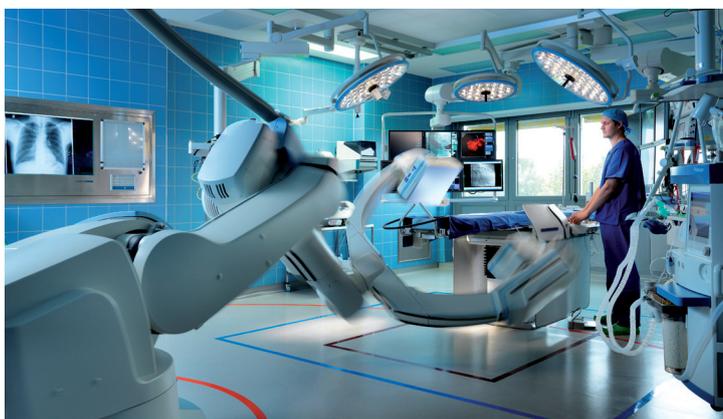


Mecklenburg-Vorpommern – Center of Competence for Diabetes mellitus in Germany



BioCon Valley®

**Mecklenburg
Vorpommern**



Ministry of Economics,
Construction and Tourism

Life Sciences and Healthcare in Mecklenburg-Vorpommern





The healthcare industry has developed into one of the largest business sectors in Germany. Accordingly, Mecklenburg-Vorpommern, a state in the country's northeast, views the healthcare industry as one of the most important opportunities for innovative products and services. Here and in the rest of the world, people are increasingly interested in their health. The demand for products and services which maintain and restore people's health is rising steadily.

The German healthcare system and the medical skills available here occupy a leading international position and enjoy an excellent reputation in many countries. This means outstanding opportunities for Mecklenburg-Vorpommern. Our universities have the corresponding know-how and research expertise. Local companies offer their highly innovative products and services far beyond our borders. Our state is particularly advanced in the area of diabetes treatment. As societies become more affluent, so does the incidence of diabetes. This is accompanied by secondary disorders and huge financial burdens on insurance companies and health funds. Innovations such as telemedicine solutions from Mecklenburg-Vorpommern can provide effective help in preparing healthcare providers for these challenges. One outstanding example of Mecklenburg-Vorpommern's leading position in this field is KADIS[®],

a computer-based counseling program for doctors and patients. The program was developed at the Gerhard Katsch Institute of Diabetes in Karlsburg. It recommends individually optimized therapeutic options for overcoming the weaknesses detected in the patient's metabolism.

In this brochure we will present additional examples of the innovative scientific skills that are available in Mecklenburg-Vorpommern in the hope of arousing your interest in the products and services our state has to offer.

Find out more about Mecklenburg-Vorpommern, get to know us, visit us!

Harry Glawe

Minister of Economics, Construction and Tourism

Mecklenburg-Vorpommern

The occurrence of diabetes is on the rise all over the world due to changing life styles. It is not as a “classical” disease which can be cured by a single or time-limited therapy. It is a creeping disease whose harmful effects increase over years and cause deleterious effects such as blindness, neuropathy, myocardial and cerebral infarction and loss of extremities in patients who are not in state-of-the-art care. Diabetes is not only a severe burden to the patient, but also to society in general since the costs of therapy have increased tremendously. All over the world, strong efforts are being made to prevent the onset of the disease and to provide optimal therapy to patients.

The state of Mecklenburg-Vorpommern is a leading region in the medical treatment of diabetes in Germany. Since the region is a former WHO reference center for diabetes, its medical professionals can rely on more than 60 years of experience: In 1947 the first diabetes hospital was opened by Prof Gerhard Katsch in the small city of Karlsburg in Mecklenburg-Vorpommern. With basic and applied research at the Universities in Rostock and Greifswald, clinical research and therapy at private and public hospitals and advanced education and training, modern services from innovative companies are now being offered for the benefit of the patients. Diabetes patients can spend their holidays in one of the most charming and beautiful resort regions of Germany without loss of quality in disease therapy. As the local



networking agency, BioCon Valley promotes the health care industry in the region, acts as a catalyst between science, industry and government, and – last but not least – provides one-stop service.

Prof Dr. Dr. h.c. (mult.) Horst Klinkmann,

F.R.C.P., President of BioCon Valley

Mecklenburg-Vorpommern

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Global burden of diabetes, the epidemic of the 21st century

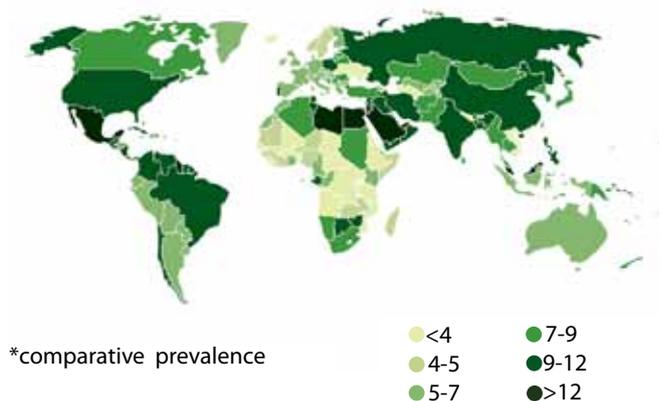
Diabetes mellitus is a state of chronic hyperglycemia, which, if untreated, leads to blindness, renal failure, painful neuropathy and myocardial and cerebral infarction. Diabetes etiology is very heterogeneous. The most prevalent form is type 2 diabetes. Its prevalence has dramatically increased worldwide in recent decades. The International Diabetes Federation recently published the following data on its website (www.idf.org):

- 366 million people have diabetes in 2011; by 2030 this number will rise to 552 million
- The number of people with type 2 diabetes is increasing in every country
- 80 percent of people with diabetes live in low- and middle-income countries
- Most people with diabetes are between 40 to 59 years of age
- 183 million people with diabetes (50 percent) are undiagnosed
- Diabetes caused 4.6 million deaths in 2011
- Diabetes caused at least US\$465 billion in healthcare expenditures in 2011, 11 percent of total healthcare expenditures for adults (20-79 years)
- 78,000 children develop type 1 diabetes every year

The main cause of the dramatic rise in the prevalence of type 2 diabetes is obesity caused by a sedentary lifestyle and unhealthy eating habits, which have become more and more common worldwide in recent decades. Solving this global problem by preventing new cases of diabetes and providing effective care to patients with existing diabetes in order to prevent complications is an international challenge.

Prof. Dr. Wolfgang Kerner,
Clinic for Diabetes and Metabolism,
Klinikum Karlsburg, Germany

Map 2.1. Prevalence* (%) of diabetes in (20-79 years), 2011



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Klinik für Diabetes und Stoffwechselerkrankungen
Direktor: Prof. Dr. med. W. Kerner
KLINIKUM KARLSBURG
der Klinikgruppe Dr. Guth GmbH & Co. KG

Personalized diabetes management

Randomized controlled trials have convincingly shown that appropriate diabetes care that maintains HbA1c levels within the target range decreases the development and progression of micro- and macrovascular complications such as blindness, kidney failure, and coronary heart disease.

However, the recommendations of general clinical practice guidelines have not yet been widely adopted, especially in regions and countries without adequate access to state-of-the-art techniques in diabetes care and management and where traditional practices may prevail. Consequently, the growing number of people affected with overt diabetes and late diabetic complications has driven up the cost of diabetes care and imposed heavy financial burdens on national health care systems worldwide. Appropriate and cost-effective diabetes care can be achieved, however, by employing new technologies such as evidence-based decision support and personalized diabetes management (PDM) systems.

Effective and cost-saving management of diabetes has been facilitated in Germany by integrating PDM and telemedicine-based communication into routine diabetes care. One such PDM system is the interactive diabetes service program KADIS® (Karlsburg Diabetes Management System), which has been developed over the last thirty years by the Institute of Diabetes Karlsburg, Germany. The

patented KADIS® program supports primary care providers in their outpatient settings through the visualization and evaluation of the patient's current metabolic situation and by predicting the outcome of metabolic control in association with therapeutic interventions. As a therapy simulator, the KADIS®-based PDM program assists physicians in choosing individual diabetes management regimes that are most appropriate for achieving patient-focused blood sugar targets.

