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May - September

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Patented Functional Clothing

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SANKOM[®] Patent Bra

- Uses the weight of the breasts to straighten shoulders
- Improves posture
- Reduces back pain
- Wire free Push-up effect
- Comfortable and breathable

SANKOM[®] Patent Shaper

- Restores body's center of gravity
- Minimizes lower back pain
- Hourglass figure - flat tummy & butt lift
- Stronger abdominal muscles
- Comfortable and breathable

SANKOM[®] Patent Socks

- Improves blood circulation
- Active graduated compression
- Anatomical design for calf, ankle and arch support
- Energizes tired achy legs
- Reduces swellings



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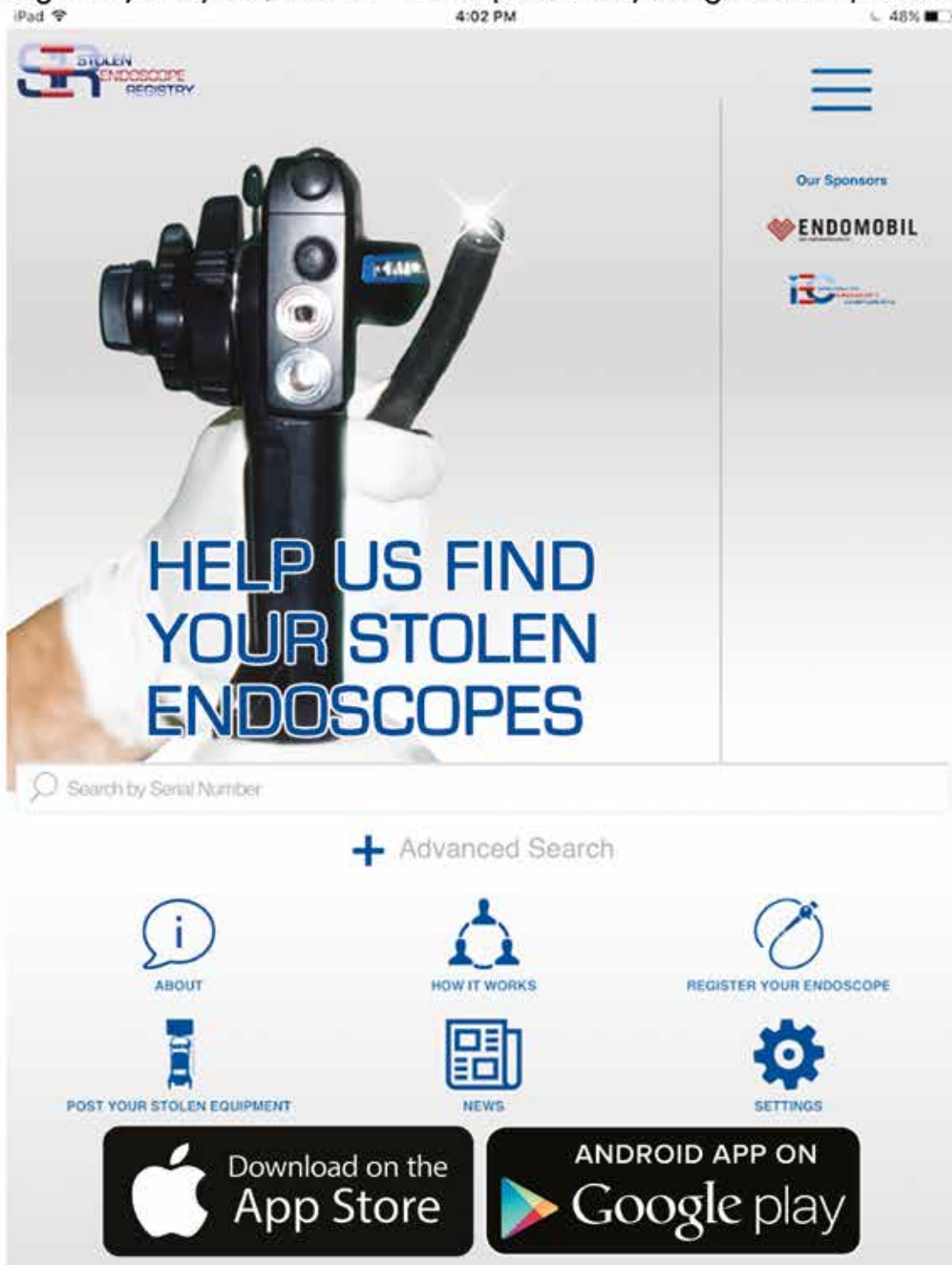
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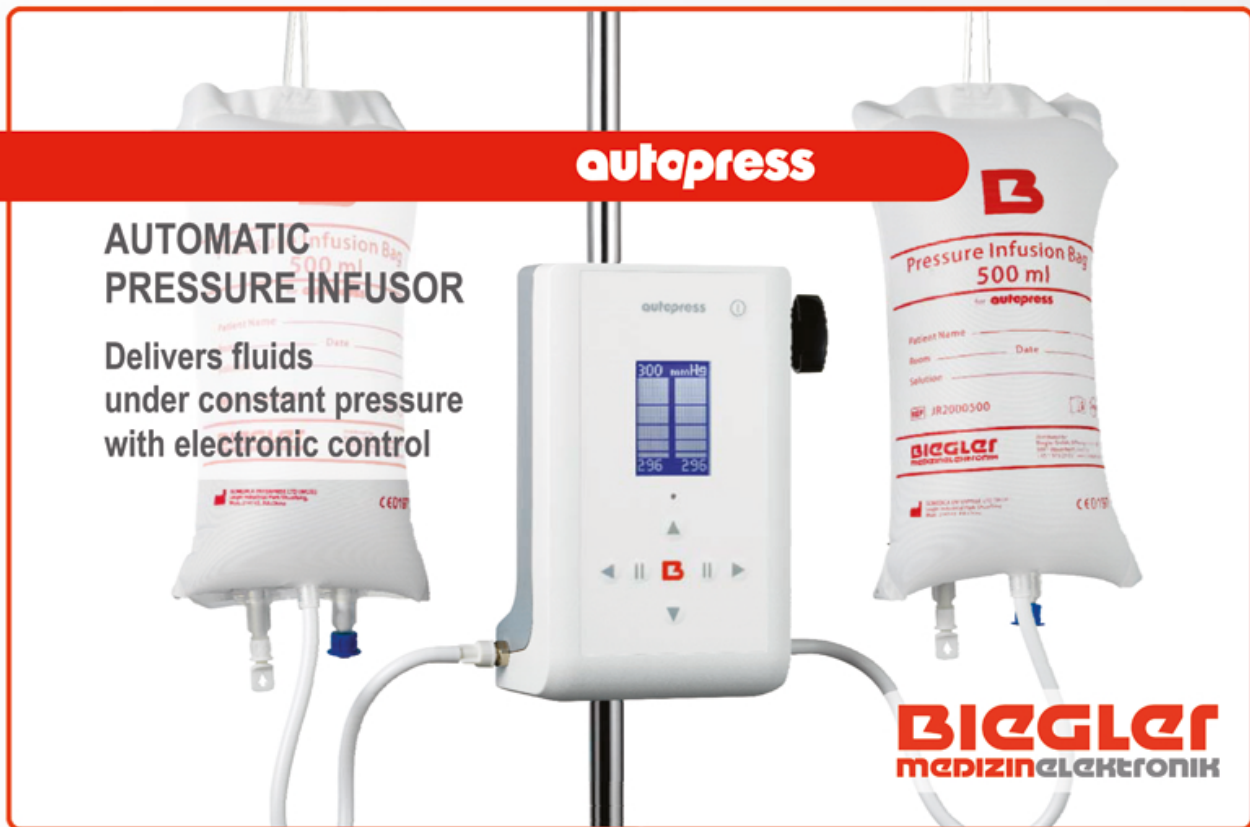
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In an effort to protect the international medical equipment trading community as well as hospitals, clinics, physicians, repair facilities, leasing, and insurance companies etc. IEC created the first open database and news platform for stolen endoscopes, ultrasound probes, cameras, light sources etc.

Medical Equipment theft has reached millions in financial damages with an ever-increasing number of products missing from facilities all around the world. This FREE APP is brought to you by IEC, LLC and made possible by our generous sponsors.





Automatic Pressure Infusor

BIEGLER GmbH develops and manufactures medical devices and disposables for over 40 years. Biegler serves their customers by offering them not only high quality products and services but comprehensive and personal support as well.

The company based in Austria / Europe introduced the AUTOPRESS device as an important part of its fluid warming philosophy. Autopress works directly with Biegler blood and infusion warmers to deliver blood and fluids at high flow rates or as a stand-alone unit to deliver fluids at constant pressure up to 300 mmHg wherever needed.

Pressure infusing bags are mainly used for irrigation purposes during arthroscopy, laparoscopy and hysteroscopy. The adjusted pressure is constantly maintained and therefore does not require manual compensation.

When connected to an electrical outlet, Biegler Pressure Infusor automatically maintains pressure on blood and IV fluid bags. Pressure range is zero to 300 mmHg.

Features at a glance:

- Pressure is adjustable and always maintained
- Precise pressure setting from zero to 300 mmHg with electronic control
- Accommodates pressure cuffs
2 x 500, 2 x 1000 or 2 x 3000 cc
- Small and lightweight
- Mains operated
- Pressure cuffs can be emptied rapidly and easily
- Significant reduction of set up time

Biegler GmbH
Allhangstrasse 18a
3001 Mauerbach
Austria

Tel.: +43 1 979 21 05
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Back orthosis

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DYNAMICALLY COMFORTABLE



The new **SpinAir** spine orthosis works the postural correction in a dynamic and gradual way, maximizing comfort and providing patients with a more active daily life



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SP500

Available
in 5 sizes



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and rehabilitation



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5 DIFFERENT CONFIGURATIONS



● 808nm/10W

● 1470nm/15W

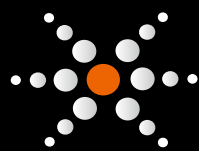
● 980nm/30W

● 1064nm/15W

● 980nm/15W
+635m/400mW

FOR WIDE RANGE OF APPLICATIONS

MICROSURGERY, PHYSIOTHERAPY
ENT AND OPHTHALMOLOGY
PHLEBOLOGY AND DERMATOLOGY
NEUROSURGERY
PODIATRY



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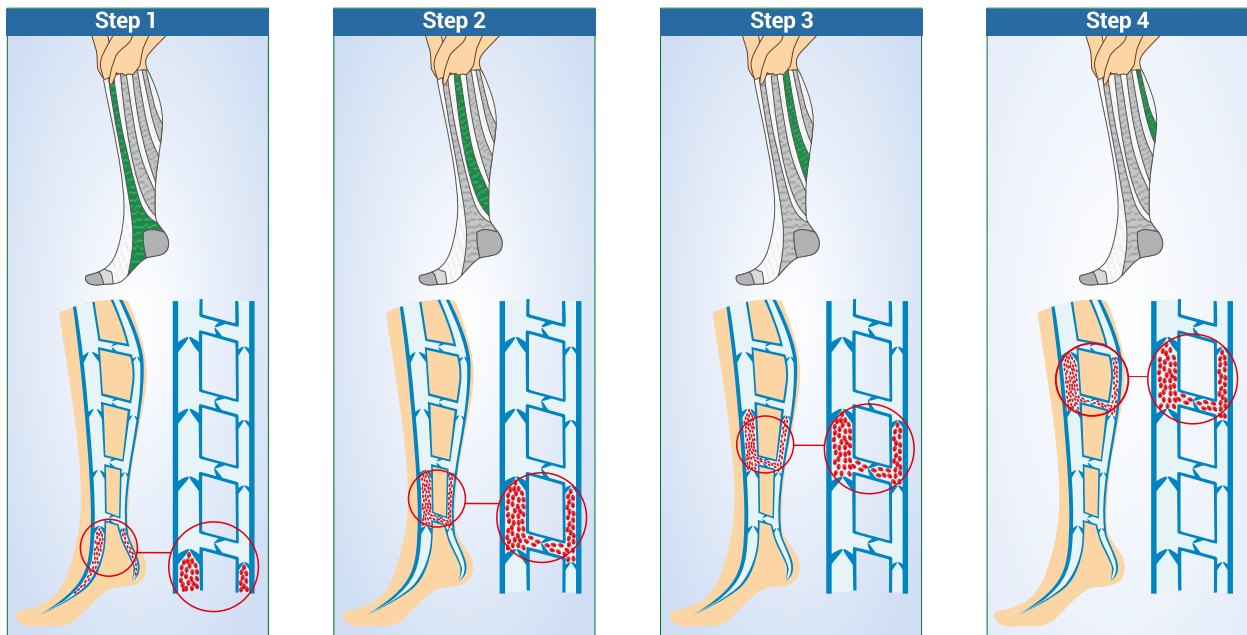
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SANKOM® Patent Socks

The SANKOM® Patent Socks are the First compression socks in the world that use the unique active anatomically targeted compression. The SANKOM® Patent Socks eliminate the cause of venous blood stagnation and fight the negative consequences of poor blood circulation in the legs. Through active targeted step-by-step compression, the SANKOM® Patent Socks help evacuate venous blood upwards and decrease excess intravenous blood pressure in the lower extremities.

The SANKOM® Patent Sock is composed of 4 gradual compression lines, that when pulled one after another will help improve blood circulation:

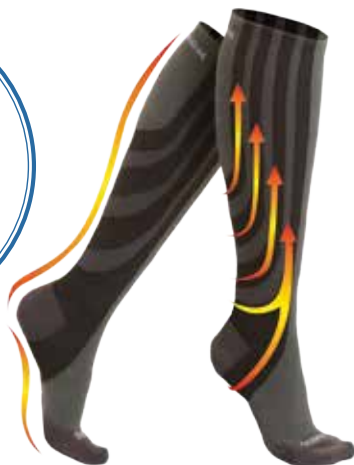


With each stage venous blood is pushed out into the above-lying blood vein system. The regular repetition of these 4 stages activates the gradual targeted stimulation to improve blood circulation.

Unlike ordinary compression socks that use extreme compression to restrict blood flow to the lower leg, the SANKOM® Patent Socks use innovative patent technology step by step targeted compression to improve the efficiency of the veins.

Invented and developed by Dr. Mazourik, Switzerland, the SANKOM® Patent Sock is a breakthrough concept to help people with common problems caused by sedentary lifestyles, low or extreme physical activity, excess weight, pregnancy etc.

The only socks in the world to both prevent the cause and fight the consequence of poor blood circulation.



- Improves blood circulation
- Energizes tired legs
- Reduces swelling & heaviness
- Anatomical muscle & joint support
- Varicose & spider veins relief
- Quicker muscle recovery
- Anti-fatigue
- Shock absorption heel
- Built-in Arch support
- Ankle support
- Cushioned sole
- Moisture wicking

USA Patent app.15/179,598; PCT International app. (PCT/US 2017/032256);
USA Patent app. 29/587,207; EU Patent 003512524-001; Chinese Patent CN304148090S more is coming soon!



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THE “ABILITY” OF CONTENT MARKETING



You must have heard the phrase content is king; a statement that has never been more relevant. In a world where consumers are more savvy, more demanding and more empowered than ever, brands and businesses need to increase their content marketing efforts to engage and inspire

customers. In today's fast-paced digital world, content marketing is the heart of marketing. When it comes to building brand awareness, connecting with your target audience, building trust and showcasing your authority, there's no pursuit more powerful.

But what is content marketing? Content marketing covers a broad spectrum but, it's a strategic marketing approach focused on the implementation of creating, sharing and distributing quality content that is informative, entertaining and valuable to attract and retain a clearly-defined target audience. Ultimately, enhance awareness, encourage loyalty and increase profitability. With digital technologies constantly evolving, there have never been more opportunities for brands and businesses to branch out to new prospects with innovative and inspirational niche content.

So, as businesses are devoting always more budget to content marketing, the question is, how can you get the most out of incorporating print into your content marketing plan? We've been hearing for decades now that print is dead. And the debate over whether this is true will probably continue for decades to come. However, there has never been a greater time of opportunity for brands in the printed channel than right now! **The key is to produce a highly niche, highly targeted publication that positions your business as a top expert on subject matter that your audience cares about.** Why is the print approach making such a rebound? In these days of 140-character tweets, instant messages and texts, print gives your customers something to sink their teeth into. You can discuss topics at greater length and give your readers something to hold onto for more than a few fleeting seconds.

Since print is now considered “non-traditional,” it's the perfect medium to use to capture — and hold — attention.

This is what Infomedix International printed magazine is all about. We make all efforts in creating and sharing with our readers in-depth quality and valuable information on medical markets, social health issues and events.



This time we have focused on world air pollution and its health effects in the intent to enhance awareness on what is too often taken for granted or not adequately evaluated... if you think that in 2013 air pollution caused, in Europe, almost three times the number of deaths by road traffic. But we never leave behind what we are specialized in: world markets. Our outlook is on the Cuban medical market, a curious health system, so different from all. How do we do all this? We have created long-standing connections and content-based synergies with scientific and trade medical associations, trade show organizers, chamber of commerce and health ministries in most countries around the world. We collect reliable and quality information, we search, double check and compare data from our sources and we travel the world to participate at congresses and trade exhibitions, round tables, press conferences and all sorts of industrial and scientific gatherings to get as much knowledge and know-how as possible, building a network of meaningful connections.

So, the path for content marketers is clear. Be it print, text, imagery, gifs or video – the importance of content marketing cannot be stressed enough and should be a vital part of every brands modern strategy. Nonetheless, writing great content is a choice. You can choose to put in the time and work required to create great content and build a prosperous brand. Or you can choose to take the easy path and write poor content – a path that ultimately will get you nowhere. It will only result in a waste of time, energy and resources. We, at Infomedix, have chosen quality and work.

Baldo Pipitone

CEO Infodent S.r.l.

baldo.pipitone@infodent.com

Metaltronica: an Innovative & Progressive Company in Mammography Technology

Metaltronica is focused on diagnostic imaging and in the manufacturing of advanced mammography equipment.

