catch up! Essentially, the push "from volume to value" in recent years has been an excellent fit with our capabilities and strategy. Today, we're finally operating these value-based programs at significant scale with almost 35,000 patients, and we expect to see continued growth in this area. That scale not only gives us leverage on our infrastructure, it also provides us with stability – or as actuaries would say, credibility – in the population.

Do you have an example of how these value-based care concepts improve patient outcomes and quality of life?

W. MCK. We have numerous individual patient stories that highlight the impact this has made – that's what keeps our teams excited about the work they're doing every day. At a macro level, we can get an idea of our impact by looking at hospitalization rates. In one of our longest-standing programs, we've seen pretty dramatic year-on-year improvements that have enabled us to reduce hospitalizations by over 32% since we started. In our largest program, the Comprehensive ESRD Care (CEC) model responsible for the ESRD Seamless Care Organizations (ESCOS), we experienced a reduction of more than 5% in the total cost of care in the first year alone. Most of those savings came from keeping our patients healthy and out of hospital.

F. M. A primary way we can reduce hospitalizations is by keeping our patients healthy and ensuring they adhere to their dialysis treatments and therapies. There is no doubt that a reduction in hospitalizations correlates to an improved quality of life.

Looking ahead, what are your goals for the future? How do you aim to develop Fresenius Health Partners and the programs you offer?

W. MCK. Given the many co-morbidities that dialysis patients are subject to – mostly chronic diseases like diabetes and various cardiovascular disorders – we’ve been able to build the infrastructure and expertise not only for ESRD, but also in these related areas. This allows us to extend our capabilities and product offerings to include other complex, chronic conditions.

Can you give us an example?

W. MCK. As we manage more and more patients with chronic kidney disease that could lead to end-stage renal disease and the need for dialysis, our primary objective is to delay progression in existing patients but also to properly prepare those patients likely to progress to ESRD, for example by placing a permanent vascular access. Some of our emerging predictive models appear to be remarkably good at forecasting the progression of chronic kidney disease and helping us understanding the levers to manage this disease and the timing of the transition to ESRD.

What do you think is the future of predictive analytics in health care?

W. MCK. When it comes to managing patients with complex, chronic conditions like ESRD, it’s all about getting the right care to the right patients at the right time – almost the perfect use case for predictive analytics. The better we get at making predictions, the earlier we can intervene. Predictive analytics will, in my opinion, be one of the major factors that allow us to finally focus on preventive instead of reactive health care in the future.

F. M. I completely agree with William. Predictive analytics can give us a level of understanding that would simply not be possible even if we had an unlimited amount of time to look through individual clinical records. Looking to the future, this gives us even better opportunities to create care systems that use artificial intelligence to learn more about patients, enhance decision-making and accelerate response times. That way, we can help patients navigate and avoid complex health care problems.

What does this mean for Fresenius Medical Care in the years to come?

F. M. Our ability to expand the use of predictive analytics to optimize care pathways using richer and more useful data will allow us to make innovations in medical science to improve patient care a lot more quickly. The quicker we can advance technology breakthroughs and deploy them in clinical practice, the better we will be at serving the needs of our patients and creating a personalized experience that nonetheless fits with standardized processes of care. When all the insights from the data can be used directly by our clinical staff, we can look forward not only to better patient outcomes overall, but also to an optimal deployment of limited health care resources worldwide.

Thank you very much for the interview.

Building progress: In the future, global development will take place in the new Technology Center in Schweinfurt. This new building with short distances to bridge between research and production is a further example of the highly integrated, international working culture at Fresenius Medical Care.

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*“In the new Technology Center,
we will develop innovative solutions for the
benefit of our patients.”*

DR. OLAF SCHERMEIER

Member of the Management Board of Fresenius Medical Care, responsible for research and development

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employees work in research
and development at
Fresenius Medical Care worldwide.