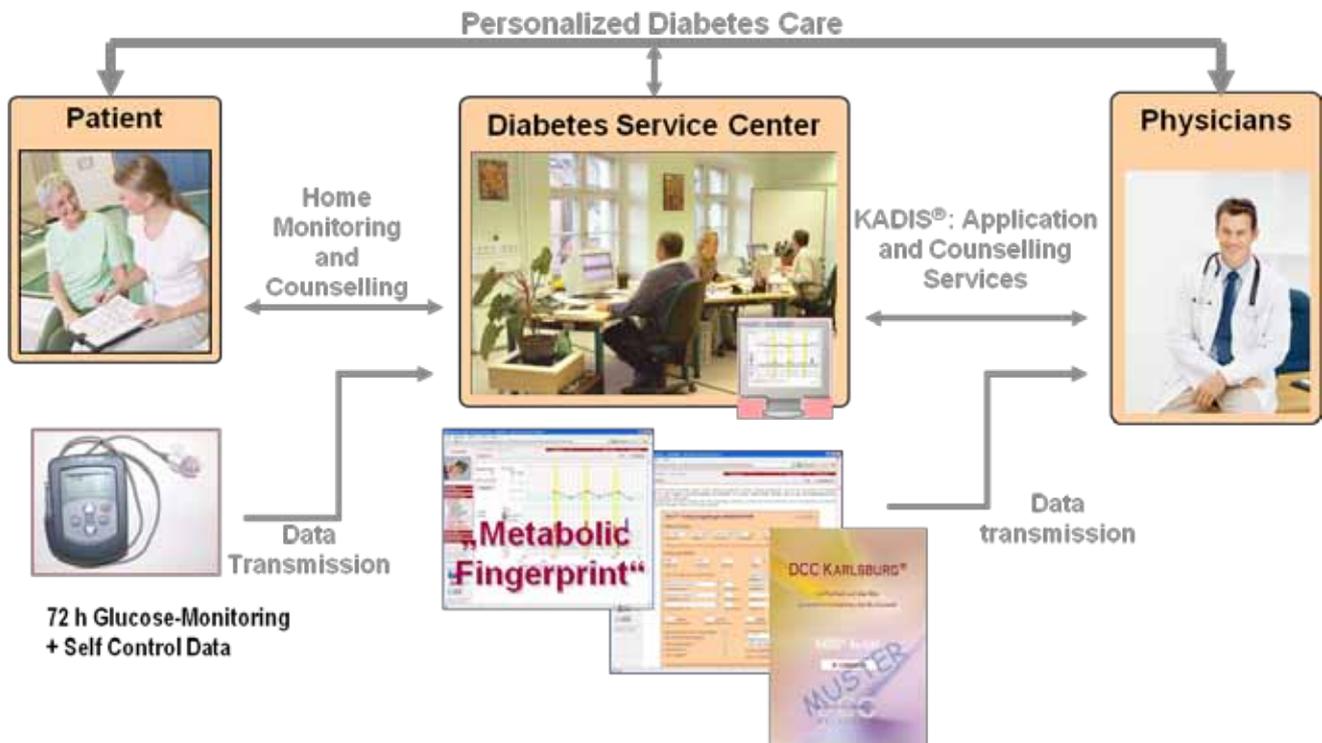
Several national and international pilot studies, including in the United Arab Emirates, have convincingly demonstrated that in patients with insufficient blood sugar control, HbA1c can be significantly reduced by up to 1.5 percent if KADIS®-based PDM is implemented. The program can also achieve annual cost reductions of up to US\$1,400 per patient.

Global diabetes health initiative

As a result, the diabetes programs which have been initiated all over the world focus on prevention and personalized medicine using evidence-based, clinical treatment guidelines with the latest technologies in diabetes treatment. This applies in particular to the kind of diabetes care which is already available in countries like Germany and the United States, but is still sorely needed in developing countries. To close this gap, the City of Hope (COH) in

the United States and the Institute of Diabetes “Gerhardt Katsch” (IDK) Karlsburg in Germany have therefore started a program under the title “Global Diabetes Health Initiative”. COH and IDK have entered into a 15-year cooperation and licensing agreement with the goal of providing doctors who diagnose and treat diabetes with access to state-of-the-art, evidence-based and patient-centered diagnostic and treatment methods with the help of KADIS® in order to make a sustainable contribution to improving care for diabetics on a global scale, but particularly in areas with a high prevalence of the disease.

Dr. Eckhard Salzsieder
 Institute of Diabetes “Gerhardt Katsch”
 Karlsburg e.V., Germany
 Prof. Fouad Kandeel,
 City of Hope,
 Los Angeles, California, USA



Prevention: Can we out-run obesity and the diabetes epidemic?

Epidemiology

Based on data provided by the World Health Organization (WHO), the total worldwide prevalence of diabetes mellitus in 2030 is expected to double from the year 2000 estimate of 171 million (Wild et al., 2004; Carnethon, 2007). This increase in prevalence is caused by an increase in both, type 1 and type 2 diabetes (Lammi et al., 2008). In terms of numbers, however, type 2 diabetes is the most prevalent form of the disease worldwide and has already reached epidemic proportions (Carnethon, 2007).

General intervention strategies

In recent years several studies have been published that show a strong link between pre-diabetes (impaired fasting glucose or impaired glucose tolerance), type 2 diabetes, physical activity and excess weight/obesity (Edelstein et al., 1997). Cross-sectional and longitudinal trials provide solid evidence that the risk of metabolic disorders can be reduced through improved diet and increased physical activity (Carnethon, 2007; Yates et al., 2007; Buyken et al., 2010). With this lifestyle change and these intervention strategies we have to start early in life: 15 percent of children and adolescents are already overweight or obese today, and the numbers are continuously increasing (Kurth, 2007). This is where effective intervention strategies have the potential to reduce body weight and associated long-

term complications like pre-diabetes, type 2 diabetes, but also cardiovascular diseases and disorders of the musculoskeletal system (Frost et al., 2002; Knowler et al., 2002; Diabetes Prevention Program Research Group, 2002; Gaede et al., 2003; Buchwald et al., 2004). In addition, young people are still open to change their lifestyle.

Intervention in Mecklenburg-Vorpommern, Germany

In 2004/2005 a structured intervention program was started in Mecklenburg-Vorpommern. Mainly, the intervention strategy focused on the following areas:

- 1. Structured treatment and teaching programs (Arbeitsgemeinschaft Adipositas im Kindes- und Jugendalter [AGA], 2004), performed by specialized physicians, psychologists, educators in sports and nutrition and pedagogical staff have been implemented in specialized hospitals like the MEDIGREIF Inselklinik Heringsdorf GmbH, Ostseebad Heringsdorf, Germany (Figures 1 and 2).**
- 2. Funded by Mecklenburg-Vorpommern's Ministry of Economic Affairs, Building and Tourism, a network of general practitioners, specialized physicians in ambulatory practices and centers for metabolic diseases, psychologists, educators in nutrition and sports as well as teachers from elementary schools and the pedagogical staff of kindergar-**

tens was established (Adipositasnetzwerk Mecklenburg-Vorpommern e.V.). The network identifies children and adolescents who are overweight or obese and places them in special treatment programs since they are at high risk of developing diabetes.



3. Published data (Verhoeven et al., 2007) shows that the increased integration of electronic healthcare technology and telemedicine offers practical, cost-effective and reliable ways to improve healthcare.

Based on these results, the MEDIGREIF Inselklinik Heringsdorf GmbH, Ostseebad Heringsdorf developed and scientifically evaluated a telemedicine support program for the long-term treatment of obese children and adolescents.

Using a combination of a mobile phone-based sensor for physical activity and pattern recognition (Fraunhofer-Institut für Graphische Datenverarbeitung [IGD], Rostock) and an interactive e-learning program (medutain GmbH, München), this strategy will guarantee effective long-term weight loss (Schiel et al., 2008; Schiel et al., 2011)

(Figures 3 and 4).

Ralf Schiel^{1,2}, Alexander Kaps¹,
Gerald Bieber³ and Georg Ruile⁴

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Figure 1 (left) and 2 (right): Children and adolescents with metabolic diseases (overweight/obese and/or diabetes mellitus) participate in a structured treatment and teaching program at MEDIGREIF Inselklinik Heringsdorf GmbH, Ostseebad Heringsdorf, Germany.

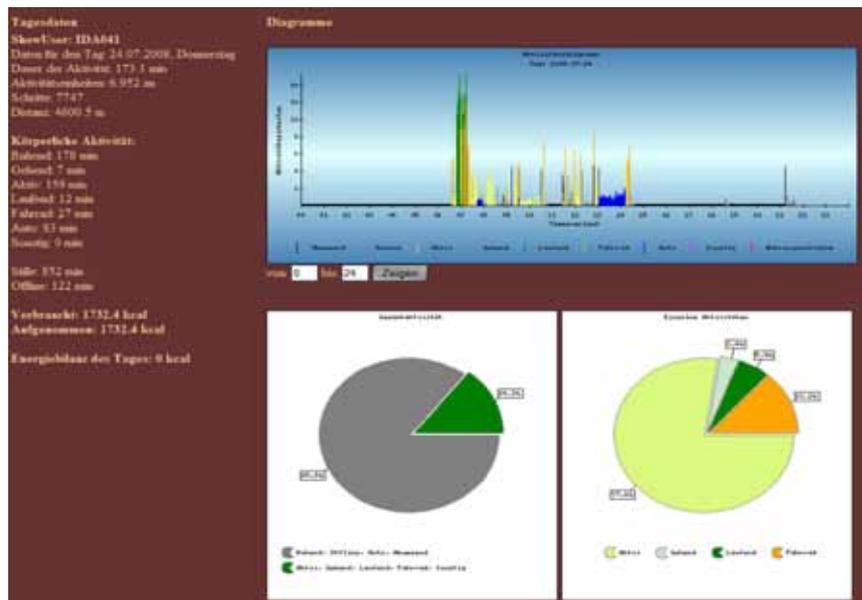


Figure 3. Modern electronic health technology consisting of a wireless sensor for physical activity, integrated in a mobile phone with a digital camera (DiaTrace®, Fraunhofer-Institut für Graphische Datenverarbeitung [IGD], Rostock, left) and an analysis chart (right).



Figure 4. The e-learning and training program (medutain GmbH, München). These intervention strategies and the results of evaluations will be presented.