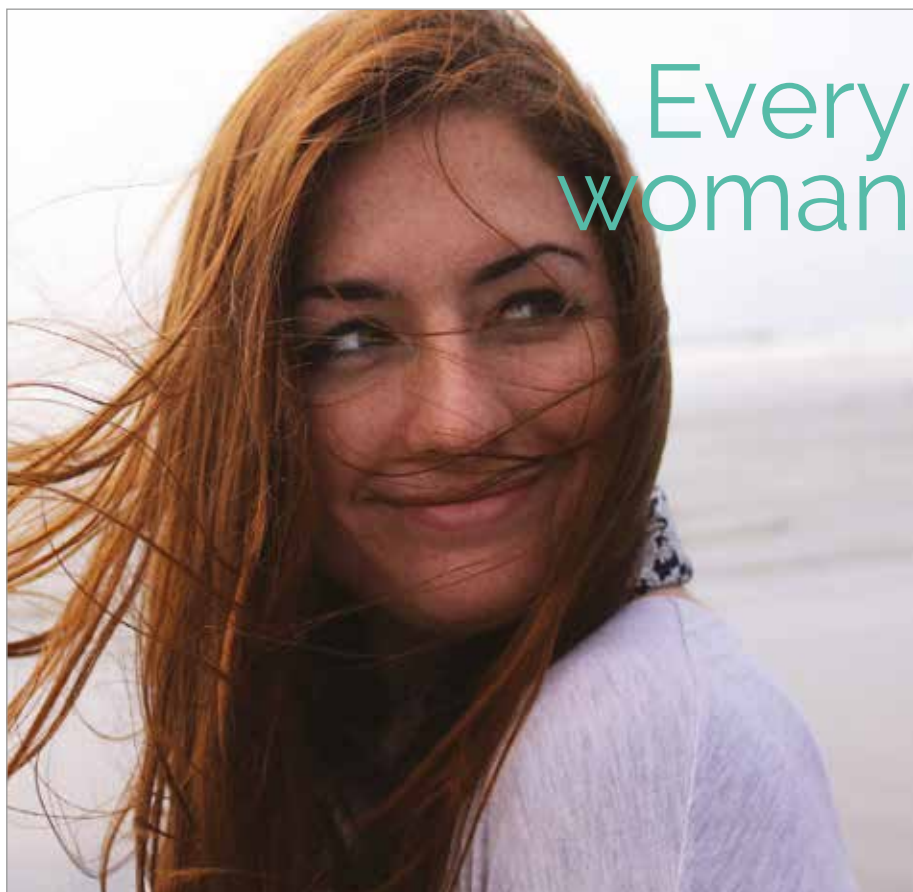
For over 40 years, Metaltronica has been at the forefront of breast cancer prevention, assisting medical professionals, radiologists and technicians with superior diagnostic capabilities. Specifically, we offer high quality mammographic images, while significantly reducing the dose of radiation. Our state-of-the-art systems are built with two main objectives: to simplify operations and improve workflow, and to ensure the mammographic examination is a comfortable experience for the patient.

The highly trained technical staff at Metaltronica has extensive experience in the field of mammography. The company is able to offer analog mammography units for in-depth breast exams and mammo-

graphy screening. We also provide digital mammography solutions, which result in excellent diagnostic images for two-dimensional screening, breast tomosynthesis, and for stereotactic biopsies.

Recently, Metaltronica introduced its new ultra-compact, ergonomic 2D mammography system, the Helianthus C. This all-in-one system, with its integrated lateral acquisition station, is designed to provide patient comfort and complete operator support. The system has reduced the weight of the equipment and can now be used in small vans, which do not require professional driver licenses. Its low power consumption in stand-by mode, and lower component count, ensures that it is an eco-friendly system.

www.metaltronica.com //
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Every woman has a story.

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- Its unique design allows core body heat to be easily maintained and serves as your own personal radiator.

- Available with a rechargeable battery power supply or air activated warmers for those requiring complete mobility or a plug-in transformer for those who are stationary.

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1) The first and only patented portable OR personnel warming device.

2) Nurses, Anesthesia Staff, and Perfusionists will be more comfortable and function better as the distraction of working in the cold is eliminated.

3) Reduce Surgical Site Infections as staff will no longer need to borrow the hose from forced-air patient warming systems for themselves and spread bacteria.

4) Save money on OR laundry as nurses will no longer need to borrow multiple blankets to keep warm.



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Please contact us for more details about the specific model of interest.

www.bmibiomedical.it // info@bmibiomedical.it





Villa Sistemi Medicali presents the new mobile application "RAD/AR"

Villa Sistemi Medicali, characterized by its strong propensity for innovation, has decided to invest first in its industry in the use of the latest augmented reality technologies, to promote its products in an unprecedented and effective way. The result of this project is "RAD/AR", an application for smartphones and tablets that uses these technologies in an original way to visualize and integrate in the real environment the three-dimensional models of its equipment, showing their functionalities and possible applications. RAD/AR is therefore a powerful information tool for customers, and a revolutionary working tool for the commercial network, supporting in a simple and intuitive way the communication, sales and staff training activities, allowing also to work remotely, with consequent reduction in costs and working times. The "RAD/AR" App, premiered at the European Congress of Radiology 2018 in Vienna, is already available for download on the App Store and on Google Play.



www.villasm.com // vsmmkt@villasm.com

Spinair. Technically innovative, dynamically comfortable

PRIM launches SPINAIR, an innovative spinal orthosis specially designed for patients with osteoporosis and kyphosis. It's been created to help them to stay more active in their daily lives, working the postural correction and maximizing their comfort.

SPINAIR has a duraluminium spine, whose characteristics make it unique in the market: it incorporates flexible upper flaps that favor the anatomical adaptation of the orthosis to the shoulders and a soft padding along the splint that provides total comfort. It is light and it adapts



to every patient anatomy, thus helping the spine to maintain a correct posture. It has elastic and non-elastic zones "on/off" that favor the adaptation and fixation of the orthosis to the body as well as "butterfly" buckle that promotes a gradual retropulsion of the shoulders. Available in 5 sizes, it is indicated for some pathologies such as osteoporosis, kyphosis, degenerative processes as well as postural and post-operative rehabilitation.

www.prim.es/?lang=en // info@prim.es

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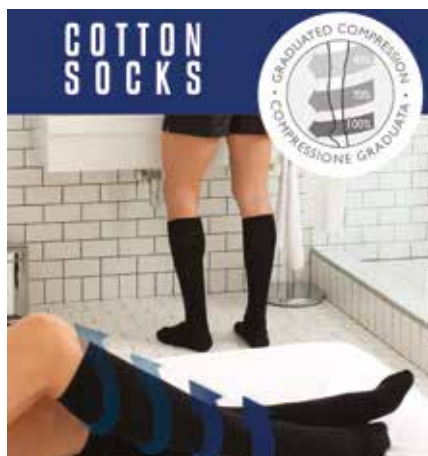
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RELAXSAN Medical Socks

Calze G.T. S.r.l. propose a line of socks with graduated compression in Cotton or Milk fiber for Men and Women. Style 820B is a new pattern Cotton Socks with graduated compression 18-22 mmHg with a special foot sole to gently massage the foot at each step.

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All products from Relaxsan are Made in Italy, Certified ISO 9001-13485 and CE as Medical Devices Class I. Available also production for Private Label.

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RELAXSAN

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- Effectively seals catheter insertion site
- Establishes a microbial barrier
- Immobilizes skin flora
- Bactericidal on contact in vitro



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An affordable wound closure solution.

- Strong 2-octyl cyanoacrylate formula
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- No suture removal required



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Long-lasting microbial protection.

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OPERA Swing, R/F multifunctional remote-controlled system with digital flat panel detector



OPERA Swing is an advanced R/F multifunctional remote-controlled system designed for the best combination with state-of-the-art digital flat panel detectors. A system that actually allows the operator to manage, through a unique highly integrated solution, examinations in both digital radiography and fluoroscopy. Thanks to its cutting-edge technology, OPERA Swing ensures an extraordinary user-friendliness, as well as an unrivalled operational efficiency in any kind of diagnostic procedure: skeletal system, thorax, lungs, gastroenterology, gynaecology, paediatrics, emergency, digital angiography, tomography, tomosynthesis, reconstruction of the column and lower limbs. The extreme flexibility of the system structure makes it possible to execute examinations, including fluorography, with the detector being in contact with radio-transparent stretchers-tabletop; additionally, in combination with its special stretcher, it ensures the execution of different projections and incidences: AP and lateral projections, transversal oblique projections, special projections on stretchers. OPERA Swing, the actual "all in one" system.

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GMM, know-how and innovation in diagnostic imaging

GMM range of products includes cutting-edge solutions for both conventional and digital radiography applications: extreme user-friendliness, reliability and safety in any diagnostic procedure.

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Giotto Class, the new dimension in tomosynthesis and prone biopsy

Giotto Class is an advanced breast tomosynthesis (DBT) system including an integrated capability to generate full-field digital mammography (FFDM) images.

It features a unique, particularly ergonomic design which ensures patient comfort and user-friendliness for the operator. The C-arm stand enables a wide freedom of inclination: it can be tilted downwards and up-wards to maximize patient comfort and breast positioning. The gantry is also able to reach the horizontal position (+90°) for interventional procedures with patient in the prone position. A high-precision tomo-guided biopsy kit allows the operator to reduce the procedure time minimizing patient's anxiety level by choosing the best lesion's approach.

IMS Giotto is a company of GMM Group.

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- TOMO & STEREO BIOPSY
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Giotto Class

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- Provides moist environment for proper healing.

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Kemage® Silicone

Medical grade advanced topical Silicone Gel, used to improve the physiological and cosmetic appearance of the scar that may result from C-section and stretch marks that developed during pregnancy.

Biosecrets® Baby Wipes

- Dermatologically approved soft gentle non-woven impregnated with an alcohol free lotion specially developed for baby's delicate skin which are perfect for each nappy change.

- It can be used all over the body to clean baby's delicate skin during nappy change or during feeding time.

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Biegler Medizinelektronik - more than 40 years of experience in the medical field

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Biegler's expertise is in the development and manufacture of ready-for-sale medical products. The company operates distribution to end customers in over 70 different countries with distribution partners.

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SANKOM Patent Bra



Awarded "Best Consumer Oriented Product" at ERA Europe!

The revolutionary SANKOM Patent Bra is the first bra in history that combines the advantages of ordinary and orthopaedic bras and excludes their disadvantages combining functional, health and aesthetic benefits.

The SANKOM® Patent Bra is an innovative, patented bra technology developed in Switzerland by Dr. Mazourik.

How does it work?

SANKOM® technology uses the weight of the breasts to straighten the shoulders. It fights against poor posture, back pain, and strengthens the back and core muscles, giving the desired push-up effect and creating attractive cleavage at the same time.

Poor posture is a key cause of back pain, fatigue, tension and weak core muscles. SANKOM® Patent BRA helps to improve a women's posture naturally and comfortably.

Unlike other bras, it is made out of 2 individual structures giving each breast the support it needs, as well as a push-up effect.

Unique Benefits:

- Improves posture
- Reduces back pain
- Minimizes neck tension
- Wire-free push-up effect
- Excellent Support



- Hypoallergenic & breathable fibers
- Targeted shaping

Ideal for all ages, everyday wear as well as for exercise.

Perfect for pregnancy & beyond: Doctor's recommended during pregnancy thanks to it's flexible wire free cup sizing and hypoallergenic non irritating breathable material for extra sensitive skin, as well as for easy breastfeeding with easy access thanks to it's double individual structure and removal pads.

The SANKOM Patent Bra has helped hundreds of thousands of women of all ages, to avoid and improve health pro-

blems caused by ordinary bras, as well as the modern sedentary lifestyle all while feeling comfortable and looking great!

Awarded 3 Utility Patents in the US, and many more patents worldwide, the SANKOM Patent Bra is groundbreaking invention that is revolutionising the Bra industry.

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IAE - High Quality X-Ray Tubes



IAE history started in 1955 as manufacturer of electronic valves but very soon this production was abandoned and the Company focussed all production efforts on rotating anode tubes. Nowadays IAE is a major role player in the International X-Ray market as the only independent manufacturer in Europe of rotating anode tubes. With its wide product line of more than 100 insert/housing combination, IAE is a strategic and reliable partner to the most important equipment manufacturer globally.

C20

A new compact lightweight housing, specifically designed for mobile equipment.

A low weight, less than 8.5 kg, combined with compact dimensions, 116 mm diameter and 342 mm length, allows significant reductions in the equipment supporting structures.

High voltage sockets are the compact and reliable Mini Claymount, who allow a significant reduction in the size of the unit.

Low voltage connections to the stator and pressure safety switch are obtained by fast connection sockets, to ease quick and error proof tube installation and replacement.

A range of tube inserts up to 54 kW peak radiographic power at high rotation speed is available for this unit.



XKI016 T

IAE has recently developed a compact light weight rotating anode mammography x-ray tube unit, with special double angle target, for optimal performances with all techniques.

A non traditional, metal ceramic structure consented to divide by a factor two both the dimensions and the weight, compared to a standard mammographic unit, down to a lightweight 5.5 kg, and at the same time to increase the heat dissipation by a factor 4, obtained by an efficient air cooling.

This high dissipation, combined with the light weight, makes it the ideal tube for high energy imaging techniques with moving X-ray source like tomosynthesis.

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Air pollution is a major environmental risk to health. By reducing air pollution levels, countries can reduce the burden of disease from stroke, heart disease, lung cancer and both chronic and acute respiratory diseases, including asthma

Joint effects of outdoor and indoor air pollution in both cities and rural areas were estimated to cause 7 million premature deaths worldwide in 2012

According to the European Commission, Nitrous Oxide was responsible for killing as many as 70,000 people in 2013. This was almost three times the number of deaths by road traffic accidents in the same year

92% of the world's population in 2014 lived in areas where WHO air quality standards weren't met.

Reducing outdoor emissions from household coal and biomass energy systems, agricultural waste incineration, forest fires and certain agro-forestry activities (e.g. charcoal production) would reduce key rural and peri-urban air pollution sources in developing regions

Reducing outdoor air pollution also reduces emissions of CO₂ and short-lived climate pollutants such as black carbon particles and methane, thus contributing to the near- and long-term mitigation of climate change

Every year, an estimated 2.2 billion tons of waste is dumped in our oceans. Marine ecosystems are dying out because of water pollution. We have garbage islands the size of continents floating in our oceans. 27% of our coral reefs have been destroyed

Some 87% of those premature deaths occurred in low- and middle-income countries, and the greatest number in the WHO Western Pacific and South-East Asia regions

The toxic chemicals released into the air settle into plants and water sources. Animals eat the contaminated plants and drink the water. The poison then travels up the food chain – to us

When exposed to ground ozone for 6 to 7 hours, scientific evidence shows that healthy people's lung function decreased and they suffered from respiratory inflammation

At a Glance

Policies and investments supporting cleaner transport, energy-efficient housing, power generation, industry and better municipal waste management would reduce key sources of urban outdoor air pollution





Focus Air pollution

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A Breath of Fresh Air

Clean air is a basic requirement of human health and well-being; however, air pollution continues to pose a significant threat to health worldwide and most of the disease burden is borne by the populations of developing countries. But every positive action counts. Since we share everything on Earth with every living thing on the planet, what happens in one area affects everything too, no matter how far away. The small effort we make towards a cleaner environment can start a healing ripple effect. We may still save what is left of our natural resources and make the world a better place to live in for our future generations.

Air pollution is a major problem affecting everyone in developed and developing countries alike, which has a serious toxicological impact on human health and the environment. It is caused by both human interventions and/or natural phenomena. It is made up of many kinds of pollutants including materials in solid, liquid and gas phases. **It has several different emission sources varying from small unit of cigarettes and natural sources such as volcanic activities, forest fire, sea water but, emissions from motor vehicles and industrial processes contribute the major part of air pollution.** Long and short-term exposure to air suspended toxicants has a different toxicological impact on human including respiratory infections and inflammations, cardiovascular dysfunctions, neuropsychiatric complications, the eyes irritation, skin disease and long-term chronic diseases such as cancer; hence, air pollution is linked with millions of deaths globally each year.

World Health Organization (WHO) estimates that in 2012, some 72% of outdoor air pollution-related premature deaths were due to ischemic heart disease and strokes, while 14% of deaths were due to chronic obstructive pulmonary disease or acute lower respiratory infections, and 14% of deaths were due to lung cancer. These estimates reflect the very significant role air pollution plays in cardiovascular illness and premature deaths – much more so than was previously understood by scientists. Some deaths may be attributed to more than

one risk factor at the same time. Some lung cancer deaths could have been averted by improving ambient air quality, or by reducing tobacco smoking. A 2013 assessment by WHO's International Agency for Research on Cancer (IARC) concluded that outdoor air pollution is carcinogenic to humans, with the particulate matter component of air pollution most closely associated with increased cancer incidence, especially cancer of the lung. An association also has been observed between outdoor air pollution and increase in cancer of the urinary tract/bladder.

A recent study has also revealed the association between male infertility and air pollution. Air pollution is further considered as the major environmental risk factor in the incidence and

These estimates reflect the very significant role air pollution plays in cardiovascular illness and premature deaths – much more so than was previously understood by scientists.

progression of some diseases such as asthma, the onset of type 2 diabetes, ventricular hypertrophy, Alzheimer's and Parkinson's diseases, psychological complications, autism, retinopathy, fetal growth and low birth weight.

According to the WHO study, outdoor air pollution from traffic and industry in both cities and rural areas was estimated to cause some 3 million premature deaths worldwide per year in 2012, globally, that's more than malaria and HIV/Aids combined; this mortality is due to exposure to small particulate matter of 10 microns or less in diameter (\leq PM10), which cause cardiovascular and respiratory disease and cancers. In addition to outdoor air pollution, indoor smoke is a serious health risk for some 3 billion people across the world who cook and heat their homes inefficiently and use dirty fuels which exacerbate air quality levels. **Some 4.3 million premature deaths were attributable to household air pollution in 2012. Of these numbers, as many as 60% are estimated to be women and children, the WHO says. It adds that 92% of the world's population in 2014 lived in areas where WHO air quality standards weren't met.** These figures come as the WHO works on reaching its 2030 global health targets which include reducing the per capital environmental impact of cities on air quality, ensuring universal access to modern energy services and increasing the share of sustainable and renewable energy source.

People living in low- and middle-income countries disproportionately experience the burden of outdoor (as well as indoor) air pollution with 87% (of the 3 million premature deaths) occurring in low- and middle-income countries, and the greatest burden in the Western Pacific and South-East Asia regions as a result of cheap and low quality of vehicle's fuel particularly gas oil, nonstandard motor engines, inappropriate public transport, overuse of fossil fuel, lack of public awareness and transparency, legislation and cooperation between different departments and green societies. On the contrary, the implementation of clean air regulations and other mitigation measures have helped in reducing emissions of air pollutants and reduce overall population exposure, especially in Europe, limiting the actual change in the global premature death toll from air pollution to a relatively modest increase. Nonetheless, the problem has not gone away even in countries with a long history of tackling air pollution. The UK, for example, which passed its first anti-air pollution legislation over 60 years ago, is currently involved in a long-running legal battle over its failure to cut pollution to legal levels.



A Global Outlook on Pollution and Health

While Delhi's air quality generates headlines worldwide, it is only 11th amongst the most polluted cities in the world, according to the WHO, with an average (mean) annual PM 2.5 concentration of 122 micrograms per cubic meter (ug/m3). In winter 2017 Delhi's pollution hit almost 30 times the WHO's safe limits, with the concentration of harmful PM 2.5 particles topping 700 ug/m3. To provide a little context, the highest reading at the same time in London was 69 and anything above 300 is considered "hazardous". Other cities at the same time registered even higher concentrations such as Igdir in Turkey with a whopping 999. In Piedras Negras, Mexico, the figure was 814. Hazardous readings were also reported in Aguascalientes, Mexico, Carmel, Israel and Dazhou, China.

But the most polluted of all is Zabol, a city of 137,722 residents in Iran with an average PM 2.5 of 217. By comparison, London's average PM 2.5 is 15, in Paris it is 18, in Los Angeles it is 11 and in Beijing it is 85. In Iran, as a developing country, the level of air pollutants has increased gradually since the beginning of industrialization in the 1970s and it is now amongst the world's most polluted country, reaching very harmful levels in megacities. Air pollution caused almost 4,500 deaths in 2013 only in Tehran and 20,000 across the country, according to health ministry estimates, resulting in 16 billion \$ annual loss, more than 2% of Iran's 2016 GDP. A combination of poor political decisions, substandard gasoline produced in the country and traffic congestion means that residents inhale a deadly mix of rubber particles, lead, sulphur dioxins and benzene. According to reports, Tehran enjoys less than 100 healthy days a year.