36

What do virtual reality simulations, laboratories for measuring electromagnetic interference, rapid prototyping of machine components, and intercultural usability tests of prototypes have in common? They all play a key role when it comes to developing and optimizing dialysis treatment. Together with all other relevant areas of development, they will soon be housed under one roof – in Fresenius Medical Care’s new Technology Center in Schweinfurt, Germany. The building has the size of a soccer field and will accommodate the more than 1,200 employees already working on the site, a third of them in research and development. And the number is increasing. “In the new Technology Center, we will develop innovative solutions for the benefit of our patients. The focus is on close networking with clinic staff, patients, service and production.” says Dr. Olaf Schermeier, member of the Management Board responsible for research and development at Fresenius Medical Care.

The objectives and approach of the new Technology Center are clearly delineated: to continuously improve the daily lives of patients with end-stage

renal disease, develop products for an improved quality of life, minimize side-effects, generate knowledge more effectively worldwide, and bring innovations to production by the shortest route possible. In other words, to ensure that patients benefit from progress faster. This is a process that has long been established also beyond Germany’s borders: Fresenius Medical Care operates development sites worldwide from France and Italy to countries further afield such as Mexico and China, with 825 employees in research and development alone. Interdisciplinary teams across locations have been a reality for some time now, and networking across time zones is part of everyday work. In the future, all these strands will merge at the Technology Center in Schweinfurt, in a modern new building that embodies the Company’s interdisciplinary working culture.





“In dialysis technology, even the tiniest improvements can have a significant positive impact on patients’ daily lives. In this respect, closely coordinated development work that is advanced on a global scale is essential to Fresenius Medical Care,” says Johann Brede, the manager responsible for the Technology Center. “We are shortening our lines of communication and facilitating professional exchange to be able to react more quickly worldwide.” Topics range from improving individual components such as water treatment for dialysis to performing digital fine-tuning of equipment. For example, software developers are working on evaluating signals that show how blood properties change during the dialysis treatment.

As dialysis expertise involves a wide range of disciplines, a clash between the different working methods applied in the various specialist departments is something that is expressly desired. A dialysis machine incorporates knowledge from the fields of medicine, electronics, mechanics, physics, chemistry, and physiology, as well as production technology, process engineering, and IT. Catering for regional specifics is an increasingly important aspect of development work. What are the implications for the design of a touch screen for a new dialysis machine if staff in Germany are used to and want no-frills displays, while in Asia, more playful ones with pictures are the cultural norm? The answers to questions like these are explored by international teams that collaborate on specific projects. That way, effective solutions can also be found more quickly for growth markets with specific regional needs.

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Catering for regional specifics is becoming increasingly important. It will also be possible to optimize the operation of devices by means of virtual reality tests.

“We are shortening our lines of communication and facilitating professional exchange to be able to react more quickly worldwide.”

JOHANN BREDE
Director Interface Management Global R&D

“A medical product is not a lifestyle product. If the screen fails on a cellphone, it’s annoying, but it must not happen to a dialysis machine while a patient is connected,” says Johann Brede. In so-called usability labs, authentic clinic environments can be simulated to find out how self-explanatory the devices actually are for specialist staff. “We can gain valuable findings by testing how application consultants from Germany, India or Australia handle newly developed devices like the dialysis machine 6008, for example.” In future, it will also be possible to optimize the operation of devices by means of virtual reality tests.

In the laboratories and test rooms in Schweinfurt, the devices are constantly available and placed nearer to the project teams than ever before. Software developers and mechanics work closely together assisted by rapid prototyping, a process that allows new components to

be produced on a 3D printer and immediately installed on the product and tested. Interference from cell phones for instance, an increasingly common phenomenon in the mobile age, is simulated and analyzed in the electromagnetic compatibility labs. And in the verification and test centers, modules and machines are subjected to long-term tests to ensure their long service life and durability.

Fresenius Medical Care operates over 40 production facilities, manufactures more than half of all dialysis machines in the world, and performs around 48 million dialysis treatments a year. Every patient has highly individual requirements in terms of their treatment. The Technology Center will be the central interface – between customer preferences, user priorities, development, and production – a cradle of innovation.