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Diabetes mellitus: Clinical aspects



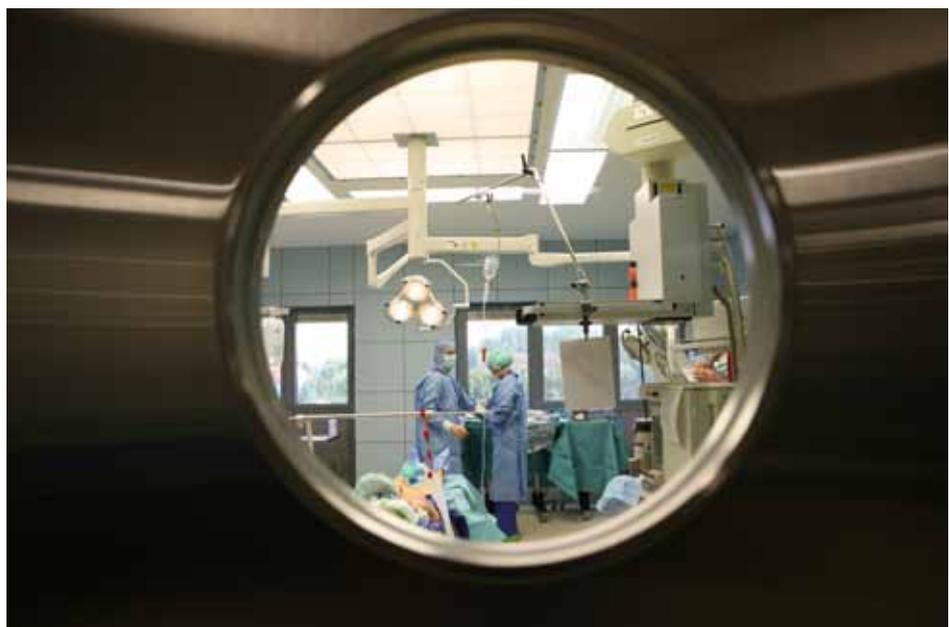
Its complications, however, develop in the small retinal and kidney vessels and in the large cardiac, cerebral and peripheral arterial vessels.

Diabetes management has four goals: (1) early detection of diabetes, (2) education of patients, (3) multifactorial diabetes treatment, and (4) treatment of com-

Diabetes is a heterogeneous disease. The most prevalent form is type 2 diabetes, accounting for more than 90 percent of all diabetes cases. Type 2 diabetes is a disease generally associated with older people. Patients are for the most part obese and do not have to be treated with insulin from the onset of the disease. Type 1 diabetes is much less prevalent. It is a disease that starts predominantly in children and adolescent age groups. Patients are generally not obese and require insulin treatment from the onset of the disease. Diabetes is primarily a metabolic disease.

plications of diabetes.

In many regions of the world, diabetes is diagnosed at a very late stage, and early diagnosis is missed in about 50 percent of patients. This could be avoided by regular screening for





elevated fasting plasma glucose in adults at risk for diabetes.

The main risk factors for developing diabetes are obesity, a sedentary lifestyle, arterial hypertension and a family history of diabetes.

Once the diagnosis has been made, the first step in managing the disease is to educate the patient. This means that patients with diabetes must be able to understand their condition, the principles and the effects of dietary and drug treatment, and how to prevent complications.

They need to know what to do if complications occur. There is an international consensus about the important role education plays in diabetes management.

Diabetes treatment aims at preventing complications and maintaining the quality of life. Microangiopathy of retinal and kidney vessels and peripheral neuropathy are best prevented by controlling and maintaining blood glucose

at near normal levels. Macroangiopathy of cardiac, cerebral and peripheral arteries requires the treatment of elevated blood pressure and lipid levels in addition to glucose control. Therapeutic targets for glucose, blood pressure and lipid control must be defined on an individual basis. Several clinical trials have clearly demonstrated that multifactorial diabetes therapy can reduce the incidence of diabetes-related complications.

Guidelines generally recommend annual testing for the early detection of complications of diabetes: dilated fundoscopic eye examination, peripheral nerve examination, palpation of foot pulses, measurement of creatinine clearance and urinary albumin excretion. When complications are detected, the multifactorial drug therapy must be intensified. Painful neuropathy has to be treated with suitable drugs. Clinical diabetes centers must have the capabilities to diagnose and treat advanced complications: laser treatment of eye fundus, renal dialysis, Doppler/duplex sonography of cerebral and peripheral vessels, coronary and peripheral angiography and angioplasty, and surgical and conventional management of diabetic foot syndrome.

Prof. Dr. Wolfgang Kerner,
Clinic for Diabetes and Metabolism,
Klinikum Karlsburg, Germany

Specialist providers in Mecklenburg-Vorpommern

Best of
Northern Germany

**Mecklenburg
Vorpommern** 



BioArtProducts GmbH (B.A.P.)

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BioArtProducts GmbH is a service and consulting company with many years of service to medical facilities. The company operates primarily in the areas of medical research on extracorporeal detoxification, quality management in health care and the development of proprietary software for medical studies and registries. BioArtProducts GmbH also helps health facilities implement cross-sectoral collaborative structures.

Early identification of patients with diabetes, hypercholesterolemia and cardiovascular comorbidities

Business segments:

- Clinical research, development and application of screening software for the early identification of patients with diabetes, hypercholesterolemia and premature cardiovascular and/or kidney diseases
- Software development (including medical “apps”) to improve patient compliance
- Implementation of quality management systems in health facilities, supplemented by the development and application of SOPs
- Organization and management of clinical studies, including the development of a web-based infrastructure for data collection and analysis in multi-center studies
- Data collection and analysis in national and international medical registries
- Joint projects with health insurance providers such as screening programs for familial hypercholesterolemia (FH) in close cooperation with partners from science and industry

Atherosclerotic cardiovascular diseases are the leading cause of mortality in industrialized countries, but only a few people know their individual cardiovascular risk profile and the consequences thereof. Apart from lifestyle factors such as smoking, comorbidities (including diabetes and renal disease) play an important role in affecting the course of the disease. The more risk factors are present, the higher the chances of developing a cardiovascular disease. In fact, the occurrence of multiple risk factors increases the cardiovascular risk exponentially. B.A.P. focuses on the early screening of nephropathy, hypercholesterolemia, diabetes and other cardiovascular comorbidities utilizing newly developed search tools.

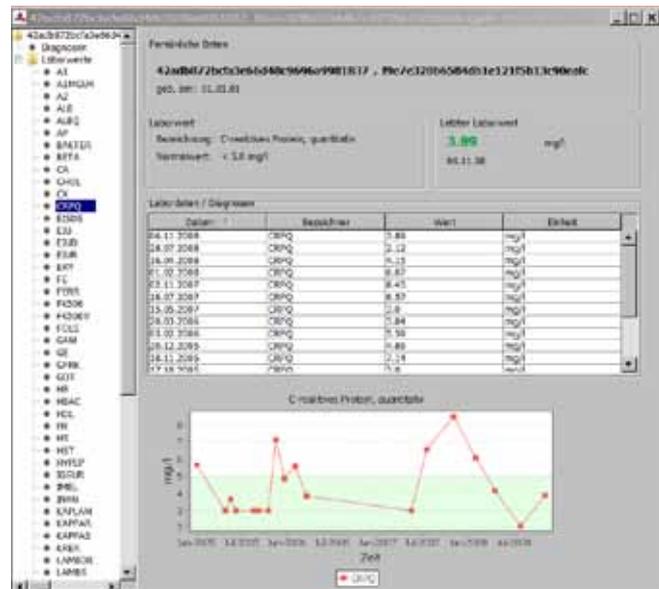
We look at laboratory data, diagnostic data and pharmaceutical prescriptions to identify undiagnosed patients.

Although there are many initiatives to improve the medical care in this specific group of patients, the adherence to established guidelines in a daily routine is still inadequate.

B.A.P activities help to improve medical care and cost-effectiveness.



BAP Medical Reporting Tool



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EUROIMMUN produces reagents for medical laboratory diagnostics with special focus on test systems for the identification of various antibodies in patient serum in the diagnosis of autoimmune diseases, infectious diseases and allergies.

Your global partner for serological diagnostic products (autoimmune diseases, infectious serology and allergology) made in Germany

For the optimal treatment of diabetes mellitus, it is essential to differentiate type I diabetes mellitus (T1DM) and latent autoimmune diabetes in adults (LADA) from type II diabetes mellitus. The investigation of autoantibodies – found only in T1DM and LADA – contributes greatly to diagnosis and also aids in the prognosis.

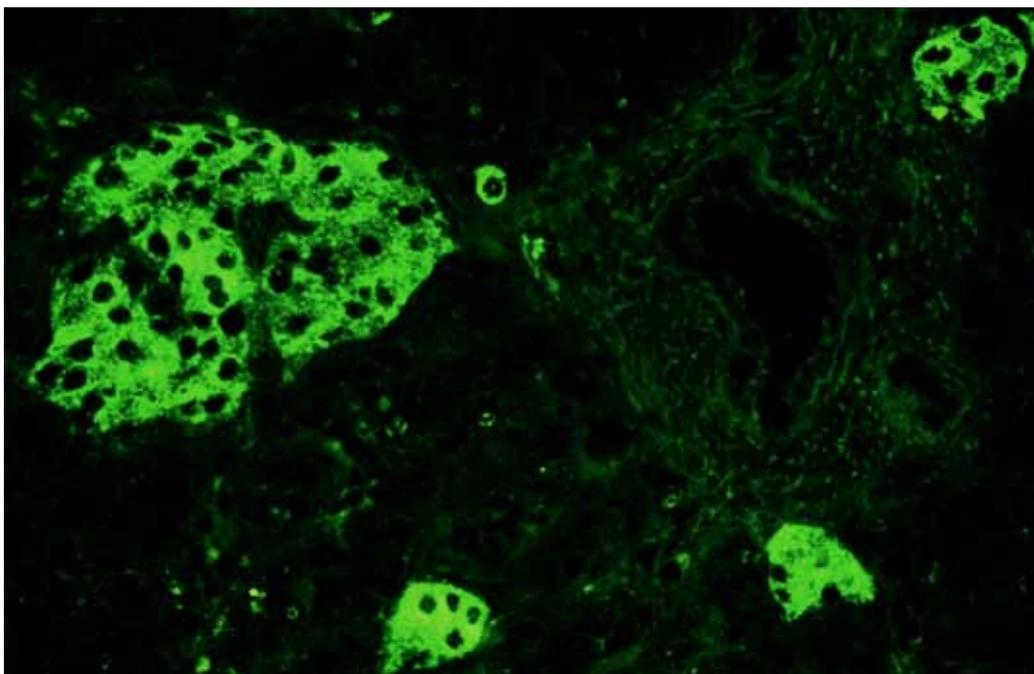
EUROIMMUN AG offers a broad panel of state-of-the-art test systems for diabetes autoantibody diagnostics.