PM 2.5 refers to fine particles (2.5 micrometers or smaller in diameter), which often cannot be seen with the naked eye, produced by combustion, including motor vehicles, power plants, forest fires and some industrial processes. **Particulate matter (PM) can be solid particles or liquid droplets in the air made up of heavy metals and toxic organic compounds.** When smaller than 2.5 micrometers (that's 60 times thinner than a human hair), they are small enough to penetrate deep into the lungs and enter the bloodstream.

PM2.5 is considered the best indicator of assessing health impacts from air pollution. Its fine size poses the biggest risks to human health as they can be inhaled and accumulated in the respiratory system. Although the WHO says there is no safe level of PM2.5, according to annual average,

PM2.5 values should not exceed 10 ug/m3 (ug/m3 = micrograms per cubic meter). Larger particles, the result of crushing or grinding operations, dirt or dust stirred up from vehicles are known as PM10. PM10 are actually highest in the Nigerian city of Onitsha, followed by Peshawar in Pakistan and then Zabol in Iran - with Delhi just outside the top 20.

Spotting the world's most polluted countries is a little more problematic as the WHO tracks air quality at more than 1,600 locations in nearly 100 countries - but all are urban areas. **If you are now thinking about China's deadly air, you'd be surprised to know that it is not amongst the 10 most polluted countries, where the air quality is so poor it's hard**

WORLD'S MOST POLLUTED CITIES (PM 2.5)

	City	Average (mean) annual PM 2.5 concentration
1	Zabol, Iran	217
2	Gwalior, India	176
3	Allahabad, India	170
4	Riyadh, Saudi Arabia	156
5	Al Jubail, Saudi Arabia	152
6	Patna, India	149
7	Raipur, India	144
8	Bamenda, Cameroon	132
9	Xingtai, China	128
10	Baoding, China	126
11	Delhi, India	122
12	Ludhiana, India	122
13	Dammam, Saudi Arabia	121
14	Shijiazhuang, China	121
15	Kanpur, India	115
16	Firozabad, India	113
17	Lucknow, India	113
18	Handan, China	112
19	Peshawar, Pakistan	111

Source: www.telegraph.co.uk/travel/destinations/asia/india/articles/delhi-most-polluted-city-in-the-world/

to breathe. In fact, Pakistan's urban areas are, on average, the world's most polluted, followed by Qatar and Afghanistan. While Europe's most polluted cities are found in Turkey, Bulgaria and Serbia.

In China however, although levels of dangerous particulate matter, and corresponding premature deaths, have largely stabilized in recent years, pollution remains a concern. According to a study published last year by the U.S.-based Health Effects Institute, air pollution killed more than 1.1 million people in China in 2015, the most in any country in the world. The government is taking aggressive steps to curb air pollution by placing limits on coal power and vehicle traffic and has also begun investing heavily in renewable energy, most re-

cently announcing a \$360 billion investment in clean energy by 2020. Still, China remains fairly dependent on coal-generated power and its aspirational limit on coal-generated electric capacity—1,100 gigawatts by 2020—would still be three times as much as the coal-fired capacity in the United States.

Below, a brief outlook of the countries with the worst air pollution (most polluted urban areas) ranked by the WHO.

- **Pakistan** (average annual PM 2.5 concentration: 115.7 ug/m³)

With a population of over 190 million, urban air pollution in Pakistan causes thousands of adult deaths each year and is getting worse every year. At its peak in November 2017, Lahore's

levels of PM 2.5 were more than 30 times the WHO's safe limit (1,077 ug/m³). **But the problem is not limited to the city; in 2015, according to a WHO estimate, almost 60,000 Pakistanis died from the high level of fine particles in the air, one of the highest death toll.** A World Bank report found that outdoor air pollution alone causes more than 80,000 hospital admissions per year in Pakistan; nearly 8,000 cases of chronic bronchitis and almost five million of lower respiratory cases in children under the age of five. Yet there is little official data on the sources of the pollution, or on how bad the air is.

- **Qatar** (average annual PM 2.5 concentration: 92.4 ug/m³)

With a population of 2.5 million people and growing, Qatar also faces increased pollution, explained in part by the country's building boom and busy air traffic, making it the second most polluted country in the world. Its urban areas – Doha and Al Wakrah combined – in 2016 had an annual average of 105 ug/m³, a significant increase from four years before. **Nonetheless, although Qatar's pollution readings are some of the worst in the world, the number of deaths attributed to poor air quality is not as high, according to the WHO.** It's possible the country's PM2.5 particles could be less harmful as are at least partly formed in the desert. This may mean that Qatar's air pollution levels, while still worrying, may not cause as many health problems as bare statistics suggest.

- **Afghanistan** (average annual PM 2.5 concentration: 86 ug/m³)

With a population of over 33 million, Afghanistan suffers from traffic congestion, dust and the geographical limitations of a mountainous city. Kabul's swelling size has led to illegal homes powered by diesel generators or for those who can't afford electricity, they burn tires and plastic bags for fuel. **The Afghan Ministry of Health estimates that up to 3,000 citizens die each year in Kabul due to air pollution and many more suffer from severe upper and lower chest infections, including asthma, chronic bronchitis and heart disease.** It is said that most of the fuels used in Afghanistan do not comply with international standards and contain high levels of lead. A study carried out by the Afghan ministry of health in 2009 showed that the blood samples of 80% of some 200 Kabul residents contained lead. If air pollution keeps rising in the same way, Afghan people will encounter with a health disaster in the near future.

- **Bangladesh** (average annual PM 2.5 concentration: 83.3 ug/m³)

WORLD'S MOST POLLUTED CITIES (PM 10)

	City	Average (mean) annual PM 10 concentration
1	Onitsha, Nigeria	594
2	Peshawar, Pakistan	540
3	Zabol, Iran	527
4	Rawalpindi, Pakistan	448
5	Kaduna, Nigeria	423
6	Aba, Nigeria	373
7	Riyadh, Saudi Arabia	368
8	Al Jubail, Saudi Arabia	359
9	Mazar-e Sharif, Afghanistan	334
10	Gwalior, India	329
11	Hamad Town, Bahrain	318
12	Allahabad, India	317
13	Shijiazhuang, China	305
14	Karachi, Pakistan	290
15	Dammam, Saudi Arabia	286
16	Umuahia, Nigeria	274
17	Raipur, India	268
18	Kabul, Afghanistan	260
19	Ma'ameer, Bahrain	257
20	Boshehr, Iran	255

Source: www.telegraph.co.uk/travel/destinations/asia/india/articles/delhi-most-polluted-city-in-the-world/

Home to over 160 million people, the air quality has fallen nearly 60% in the last 10 years. **According to a World Bank report, air pollution kills 15,000 Bangladeshi each year. Automobiles, industrial emissions, bad civic practices and poor government services are some of the major sources.** The tremendous force of population has made it almost unfeasible to maintain a clean environment in the capital city of Dhaka, one of the most densely populated cities in the world. Industries are mainly concentrated in major seaport cities and urban metropolitan areas, where the air pollution problem is more severe, such as Dhaka and Rajshahi. A public notice by the Department of Environment states that 58% of the particulate pollutants responsible for the smog in the air of Dhaka city comes from the orthodox brick kilns around and inside Dhaka, 18% from road dust and soil dust, 10% from vehicles, 8% from burning of biomass and 6% from other sources.

- **Egypt** (average annual PM 2.5 concentration: 73 ug/m³)

The average resident of Cairo breathes in more than 20 times the acceptable level of air pollution every day according to WHO. Known in Egypt as the black cloud, the dense smoke first appeared over Nile Delta cities and Cairo in 1997. It spread rapidly and now it accounts for 42% of the country's air pollution, according to the Egyptian Environment Ministry. The growing number of cars, factories and power plants and the use of old heating methods such as burning coal and wood are the main man-made sources of air pollution. On top of the everyday pollution, farmers outside the city burn leftover rice husks at the end of the growing season, adding smoke to already smoggy air. Air pollution kills 35,000 a year:

- **United Arab Emirates** (average annual PM 2.5 concentration: 64 ug/m³)

It may be one of the richest regions in the world, but it has made its fortune from the oil and gas industries that are notoriously filthy. Many are the efforts under way to improve air quality in all emirates. With a population of more than 9 million, Dubai is taking a lot of steps to reduce pollution, including eco-friendly and hybrid cars and taxis and the increase in public transportation. Furthermore, Dubai Municipality has launched the Air Quality Strategy for the emirate of Dubai for 2017-2021, for which it has developed several plans and initiatives to implement over the five years at a cost of more than Dh500 million. **The strategy, the first of its kind in the region, is aimed at establishing Dubai as one of the world's cities with the best air quality by 2021.**

- **Mongolia** (average annual PM 2.5 concentration: 61.8 ug/m³)

Its population may only be 3 million but Mongolia's long, cold winters that can drop to minus 40 degrees Celsius means that many Mongolians burn coal for cooking and heating creating a huge air pollution problem. **In its capital, Ulaanbaatar, one of the world's most heavily polluted cities, the levels of fine particulate matter have been recorded as 80 times higher than WHO guidelines and the situation is predicted to worsen over the next 10 years as almost half of Mongolia's three million people have migrated to the capital over the past three decades.** 80 % of all pollution in Ulaanbaatar is caused by ger stoves ("ger" is a traditional tent-like structure), according to the WHO. The rest is caused by transportation (10 %), thermal power plants (6 %), and solid waste (4 %). According to the World Bank, if the air pollution in Ulaanbaatar was reduced by 50%, the country would save \$19 million to \$38 million in healthcare costs. But the government does not prioritize this pressing issue as much as it should, and the rate of pollution-related pneumonia is now the second most common cause of mortality among Mongolian children, accounting for 15 % of all deaths. **A 2011 study found that one in 10 deaths in Ulaanbaatar can be attributed to air pollution. Researchers studying the impact of pollution estimate 29 % of cardiopulmonary deaths, and 40 % of lung cancer deaths in Mongolia are caused by pollution.**

- **India** (average annual PM 2.5 concentration: 60.6 ug/m³)

Pollution from construction sites, industrial emissions, open fires, vehicle emissions and a staggering population of 1.3 billion put India at high risk. In winter of 2016, air pollution in New Delhi was 16 times higher than the level considered safe, the worst air quality that Delhi had seen in 17 years. But it was not a one-time phenomenon for the rapidly developing country. Premature deaths in India have increased 50 % between 1990 and 2015. According to a study reported by the CNN last January 75% of air pollution-related deaths in India during 2015 came in its rural areas and was not just limited to urban centers and megacities. The study found that exposure to PM2.5 was roughly equal across rural and urban India. **In 2015, over a million deaths could be attributed to air pollution in India (about 25% of total deaths linked to air pollution around the globe) and the problem has steadily worsened over the past 25 years, as its economy has grown.** According to the research, residential biomass burning is the largest individual contributor to air pollution

across India, with many poor residents relying on burning wood, crop residue or cow dung to heat homes or to cook food. **Unless Indian authorities commit to aggressive energy efficiency targets and clamp down on biomass burning, air pollution deaths could rise to as many as 1.6 million across the country by 2030.** Even if major political parties still see pollution as a fringe issue, India has set a lofty goal for its transition to renewable energy, with plans to obtain around 60 % of the country's electricity from non-fossil fuel sources by 2027. As the world's third-largest emitter of greenhouse gases (after China and the US), that would be a big win for climate.

- **Bahrain** (average annual PM 2.5 concentration: 56.1 ug/m³)

Air pollution is not entirely relegated to the world's developing nations. The high-income country of Bahrain may only have a population of 1.4 million but is on the list due to its high levels of pollution from energy production, dust, smoke and industrial emissions. **However, according to official environmental statistics, 49% of air pollution in the Kingdom is caused by car exhausts. The figures unveiled that there's one vehicle for every 2.7 persons in Bahrain with more than half a million registered cars in the country.** Pollution caused by the transportation sector is the key harmful factor to the environment also due to rapid growth of the population and the small size of the country.

- **Nepal** (Average annual PM2.5 concentration: 50 ug/m³)

Nepal generally evokes images of a pristine mountain nation on top of the world but the thick cloud of pollution that threatens to suffocate Nepal's largest city, however, provides a stark contrast to this reputation. Kathmandu is one of the fastest-growing metropolitan areas in South Asia and the number of vehicles has risen threefold in the past 10 years. During surges in Kathmandu traffic congestion, the level of small particulate matter can measure over 500 ug/m³, or 20 times the WHO's safe upper limit. **Some of the worst air in Nepal is, however, not in Kathmandu, but in the southern plains, where brush fires, brick kilns and cooking stoves produce a haze of smoke. The pollution could have far-reaching consequences as it floats north into the Himalayas.** Smoke from fires and emissions from vehicles produce soot containing black carbon. Black carbon settles on glaciers and snow, and its dark color causes the snow and ice to absorb more of the sun's radiation. It also warms up the air, changing rainfall patterns. For the mountains that are called the "water towers of Asia," this could

have serious impacts. Over a billion people depend on the monsoon rains and snow melt of the Himalayas for their source of water. Greenhouse gases are the leading cause of the warming atmosphere, but black carbon is also a major contributor to shrinking glaciers.

Among the least polluted countries is Australia, with the least polluted urban areas, followed by Brunei and New Zealand. Estonia is Europe's top performing nation, followed by Finland and Iceland. The UK just misses out on the top 20, coming 21st. However, the cleanest capital on Earth is Stockholm. Within Europe, according to 2017 WHO statistics, Bosnia and Herzegovina, Bulgaria, Albania and the Ukraine have the highest European mortality rates at-

tributed to home and air pollution. Many of these same countries, including the Former Yugoslav Republic of Macedonia (FYROM), Poland and Hungary have the highest average annual levels of city air pollution. Bosnia's high-level of air pollution meant that in 2012 the country suffered nearly 231 deaths per 100,000 people, representing the world's second highest death rate among listed countries in the WHO report. Among Europe's best performers for both least air pollution averages and air pollution-related deaths include all of Scandinavia, Finland, Spain, Portugal and Ireland. Stockholm was the first city to be crowned European Green Capital in 2010 and aims to be fossil fuel free by 2050.

A 2016 report by the European Environmental Agency (EEA) found that, despite

improvements in air quality, a large portion of European populations remain exposed to these fine air pollutants. The report analyzed air quality from 2000 to 2014 and covered 42 European countries and data obtained from 400 monitoring stations. **It found that pollution from cars, power plants, households and agriculture, contribute to nearly 467,000 premature deaths throughout the continent, a vast majority of them within EU-member countries. The report also said that in 2014 nearly 85 % of Europeans were exposed to hazardous levels of fine particulate air pollutants in excess of WHO guidelines.** Fighting air pollution levels on the continent has been the focus of European lawmakers for decades, but it has taken on new significance since the signing of the Paris climate deal. Following the EEA report, France, the UK, Germany, Spain and Italy were sent final warnings from the European Commission for failing to correct repeated violations of Nitrous Oxide limits.

Although cities across Europe including Paris, London and Berlin, have implemented contingency plans to address high pollution levels, more people die per 100,000 of air pollution in Norway (12.7) than do people in the United States (12.1), according to the WHO, even if Norway ranks as the fourth least hazardous European country in terms of air quality by the WHO and the United States ranks as the one of the world's top polluting countries.

The European Commission said Nitrous Oxide was responsible for killing as many as 70,000 people in 2013. This was almost three times the number of deaths by road traffic accidents in the same year, it added.

Air pollutants and their toxicities

Effects of air pollutants on living organism will not only be limited to the human and animal health but also include the whole environment. **Ecologically, air pollution can cause serious environmental damages to the groundwater, soil and air. It is also a serious threat to the diversity of life.** Studies on the relationship between air pollution and reducing species diversity clearly show the detrimental effects of environmental contaminants on the extinction of animals and plants species. Air suspended toxicants may also cause reproductive effects in animals. Acid rain, temperature inversion and global climate changes due to the emissions of greenhouse gasses to the atmosphere are other major ecological impacts of air pollution.

According to the WHO, particle pollution, ground-level ozone, carbon monoxide, sulfur oxides, nitrogen oxides and lead are the six major air pollutants which harm human health

WORLD'S LEAST POLLUTED COUNTRIES

	City	Average PM 2.5 concentration
1	Australia	5.7
2	Brunei	6.6
3	New Zealand	6.8
4	Estonia	7.2
5	Finland	7.3
6	Canada	7.5
7	Iceland	8.2
8	Sweden	8.7
9	Ireland	8.8
10	Liberia	9.3
11	Japan	10
12	Bhutan	10
13	Norway	10.9
14	Malta	12
15	Portugal	12.3
16	Spain	12.4
17	United States	12.9
18	Monaco	13
19	Malaysia	13.2
20	Luxembourg	14

Source: www.telegraph.co.uk/travel/destinations/asia/india/articles/delhi-most-polluted-city-in-the-world/

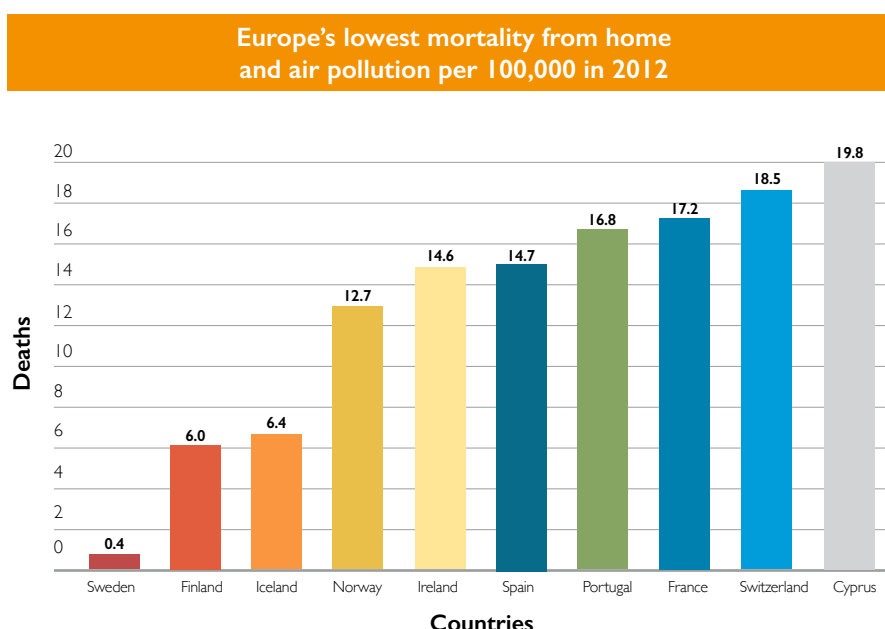
and the ecosystem. There are many pollutants of suspended materials such as dust, fumes, smokes, mists, gaseous pollutants, hydrocarbons, volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs) and halogen derivatives in the air which at the high concentrations cause vulnerability to many diseases including different types of cancers. The most important air pollutants and their toxic effects on different human body organs and related diseases have been briefly described below.