“Having cross-functional teams with different cultural backgrounds allows us to maximize the effect of our innovation work and ensures that we always meet the high quality requirements of our customers worldwide.”

FEI WANG

Senior Software Development Expert, Concord, California, U.S.

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M**

dialysis treatments are performed in Fresenius Medical Care clinics every year.









b

ADDED VALUE

sharing knowledge

- a Dr. Sovann Kanitha, M.D., nephrologist Phnom Penh, Cambodia
- b Margaret Clarke, Director of Home Therapies South Asia-Pacific, Fresenius Medical Care, Singapore
- c Prof. Dr. Peter Kerr, Director of Nephrology at Monash Medical Centre, Melbourne, Australia



c

long- and short-term fellowships have been funded by CREED

19



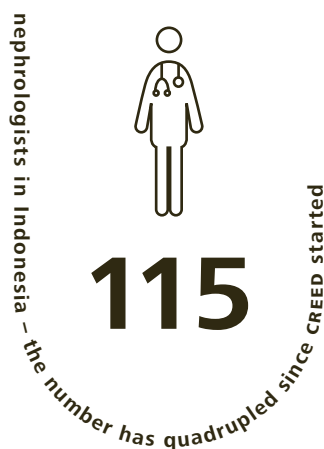
SHARING KNOWLEDGE

achieving more

In many Asian countries, health care systems are just starting to evolve. Fresenius Medical Care set up the CREED program in 2001 to promote the exchange of knowledge about dialysis in the region. Dialysis centers in Australia and New Zealand are committed to this partnership, with major success.



d



Dr. Sovann Kanitha is still excited after having spent two weeks in Melbourne, Australia. “The way they work here is truly extraordinary,” says the nephrologist from Cambodia. The 37-year-old, who runs a small dialysis clinic in Phnom Penh, can only dream of conditions like those at the Monash Medical Centre, a teaching hospital linked to the neighboring university. Dr. Kanitha is a CREED fellow in Australia, where he has shadowed staff in the renal unit for two weeks.

CREED is a program set up in 2001 to promote the exchange of dialysis knowledge in Southeast Asia; the abbreviation stands for “Cross-Regional Education & Exchange in Dialysis”. The program is jointly supported by Fresenius Medical Care, the Australian and New Zealand Society of Nephrology (ANZSN) and the International Society of Nephrology (ISN). One method of exchange is enabling a stay abroad for physicians and nurses from less developed countries. There are long-term placements that last up to one year, but also much shorter visits, such as Dr. Kanitha’s. “I was originally meant to stay in Melbourne for four weeks, but unfortunately, I could only come for two weeks as I am closely involved in day-to-day clinic operations in Phnom Penh,” explains the physician from Cambodia. He would have liked to have taken even more new knowledge home with him, but he is nevertheless satisfied as he was able to familiarize himself with latest-generation dialysis machines.

“The conditions at home and in Australia are very different,” says Dr. Kanitha. In Cambodia, where there is no health insurance, he has to make it work with simpler technology and limited resources. “We can only really offer hemodialysis,” he adds. Although he is organizing initial attempts with peritoneal dialysis in Phnom Penh, patients still have to go to Thailand for a renal biopsy, for example.



e

- d CREED is a program set up in 2001 to promote the exchange of dialysis knowledge in Southeast Asia
- e Dr. Kanitha, one of very few nephrologists in Cambodia, gains new insights into dialysis as a CREED fellow in Melbourne
- f The Monash Medical Centre in Melbourne is one of the most active dialysis centers in the CREED network



f



g



h



9 "The way they work here is truly extraordinary," says Dr. Kanitha Melbourne is an important contact point for many CREED fellows from all over Southeast Asia Dr. Kanitha gained a lot of new knowledge during his stay at the Monash Medical Centre in Melbourne