Autoantibodies in T1DM or LADA are directed against the insulin-producing islet cells of the pancreas. The main target antigens of these islet cell antibodies (ICA) are:

- Glutamic acid decarboxylase (GAD)
- Tyrosine phosphatase (IA2)
- Insulin

The standard method for determining ICAs is the indirect immunofluorescence test (IIFT) with primate pancreas as the antigenic substrate.

Specialized microplate ELISAs provide the monospecific detection of antibodies against GAD or IA2, or the bispecific detection of both antibodies in one reagent well. The ELISAs can be fully automated, allowing large sample series to be processed quickly and efficiently. Anti-insulin antibodies are determined most effectively via radioimmunoassay (RIA). EUROIMMUN's product portfolio includes RIAs for the detection of anti-insulin, anti-GAD and anti-IA2 bodies. EUROIMMUN's annual participation in the Diabetes Autoantibody Standardization Program demonstrates that our assays are among the best performing on the market and can be relied upon to provide excellent results.



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Since its foundation in 1991, the

University of Applied Sciences Neubrandenburg has developed a special profile in the areas of research, development and knowledge transfer.

Disease management programs (DMPs) for type II diabetics

Since the late 1990s, intensive efforts have been made in Germany to enhance integration and quality management in the fragmented health care sector, especially in diabetes care. Disease management programs were introduced by legislation to improve the quality of care for the most common diseases such as diabetes.

Disease management programs are one of the newer tools for improving effectiveness and efficiency in the health-care field. They are also referred to as structured treatment programs or chronic disease programs. The purpose of a disease management program is to improve the treatment of a disease as well as the management of the related care. On behalf of BARMER, Germany's largest health insurance provider, the University of Applied Sciences Neubrandenburg conducted a representative study of patients with diabetes mellitus (type II) within and without their disease management program. Their treatment was coordinated in accordance with scientifically proven medical guidelines. In line with these guidelines, the doctors coordinated their medical care while also basing it on the patients' personal needs. Type II diabetes patients who participated in the BARMER program were also able to take advantage of special services provided by the company. A nationwide survey

currently being conducted by the insurance company will provide information about the patients' opinion regarding the quality of their care and support. The results of this survey will also show whether DMP participants feel that they receive better care than non-DMP participants. Under the guidance of Prof. Dr. Thomas Elkeles of the Health and Medical Care Department of the University of Applied Sci-

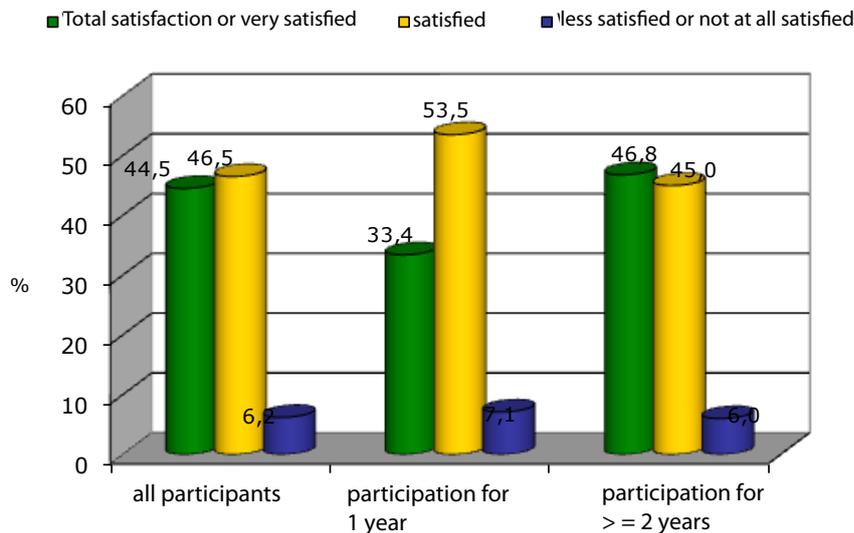
ences Neubrandenburg, a questionnaire has been developed with 64 questions about the patients' general health, their frequency of doctor's visits and their quality of care (support, references, information received, doctor-patient relationship, etc.). "We are aiming to reach 1,000 type II diabetics between the ages of 45 and 79 in each group, i.e. people who participate in a DMP and people who don't."



Hochschule Neubrandenburg
University of Applied Sciences



Overall DMP Satisfaction



Survey of BARMER insurants with Diabetes mellitus Typ 2 (2007, n = 2.061)

Prof. Dr. Thomas Elkeles 2008

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The internationally renowned Karlsburg Institute of Diabetes "Gerhardt Katsch" in Karlsburg, a former WHO reference center for diabetes, has many years of experience in providing personalized support for doctors and patients, in experimental and clinical research in type II diabetes research, in training doctors in diabetology, as well as in the general organization and coordination of outpatient and clinical support for diabetics.

KADIS® - Personalized diabetes management

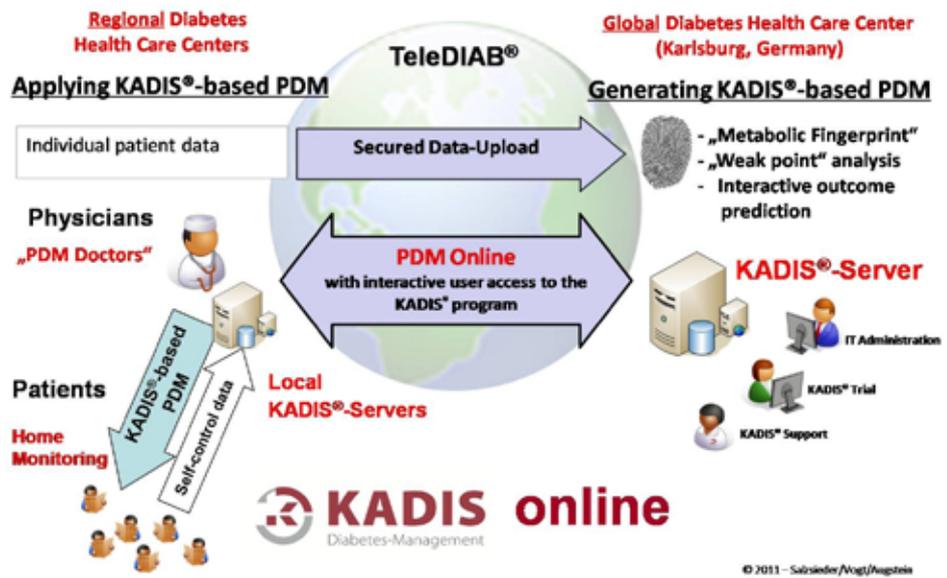
Measure your own blood glucose level over the course of the day and identify individual patterns

- Optimized therapy management with evidence-based decision support for the treating physician
- Avoid hospital visits
- No revolving door effect
- Optimize your everyday metabolism
- Improved medical expertise
- Save on costs

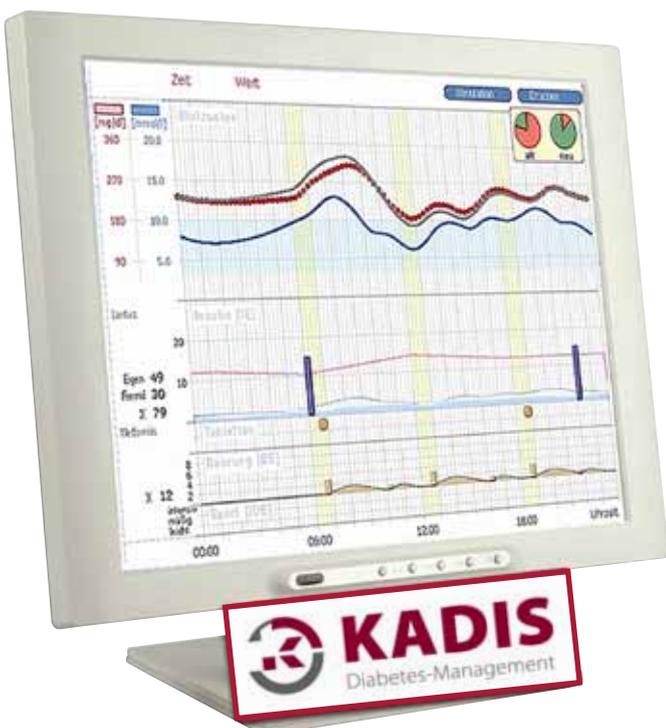
The TeleDIAB® project team at the Institute of Diabetes "Gerhardt Katsch" in Karlsburg has developed the unique KADIS® interactive support program, which is based on many years of research and will soon become available online as well. Since 2006, KADIS® has been used for integrated diabetic support activities in Germany with great success. With continuously measured blood glucose readings and self-checking data, the program makes it possible to develop customized recommendations for optimizing the patient's metabolic management under everyday conditions and to provide personalized decision-making support for the treating physician.