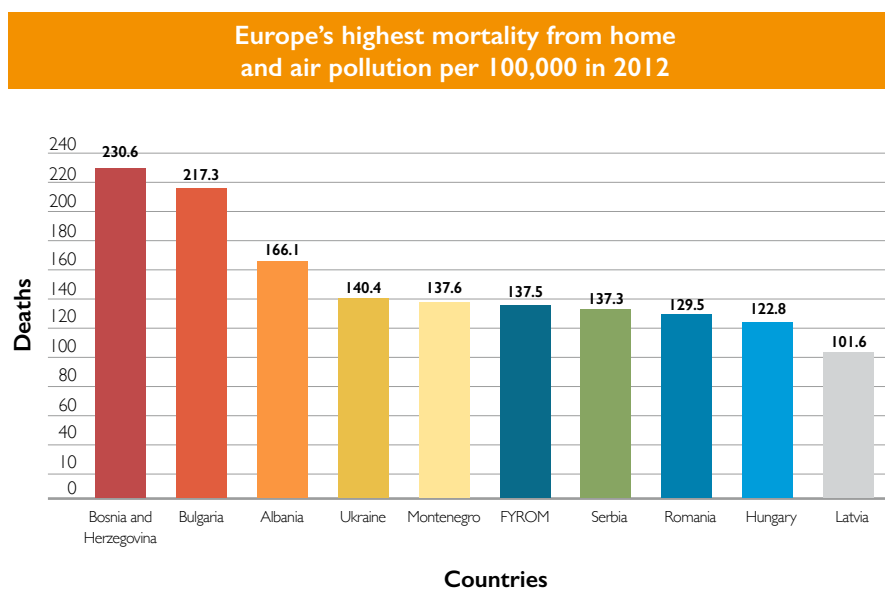
Particle pollutants or Particulate matter (PM)

Particle pollutants affects more people than any other pollutant. The major components of PM are sulfate, nitrates, ammonia, sodium chloride, black carbon, mineral dust and water. It consists of a complex mixture of solid and liquid particles of organic and inorganic substances suspended in the air. The most health-damaging particles are those with a diameter of 10 microns or less, (\leq PM₁₀), which can penetrate and lodge deep inside the lungs. Chronic exposure to particles contributes to the risk of developing cardiovascular and respiratory diseases, as well as of lung cancer. Moreover, numerous scientific data have demonstrated that fine particle pollutants cause premature death in people with heart and/or lung disease including cardiac dysrhythmias, nonfatal heart attacks, aggravated asthma and decreased lung functions. Depending on the level of exposure, particulate pollutants may cause mild to severe illnesses. Wheezing, cough, dry mouth and limitation in activities due to breathing problems are the most prevalent clinical symptoms of respiratory disease resulted from air pollution. Long-term exposure to current ambient PM concentrations may lead to a marked reduction in life expectancy. The increase of cardiopulmonary and lung cancer mortality are the main reasons for the reduction in life expectancy. Reduced lung functions in children and adults leading to asthmatic bronchitis and chronic obstructive pulmonary disease are also serious diseases which induce lower quality of life and reduced life expectancy.

There is a close, quantitative relationship between exposure to high concentrations of small particulates (PM₁₀ and PM_{2.5}) and increased mortality or morbidity, both daily and over time. Conversely, when concentrations of small and fine particulates are reduced, related mortality will also go down – presuming other factors remain the same. This allows policymakers to project the population health improvements that could be expected if particulate air pollution is reduced. Small particulate pollution has health impacts even at very low concentrations – indeed no



Source: www.euronews.com/2017/05/18/which-european-countries-are-the-most-polluted-who-statistics



Source: www.euronews.com/2017/05/18/which-european-countries-are-the-most-polluted-who-statistics

threshold has been identified below which no damage to health is observed. Therefore, the WHO guideline limits are aimed to achieve the lowest concentrations of PM possible. "WHO Air Quality Guidelines" estimate that reducing annual average particulate matter (PM₁₀) concentrations from levels of 70 $\mu\text{g}/\text{m}^3$, common in many developing cities, to the WHO guideline level of 20 $\mu\text{g}/\text{m}^3$, could reduce air pollution-related deaths by around 15%. However, even in the European Union, where

PM concentrations in many cities do comply with guideline levels, it is estimated that average life expectancy is 8.6 months lower than it would otherwise be, due to PM exposures from human sources.

There are serious risks to health not only from exposure to PM, but also from exposure to ozone (O₃), nitrogen dioxide (NO₂) and sulfur dioxide (SO₂). As with PM, concentrations are often highest largely in the urban areas of low- and middle-income countries.



Ozone (O₃)

Ozone at ground level – not to be confused with the ozone layer in the upper atmosphere – is one of the major constituents of photochemical smog. It is a colorless gas formed by the reaction with sunlight (photochemical reaction) of pollutants such as nitrogen oxides (NO_x) from vehicle and industry emissions and volatile organic compounds (VOCs) emitted by vehicles, solvents and industry. As a result, the highest levels of ozone pollution occur during periods of sunny weather. Excessive ozone in the air can have a marked effect on human health. It can cause breathing problems, trigger asthma, reduce lung function and cause lung diseases. In Europe it is currently one of the air pollutants of most concern. Several European studies have reported that the daily mortality rises by 0.3% and that for heart diseases by 0.4%, per 10 µg/m³ increase in ozone exposure. On ecological aspect, O₃ can reduce carbon assimilation in trees leading to deforestation which may affect global food security in long-term exposure.



Sulfur dioxide (SO₂)

SO₂ is a colorless gas with a sharp odor. It is produced from the burning of fossil fuels (coal and oil) and the smelting of mineral ores that contain sulfur. The main anthropogenic source of SO₂ is the burning of sulfur-containing fossil fuels for domestic heating, power generation and motor vehicles. SO₂ is very harmful for plant life, animal and human health. A SO₂ concentration of 500 µg/m³ should not be exceeded over average periods of 10 minutes duration. Studies indicate that a proportion of people with asthma experience changes in pulmonary function and respiratory symptoms after periods of exposure to SO₂ as short as 10 minutes. People with lung disease, children, older people and those who are more exposed to SO₂ are at higher risk of the skin and lung diseases. The major health concerns associated with exposure to high concentrations of SO₂ include respiratory irritation and dysfunction and aggravation of existing cardiovascular disease. SO₂ is predominantly absorbed in the upper airways. As a sensory irritant, it can cause bronchospasm and mucus secretion in humans. Residents of industrialized regions encountered with SO₂ even at lower concentrations (<1 ppm) in the polluted ambient air might experience a high level of bronchitis. The penetration of SO₂ into the lungs is greater during mouth breathing compared to nose breathing. An increase in the airflow in deep, rapid breathing enhances penetration of the gas into the deeper lung. Therefore, people who exercise in the polluted air would inhale more SO₂ and are likely to suffer from greater irritation. Due to its solubility in water, SO₂ is responsible for acid rain formation and acidification of soils. SO₂ reduces the amount of oxygen in the

water causing the death of marine species including both animals and plants. Exposure to SO₂ can cause damages to the eyes (lacrimation and corneal opacity), mucous membranes, the skin (redness and blisters) and respiratory tracts. Bronchospasm, pulmonary edema, pneumonitis and acute airway obstruction are the most common clinical findings associated with exposure to SO₂.



Nitrogen oxide (NO₂)

Nitrogen oxides are important ambient air pollutants which may increase the risk of respiratory infections. The major sources of anthropogenic emissions of NO₂ are combustion processes (heating, indoor gas cookers, power generation and engines in vehicles and ships). They are deep lung irritants that can induce pulmonary edema if been inhaled at high levels. Epidemiological studies have shown that symptoms of bronchitis in asthmatic children increase in association with long-term exposure to NO₂. Reduced lung function growth is also linked to NO₂ at concentrations currently measured (or observed) in cities of Europe and North America. Exposures at 2.0–5.0 ppm have been shown to affect T-lymphocytes, particularly CD8+ cells and natural killer cells that play an important role in host defenses against viruses. Although these levels may be high, epidemiologic studies demonstrate effects of NO₂ on respiratory infection rates in children. Coughing and wheezing are the most common complication of nitrogen oxides toxicity, but the eyes, nose or throat irritations, headache, dyspnea, chest pain, diaphoresis, fever, bronchospasm and pulmonary edema may also occur.



Carbon monoxide (CO)

CO is a colorless and odorless gas, which is produced by fossil fuel, particularly when combustion is not appropriate, as in burning coal and wood. The affinity of CO to hemoglobin (as an oxygen carrier in the body) is about 250 times greater than that of oxygen. Depending on CO concentration and length of exposure, mild to severe poisoning may occur. Symptoms of CO poisoning may include headache, dizziness, weakness, nausea, vomiting and finally loss of consciousness. The symptoms are very similar to those of other illnesses, such as food poisoning or viral infections. No human health effects have been showed for carboxyhemoglobin (COHb) levels lower than 2%, while levels above 40% may be fatal. Hypoxia, apoptosis and ischemia are known mechanisms of underlying CO toxicity. The mechanism of such toxicity is the loss of oxygen due to competitive binding of CO to the hemoglobin heme groups. Cardiovascular changes also may be observed by CO exposures that create COHb

in excess of 5%. Thus, the reduction in ambient CO can reduce the risk of myocardial infarction in predisposed persons.



Lead (Pb)

Metals, including lead, mercury, arsenic are less of a problem in some countries due to controls on emissions. Iron and steel sectors dominate lead emissions, while disposal of treated wood by burning is source of arsenic. Pb or plumb (lead) is a toxic heavy metal that is widely used in different industries. Pb pollution may result from both indoor and outdoor sources. It is emitted from motor engines, particularly with those using petrol containing Pb tetraethyl. Smelters and battery plants, as well as irrigation water wells and wastewaters, are other emission sources of the Pb into the environment. Evaluation of the blood Pb level in traffic police officers shows that environmental pollution may be considered as a source of Pb exposure. Fetuses and children are highly susceptible to even low doses of lead. Lead accumulates in the body in blood, bone and soft tissue. Because it is not readily excreted, it can also affect the kidneys, liver, nervous system and the other organs. Pb absorption by the lungs depends on the particle size and concentration. Around 90% of Pb particles in the ambient air that are inhaled are small enough to be retained. Retained Pb absorption through alveoli is absorbed and induces toxicity. It is a powerful neurotoxicant, especially for infants and children as the high-risk groups. Mental retardation, learning disabilities, impairment of memory, hyperactivity and antisocial behaviors are of adverse effects of Pb in childhood. Therefore, it is very important to reduce the Pb level of ambient air. Pb exposure is often chronic, without obvious symptoms. It can affect the different parts of the body including cardiovascular, renal and reproductive systems, but the main target for Pb toxicity is the nervous system. Pb disrupts the normal function of intracellular second messenger systems through the inhibition of N-methyl-D-aspartate receptors. Pb may also replace calcium as a second messenger resulting in protein modification through various cellular processes including protein kinase activation or deactivation. Abdominal pain, anemia, aggression, constipation, headaches, irritability, loss of concentration and memory, reduced sensations and sleep disorders are the most common symptoms of Pb poisoning. Exposure to Pb is manifested with numerous problems, such as high blood pressure, infertility, digestive and renal dysfunctions and muscle and joint pain.

Other air pollutants

Other major air pollutants that are classified as carcinogen and mutagen compounds and are thought to be responsible for incidence and progression of cancer in human include VOCs such

as benzene, toluene, ethylbenzene and xylene, PAHs such as acenaphthene, acenaphthylene, anthracene and benzopyrene and other organic pollutants such as dioxins, which are unwanted chemical pollutants almost totally produced by industrial processes and human activity.

The "WHO Air quality guidelines" offer global guidance on thresholds and limits for key air pollutants that pose health risks. They provide interim targets for concentrations of the main air pollutants aimed at promoting a gradual shift from high to lower concentrations. If these interim targets were to be achieved, significant reductions in risks for acute and chronic health effects from air pollution can be expected. Progress towards the guideline values, however, should be the ultimate objective. The figures reported above by the WHO of some 3 million and 4.3 million premature deaths for ambient and household air pollution respectively, exceed by a clear margin each of the other identified risk factors in the global death toll, with the exception only of high blood pressure at 9.4 million and tobacco smoking at 5.7 million. As it can be easily understood, urgent and concerted actions at national and international levels are required.

The evidence from economics shows that ambient and household air pollution also imposes, by being responsible for those deaths, a high cost to people who suffer from illness and premature death, to our health services and to business; a so-called economic cost to society of several trillion dollars per year, globally. As reported by the OECD, in the case of ambient air pollution for the 34 OECD countries plus China and India,

this cost can be estimated at a combined total of 3.5 trillion US\$ for the year 2010.

According to 2010 estimates on the impact of air pollution on health:

- the annual economic cost of premature deaths from air pollution across the countries of the WHO European Region stood at US\$ 1.431 trillion;
- the overall annual economic cost of health impacts and mortality from air pollution, including estimates for morbidity costs, stood at US\$ 1.575 trillion.

Such health impact of air pollution is substantial, hence the benefits of cleaner air are very large. Available evidence on air pollution emission sources suggests that, across the WHO European Region as a whole, several sectors should be targeted for abatement policies. Motorized road transport, household fuel combustion together with agriculture and industrial coal burning sources are of special concern, in terms of their contribution to the health impact of ambient and household air pollution, and the consequent societal costs. A relatively successful, if imperfect, regulatory regime on air quality in Europe has resulted in substantial progress, especially in European Union Member States, in terms of health impacts and costs. Reducing air pollution and the toll it imposes is not primarily a matter for health policy or for the health sector alone. Rather, it is a policy matter for all the many sectors in which air pollution is generated, and, thereby, a matter requiring a whole-of-government policy approach. It is therefore desirable to address this problem in terms that can engage decision-

makers across the whole of government, and the use of economic evidence provides a well-established common ground, to this end.

Among main sources:

- Extracts from "Effects of air pollution on human health and practical measures for prevention in Iran" by Adel Ghorani-Azam, Bamdad Riahi-Zanjani, and Mahdi Balali-Mood: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5122104/>
- Extracts from "Ambient (outdoor) air quality and health", World Health Organization: <http://www.who.int/mediacentre/factsheets/fs313/en/>
- Extracts from "The telegraph": <http://www.telegraph.co.uk/travel/maps-and-graphics/most-polluted-countries/> and <http://www.telegraph.co.uk/travel/destinations/asia/india/articles/delhi-most-polluted-city-in-the-world/>
- Extracts from Euronews "Which European countries are the most polluted?" <http://www.euronews.com/2017/05/18/which-european-countries-are-the-most-polluted-who-statistics>
- <http://www.news.com.au/travel/world-travel/countries-with-the-worst-air-pollution-ranked-by-world-health-organisation/news-story/524a5b1df6311d122892c0b7de940934>
- "Economic cost of the health impact of air pollution in Europe" (WHO and OECD)
- "Every breath we take: the lifelong impact of air pollution" by the Royal College of Physicians
- <https://www.theguardian.com/sustainable-business/2016/jul/05/how-air-pollution-affects-your-health-infographic>
- <http://www.theworldcounts.com/stories/How-Does-Pollution-Affect-Humans>

WHO AIR QUALITY GUIDELINES

Air pollutants	Major source of emission	Averaging time	Standard level	Health impact target organs
Particle Pollutants PM2.5	Motor engines, industrial activities, smokes	Annual mean 24-hour mean	10 µg/m ³ 25 µg/m ³	Respiratory and cardiovascular diseases, Central nervous system, and reproductive dysfunctions, cancer
PM10		Annual mean 24-hour mean	20 µg/m ³ 50 µg/m ³	
Ground level ozone (O ₃)	Vehicular exhaust, industrial activities	8-hour mean	100 µg/m ³	Respiratory and cardiovascular dysfunctions, eye irritation
Sulfur dioxide (SO ₂)	Fuel combustion, burning coal	24-hour mean 10-minute mean	20 µg/m ³ 500 µg/m ³	Respiratory and central nervous system involvement, eye irritation, skin diseases
Nitrogen dioxide (NO ₂)	Fuel-burning, vehicular exhaust	Annual mean 1-hour mean	40 µg/m ³ 200 µg/m ³	Respiratory infections, damage to liver, lung, spleen and blood

Source: <http://www.who.int/mediacentre/factsheets/fs313/en/>





Cuba's Paradox

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Cuba maybe judged poor by material living standards, but its medical sector is a strong demonstration of its wealth in human resources.

Cuba's position in the developing world has always been something of a paradox. Its low material living standards and crisis-ridden economy leads to a low per capita income, but Fidel Castro's Caribbean blend of socialism has developed a public health system that places Cuba in another league altogether on human development indexes. After the triumph of the Revolution in 1959, Cuban medicine has made remarkable advances; the development of new drugs, hygiene and sanitary education for the people, the construction of hospitals and polyclinics and free access to medical and oral care for the entire population are some of the key factors.

The poorer countries of the world continue to struggle with an enormous health burden from diseases that we have long had the capacity to eliminate. Similarly, the health systems of some countries, rich and poor alike, are fragmented and inefficient, leaving many population groups underserved and often without healthcare access entirely. **Cuba represents an important alternative example, where modest infrastructure investments combined with a well-developed public health strategy have generated health status measures comparable with those of industrialized countries.**

In virtually every critical area of public health and medicine facing poor countries Cuba has achieved undeniable success; these include most prominently—creating a high quality primary care network and an unequaled public health system, educating a skilled work force, establishing and sustaining a local biomedical research infrastructure and a biotechnology industry, controlling infectious diseases, achieving a decline in non-communicable diseases and meeting the emergency health needs of less developed countries (the “Cuban medical internationalism program”). For decades Cuba has in fact exported workers, predominantly health professionals, to the developing world as “missionaries for the Cuban Revolution”, with the goal to strengthen ties with host nations, earn hard currency and advance other financial goals of the regime while gaining influence, prestige, legitimacy and sympathy abroad.

A better understanding of the transformations produced in the Cuban public health system over the past 50 years requires knowing, as a starting point, the context prevailing before the triumph of the Revolution in 1959. A single university hospital and medical school existed alongside a dominant private sector and a rudimentary public system. ‘Mutual aid’ health facilities served employed groups, especially in the cities, while primary care for the poor and rural population was weak or non-existent. A health scenario ravaged by tetanus, diphtheria, measles, whooping cough, polio, tuberculosis and other diseases. Children were suffering from gastroenteritis and respiratory in-

In the early stages emphasis was placed on basic public health improvements, such as sanitation and immunization and medical care was extended to the rural areas.

fections, which were the leading causes of death. Infant mortality rate, with no reliable statistical records, was above 60 per 1,000 live births and life expectancy was only 60 years for a population of about six million. By the mid-1960s, the various elements of curative medicine and traditional public health were gradually incorporated into one single structure organized under the Ministry of Public Health. In the early stages emphasis was placed on basic public health improvements, such as sanitation and immunization and medical care was extended to the rural areas to prioritize care for the most vulnerable groups of society. **A system of regional polyclinics and hospitals subsequently evolved, complemented in the 1980s by a reorientation of the entire system toward primary care and the education of large numbers of family doctors.** The growing number of professionals in the medical field made it possible to provide primary and preventive care and by the 1990s the strategic goal was reached whereby a team of a family physician and a nurse lived on every block and provided care for 120–160 families. At present there are some 31,000 family doctors within Cuba, with a total doctor: population ratio of 1: 170.22 (highest doctor-patient ratio in the world), although a reduction of them, together with specialists, has been widely reported since the mid-2000s due to an increase in export of the medical workers to underdeveloped countries decid-

ed by the Cuban government to further increase the country’s income.

In 2013 Cuba reached an infant mortality rate of 5 per 1,000 live births, the lowest in the Americas and basic health indicators are now comparable to the achievements of welfare systems in western Europe. Among the factors that contributed to these favorable results are, first, the political will of the revolutionary government to provide free healthcare to all citizens, with a focus on mothers and their children; the existence of a high educational level among the population; and a national vaccination program with a coverage of almost 100 % of children.