visits to conferences by physicians have been funded by CREED

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The Monash Medical Centre in Melbourne is one of the most active dialysis centers of the CREED network. This is in no small part thanks to Prof. Dr. Peter Kerr, Director of the Department of Nephrology. Prof. Kerr has been Chair of the CREED Executive Committee for over ten years. "This exchange is very important," he says, "because in many countries, the conditions in which dialysis is carried out are really very poor." Cambodia, along with Vietnam, Laos and Myanmar, has some of the biggest problems. "I am one of very few nephrologists in the country," confirms Dr. Kanitha, who was trained in France, like most of his colleagues. "Although Dr. Kanitha was with us for only two weeks, he benefited a great deal," says Prof. Kerr, who has also introduced CREED to the International Society of Nephrology (ISN). The ISN now helps to raise the profile of this previously small initiative. Not only the physicians and nurses from Australia and New Zealand, but also "employees of Fresenius Medical Care invest a lot of time in supporting CREED," adds Prof. Kerr. They help with coordination and organization as well as making on-site visits to the clinics. "That is really impressive," he says. "I don't know of any other company that does anything like that."

This credit also goes to Margaret Clarke, Director of Home Therapies South Asia-Pacific at Fresenius Medical Care in Singapore, who has run the CREED office and organized its activities for the past five years. This is more than a sideline and anything but a desk job. Ms. Clarke is constantly out and about in the region, partly to raise awareness of CREED. "Many countries are in urgent need of help," she has discovered.

To improve the way dialysis therapy is carried out in Southeast Asia, CREED also sponsors so-called CREED ambassador programs. The biggest of these events to date took place in Vietnam recently. Two physicians and two experienced dialysis nurses from Westmead Hospital in Sydney spent five days there holding workshops and training sessions. The overwhelming interest in the event shows how urgently this kind of knowledge transfer is needed: More than 600 physicians and nurses from all over Vietnam signed up to see the Australian experts.



j

registrations for a CREED event in early 2018

MORE THAN

600

j Dr. Kanitha enjoys his time in Australia
 k The exchange program is very important to Prof. Kerr,
 Chair of the CREED Executive Committee; he wants to support
 countries that do not have such good conditions
 l CREED fellow Dr. Kanitha also learned to handle dialysis
 machines used in Melbourne for treating patients



k

CREED resources are available above all for ambassador programs, fellowships, and to enable young nephrologists to attend international conferences to present their research. The relatively small funding pot is used to pay for travel and accommodation costs as well as registration fees for conferences. However, the physicians and dialysis centers provide their services for free.

The exchange of knowledge facilitated by CREED is bearing fruit. The initiative was launched in 2001 as a cooperation program between Australia and New Zealand on the one hand and the Indonesian Society of Nephrology (PERNEFRI) on the other. Back then, dialysis care in Indonesia was comparable with the current situation in Cambodia and Vietnam. A great deal has happened since then. The Indonesian health-care system has evolved considerably, as has the dialysis infrastructure. “When we started, there were 30 nephrologists in the whole of Indonesia,” recalls Prof. Kerr. “Now, there are over 115, and many other physicians offer dialysis.”

Six Australian hospitals have signed up as “sister centers” and are regularly on hand to answer questions by physicians or help resolve problems. Personal relationships have also evolved from the exchange program. “CREED has been instrumental in bringing about vast improvements to the situation for dialysis patients in Indonesia,” Prof. Kerr ascertains.

Following the expansion of CREED in 2009 to other Asian countries and more recently to Fiji and Papua New Guinea, more and more physicians and nurses are now seeking contact within the program. Coordinator Margaret Clarke would therefore like to see greater involvement from clinics and physicians in more developed Asian nations. “Our aim is to turn clinics in places like Malaysia into sister centers in the near future,” says Margaret Clarke. This is partly because in these countries, the linguistic and cultural barriers that nurses and physicians have to overcome as fellows are lower than in Australia. Margaret Clarke hopes that this will boost the development of CREED even more.



Thank
YOU

**WE WOULD LIKE TO THANK
OUR PATIENTS AND PARTNERS FOR THEIR CONFIDENCE
IN US AND OUR EMPLOYEES FOR THEIR DEDICATION
AND COMMITMENTS.**

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