The Karlsburg Diabetes Management System KADIS® is a computer-supported, evidence-based program which enables diabetes specialists to quickly and reliably analyze individual therapy options. The goal is to overcome identified weaknesses in the patient's personal metabolism management by predicting his or her expected blood glucose curve. Based on the treatment guidelines developed by the German Diabetes Society, various therapeutic options can be identified by varying the following:

Personalized Diabetes Management (PDM) Worldwide



- Insulin therapy (dosage, timing, type)
- Oral diabetes medication (dosage, timing, type)
- Exercise (intensity, timing, duration)
- Food (number of bread units, timing, type)



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HealthNet-MV's mission is to provide the best medical treatment with state-of-the-art procedures and technologies. The interdisciplinary approach of our highly qualified teams of doctors and nurses ensures the best possible care for you.

HealthNet-MV's mission is to provide the best medical treatment with state-of-the-art procedures and technologies.

HealthNet-MV provides its partners in the healthcare and tourism industries a high degree of convenience and security with regard to the planning and execution of medical care as well as with travel arrangements.

The customer can select the desired level of services, from the simple arrangement of medical treatment to the addition of optional services to an all-inclusive "medical tourism" program. Of course, accompanying persons enjoy the same level of service.

Our corporate philosophy centers on ensuring personal support and the seamless integration of medical and tourism providers.

HealthNet-MV provides the link between healthcare and tourism providers in Mecklenburg-Vorpommern and target groups in selected source markets who are looking for medical treatment options abroad.



We focus especially on international customers who want to benefit from the high level of expertise in German medicine.

Use our services when your goal is to restore and maintain your health, because HealthNet-MV stands for first-class service, exceptional medical care as well as maximum comfort and convenience during your stay in our beautiful state.



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Infokom (founded in 1991) offers customer-oriented full-range IT solutions. Our range of services includes consulting, software development and IT training, as well as the distribution, installation and management of hardware, software and networks. We are proud of our international cooperative ventures and relationships, especially in the Middle East, the USA and China, as well as of our experience in sourcing, planning and running international pilot projects in the health sector.

Mobil Diab®: Modern, innovative solutions for assisting in the monitoring and treatment of diabetes patients.

The idea behind Mobil Diab® is to involve the patient in the therapy process and to motivate him to actively participate in the treatment process.

Infokom is a partner in the European FEARLESS project of the Ambient Assisted Living Initiative with partners in Austria, Spain, Italy and Germany. The goal of this project is to improve the quality of life for people in all stages of life by combining new technologies with their social environment. The basic idea involves recognizing events and threats such as falls (diabetics have a higher risk of falling than non-diabetics) early and to trigger an automatic alarm that summons help. Infokom is developing the integrated data system and innovative marketing strategies for this project.

This empowers the patient to take responsibility for his treatment in partnership with the physician.

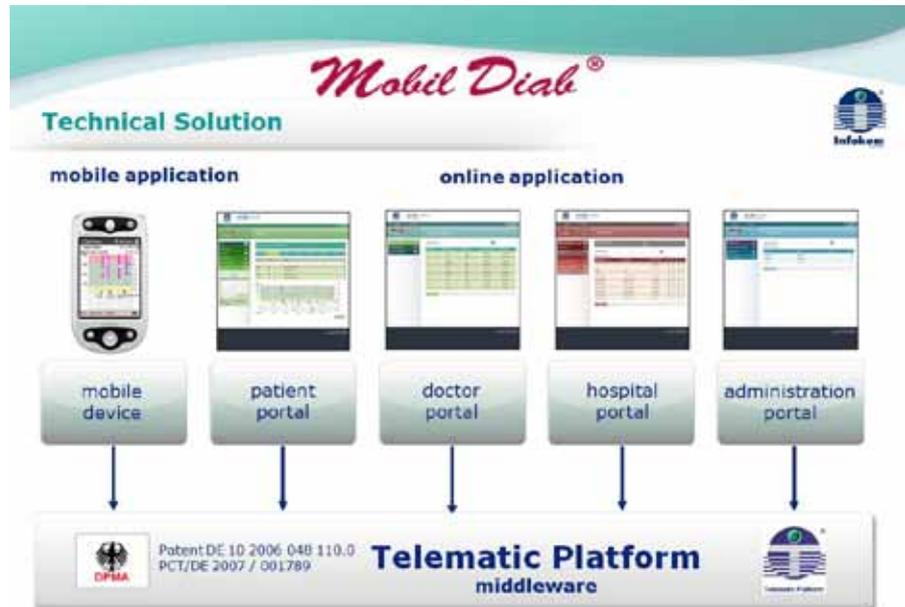
The system offers the opportunity for interactive communication between the doctor and the patient. The patient keeps an electronic diary, in which he continuously records his personal health data (blood glucose levels, medication, food, exercise, etc.), and makes this information available to the

doctor. This way, the doctor can monitor the patient's data remotely.

As a result, the doctor can adapt the therapy at any time, intervene if necessary and make relevant information available to the patient.

Mobil Diab® offers diabetics the opportunity to monitor their medical data 24 hours a day. The data can be matched with the telematics platform (TMP) at any time.

In the case of emergencies, the system will notify the doctor in charge and provide him with the relevant data.



The main features are:

- Easy-to-handle and transportable device with integrated mobile phone
- Diary for continuous recording of the medical data
- Integrated measuring devices and camera
- Matching of data independently of time and location with the TMP
- Reminder features
- Receiving messages from the physician
- Multilingual
- Simple Windows-based user interface

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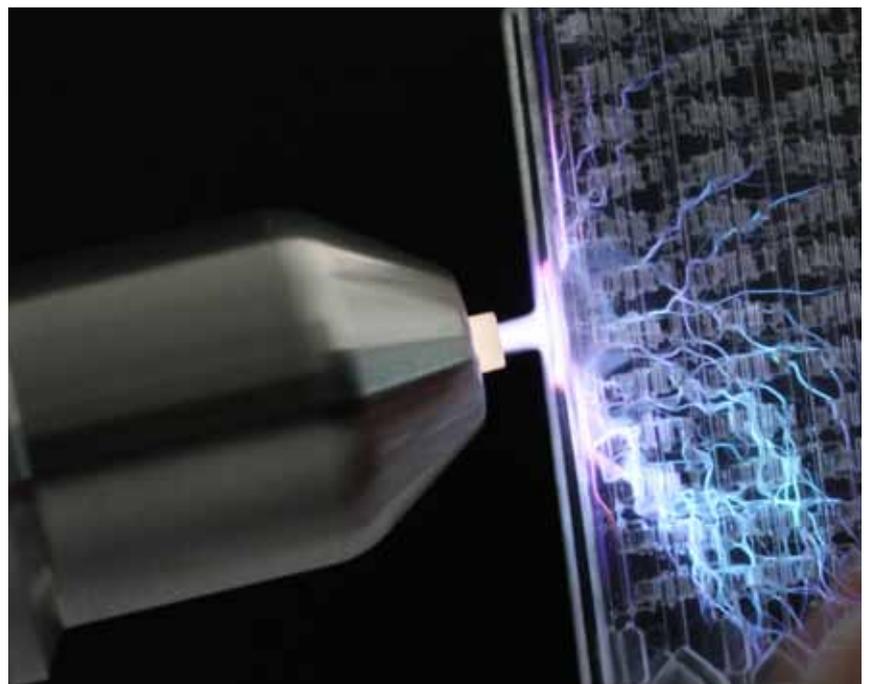
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The Leibniz Institute for Plasma Science and Technology (INP Greifswald) is the largest non-university-affiliated institute in the field of low-temperature plasmas, their basic principles and technical application in Europe.

Plasma medicine for diabetes wound management: from science to prototype

Greifswald has become a leading international center for plasma medicine in recent years. One of the major reasons for this development is the safety and tolerability of plasma applications. The establishment of the first professorship in the field is another indicator of plasma medicine's potential for the future.

The Leibniz Institute for Plasma Science and Technology (**INP Greifswald**) is the largest non-university-affiliated institute in the field of low-temperature plasmas, their basic principles and their technical application in Europe. INP



conducts application-oriented basic research and aims to improve established plasma-assisted procedures and products. INP also adapts plasmas to customer-specific needs and offers feasibility studies, consulting and other services. The therapeutic use of cold plasma sources is developing into a separate international medical field. The use of physical plasmas may become established in only a few years as a tool for fighting dangerous hospital-based infection sources as well as for introducing patient-friendly treatment methods.

The therapeutic use of plasmas directly on or in the human body is a totally new field that is rapidly raising interest all

over the world under the name plasma medicine. A major potential application area for plasma medicine involves the healing of wounds such as foot wounds, which are common in diabetics, because badly healing chronic wounds can make the affected patients' lives miserable.