In the 1980s millions of dollars were also invested by the Cuban government to foster a scientific area dedicated to the research and development of medical and pharmaceutical products through genetic engineering and biotechnology, as well as a modern pharmaceutical industry. With consistent state support, a robust local infrastructure has been created which now generates significant export income and has been characterized as ‘the envy of the developing world’. Production of the first vaccine for meningitis B (late 1980s) and a vaccine for Haemophilus influenzae type b, which for the first time incorporated a synthetic antigen, are two of the most important accomplishments. A recent initiative between a US corporation and the Center for Molecular Immunology in Havana to work jointly on a cancer vaccine reflects the growing international importance of this research.

In 2011 in Cuba there were 13 research institutes offering assistance, teaching and research services; 146 general and specialized hospitals; 11,466 family doctor offices for primary care; more than 200 dental clinics; 122 nursing homes for the elderly; 231 grandfather homes; and 141 maternities located mainly in remote areas to bring pregnant women closer to services with delivery rooms. More than 100,000 physicians graduated in the country in the period between 1959 and 2010 (43,088 women). The country has 13 medical universities and 17 medical schools. There are thousands of graduates in the areas



of dentistry, medicine and health technology. Let us recall that at the time of the triumph of the Revolution, the country had about 6,000 doctors, two thirds living in Havana; of these, 50% emigrated to the United States. **The methodological budgets that shaped the Cuban Medical School were also formulated, establishing prevention as a primary concept of the health system, to eliminate the remnants of the old medicine that focused on the disease rather than the patient.** For many years now, the overall mortality rate in Cuba has not been the result of the so-called "diseases of poverty", but like in the highly developed countries, of heart diseases, cancer and stroke. The life expectancy of Cubans today is nearly 80 years.

Indicators of Cuba's accomplishments in public health

- First country to eliminate polio -1962
- First country to eliminate measles -1996
- Lowest AIDS rate in the Americas
- Most effective dengue control program in the Americas
- Comprehensive healthcare, 1 physician per 120-160 families
- Highest rates of treatment and control of hypertension in the world
- Reduction in cardiovascular mortality rate by 45 %
- Development and implementation of a "comprehensive health plan for the Americas"
- Free medical education for students from Africa and Latin America
- Creation of a national biomedical internet grid (INFOMED)
- Indigenous biotechnology sector; producing the first human polysaccharide vaccine
- Cuba becomes the first country to eradicate mother-to-child transmission of HIV and syphilis

COMPARABLE GLOBAL HEALTH INDICATORS

	Cuba	Germany	U.S.A.
Life expectancy at birth (2015)	79.1	81.0	79.3
Healthy life expectancy at birth (2015)	69.2	71.3	69.1
Neonatal mortality rate per 1000 live births (2015)	2.3	2.1	3.6
Under-five mortality rate per 1000 live births (2015)	5.5	3.7	6.5

Source: WHO, World Health Statistics 2016

AGE-STANDARDIZED MORTALITY RATES BY CAUSE PER 100 000 POPULATION (2012)

	Cuba	Germany	U.S.A.
Communicable diseases	33	22	31
Non-communicable diseases	422	365	413
Injuries	45	23	44

Source: WHO, World Health Statistics 2015

PROBABILITY OF DYING FROM ANY OF CARDIOVASCULAR DISEASE, CANCER, DIABETES, CHRONIC RESPIRATORY DISEASE BETWEEN AGE 30 AND EXACT AGE 70 (%), 2015

Cuba	Germany	U.S.A.
16.4%	12.0%	13.6%

Source: WHO, World Health Statistics 2017

Cuba has just over 11 million residents with universal and free medical and dental care continuously throughout their lives (including tertiary care) and a social policy that ensures equity in access to services in both rural and urban communities. It has 15 provinces with medical schools and clinics providing all specialties. Medical products purchasing is state controlled; the different medical associations, in accordance with regional medical associations, determines what products are needed and advises the government on product purchases while members of the Cuban Health Ministry make the actual purchases according to state budgetary allowances. This follows through in all specialties including dental and veterinarian medicine.

While Cuba is well known for its government-run healthcare, the system also struggles with problems. **The structure of the Cuban healthcare system is essentially sound but without the resources to flourish. An economic revival would in fact be decisive to its vitality, to sustain the long-term social welfare of the Cuban people.** It is suffering the restrictive effects of lack of resources because of the economic crisis as well as neglect, corruption and negligence, which among other things might be a consequence of political mistakes. To cite examples, the Latin American School of Medicine (ELAM), founded by Fidel Castro in 1999, is supposed to symbolize Cuba's generosity. Established as an extension of Cuba's health diplomacy, the school's mission was to provide free training to low-income students from all over the world but these days, as part of President Raúl Castro's attempt to stem his brother's spending, many nations that send students to the school are now expected to pay. The Raúl González Sánchez Dental Medicine Faculty, the Cuban symbol of the oral health system is also on the point of collapse. **Doctor appointments and hospital stays are free, but most patients must pay for their own medicines, which can be difficult on the island's typically low salaries. Some medicines are hard to find or unavailable, and hospitals may lack up-to-date equipment, although the government has recently been investing in modernizing some**

facilities. The budget is tight and medical equipment and materials are often either not available, not working or obsolete.

The hospitals are usually well staffed with qualified physicians, highly committed and knowledgeable in their fields but shortages of medicines, antibiotics, equipment, current textbooks, basic medical supplies as well as incidents such as loss of power and water supply prevent many hospitals from offering the public a quality service.

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Health facilities for average citizens are grossly underfunded, nonetheless, private medicine is readily available in Cuba to paying foreigners and well-connected locals. The two best hospitals

in Havana, Cira García and CIMEX, are run for profit. Both are far better than normal state hospitals, where patients are often obliged to bring their own sheets and food. Furthermore, Cuba's government has never been shy about the sale of its medical services abroad even if Cuban officials had long lauded the idealistic fervor of the medical teams sent abroad, referring to their "volunteer" services performed "for free."

In fact, for decades, Cuba has exported thousands of health professionals, providing humanitarian and emergency health care to developing countries, delivered in areas where local doctors and international volunteers do not go, in an exchange that provides the government of President Raúl Castro with hard currency or goods, such as oil, in return. Cuba claims that from 1961 to 2008, 270,743 Cubans had worked in 154 countries, and official sources report that there are between thirty-eight and forty thousand health workers in sixty-eight to seventy-seven countries, fifteen to seventeen thousand of them doctors. While these numbers are not independently confirmed, it is indisputable that in the last decade, Cuba's health diplomacy greatly expanded. Official figures show that the professionals working overseas—largely in medicine—bring in around \$6 billion a year (though the doctors themselves receive only a small fraction of the revenue), generating far more income than any other industry, including tourism.

Efforts to raise revenues from health tourism is also turning into a growing business offering foreigners access to Cuba's network of hospitals with specialist clinics, health spas and resorts catering to foreign visitors offering quality medical services at affordable prices. The country offers amenities when it comes to cases such as drug abuse, post accidental rehab, eye illness, dental implants or plastic surgery. There are packages of all kinds for foreign patients including cancer programs, infertility treatments, transplants and more. State corporate entities sell packages for numerous medical conditions that include medical consultations, testing and treatment plus all transportation, accommodations, and meals—a one-stop-shopping approach to wellness.

COMPARABLE WORKFORCE (2007-2013)

	Cuba	Germany	U.S.A.
Skilled health professionals' density per 10 000 population	157.8	136.1	122.7
Physicians density per 10 000 population (all specialties)	67.2	38.9	24.5
Dentistry personnel density per 10 000 population (dentists, technicians/assistants and related occupations)	10.7	8.1	
General government health expenditure as % of general government expenditure (2014)	18.0%	19.6%	21.3%

Source: WHO, World Health Statistics 2014-2017

Healthcare is now also available on the rising black market. Alongside the new restaurants that are opening in the capital, as a result of Raúl Castro's partial easing of economic restrictions, doctors who are paid a working-class salary (state salary is around \$20 a month) are now less shy about selling their services "privately" for extra income. These medical entrepreneurs, however, run the risk of prosecution. The director of one of Havana's main hospitals was detained several years ago for running a private health network on the side. **With the state the sole employer, no one is authorized by the government to offer health services privately, as a self-employed professional.**

Economic model and medical device market - For over fifty years Cuba has been a country with a planned economy, completely controlled by the State. **In recent years however, it has started a process of gradual modernization of the economy to respond to the challenges of market globalization and to the demands of society for better living conditions.** The current model of economic development, which has given managerial autonomy to

state enterprises and a recent cautious opening to private initiatives is the fruit of the decisions of the VI Congress of the Cuban Communist Party (CCP) in the spring of 2011. The socialist model and collective ownership of means of production are the central instruments of the Cuban government's policy. **The mentioned CCP congress did not change the socialist model but introduced some elements to "actualizarlo" and modernize it by giving more space to cooperatives and self-employed workers ('cuentapropista').** On April 16, 2016, the VII Congress of the Cuban Communist Party further provided useful indications on the speed of the economic reform process. In this framework, regulations and policies have been adopted by the Cuban government to encourage foreign investments, in particular a Special Development Zone (ZED) has been set up in an area adjacent to the new Mariel port, a new law on foreign investments has been approved and a "portfolio of opportunities" has been created.

In Cuba the importer and distributor of goods and services is the State. To import into Cuba it is therefore necessary to obtain accreditation from

a list of suppliers (Cartera de proveedores) of one of the Cuban public entrepreneurial structures responsible for importing the category of products of interest. This registration should take place once a potential interest has been registered by the Cuban party to acquire the products according to the quality/price ratio.

Consequently, if a company (manufacturer or trading company) decides to enter "directly" into the Cuban market it must necessarily be accredited to the Cuban institutions through a process of document production. Around one hundred large structures concentrate purchases for all public administrations and for the emerging private sector (cuentapropistas and cooperatives). Wholesale and retail distribution is controlled by the state. Therefore, foreign commercial companies can only carry out promotional support activities.

Due to the limited domestic production capacity and the cumbersome import mechanism (almost completely in the hands of state-owned companies), supplies to Cuba may be discontinuous, with consequent operational difficulties also for companies. The limited opportunities to commercialize and sell

devices in the Cuban public healthcare system, as well as Cuba's relatively small market, have all likely discouraged companies from greater participation in the Cuban market. However, the processes of gradual updating of the economic model create business opportunities for companies interested in operating permanently in Cuba.

Export growth to Cuba in the near term may be restricted by Cuba's centralized healthcare system, which limits the acquisition of costly, high-value-added devices. The country's limited foreign exchange and the need for favorable financing limit the Cuban market's power to purchase new devices. **However, as Cuba has expressed a need for state-of-the-art medical equipment and has identified medical tourism industry as an area of potential growth, an increase in demand for**

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exports in the longer term appears feasible. The Government of Cuba is in fact taking steps to improve the infra-

structure and organization of the health sector to attract medical tourists from all over the world.

Owing to its limited domestic products, Cuba is highly dependent on medical device imports, more than 40% of which come from Europe, primarily Germany; nearly 30% come from China and Japan collectively. The devices most commonly imported into Cuba include both low-value-added goods, such as syringes, needles and catheters and higher-valued-added goods, such as diagnostic imaging equipment, dental products, orthopedic devices and hearing aids. Cuba's highly centralized healthcare structure – 94% of healthcare expenditures are from the public sector – may suggest a continued preference for lower-cost technologies that have been historically supplied by China.

CUBA: MEDICAL DEVICES, IMPORTS BY MAJOR SUPPLIER 2005-14 (MILLION DOLLARS)

	2005	2010	2014
Germany	68.9	10.1	21.5
China	18.3	13.1	13.3
Japan	86.7	7.9	12.6
Spain	6.4	9.7	11.7
Italy	12.9	6.8	11.5
Netherlands	28.4	1.1	2.3
France	5.4	1.2	2.3
South Korea	0.8	1.0	1.7
Sweden	0.1	0.9	1.5
Mexico	0.5	0.2	1.4
United States	0.4	0.0	0.6
All other	15.4	7.0	8.3
Total	244.1	58.8	88.7

Source: GTIS, Global trade Atlas database (Dec. 2015)

Note: Cuban imports are derived from other countries' exports to Cuba, since Cuba does not readily publish detailed trade data. <http://cubajournal.co/cubas-medical-device-market-potential-for-u-s-exporters/>

YEAR/PERIOD	Prior to 1960 Pre-Revolution era. Health services and facilities are concentrated in the cities. Provision of medical supplies is heavily dependent on imports from other countries, mostly the U.S. Private sector health-care is primarily for the wealthy. A poorly funded and staffed public sector responds for the rest of the population. AT BRIEF	1959 POLITICAL CHANGE End of Cuban revolution and establishment of the socialist state and communist government. Fidel Castro takes office. TYPE OF EVENT	1960s Soon after the revolution, universal healthcare is adopted and becomes a priority of state planning. U.S. government imposes embargo against Cuba, which would lead to an increase in disease and infant mortality during this decade. Approximately half the physicians in Cuba emigrate. AT BRIEF
	1969 ORGANIZATION (RESEARCH INSTITUTE) Cuban Neuroscience Center (CNEURO) founded, in Havana. TYPE OF EVENT	1970s The polyclinic model of primary care is reinforced and expanded, focusing on health education, prevention and environmental monitoring. The number of medical graduates increase, thus enlarging the Cuban "medical internationalism program" (the Cuban program of sending Cuban medical personnel overseas, particularly to Latin America, Africa and, more recently, Oceania, and of bringing medical students and patients to Cuba). AT BRIEF	1970 POLICY The Maternal–Child Programme (Programa Nacional de Atencion Materno-Infantil—PAMI) is launched with the purpose of assuring the health of women of child-bearing age and their children. TYPE OF EVENT
YEAR/PERIOD	1980s Cuban healthcare system consolidates. Primary care is given impetus with the introduction of the Family Doctor-and-Nurse Program. Biotechnology industry takes off. AT BRIEF	1984 POLICY A Family Doctor-and-Nurse Program is launched, by which neighborhood/home clinic model is adopted. The physician and the nurse must live in the neighborhood they're serving. They're also expected to conduct research and present their findings at congresses or in journals. TYPE OF EVENT	1990s Post Soviet era, starts with Cuba's Special Period of socioeconomic collapse, due to loss of funding from the dissolved U.S.S.R. Cuba starts to accept U.S. donations of food, medicines and cash. At the same time, U.S. embargo tightens. Infectious diseases rise while infant mortality continues to decline. AT BRIEF
	1999 ORGANIZATION (MEDICAL SCHOOL) ELAM (Latin American School of Medicine) is founded, in Havana. A major international medical school in Cuba and a prominent part of the Cuban healthcare system. Operated by the Cuban government, ELAM has been described as possibly being the largest medical school in the world by enrollment with approximately 19,550 students from 110 countries reported as enrolled in 2013. All those enrolled are international students from outside Cuba and mainly come from Latin America and the Caribbean as well as Africa and Asia. The school accepts students from the United States. TYPE OF EVENT	2000s–present Cuba's health indices rank extraordinarily at a developed country level, considering that Cuba is a country of poor resources and economic underdevelopment. Cuba also boasts one of the highest physician-per-inhabitant ratios in the world, though massive deployment of doctors on foreign missions can leave gaps in the country's domestic primary healthcare programs. Medical tourism is also a thriving and growing industry today in Cuba. So far, it is widely believed that medical workers are Cuba's most important export commodity. Cuba also successfully exports many medical products, such as vaccines. AT BRIEF	
YEAR/PERIOD	2011 ACHIEVEMENT Cuba announces release of the world's first lung cancer vaccine. Cima-Vax-EGF is a vaccine used to treat cancer, specifically non-small-cell lung carcinoma (NSCLC). CIMAvax-EGF is composed of recombinant human epidermal growth factor (EGF) conjugated to a protein carrier. Cima-Vax is relatively cheap to produce and store and has low toxicity. Side effects of the vaccine appear to be mild, and include chills, fever, and feeling sick. The vaccine is being tested. TYPE OF EVENT	2012 DEVELOPMENT First Latin American catheter ablation registry established. TYPE OF EVENT	2015 ACHIEVEMENT Cuba becomes the first country to eradicate mother-to-child transmission of HIV and syphilis. TYPE OF EVENT



<p>1962</p> <p>POLICY "Vaccination days" are established with the goal of reaching the entire population. Proving later to be effective in eliminating polio, it is subsequently adopted in other countries as a primary strategy.</p> <p>TYPE OF EVENT</p>	<p>1963</p> <p>FOREIGN POLICY U.S. embargo against Cuba prohibits trade in food, medicines, and medical supplies.</p> <p>TYPE OF EVENT</p>	<p>1965</p> <p>POLICY Cuban government creates a system of community-based polyclinics, with aims at providing primary-care, specialty services, and laboratory and diagnostic testing to a catchment area of 25,000 to 30,000 people.</p> <p>TYPE OF EVENT</p>
<p>1972</p> <p>ORGANIZATION (alliance) Cuba becomes a full member of the Soviet-based Council for Mutual Economic Assistance (COMECON)</p> <p>TYPE OF EVENT</p>	<p>1976</p> <p>POLICY Fidel Castro elected president. Cuban constitution revision. Article 50: <i>Everyone has the right to health protection and care. The state guarantees this right by providing free medical and hospital care by means of the installations of the rural medical service network, polyclinics, hospitals, preventative and specialized treatment centers; by providing free dental care; by promoting the health publicity campaigns, health education, regular medical examinations, general vaccinations and other measures to prevent the outbreak of disease. All the population cooperates in these activities and plans through the social and mass organizations.</i></p> <p>TYPE OF EVENT</p>	
<p>1991</p> <p>CRISIS Collapse of Soviet Union and beginning of the so-called Special Period. Soviet funding halts, depriving Cuba from almost all foreign commodities, including pharmaceuticals. An epidemic of optical and peripheral neuropathy, subsequently traced to a sharp decline in protein, vitamins, and some other micronutrients, afflicts at least 50 000 Cubans. Also, a modest increase in mortality from infectious diseases, particularly tuberculosis, is observed.</p> <p>TYPE OF EVENT</p>	<p>1992</p> <p>FOREIGN POLICY/CRISIS U.S. "Torricelli Bill" tightens embargo against Cuba, thus deepening the severe material shortages and affecting medical care. The number of foreign-based subsidiaries of U.S. companies granted licenses to sell medicines to Cuba start to decline dramatically.</p> <p>TYPE OF EVENT</p>	<p>1994</p> <p>ORGANIZATION (RESEARCH INSTITUTE) Center of Molecular Immunology (Centro de Inmunología Molecular) or CIM is founded, in Havana. A cancer research institution focusing on the research and production of new biopharmaceutical products for the treatment of cancer and other non-transmissible diseases.</p> <p>TYPE OF EVENT</p>
<p>2000</p> <p>Kofi Annan: "Cuba's achievements in social development are impressive given the size of its gross domestic product per capita. As the human development index of the United Nations makes clear year after year, Cuba should be the envy of many other nations, ostensibly far richer. Cuba demonstrates how much nations can do with the resources they have if they focus on the right priorities - health, education, and literacy".</p> <p>TYPE OF EVENT</p>	<p>2002</p> <p>REPORT Cuba attains the second lowest infant mortality in the Americas, 20% below the U.S. rate for all ethnic groups and also below the rate for white Americans.</p> <p>TYPE OF EVENT</p>	<p>2004</p> <p>ORGANIZATION (PROGRAM LAUNCH) Operation Miracle is initiated by Cuba jointly with Venezuela, in which medical workers from both countries would perform surgeries for cataracts, glaucoma, and other eye ailments, with the goal of reaching six million operations across the Americas by 2015.</p> <p>TYPE OF EVENT</p>

Source: from the web - https://en.wikipedia.org/wiki/Timeline_of_healthcare_in_Cuba

Among main sources:

- Extracts from "Health in Cuba": <https://academic.oup.com/ije/article/35/4/817/686547>
- Extracts from "A first-hand look at public health in Cuba", http://www.scielo.br/scielo.php?pid=S0103-40142011000200008&script=sci_arttext&tng=en
- Extracts from "Cuba's Health-Care Diplomacy: The Business of Humanitarianism", <http://www.worldaffairsjournal.org/article/cuba%E2%80%99s-health-care-diplomacy-business-humanitarianism>
- <http://news.bbc.co.uk/2/hi/business/3284995.stm>
- Extracts from The Economist "Nip and tuck in. Medicine is big business in

- Cuba" <https://www.economist.com/news/americas/21566670-medicine-big-business-cuba-nip-and-tuck>
- Extracts from "Cuba's Medical Device Market, Potential for U.S. Exporters" <http://cubajournal.co/cubas-medical-device-market-potential-for-u-s-exporters/>
- Italian Trade Commission, http://www.infomercatiesteri.it/paese.php?id_paesi=43#slider-1
- WHO, World Health statistics 2010-2016
- "The Curious Case of Cuba", <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3464859/>

Trends and Economic Impact of Hip and Knee Arthroplasty in Central Europe: Findings from the Austrian National Database

The first National Arthroplasty Register was introduced in Sweden in 1975, followed by many other countries. Arthroplasty registration can lead to identification of poorly-performing implants and surgical procedures after market introduction, so that healthcare providers may improve surgical practice by choosing better performing products. In Sweden, a significant reduction of revision surgeries is considered to be a result of the register. Effective register recording requires a complete, yet practicable information-set, as well as a high level of input compliance, which in turn demands the management of complex political, economic, and practical challenges.