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Klinikum Karlsburg has a rich history and enjoys an excellent reputation in Mecklenburg-Vorpommern and Germany. In 1986 Klinikum Karlsburg was nominated the collaborating-center of the WHO. Today, the Cardiac and Diabetes Center Mecklenburg-Vorpommern of Klinikum Karlsburg offers its patients state-of-the-art services in the entire field of cardiovascular medicine (cardiology, angiology, cardiac and vascular surgery) and all forms of diabetes care, including juvenile diabetes and associated diseases. Each year, roughly 2,500 cardiac and vascular surgeries and over 5,000 cardiological procedures are performed at the center. The diabetes clinic treats over 2,000 patients of all ages annually. The broad experience of our physicians and employees gives our patients peace of mind and ensures that their treatment will be successful.

Diabetes – an affair of the heart

Type 2 diabetes mellitus is a systemic vascular disease – some 65 percent of all type 2 diabetes patients die from or at least suffer from heart disease. This is where Klinikum Karlsburg comes into play.

Although it is a metabolic disease, diabetes mellitus is also a vascular disease from the very beginning. Diabetes patients normally suffer from rapidly advancing arteriosclerosis in their coronary vessels combined with an increased tendency to blood clotting. Factors such as excessive weight, high blood pressure and increased blood fat levels frequently add to the strains on the heart and blood vessels. Due to these factors, a type 2 diabetes patient has the same high cardiovascular risk as a nondiabetic patient after the first heart attack. "Despite this knowledge, diabetes and heart diseases are seldom considered in connection with each other, since diabetic patients are normally treated by diabetes specialists and patients suffering from heart disease by cardiologists. Interdisciplinary treatment occurs very rarely,"

says Prof. Wolfgang Kerner, Director of the Clinic for Diabetes and Metabolic Diseases in Karlsburg, Vorpommern. At Klinikum Karlsburg, diabetic patients suffering from heart disease are treated simultaneously by cardiologists and diabetes specialists during their stay. This innovative treatment concept is also promoted and supported by the foundation

“Der herzkranke Diabetiker“ (The Cardiac and Diabetic Patient).

The clinic also focuses on treating diabetic children and adolescents. Regardless of the specific disease, children and young people in the clinic are therefore motivated above all to inject themselves with insulin and learn how to live with diabetes. For this reason, parents are also integrated very closely into the therapy. The primary objective in the treatment of diabetic patients at Klinikum Karlsburg is to improve the patient’s quality of life on a sustained basis. Finally, the treatment of diabetic foot problems is a particular area on which Klinikum Karlsburg specializes. The genesis of diabetic foot problems is very complex, with diabetic neuropathy and arteriosclerosis of the leg vessels being the main causes. The interdisciplinary treatment of this disease aims to avoid amputations and to restore the patient’s mobility.



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MEDIGREIF Inselklinik Heringsdorf
GmbH consists of:

- MEDIGREIF Inselklinik Heringsdorf GmbH, "Haus Gothensee", Specialist Clinic for Children and Adolescents with Metabolic, Psychosomatic and Skin Diseases
- Mütter-Gesundheit-Usedom e.V., Specialist Clinic for Mother-and-Child Convalescence
- MEDIGREIF Inselklinik Heringsdorf GmbH & Co. KG, "Haus Kulm", Specialist Clinic for Psychosomatic Medicine and Psychotherapy

Hospital for rehabilitation of children and adolescents

Specialist clinic for mother-and-child-convalescence

15 percent of children and adolescents are already overweight or obese, and the rate continues to increase. Here, effective intervention strategies have the potential to reduce body weight and associated long-term complications like pre-diabetes and type 2 diabetes. The MEDIGREIF Inselklinik Heringsdorf GmbH incorporates a highly specialized preventive and rehabilitative clinic for children and adolescents with metabolic disorders.

The comprehensively oriented care-concept comprises the integrated medical, psychological and pedagogical care and consulting of the patients, with a sports and culturally oriented background of leisure activities conducive to the highest levels of recovery. The competence of the patients and their companions to deal with the disease independently under domestic conditions is accorded the highest possible priority.

Specialist clinic for mother-and-child-convalescence

The mother and child convalescent facility is operated by the registered non-profit Mütter-Gesundheit-Usedom e.V. The main objective of this German charity is the promotion of precautionary health and convalescence for mothers and their children. The facility meets this objective primarily with its mother-and-child convalescent facility.

Hospital for rehabilitation of children and adolescents

Among the two independent facilities accommodated in Haus Gothensee, the preventive and rehabilitative clinic for children and adolescents with metabolic, psychosomatic and skin diseases determines the medical profile for the entire house. With a capacity of 108 beds, rehabilitation courses last from four to six weeks and are held on an in-patient basis.



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neoplas puts its emphasis on the support of academic and industrial R&D. Our clients are public research institutions and high technology companies:

- Expedient technology development
- Efficient technology management
- Effective technology marketing

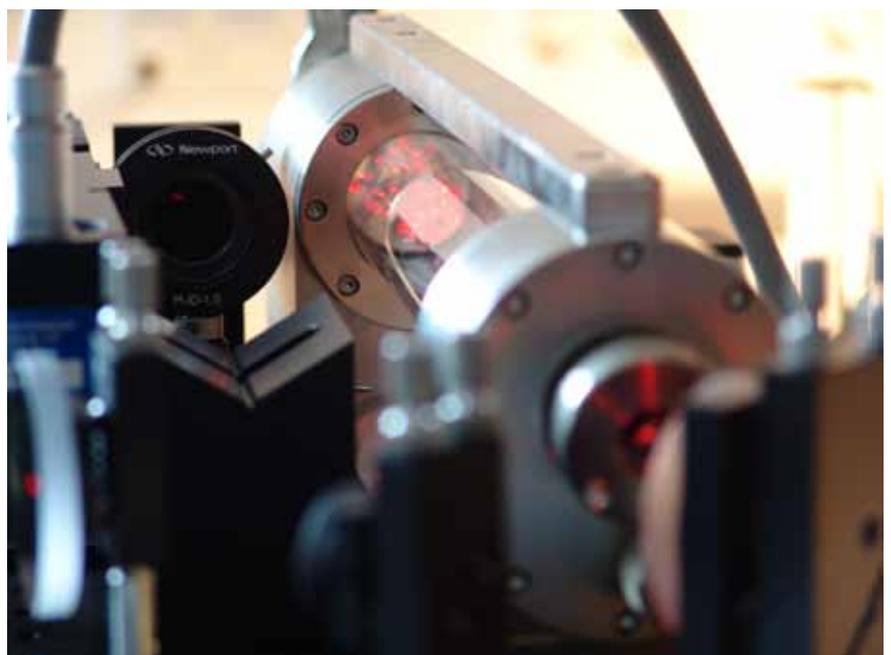
neoplas closes the gap between the initial idea in the lab and the successful product launch on the market. Our experience enables us to overcome the numerous barriers of the highly complex technology transfer landscape and therefore achieves measurable results more quickly.

Typical research fields are plasma medicine, enzyme immobilization and biodecontamination.

From science – for science – into the market
 Plasma devices for research and development

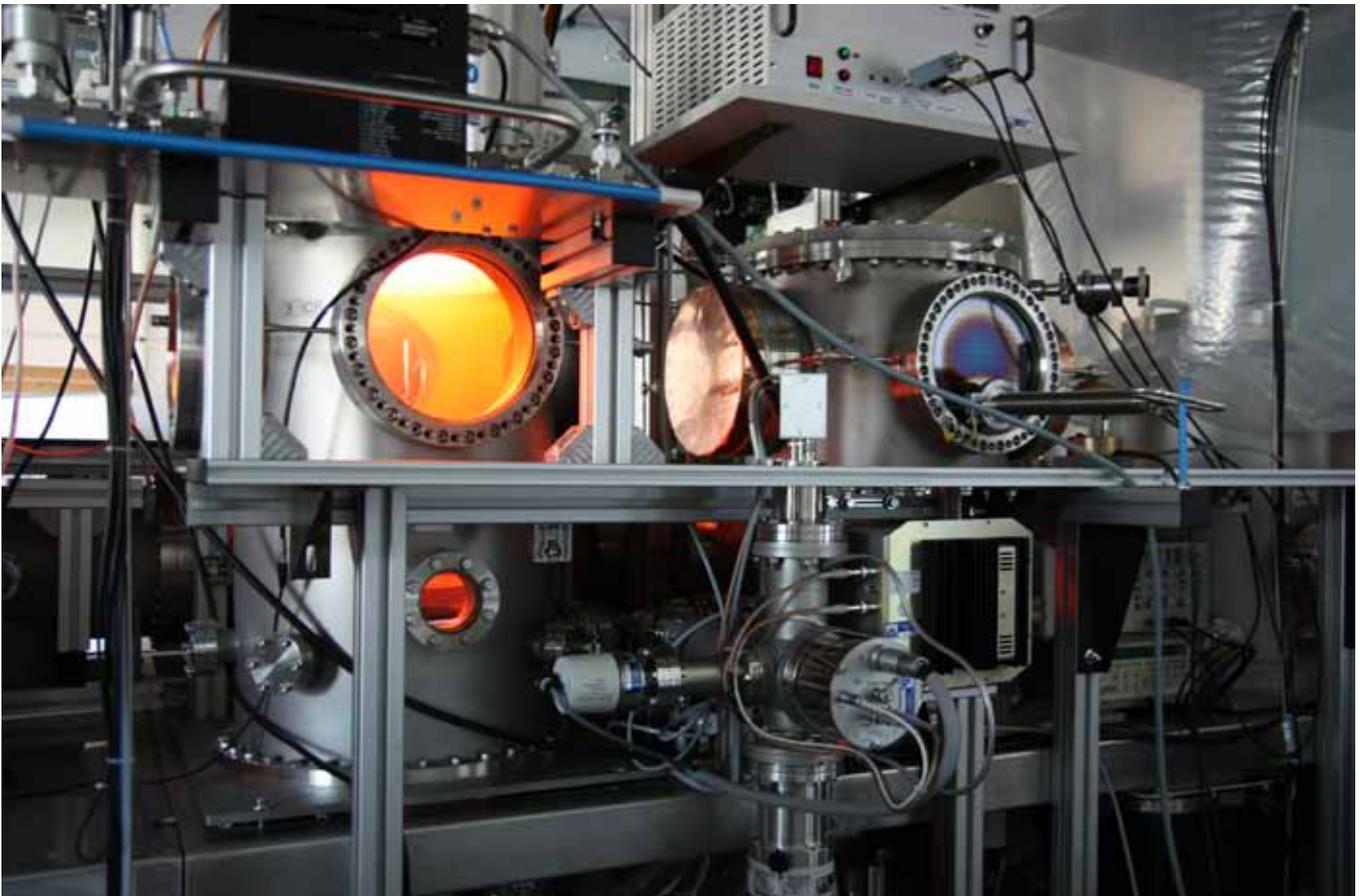
Plasma medicine is a rapidly developing field – like laser medicine was 20 years ago. Every day new research groups around the world are getting active in this promising field for the treatment of wounds and skin diseases. Essential tools for this research are comprehensively characterized and well described plasma systems (plasma sources).