Austria is a Central European Country with a nationally funded health system. **Under the aspect that the highest rate of total knee arthroplasties (TKA) per inhabitant of all OECD countries in 2014 was reached in Austria, knowledge on numbers of surgeries in this field seems to be important for quality control and anticipation of future trends.** The total number of total hip arthroplasty (THA) and total knee arthroplasty (TKA) and implant related revision surgeries in this field is recorded in a standardized manner by the national health authorities since 2009. The recorded data include age group, sex, and in which of the nine Austrian federal provinces it was included. The implementation of the registry in Austria is not a classical arthroplasty register as compared to Sweden or Germany but an analysis of the performance-based hospital financing system.

The purpose of this study was to provide the first analysis of the Austrian database, representing a highly developed industrialized country, with the focus to present systematic data on trends in arthroplasty of the hip and knee from 2009 to 2015 in relation to the demographic development.

Analysis of primary arthroplasties
Between 2009 and 2015 an almost continuous increase in the number of hip and knee arthroplasties was found. In detail, the number of primary THA increased by 14% (n=15,834 in 2009 and n=18,052 in 2015) and the number of primary TKA increased by 13% (n=15,350 in 2009 and n=17,324) over this period, respectively (Fig. 1, Table 1).

The implementation of the registry in Austria is not a classical arthroplasty register as compared to Sweden or Germany but an analysis of the performance-based hospital financing system.

This represents 210 primary THA and 202 primary TKA per 100,000 inhabitants in 2015. Ninety-two percent of THA and 97% of TKA were performed in the age group 50-90 between 2009 and 2015. Between 2009 and 2015 the population aged 50-90 increased only by 1.1% to 3.3 million people, the population older than 65 years in Austria increased by 9.3%, and the population older than 70 years increased the strongest by 19.8%. The mean age of patients receiving THA (67.1 to 67.4 years) and TKA (69.7 to 69.5 years) remained relatively constant between 2009 and 2015 (Table 1), whereas the corresponding mean age in the Austrian general population increased during this period (41.2 to 42.3 years).

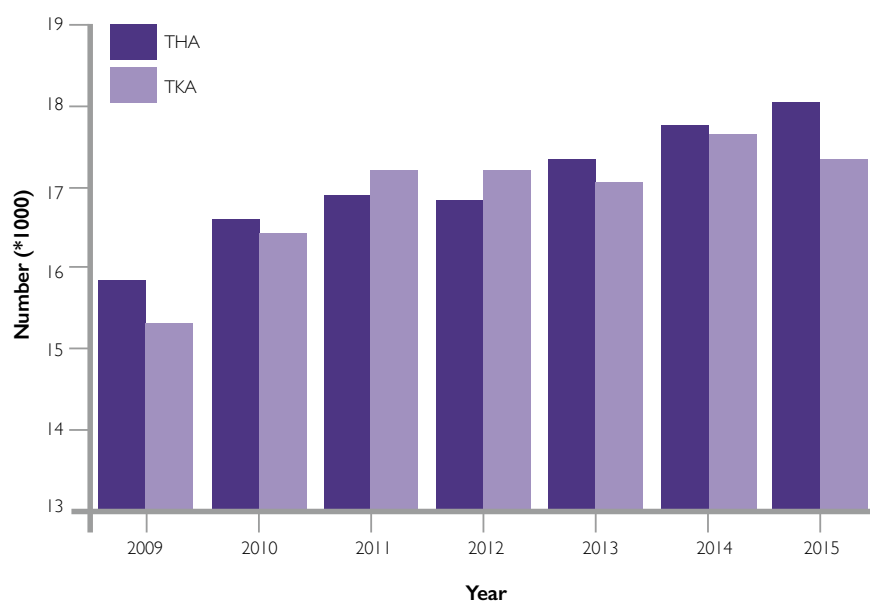


Fig. 1. Primary THA and TKA per year in Austria

Year	2009	2010	2011	2012	2013	2014	2015
Primary THA							
Male	6760	7106	7330	7380	7404	7743	7831
Female	9074	9479	9560	9446	9921	9974	10221
Total	15834	16585	16890	16826	17325	17717	18052
Age (y; mean)	67,1	66,9	66,9	67,1	67,3	67,2	67,4
Primary TKA							
Male	5625	6064	6467	6571	6353	6597	6703
Female	9725	10367	10702	10579	10677	11034	10621
Total	15350	16431	17169	17149	17030	17631	17324
Age (y; mean)	69,7	69,7	69,7	69,4	69,5	69,4	69,5
Reimpl. THA							
Male	419	389	429	418	371	437	543
Female	539	532	541	525	498	484	747
Total	958	921	970	943	869	921	1290
Age (y; mean)	70,0	69,7	69,9	70,0	70,6	71,1	70,8
Reimpl. TKA							
Male	266	275	289	310	335	341	347
Female	485	506	510	493	550	540	572
Total	751	781	799	803	885	881	919
Age (y; mean)	70,4	69,6	69,8	69,8	69,9	69,6	70,2

Table 1. Absolute numbers of primary implantation and re-implantation of THA and TKA, including sex and age, from 2009 to 2015 in Austria.

Analysis of revision arthroplasties

An increase over time was also found for revision surgeries, as 1290 THA re-implantations (7.1% of primary hip arthroplasties, increase of 34.7% between 2009 and 2015) and 919 TKA re-implantations (5.3% of primary knee arthroplasties, increase of 22.4% between 2009 and 2015) were performed in 2015 (Fig. 2, Table 1).

In 2015 the calculated mean age of patients receiving re-implantation surgery in Austria was 70.8 years for THA and 70.2 years for TKA (Table 1).

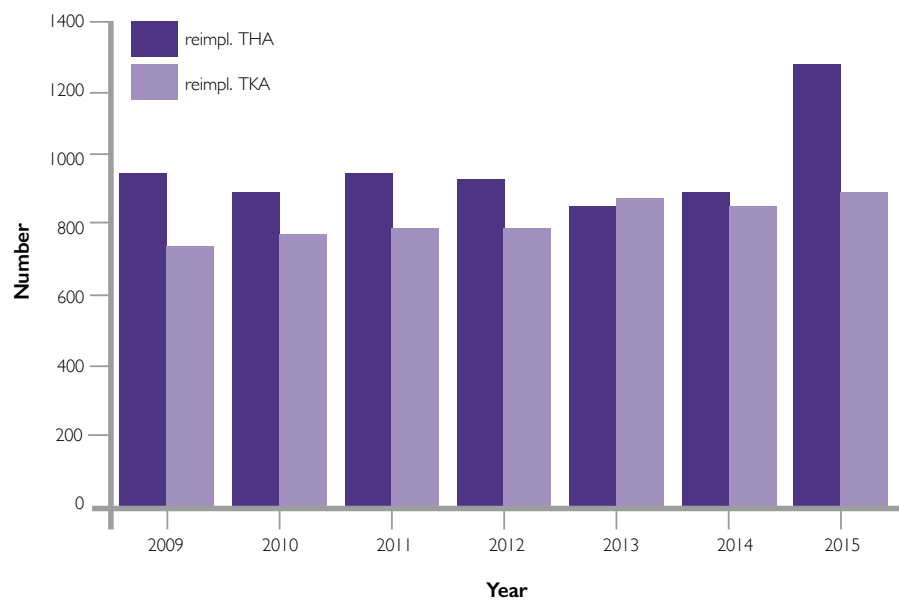


Fig. 2. Re-implantation THA and TKA per year in Austria.

Relation to demographic development

The number of Austria's inhabitants increased only moderately during the period of investigation (3%; $n=8.335.003$ in 2009 and $n=8.584.926$ in 2015) compared to the increase of primary THA (14%) and TKA (13%) (Fig. 3A). **The peak of this development resulted in the highest rate of TKA per inhabitant of all OECD countries in 2014 (Fig. 3B).**

Sub-analysis of miscellaneous arthroplasties

Exchange of none-bone-anchored implant components performed after THA (i.e. inlay, head) remained on a steady state during the observation time ($n=681$ in 2015; increase of 5.6%). Registration of spacer implantation of the hip was first initiated in 2015 where a total number of 114 spacers were implanted, most often in the age group between 70 and 74 years. During the period of investigation, the number of implanted mega prostheses or tumor prosthesis for knee ($n=112$ in 2015) and hip ($n=184$ in 2015) remained stable. **Implantation**

was mainly performed in two regions with orthopedic tumor centers in Austria (i.e. Vienna, Styria). Two implantation peaks were found for mega prosthesis and tumor prosthesis for knee and hip, the first around 15–20 years and the second in the population 60 years and older. The only implant type that clearly decreased in case numbers during the observation period was patellar resurfacing with a decrease of 31.6% between 2009 ($n=1983$) and 2015 ($n=1356$).

Discussion

This manuscript provides the first analysis of a detailed report on the Austrian National database on knee and hip arthroplasty, in comparison with demographic development in Austria from 2009 to 2015.

We explored an increase in almost all implant-related surgeries of the knee and hip joint in Austria during the observation time from 2009 to 2015. Corresponding increases can be found in similar studies from most developed countries. The increased number of implanted THA by 14% and the increased number of TKA by 13% over this period represents 210 THA and 202 TKA in 100k inhabitants in 2015. This number is relatively high in comparison to numbers from other countries previously published by our study group. Demographic change, especially increasing proportion of elderly people, might be a main reason for this increase in operations. Studies in Germany, a neighboring country to Austria with a similar demographic change, have shown that the increase in age leads to an increase in multimorbidity and especially to an increase in the prevalence of osteoporosis which triggers musculoskeletal diseases. On the other hand, it has been shown that technical innovation led to reduced surgical risk, resulting in lower threshold for indicating arthroplasties, and thus enabling an increased number of surgeries especially in elderly patients. Our data revealed that the increment of implanted THA and TKA is disproportional compared to increase in Austria's population during the observation time (Fig. 3A). The OECD recently published, that Austria had the highest rate of TKA per inhabitant of all OECD countries in 2014 (Fig. 3B).

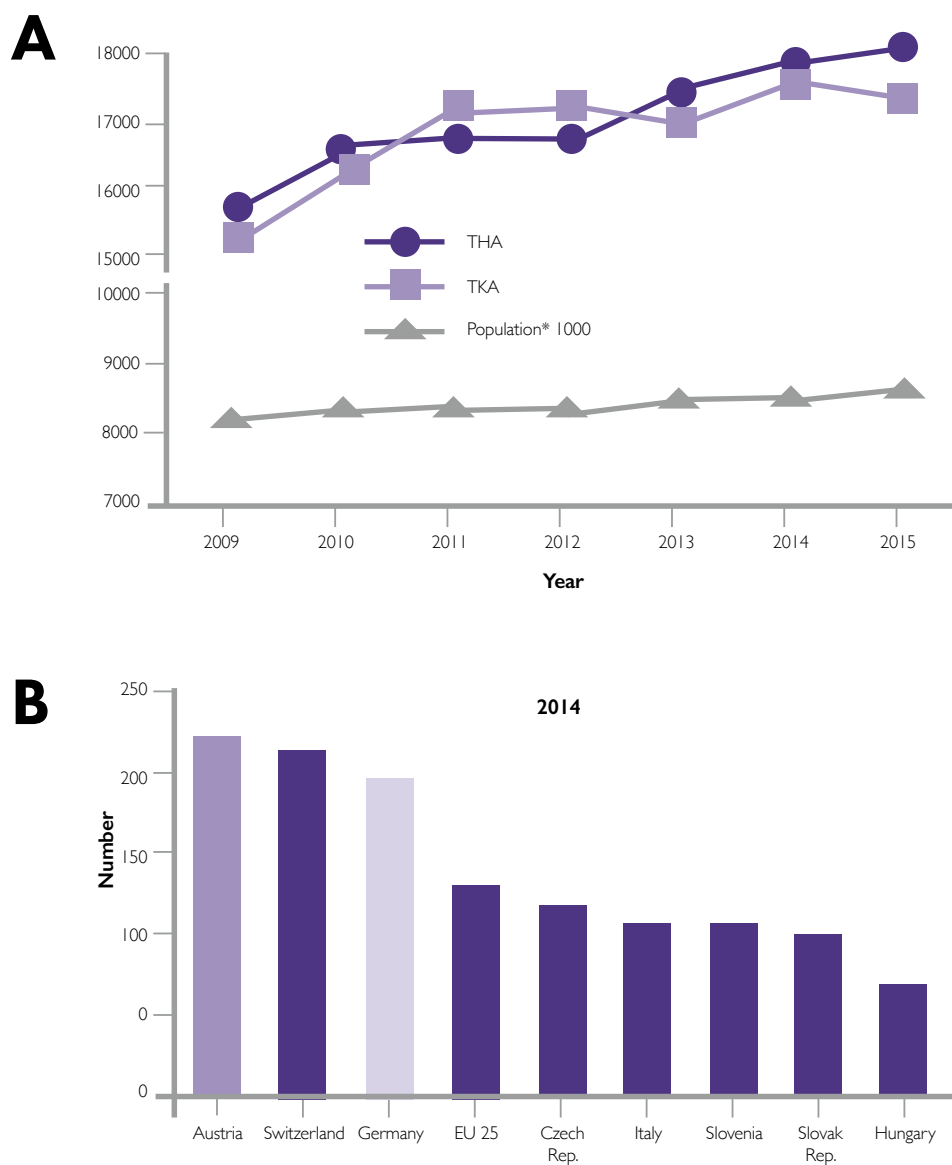


Fig. 3. (A) Development of implanted primary THA and TKA and Austria's population during the study observation time. (B) Knee replacement surgery 2014, Austria and neighboring countries



As stated before, demographic change alone can only represent part of explanation for increasing number of implanted prosthesis. In part, ongoing development of medical care also seems to be responsible for increased intervention numbers. On the other hand, environmental development may lead to economic growth pressure, resulting in higher implant numbers than explored for comparable neighboring countries (Fig. 3B). Such a development should be avoided in a health system since it may result in 'over-treatment' with arthroplasties.

Mean age in Austria's population increased, whilst mean age of patients undergoing primary THA and TKA remained on steady state during the observation period, suggesting a slight trend towards younger arthroplasty receivers. A similar phenomenon was explored in the United States and Canada in earlier studies.

Especially the disproportionately high increase in revision surgeries after THA and TKA (Fig. 2) seems to be a result of the combination of trends addressed above, higher implantation numbers, younger receivers, and increasing life expectancy, altogether resulting in an increased population at risk. Earlier authors have raised concern on survivorship of primary TKA and revision surgeries in younger patients, for which higher risk of early periprosthetic joint infection and aseptic mechanical failure after primary implantation as well as higher rates of aseptic failure after revision have been described.

Implantations of mega prosthesis or tumor prosthesis for the knee and hip are usually performed in tertiary centers, where the underlying disease can be treated, resulting in concentration of implant numbers in Vienna and Styria, where skeletal oncology centers are located. This data interpretation is supported by the two age peaks for both, implanted mega prosthesis or tumor prosthesis for the knee and hip, congruent to age peaks for incidence of osteosarcoma and Ewing sarcoma in young patients and chondrosarcomas and bone metastases in the elderly.

The Austrian database reveals a continuous decrease of 31.6% in the number

Mean age in Austria's population increased, whilst mean age of patients undergoing primary THA and TKA remained on steady state during the observation period, suggesting a slight trend towards younger arthroplasty receivers. A similar phenomenon was explored in the United States and Canada in earlier studies.

of patellar resurfacing performed during the observation time. A similar trend has been described by our group in a meta-analysis of arthroplasty registers, as, for example in Sweden, whereas TKA is nowadays mostly performed without patella buttons. The benefit of patellar resurfacing is discussed controversially in the scientific society; whilst the majority of surgeons (>90%) routinely resurface the patella in North America, most Austrian surgeons seem to only selectively resurface based upon patient factors or during revision surgeries.

Study Limitations

The Austrian arthroplasty registry is based on data which are transmitted mainly for deposit with the public health system. Although this implicates high completeness of our dataset, it has lower granularity than conventional prosthesis registers on the patient-level as provided by Sweden or Germany. Although, networking back on individual cases (for inspection purposes) is possible, the data do not contain additional information except for the

parameters presented. Therefore, no information is available on patients' clinical condition, how surgery was performed, implant type and manufacturer, patient reported outcome scores, or follow up, (etc.) presenting a major limitation for more detailed investigations. However, it is possible to screen for higher revision or complication rates in order to perform an on-site peer review audit organized by the Austrian ministry of health.

In 2015, the service codes for revised knee or hip arthroplasty were further specified on the component of the prosthesis, which was revised. For comparability with data from the years before, the numbers for new codes were summed up. Notably there was a peak in number of THA re-implantations in 2015, which could result from transmission of service codes for each component when the complete system was changed. This would represent a reporting bias. This effect was not found for TKA re-implantations in 2015.

The authors believe that the implantation number for mega prosthesis reported to the Austrian health authorities is too high. This could represent a reporting bias, resulting from transmission of service codes for mega prosthesis when large revision surgeries of TKA or THA were performed.

Conclusion

Many parallels to earlier published databases and register results can be drawn from this Austrian National database analysis and underline the validity of our data. **A common consensus could be that numbers of arthroplasties are still increasing in developed countries; the peak in implantation numbers for primary implantations and revision surgeries after arthroplasty seems not to be reached yet.** Knowledge on numbers of surgeries in this field is important for quality control in the Austrian public health system. Inclusion of more detailed information on used and revised components, as it is established since 2015, will improve efficacy in quality control.