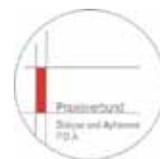
The device is CE-certified for industrial applications such as surface hydrophilization. The plasma source is reproducibly characterized and well documented in peer-reviewed journals and its therapeutic potential was demonstrated on many occasions. The device is intended exclusively for research purposes (no medical device).



Gold standard in plasma medicine

The “kinpen” plasma jet was developed in cooperation with medical scientists, physicists and engineers. Due to its very well documented characteristics, it is set to become the gold standard in R&D in plasma medicine such as the treatment of biological surfaces and structures. With this tool, practitioners are able to move to the forefront of modern international treatment standards. Experiences from numerous disciplines were combined during product development.





Group Practice for Dialysis and Apheresis (PDA) Rostock

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The Praxisverbund für Dialyse und Apherese in Rostock was established in 2005 with the merger of two existing group practices specializing in internal medicine and nephrology.

High-end medicine in the field of extracorporeal outpatient therapy

- Diagnostics and conservative therapy in special clinics for internal medicine, nephrology, cardiology and lipidology
- Hemodialysis (high-flux, single-needle), 70 percent hemodiafiltration (high-flux), Genius, peritoneal dialysis, hemofiltration
- Pretreatment and follow-up for kidney transplant surgery
- LDL and Lp(a) apheresis for the treatment of lipid metabolism diseases, familial hypercholesterolemia (FH)
- Immunoglobulin apheresis for the treatment of autoimmune diseases
- Clinical studies and application monitoring
- Development and implementation of special training and continuing education programs for medical personnel

We operate in accordance with the guidelines published by recognized medical boards and associations. All our locations feature a modern IT infrastructure and state-of-the-art medical equipment. Persons who spend their vacation on the Baltic coast can be treated as guest patients in our dialysis centers. Since all our activities focus on providing our patients with high-quality medical care, our network accepts only practices which can prove that they implement a functioning quality management system in their everyday operations.

Our quality management system meets the requirements of **DIN EN ISO 9001:2008** and is checked with annual internal and external audits.

More and more people require dialysis. The most frequent

causes of renal failure are diabetes and high blood pressure. Our network cooperates with health insurers on the development of dialysis prevention programs.

PDA specializes in the treatment of dialysis and apheresis patients.

At five locations in and around Rostock we provide roughly 50,000 dialysis treatments annually. We also have performed over 2,000 highly specialized apheresis treatments. By operating in a network we can provide the best possible patient

care, because it enables us to cooperate across specialties and ensure that each provider has access to the latest information at all times.



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As part of the University of Rostock's Medical Center, the University Eye Clinic is also active in scientific research. In recent years it has been particularly successful in the use of lasers for ophthalmological applications, especially in the treatment of malicious diseases of the eye, eye socket and eyelids.

Rostock Cornea Modul:

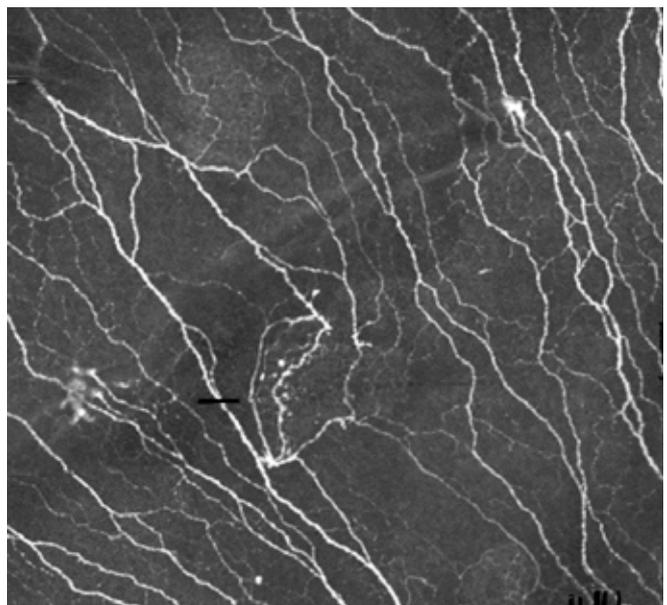
Three-dimensional laser diagnostics for patients with diabetic retinopathy University of Rostock

The experimental developments of a research group led by Prof. Rudolf Guthoff at the University of Rostock Eye Clinic now allow three-dimensional imaging of the cornea – something that was previously scarcely considered possible – and could, among other things, be used for improved diagnosis of nerve damage among diabetic patients (diabetic retinopathy).

New diagnostics for nerve damage caused by diabetes

For some years now, the University of Rostock Eye Clinic has been working on the development of imaging techniques that provide microscopic views of a patient's cornea. In cooperation with Heidelberg Engineering GmbH (Dossenheim), we developed a marketable device that is based on laser scanning technology. In the meantime, further advances permit us to produce three-dimensional images of the human cornea in a way that used to be considered virtually impossible.

In recent months it became apparent that the nerves running through the cornea may be used as an indicator of damage in the peripheral nerve system in diabetics. In cooperation with the Karlsruhe-based Institute for Technology and the University of Leipzig we were also able to develop software modules for quantifying the level of nerve damage. Today, this method is already being used in the United States, Australia and Manchester, England, where the positive results of the scientists in Rostock could be confirmed. We expect this technology to replace the previous need for collecting biopsies from the skin of diabetics and provide a non-invasive way to monitor nerve changes caused by degenerative diseases, especially diabetes. We are currently conducting clinical studies in cooperation with the Südstadt Rostock Medical Center and the Institute for Clinical Diabetology at the German Diabetes Center of Heinrich Heine University in Duesseldorf.



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Please feel free to contact us at any time. We would be pleased to answer any additional questions concerning medical services in Germany.

Our specially trained and certified professionals prepare individual plans for a healthy diet (including training sessions on food-shopping and cooking), as well as suitable physiotherapeutic programmes, such as aqua aerobics, medical training therapy, group courses and relaxation techniques.

Diabetes mellitus – prevention, treatment – active lifestyle

The ever-increasing incidence of diabetes mellitus worldwide owing to modern lifestyles does not mean that diabetes cannot be prevented or effectively treated.

On the contrary: both scientific research and clinical practice in this area around the globe demonstrate the importance of early diagnosis as the main goal in diabetes management. Regular check-ups for individuals in high-risk groups are considered to be of utmost importance. These high-risk groups include patients suffering from arteriosclerosis, hypertension and/or obesity, as well as the elderly.

The permanent increase in blood glucose levels is regarded as a major factor in the development of this illness. The normalisation of glucose levels constitutes a key requirement for minimising the development of diabetes-related complications. An appropriate diet, an optimal exercise programme, glucose-lowering medication and insulin contribute to the achievement of this aim.

If a patient develops type 2 diabetes mellitus, an appropriate diet is recommended as an integral part of the therapy. If a treatment of exercise and dietary modification proves insufficient to control the disease, oral medication can be prescribed. Adhering to these guidelines makes it possible to control the diabetes and enjoy an active lifestyle for many years to come.

Following this approach we offer a broad range of modern services directed at prevention, diagnosis and therapy, both at our medical outpatient centre and in co-operation with other medical institutions in Northern Germany.

Our specially trained and certified professionals prepare individual plans for a healthy diet (including training sessions on food-shopping and cooking), as well as suitable physiotherapeutic programmes, such as aqua aerobics, medical training therapy, group courses and relaxation techniques.