Source: article taken from <https://www.nature.com/articles/s41598-018-23266-w>

For full report, authors and references, please visit the mentioned link

The More Youthful Face of Joint Replacement

According to a CNN report, hip, knee and other joint replacement procedures are among the most common elective surgeries in the United States.

The average age of patients undergoing hip replacement operations continues to decrease, but more men are undergoing these operations than in the past, according to a study presented in March at the American Academy of Orthopaedic Surgeons' annual meeting.

The new study indicates that the average age of patients undergoing hip replacement surgery has declined from over 66 to just under 65, while the average age for knee replacement surgeries has declined from 68 to just under 66.

Though small, these declines are real, noted Dr. Matthew Sloan, co-author of the study and an orthopedic surgery resident in the Perelman School of Medicine at the University of Pennsylvania. **The younger age of patients is "possibly due to increasing obesity or increased access to care in a generation that desires to maintain an active lifestyle into their retirement years," he said.**

And although women continue to make up the majority of patients, "men are increasingly undergoing total joint replacement surgery," he added.

21st-century changes

The history of total joint replacement dates to the late 1890s, Sloan explained, when surgeons first attempted to replace the ball in the hip joint's ball and socket. In the 1960s, Sir John Charnley popularized the contemporary style of total hip replacement in England. Total knee replacement surgeries -- though they began in the early 1900s -- did not become widespread until advances were made in bone cement in the 1970s.

Total joint replacement involves removing parts of an arthritic or damaged joint and replacing them with a metal, plastic or ceramic prosthesis that can replicate

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the movements of a healthy joint. These replacement surgeries are performed not only on hips and knees but on ankles, wrists, shoulders and elbows.

The most common total joint replacement procedures in the United States are total knee replacements (about 700,000 a year) and total hip replacements (about 400,000 a year), Sloan said.

Advances over time have been remarkable. "Today, there are total joint replacements being performed on an outpatient basis, with patients returning home on the same day of surgery," Sloan said. Still, joint replacement surgeries "do not last forever." **Inevitably, a replacement will wear out and another operation will be needed to "revise" the implant, according to the American Academy of Orthopedic Surgeons. These are challenging, complicated operations in which part or the whole implant needs to be removed and replaced and bone needs to be rebuilt with metal pieces; therefore, they aren't as successful as the original surgery.**

"Contemporary joint replacement procedures are expected to last 20 years or longer," Sloan said, a longer duration than in the past.

Greater knowledge of patients has helped surgeons advance their practice and "provide quality care," he said.

The need to better understand patients also inspired the study.

Arthritis pain and obesity

With co-author Dr. Neil P. Sheth, an assistant professor of orthopedic surgery in the Perelman School of Medicine, Sloan reviewed the National Inpatient Sample database, which contains over 116 million US patient records, from 2000 to 2014. They identified patients by code and looked at demographic data to understand whether there have been changes over time.

From 2000 to 2014, the average patient age decreased by 0.1 year annually for a first joint replacement surgery and by 0.2 year annually for a second total knee replacement surgery. During that 15-year study period, female patients accounted for up to 62% of all joint replacement procedures.

This is not unusual, Sloan explained. Prime candidates for joint replacement surgery are people with end-stage arthritis, and women have higher rates of arthritis than men (26% vs. 19%) possibly due to differences in anatomy, he said.

Still, the proportion of men undergoing a first knee replacement and a revision hip replacement is rising, Sloan said. He and Sheth also saw significant changes in the use of these elective surgeries by ethnicity. "Over the past 15 years, non-Hispanic whites have declined in proportion, while blacks have increased," Sloan said. The proportion of blacks undergoing all joint replacement surgeries (except second hip surgeries) increased by 0.1 to 0.2% per year, the study found.

Explaining these results, Sloan noted that most people say the increasingly younger average age of joint replacement patients is caused by rising rates of obesity.

US data for the past decade indicate that 54% of patients undergoing total hip replacements and 79% of patients undergoing total knee replacements are either obese (with a body-mass index of greater than 30) or morbidly obese (with a BMI of greater than 40), he said.

Dr. Matthew Hepinstall, associate director of the Center for Joint Preservation and Reconstruction at Lenox Hill Hospital in New York, said obesity is not the only driver.

Injuries and changing expectations

A combination of factors is influencing the changing age of patients, said Hepinstall, who was not involved in the new study. "A generation of people have been active and athletic through not just adolescence but through adulthood," he said. This sportiness in adulthood has led to injuries, which can cause arthritic damage. There's also been "a change in expectations about the level of activity that should be possible when you're 50 and 60 and 70," Hepinstall said. More people are seeing friends and acquaintances who were limping but then had surgery and got back to their lives. Additionally, doctors are more confident in this operation, which has improved over time and become "more reliable and more durable," he said. Thirty years ago, a 50-something patient

with pain may have been sent away with the words "Listen, you're not disabled. You're capable of working. You're capable of walking. Why would you have a hip replacement?" Hepinstall said. Today, a doctor might say to the same patient, "These are your years to still be active. If you wait till you're 75 and get your hip fixed, you will have heart disease, which will limit your mobility. Why not get it fixed now and enjoy these years?"

Overall, the study is true to what Hepinstall said he sees in his own practice. "We absolutely are seeing more and more people who need this. We're seeing them younger. Some are heavier, and some are more active and had injuries," he said. Still, the percent increases or decreases might seem tiny to most.

"Even small changes in utilization can have relatively high impact on the country from an economic perspective," Hepinstall said. "The reality is, we're talking about one of the most common and most costly elective surgeries in our country." There are down-

stream effects of the choice to either fix a problem or live with it that may influence the economy in different directions, he said.

There are increased costs associated with more people having it done but also decreased costs associated with improvement in economic productivity when a surgery allows more people to stay active instead of collecting disability benefits or becoming a drain on a family's economic engine.

Wanting to keep health care costs under control, regulators are looking at hip and knee surgery to make sure use is "neither too high nor too low," Hepinstall said. "Getting it right is important."

Source:

Article taken from the CNN Website:
<https://edition.cnn.com/2018/03/06/health/hip-knee-replacement-surgeries-earlier-study/index.html>
 For full report, author and references, please visit the mentioned link

To read full study presented at the American Academy of Orthopaedic Surgeons' annual meeting:
[http://submissions.mirasmart.com/Verify/AAOS2018/](http://submissions.mirasmart.com/Verify/AAOS2018/Submission/out/AAOS2018-005902.PDF)
[Submission/out/AAOS2018-005902.PDF](http://submissions.mirasmart.com/Verify/AAOS2018/Submission/out/AAOS2018-005902.PDF)

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Can Digital Disruption Tackle Local Healthcare Challenges?

The African region is seen to be one of the most sought after markets globally for healthcare investments, having experienced stellar growth over the last decade and showing no sign of slowing down in the near future. According to a report[1] by the IFC, the private-sector arm of the World Bank, it is estimated that by 2022, Africa will need \$25bn-\$30bn in investment in physical healthcare assets alone, including hospitals and clinics. This investment is sorely needed. An article[2] published by the World Economic Forum noted that Sub-Saharan Africa accounts for only 13% of the world's population, despite bearing 24% of the global burden of disease – most of which comprises preventable illnesses.

According to Ryan Sanderson, Exhibition Director at Informa Life Sciences Group Africa – organisers of Africa's largest healthcare conference, Africa Health - the pressure to identify real solutions for Africa's healthcare challenges should be a critical consideration for any entity looking to invest in the region.

Sanderson says that with high levels of mobile penetration on the continent, coupled with advancing technologies and new approaches to healthcare management, digital transformation within the healthcare sector may be one of the solutions to addressing the challenges faced, particularly in rural parts of Africa. **Incorporating digital disruption into the healthcare market will be one of the central discussions at the 8th annual Africa Health Exhibition & Congress, which will be held at the Gallagher Convention Centre, Johannesburg, from 29 – 31 May 2018.**

Africa Health is the largest platform on the continent for international and local companies to meet, network and do business with the ever-growing African healthcare market. The event is expected to attract more than 10,100 healthcare profes-

sionals and over 553 leading international and regional healthcare and pharmaceutical suppliers, manufacturers and service providers. The event will run 16 CPD accredited conferences offering education on the latest medical and non-medical techniques, topics and trends. The conferences will focus on a number of medical specialties including: surgery, nursing, decontamination & sterilisation (CSSD), public health, hospital build, healthcare management, healthcare technology life-cycle management, and ethics human rights & medical law, amongst others.

The exclusive Leaders in Healthcare conference will highlight the importance of Public-Private Partnerships (PPP) in enhancing the capabilities of healthcare systems in the region. The event will host distinguished local and international speakers and industry leaders, who will touch upon key issues affecting the healthcare sector, including;

- Opportunities for investment in healthcare start-ups in Southern Africa
- Water saving and efficiency in health facilities
- Making nurses techno savvy
- Planning and managing healthcare technology across the lifecycle of healthcare facility
- Community lived experiences of climate change in relation to energy sources
- The impact of political decisions on healthcare
- Telemedicine: Providing remote access to high quality care

Sanderson says that, year-on-year, Africa Health continues to cement its position as a leading platform for dialogue around the most pressing healthcare issues that the continent faces. "Finding solutions to these challenges will not only result in greater access to health services for those who need it the most, but it will in turn reduce the financial burden that all governments ex-



perience when trying to meet their nation's healthcare needs."

All proceeds from the conferences will be donated to local charity, RuDASA (The Rural Doctors Association of Southern Africa) and associations.

Africa Health is supported by CSSD Forums of South Africa (CFSa), The Association for Peri-Operative Practitioners in South Africa (APPSA – Gauteng Chapter), the International Federation for Medical and Biological Engineering (IFMBE), the Emergency Medicine Society of South Africa (EMSSA), the Independent Practitioners Association Foundation, Southern African Health Technology Assessment Society (SAHTAS), The Clinical Engineering Association of South Africa (CEASA), Medical Device Manufacturers Association of South Africa (MDMSA), Faculty of Health Sciences at the University of the Witwatersrand, the Academy of Nursing in South Africa (ANSA), the Public Health Association of South Africa (PHASA), The Council for Health Service Accreditation of Southern Africa (COHSASA), and the Trauma Society of South Africa (TSSA).

Conference cost: From R150 - R300 for online registration.

For more information: www.africahealthexhibition.com

More about Informa Life Science Exhibitions:

Informa Life Sciences Exhibitions, in charge of the healthcare portfolio within Informa's Global Exhibitions division, organises 27 exhibitions yearly covering the Middle East, Africa, Asia, Europe and US market, connecting more than 230,000 healthcare

professionals worldwide and offering a range of marketing solutions for companies involved with the healthcare sector. Over 100 congresses take place in parallel with the exhibitions.

Informa Life Sciences Exhibitions have a number of digital and print offerings, publishing a variety of healthcare magazines and medical directories, with a readership of top decision-makers in the MENA region's healthcare industry. Additionally, Omnia, their global medical directory, is a unique digital platform providing company and product information 365 days of the year, allowing users to connect with exhibitors and products in one simple click of a button. www.informalifesciences.com

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[2] World Economic Forum. (2018). Digital technologies can deliver better healthcare to sub-Saharan Africa. Here's how. [online] Available at: <https://www.weforum.org/agenda/2017/11/digital-paths-for-better-healthcare-in-sub-saharan-africa/> [Accessed 28 Feb. 2018] (see full text below).



Digital Technologies can Deliver Better Healthcare to Sub-Saharan Africa. Here's How.

Sub-Saharan Africa accounts for 13% of the world's population, yet bears 24% of the global disease burden and has only 2% of the world's doctors. The grim health situation is the result of a crisis in healthcare investments in the continent; with only 1% of the world's health expenditure being used in sub-Saharan Africa. It is estimated that \$25–\$30 billion in new investment will be needed in healthcare assets only, to meet the growing healthcare demands of sub-Saharan Africa. **But there is one area of healthcare investments which has been less explored, which is the role digital solutions can have in boosting healthcare access in Africa. Many countries in sub-Saharan Africa have already achieved a high level of mobile penetration (85%) and internet penetration is also on the rise – mobile devices have become increasingly common and have been adopted in some countries in sub-Saharan Africa as a force for delivering better healthcare.** South Africans are already being exposed to the digital health age by the increasing take-up of standalone mobile health (devices via increasing use of smartphones among clinicians and patients). The South African messaging platform *MomConnect* (a mobile messaging platform) saw 465,703 users adopt the service, demonstrating increasing maturity of digital participation. **The benefit of mobile technologies lies in access. Barriers like geographical distance and low resources, which have long prevented millions of people from getting the care they need, are much easier to overcome in the digital age.** Indeed, there are countless ways in which technology can be deployed to improve healthcare access and delivery. For example, previously, patients would travel to far-off health clinics only to find that the medicines they needed were no longer in stock. Today, around 27,000 government health workers in Uganda use a mobile health system called mTRAC to report on medicine stocks across the country. Another example is during the 2014–2015 Ebola crisis in West Africa. The WhatsApp system allowed the BBC to use its platform to share lifesaving health information with people in rural and quarantined areas, as well as ask questions, share stories and local solutions.

And in Ghana, the Novartis Foundation and its partners developed a telemedicine system to expand the reach of medical expertise. The system connects frontline health workers with a simple phone call to consultation centres in referral hospitals several hours away, where doctors and specialists with the right expertise are available around-the-clock. Acknowledging a growing demand for improved healthcare services and products in Africa, Quantum Global Group has created a dedicated \$400 million healthcare fund that will consider investment opportunities in private medical centres, pharmaceuticals, biotechnology, medical equipment and medical support

services across the continent. **In the global context, there is a slight temptation however to get caught up in what technology can do and forget about basic development principles of community-led solutions or consultation.** The real impetus lies in the ability to transform these initiatives to achieve real scale and long-term sustainability using digital technologies given their capability to deliver healthcare to people living in rural parts of Africa. The advent of technology, especially internet and internet-enabled services, has made it much easier for countries in Africa to provide healthcare services to its citizens. **However, to effectively leverage technology in the sector, you need adequately trained doctors and nurses. Health care practitioners are in short supply across sub-Saharan Africa and they do not have appropriate training or access to continuing medical education.** Up-skilling the local healthcare workforce is therefore a major prerequisite for tangible private investment in primary healthcare.

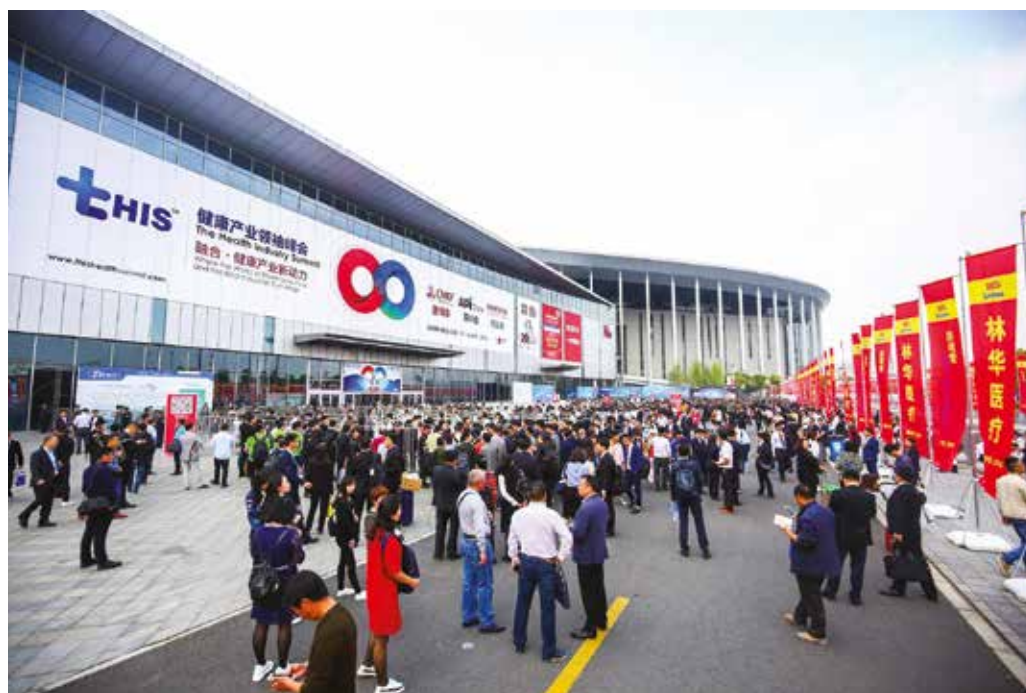
About The World Economic Forum

The World Economic Forum, committed to improving the state of the world, is the International Organization for Public-Private Cooperation. The Forum engages the foremost political, business and other leaders of society to shape global, regional and industry agendas. It was established in 1971 as a not-for-profit foundation and is headquartered in Geneva, Switzerland. It is independent, impartial and not tied to any special interests. The Forum strives in all its efforts to demonstrate entrepreneurship in the global public interest while upholding the highest standards of governance. Moral and intellectual integrity is at the heart of everything it does. Our activities are shaped by a unique institutional culture founded on the stakeholder theory, which asserts that an organization is accountable to all parts of society. The institution carefully blends and balances the best of many kinds of organizations, from both the public and private sectors, international organizations and academic institutions. We believe that progress happens by bringing together people from all walks of life who have the drive and the influence to make positive change. www.weforum.org

Sources:

- "Can Digital Disruption Tackle Local Healthcare Challenges?", <https://www.africahealthexhibition.com/en/media/news/Can-digital-disruption-tackle-local-healthcare-challenges.html>
- "Digital Technologies Can Deliver Better Healthcare to Sub-Saharan Africa. Here's How" by Jean-Claude Bastos de Morais, Founder and Chairman of the Advisory Board, Quantum Global Group, <https://www.weforum.org/agenda/2017/10/digital-paths-for-better-healthcare-in-sub-saharan-africa>

The Health Industry Summit (tHIS) to Play a Greater Role as China Set to Boost Health Industry for a Higher Level of National Health Care



The Health Industry Summit (tHIS) 2018 hosted by Reed Sinopharm, opened in Shanghai at the National Exhibition and Convention Center on 11th April 2018. This is the largest gathering of healthcare industry professionals in the world with well over 200,000 attendees from more than 150 countries and regions and over 7,000 exhibitors.

In accordance to the President Xi's call for greater promotion of the health industry at the Boao Forum for Asia, this leading health industry event covering the entire industry value chain to cover key segments like medical devices, pharmaceutical production, drug distribution and natural health and nutrition is becoming China's solution to promoting technology innovations and academic exchange on the grandest scale. Now in its fourth edition, tHIS has been firmly established as the world's largest health industry event covering an over 350,000m² exhibition space with 160 individual events and conferences alongside the main expo.

Key events of the summit included China's top medical equipment and pharmaceutical exhibitions CMEF, PHARMCHINA and API China, which featured cutting-edge technologies

such as VR, AR, wearables and AI as part of the new Intelligent Health exhibition, while traditional medicine was also highlighted at the show as China's own solution to treatment and prevention which runs parallel to modern medicine and drug development.

Leading companies with a major presence included medical device giants like GE, United Imaging, Siemens, Philips and Mindray as well as major pharmaceutical groups in China including Sinopharm, Shanghai Pharma and CR Pharmaceuticals. The majority of the most innovative companies in the medical field chose the show as their Global or Asia Pacific

new product launch platform and more than 600 new product launches took place during the 4-day show.

The Health Industry Summit was organized by Reed Sinopharm, a joint venture between the world's leading event organizer Reed Exhibitions and China's state-owned medical & pharmaceutical giant Sinopharm (ranked 199th on the Fortune 500 list). The next edition of the event will be held in May 2019 in Shanghai.