Our services for non-German-speaking patients can be compiled from a selection of modules:

- all services offered on a native-speaker level, thus ensuring a comfortable stay and effective treatment

- individual selection of the best medical institution for the patient's needs
- selection of the medical institution, medical personnel and conditions of stay in consultation with the patient
- preparation of the necessary documents in the German language for the specific treatment, including video conferences with the medical personnel involved
- communication, special rates for international calls
- written quote, payment transactions, final invoice
- travel to and from Germany (special fares from Scandinavian airlines and Lufthansa)
- transfer, accommodation
- translation of medical reports (e.g. into Russian)
- recommendations for further treatment, e.g. aftercare



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In the field of modern diabetology, diabetes-care practical training is becoming an increasingly important consideration in addition to the medical treatment of the patient. Personal motivation is a significant component of the therapy, playing a decisive role in the treatment success, as well as in the prevention of secondary diseases and complications. Health weeks for diabetics are based on the quality guidelines of the German Diabetes Association (DDG). The knowledge and practical skills gained by patients during their holiday offer a strong foundation for diabetes self-management. The involvement of partners/family members is encouraged.

Gesundheitsinsel Rügen

Rügen – **A health island** with first-class infrastructure: its health resorts, clinics, quality hotels, mild bracing climate, attractive Baltic coast, unique natural paradise, sea buckthorn and healing chalk offer excellent conditions for combining a relaxing holiday with medical treatment and high-quality, health-related services. In addition healthcare professionals cooperate closely with experienced service providers in the tourism industry through a special network called Health Island Rügen (Gesundheitsinsel Rügen e.V.), offering health holidays for people

- who would like to undergo a medical or therapeutic treatment – or require nursing care – during their holiday,
- who, owing to a physical disability, require barrier-free facilities & services,
- who live with a chronic illness and require personalised support
- or who are simply health conscious and would like to plan a holiday with activities that help them maintain their health.



Health holiday with diabetes on Rügen – lifestyle & self-management

Holidaymakers who have been diagnosed with type 2 diabetes can plan a health holiday on Germany's largest and most beautiful island. The concept of health weeks for holidaymakers with diabetes is based on the concept of learning new lifestyle habits in a setting far away from the individual's familiar, everyday environment. Following an analysis of the individual case of diabetes, a holiday programme is custom designed for the patient. Special, health-related services and programmes include games and other sports activities, such as Nordic Walking, aqua aerobics and nature walks, as well as special nutrition seminars, diabetes-related coaching and instructor-led cooking evenings. Physiotherapists, diabetes advisors, medical specialists and podiatrists guarantee a high-quality medical and therapeutic programme, which is offered in a first-class hotel atmosphere. Following each of the various

exercise, nutrition and training activities, recommendations are given on how best to apply the newly acquired skills and/or knowledge at home. During the health week, patients also have sufficient time to enjoy a relaxing holiday on the island of Rügen.

Main objectives

The organisation "Gesundheitsinsel Rügen e.V." was founded in 2004 to promote medical care, nursing care and general healthcare for Rügen's residents and guests. A system of holistic health promotion and preservation is achieved through extensive cooperation between the medical, pharmaceutical, food, tourism and educational sectors. To successfully implement its objectives, the organisation works together with various relevant actors, such as clinics, physicians, health insurance funds, recreational and informational facilities, partner hotels and service providers. It is therefore a highly efficient unit, able to react quickly, flexibly and independently to the special needs of guests, as well to political and social changes.



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IMACO GmbH was founded in 1993. Since then we have specialised in blood-glucose monitoring systems and rapid tests for the OTC market.

Over the years we have developed a wide range of systems that provide reliable services to patients and doctors – depending on the application. Our systems are subject to strict quality tests. All products have been tested and approved in accordance with the current ISO standard and the German Medical Association Guidelines (RiLiBÄK).

With our competence and know-how, we are able to provide expert advice to dispensing chemists and doctors. Our products are recommended by German health insurance funds. (Cat. B of the Association of Substitute Health Insurance Companies (VdEK) agreement on the provision of medications)

Research & development

Our development work, ideas and technological expertise are focused on current diagnostic needs in Germany.

Examples include the Monometer® ADVANCE System and the GlucoTel®.

The quality of our production unit

Over the years we have developed a comprehensive quality management system in compliance with the strict legal requirements. Before their release, every batch of test strips is tested in our own laboratory in accordance with established laboratory procedures and standards under the direction of a diabetologist (DDG). The same applies to product testing for individual systems.

Production

Advanced production technologies, large production capacities, highly qualified personnel and flexibility are essential for the satisfaction of our customers.

Quality laboratory

Our medical-scientific department, with its own laboratory facilities for quality control, is headed by an experienced medical specialist for internal medicine and diabetes (DDG).

In our laboratory, product innovations are tested and product quality is verified through round-robin tests. Individual product batches are thoroughly tested and individually approved prior to market introduction in order to maintain our exacting quality standards.

Customers, doctors, dispensing chemists and consumers can get expert advice at any time by calling our hotline.



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The University Medicine Greifswald dates back to 14th October 1456, when the University of Greifswald with its medical faculty was founded. Today the University Medicine Greifswald offers a large spectrum of medical services and encompasses a total of 21 clinics/polyclinics, 19 institutes and other important institutes working closely together.

In 2014 all clinics, which are currently distributed across the city, will be relocated to a single location: the newly built clinic building. Following this restructuring the University Medicine Greifswald will be able to work even more efficiently and innovatively, putting it on course to becoming one of the most modern medical institutions in Germany.

The highest quality for the well-being of our patients!

Gestational diabetes

Gestational diabetes affects 2-5% of all pregnant women. Because this condition can affect both mother and child, it is important to learn how to manage and control diabetes for the duration of the pregnancy.

Pregnant women diagnosed with gestational diabetes develop a condition referred to as insulin resistance, with inadequate control of blood sugar levels.

The treatment of gestational diabetes may include a special diet, exercise, blood glucose monitoring and/or insulin therapy.

The complications of gestational diabetes are usually manageable and preventable. Our interdisciplinary team of experts, including doctors specialising in maternal fetal medicine and internal medicine, nurses, diabetes educators and dieticians, provides a comprehensive treatment program to meet your special needs.

We also place a special emphasis on preventive care and life after gestational diabetes.

Top-quality medical care

The University Medicine Greifswald has 883 beds, including 23 beds in psychiatric day units and 10 beds in pain-therapy day units.

In 2011 a total of 150,000 patients were treated at the University Medicine Greifswald; of this total, 37,806 patients received a treatment involving both hospital and outpatient care.

Apprenticeships and scientific research

- 1,714 medical students
- 560 students at the University Medicine Greifswald vocational school
- Research information system
- Community Medicine and Study of Health in Pomerania (SHIP)
- Individualized Medicine in Greifswald
- Graduated college “Interaction between pathogen and host with generalized bacterial infections”
- Young professionals promotion scheme



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BioCon Valley GmbH has locations in Greifswald and Rostock to network companies, research facilities and clinics in the state. It serves as a central information hub and provides support for projects aiming to commercialize the latest research results in the region.

Becoming Germany's leading state for healthcare and wellness

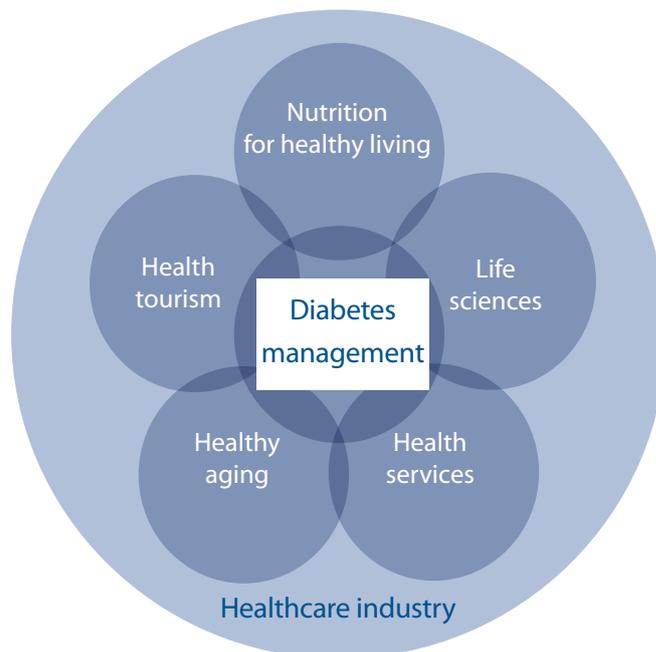
As the central point of contact and service provider for the life sciences and healthcare industries in northeastern Germany, BioCon Valley® guides the development of Mecklenburg-Vorpommern into the leader among German states in the field. It also supports the healthcare and wellness sector as well as technology-oriented businesses and research facilities with projects in health tourism, medical wellness, prevention, rehabilitation and technological development. As one of Germany's "bio regions", BioCon Valley is part of a German network of providers and offers services for international cooperation, particularly in Northern Europe, as a co-founder of the international "ScanBalt" network of biotechnology initiatives around the Baltic Sea.

Main areas of activity

Modern life sciences are the source of innovative products and services for medicine, agriculture, nutrition and the environment. Core competencies in Mecklenburg-Vorpommern are in the areas of diabetes, individualized and regenerative medicine, medical technologies and diagnosis, modern plant and animal breeding, animal health, industrial or white biotechnology. The health and wellness sector is based on natural competitive advantages like a healthy climate and intact landscapes. Together with the traditional strengths of the region such as tourism, a maritime economy, agriculture, and medical competence, a wide range of services are available.

Strong partners

With two university medical centers, 39 hospitals, over 60 preventive care and physical therapy facilities and 59 officially recognized health resorts and recovery facilities, Mecklenburg-Vorpommern offers a superb healthcare and wellness infrastructure. The subject of diabetes plays a central role in this endeavor.



Credits

Photos

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