健康产业领袖峰会
The Health Industry Summit
Where the World of Pharmaceutical
and Medical Industries Converge

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Infomedix International and Reed Sinopharm: a Long-standing Connection which Led Us to Shanghai for CMEF Spring 2018 Event

Thanks to our partnership with Reed Sinopharm, Infomedix International had the opportunity to take part to the fourth edition of The Health Industry Summit (tHIS) in Shanghai, focusing our visit more on the 79th China International Medical Equipment Fair (CMEF Spring 2018).

We are pleased to share our experience with all our readers, certain that it will trigger interest for the largest fair of medical devices in the Asia-Pacific region.

Claudia Proietti Ragonesi

pressoffice@infodent.com



Over 200,000 attendees from more than 150 countries, 90% visitors from medical institutions / distributors & agents, more than 7,000 exhibitors, over 350,000 sqm exhibition space, 600+ new products launched at the fair and 160 conference and forums. These are just some of the data coming from the fourth edition of The Health Industry Summit (tHIS) hosted by Reed Sinopharm.

Thanks to our long-lasting collaboration with Reed Sinopharm, a joint venture between the world's leading event organizer Reed Exhibitions and China's state-owned medical & pharmaceutical giant Sinopharm, Infomedix International has been chosen from among many international media companies to take part to this event as media partner and report its experience for the benefit of all our readers.

The Health Industry Summit (tHIS) opened in Shanghai at the National Exhibition and Convention Center on 11th April 2018 for a 4-day show.

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Key events of the summit included China's top medical equipment and pharmaceutical exhibitions **CMEF**, **PHARMCHINA** and **API China**, which featured cutting-edge technologies such as VR, AR, wearables and AI as part of the new Intelligent Health exhibition, while traditional medicine was also highlighted at the show as China's own solution to treatment and

prevention which runs parallel to modern medicine and drug development.

Two ladies from Reed Sinopharm team guided us in a 2-day tour of the trade show, whereas the third day of our stay we visited **Shanghai Neuromedical Center**, to know more about private hospitals in China, and **Zhongshan Hospital**, the only public hospital to be rated as Model Unit in Shanghai for 28 successive years and awarded with other important honorary titles too. We will report this memorable and very interesting experience at Chinese clinics in the next Infomedix International issue, circulating from September to December among companies in the medical trade and industry, in 165 countries.

In accordance to the President of the People's Republic of China Xi Jinping's call for greater promotion of the health industry at the Boao Forum for Asia, this leading health industry event covering the entire industry value chain to cover key segments like medical devices, pharmaceutical production, drug distribution and natural health and nutrition is becoming China's solution to promoting technology innovations and academic exchange on the grandest scale.



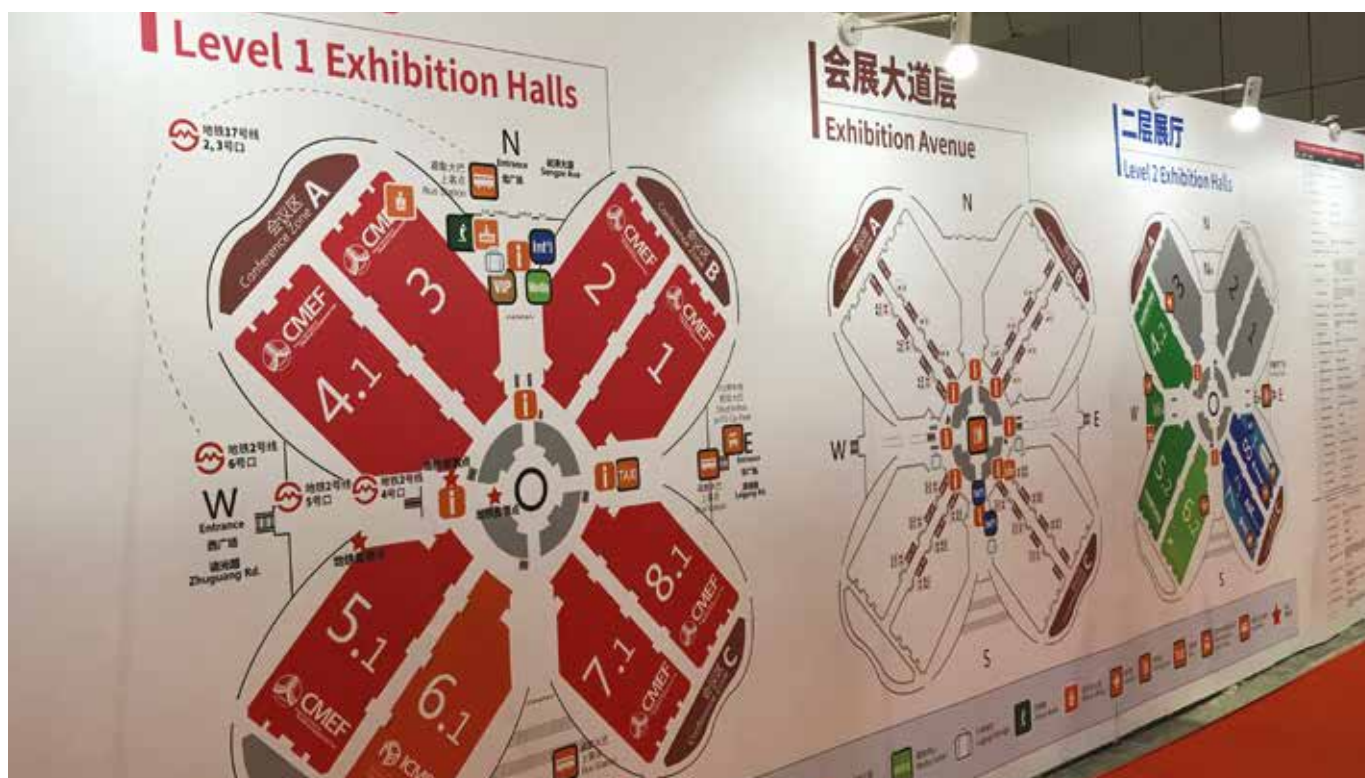
Jenny Cai (Shantou Institute of Ultrasonic Instruments Co., Ltd. - SIUI) interviewed by Infomedix International press officer

Our visit in the trade show was more focused on CMEF event, the China International Medicinal Equipment Fair.

Launched in 1979, it is held twice annually – spring and autumn. After over 38 years of continuous innovation and

self-improvement, CMEF has become the largest fair of medical devices, related products and services in the Asia-Pacific region. The fair widely covers 15,000 products such as medical imaging, IVD equipment and reagent, medical electro-

tics, medical optics, first aid, rehabilitation devices, nursing, telemedicine, wearable devices and outsourcing services, and it serves the entire value chain of medical devices from the source to the end in a direct and all-round way.





John Kuo from Gentech (Shanghai) Corporation and Claudia Proietti Ragonesi from Infomedix International

At each fair, almost 4,200 medical device manufacturers from over 28 countries, and about 120,000 visitors and buyers who are government procurement agencies, hospital buyers and dealers from over 100 countries and regions gather in CMEF for trading and exchanges.

With in-depth professional development of the exhibition, CMEF has initiated conference forums and established a series of sub-brands in medical field including **CMEF Imaging**, **CMEF IVD** and **ICMD**. Now CMEF has become the largest professional procurement and trade platform of the medical industry, the best corporate image release ground as well as a professional information distributing center and an academic, technical exchanging platform.

During our CMEF tour, thanks to Reed Sinopharm team help too, we had the chance to talk with some of the exhibitors. Some of them were at their first experience with this exhibition, such as Osypka or Möller Medical, others were familiar with it since long ago, like Gentec or Tekvor Care.

Hall 1 and 2 were dedicated to Chinese leading medical companies: United Imaging, Sinopharm-CMDC, Neusoft, Shinva, Mindray, SIUI, Kangda Medical, GE Healthcare, Weihai Wego, Yuwell are just

some of the leading figures participating to CMEF 2018.

According to Ms Jenny Cai, Shantou Institute of Ultrasonic Instruments Co., Ltd. (SIUI) sales manager of European market, this trade show is a great opportunity for companies to become familiar not only with domestic market, but also with international one. Indeed, CMEF organization is getting better and better than previous years, added Ms Cai, and this would clearly lead to more attendees and business opportunities. People visiting SIUI booth are well-known distributors and customers, but also new clients interested in this renowned key high-tech corporation at national level specialized in R&D, manufacture and sale of ultrasound imaging systems, medical X-Ray imaging products, and non-destructive testing instruments.

In booth 2H05 we have been received by Mr John Kuo from Gentec (Shanghai) Corporation, who kindly shared with us his thoughts and experience, since it's their 10th time in CMEF.

Genstar Technologies, Co. Inc., GEN-TEC®, is a global leader in the design and manufacturing of high quality pressure control components and systems. They manufacture equipment for the medical, scientific, aerospace, environmental, pe-

After over 38 years of continuous innovation and self-improvement, CMEF has become the largest fair of medical devices, related products and services in the Asia-Pacific region.

trochemical, metalwork, and beverage industries. Its mission is to provide customers with high quality, value-added products and services that meet strict safety standards. For the healthcare industry, GENTEC provides a complete range of pipeline equipment such as gas outlets, zone valve boxes, gas control panels, manifold system, and alarms. For oxygen and suction therapy GENTEC provides flowmeters, regulators, blenders, suction regulators, adapters, hose assemblies, collection jars, and accessories.

Mr Kuo confirmed us that the exhibition organised by Reed Sinopharm is a noteworthy event, it's truly impossible to miss it. During the 4-day trade show they have met a lot of Chinese customers and foreign end-users, manufacturers and dealers, especially from India and Middle East.

At Hall 2 booth C12 was located **Shenzhen Mindray Bio-Medical Electronics Co., Ltd.**, where we met international marketing communication Ms Orchid Zhou and branding department director Mr Leo Chen. **According to Ms Zhou point of view, CMEF is a key event for Chinese market, whereas they prefer to attend Medica in Düsseldorf or Arab Health in Dubai to get international contacts.** Headquartered in Shenzhen, Mindray possesses a sound global R&D, marketing and service network with subsidiaries and branch offices in 32 countries in North and Latin America, Europe, Africa and Asia-Pacific, as well as 31 branch offices in China. Founded in 1991, Mindray is one of the leading global providers of medical devices and solutions. Firmly committed to

their mission of "sharing medical technologies with the world", they are dedicated to innovation in the fields of Patient Monitoring & Life Support, In-Vitro Diagnostics, and Medical Imaging System.

Hall 3 was dedicated to Orthopaedics and Vitro Diagnostic Medical Device (IVD) pavilions, both domestic and international, as well as Medical Disposable. Intelligence Health, Hospital Equipment, Rehabilitation and Physiotherapy were gathered together in hall 4.I. In the last hall occupied by the trade show, hall 6.I, Packaging & 3D Printing, Manufacturing Equipment & OEM Technology, Design, Research & Development, Components, Parts & Modules were located. The Japanese pavilion was there too. All other countries were in hall 5.I, where it was possible to find the most renowned medical companies from Austria, Belgium, France, Germany, Holland, India, Italy, Israel, Pakistan, Poland, Singapore, South Korea, Switzerland, Taiwan, Turkey, United Kingdom and U.S.A.

First time in CMEF, Osypka sales vice president Mr Michael Schwierskott told us they are looking for partners in the whole of Asia and that's why they had selected this trade show, because it attracts people from all Asia. As a matter of fact, visitors coming to their booth are 50% from China, the leftovers are from other Asian regions. **OSYPKA AG** was founded in 1977 and its headquarters are in Rheinfelden-Herten, Germany. It designs, develops and manufactures products with the focus on pacing, electrophysiology, cardiac surgery and interventional adult and pediatric cardiology. Its international locations are OSYPKA Medtec in U.S.A. and OSYPKA s.r.o. in Czech Republic.

First time in CMEF also for **Möller Medical GmbH**, founded in 1949 by Adolf Möller under the name Adolf Möller Feinmechanik and especially present in the demanding OEM business. It is supplier for leading companies of medical technology and chemical analysis and it is certified manufacturer of components and end products.

After one year and a half of hard work, they



Shenzhen Mindray Bio-Medical Electronics booth at CMEF Spring 2018

also achieved to register their products in China, even though they still need two more months to complete the registration process. They wouldn't have been able to do it without their Chinese dealer help, said Mr Dirk Schlect, BiopC product manager.

In support of Mr Schlect's words, Mr Marco Gebhardt of Betten Malsch from Wildeck, Germany, reported that it's almost essential to have a Chinese partner in China, otherwise it would be quite impossible to conduct nego-



Möller Medical GmbH booth at CMEF Spring 2018



B.EASY: Dr. Lauranne first do-it-yourself cream



Claudia Proietti Ragonesi from Infomedix International and Orkide Karasu from IVAM

tiations or run a branch office there. Indeed, it was their Chinese dealer to organize their participation to CMEF. **However, it's also important to have a head office delegation present during these events in order to inspire confidence to visitors and new partners.** Betten Malsch GmbH care and clinical beds have been conceived for market upper level so it's not so easy to present them to such a wide and patchy audience, like the one you can see in CMEF or in other Chinese trade shows.

We met another company manufacturing care beds, **Tekvor Care**, represented by **Tekvorcare Smart Home Technology (Shanghai)** general manager Mr Kevin Zhao. He told us that their clinical beds are sought-after products in China, even because Chinese population is getting older and older, so the Central Government decided to implement conventions for these kinds of products.

Moving to Italian pavilion, we encountered SIMAD international business manager Ms Simona Sturchio.

This is their second time in CMEF since last year experience was satisfactory. They decided to take part in this event also because they are looking for dealers and partners in China, that's why they will start the products registration in China soon. **SIMAD S.r.l. X-Ray Medical Technology** designs and creates exclusively mobile x-ray systems for x-ray surgical applications.

The Italian pavilion also hosted Agami

The 79th China International Medical Equipment Fair (CMEF Spring 2018) attracted good interest from many visitors too, such as medical institutions, medical devices manufacturers, medical devices distributors/agents, R&D institutes, association/government agencies, media/press, components and design of medical devices/OEM, construction industry distributors/agents and relative services (consulting, PR, etc.)

Group, the Italian leader in beauty supplies. Established in Rome (Italy) in 1971, they

are manufacturer of skin-care products.

Agami s.r.l. main brands are DR. LAURANNE – the beauty salon brand, HINA ROME – the pharmacy and doctor brand, B-EASY – the LUXURY brand and OEM (private labels) brands. CMEF has been their first Chinese exhibition after 8 years of absence. During this time, they have been focusing more on European and Saudi Arabian markets, but now they are ready to start investing again in China. As a matter of fact, they are looking for new dealers in China as well.

During CMEF Dr. Lauranne introduced a brand new product, **B.EASY**: the first do-it-yourself cream. According to Cosmetica Italia, the national association of cosmetics companies, 85% of women don't use the products they buy because their expectations are completely different. That's why Dr. Lauranne decided to create D.EASY, an international patented system, whose inventor is Dr. Gaetano Galeppi. In Arab Health this innovative idea achieved resounding success, so CMEF exhibition has been chosen to test the Chinese feedback. Mrs Sabrina Fusar Poli, Dr. Lauranne's export manager, is in charge to assist new customers with marketing policy, agency agreements, new products development, educational concerns, meeting, exhibitions and seminars planning, any other marketing issue. Thanks to her and to Dr. Lauranne's team we had a great learning experience at hall 5.1 booth U32.

Last but not least, during the Welcome Dinner **"Shanghai Night"** organised by Ms Yolanda Yang from Reed Sinopharm,

we had the pleasure to meet Mr Andy Xu and Mr Sabino Pisani, respectively **RealVision** general manager in China and vice president & CTO. Their advanced technology concerns designing and producing 3D monitors and vision systems without the use of polarized glasses exclusively for the B2B channel. The credit for this leading-edge idea belongs to Mr Pisani, who has worked in the optometry field for a long time.

This was their first time in CMEF Spring so, according to Mr Xu, they wanted to capture visitors attention with a wide and impressive black booth designed in Italy. They launched a significant promotional campaign to announce their participation to CMEF too, indeed RealVision booth 5.I E27 was always crowded with people. Moreover, during the trade show, they received the visit from many media, CTVI

(Chinese Television) included. It is not surprising that they decided to take part in **CMEF Autumn** (from October 29 to November 1, 2018 at Shenzhen Convention & Exhibition Center).



RealVision certifications obtained in the medical field guarantee their systems the absence of alterations and consequent neuro-visual disorders. Among main products there are Realvision 9,7" 3D Tablet and Realvision 28" - 42" - 50" - 55" - 65" - 85" 3D monitors and video walls which can be used in the following fields: surgeries with laparoscopy, medical imaging, kit for microscopy, optics, technical design

and advertising too. The company is structured according to areas of expertise, representing Italian excellence all around the world.

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Next edition of CMEF Spring will be held in May 2019 in Shanghai and we wish every success to Reed Sino-pharm for next year event, to be as much outstanding as it was this time.



CMEF Spring 2018 media partners at "Shanghai Night" welcome dinner



Fighting Tuberculosis: A Global Health Emergency

March 23, 2018 - The world is losing the battle against tuberculosis (TB), which remains the deadliest infectious disease despite being curable. TB patients and treatment providers face an array of challenges, from diagnosis to treatment. Doctors Without Borders/Médecins Sans Frontières (MSF) has been fighting TB for more than 30 years and is among the biggest treatment providers. Dr. Francis Varaine, leader of the MSF working group on tuberculosis, explains what more should be done—and why the failure to make progress is, above all, a political issue.

Where are we in the fight against TB?

We're not exactly winning. TB is still the world's top infectious disease killer; since overtaking HIV/AIDS in 2015.

An estimated 1.7 million people died from TB in 2016. Of the 10.4 million people who caught the disease last year, too few have been properly diagnosed or treated.

This reflects the struggling health system in many countries—low and middle income countries account for 95 percent of deaths—and the fact that TB affects mainly the vulnerable. Its prevalence is high among neglected communities—in places like refugee camps, slums, and prisons. It's also the major cause of death among people infected with HIV/AIDS.

In short, it's a global health emergency with outsized effects on the marginalized: an obvious, urgent focus for MSF.

What has MSF been doing about it so far?

MSF finds TB in virtually all its fields of intervention. Between 15,000 and 30,000 patients are treated in MSF-supported projects every year in more than 25 countries. We have been battling TB for more than 30 years, and are one of the biggest non-governmental treatment providers in the world.

For the past decade or so, a major focus was on treating the hardest forms of TB,

called "drug-resistant TB" (DR-TB). One-tenth of our patients suffer from a drug-resistant form of the disease.

In the past five years, and after 50 years without innovation, two new drugs have been marketed. This is a truly historic moment for patients and health care providers. These two drugs, bedaquiline and delamanid, show a lot of promise. MSF has been an early adopter and has one of the largest cohorts in the world treated by regimens containing these drugs. Our experience shows that they are a new hope for patients, in particular those with the hardest-to-treat form of the disease. In addition to the patients we treated, our experience helps inform national and World Health Organization guidelines. Unfortunately, [this effort is] only a drop in the ocean. In 2017, it was estimated that, worldwide, fewer than five percent of patients who needed these drugs were getting them.

What else is being done to help DR-TB patients?

An estimated 600,000 people every year develop a resistant form of TB that requires an arduous, poorly effective, two-year treatment that involves eight months of injections, 15,000 pills, and harsh side effects, including deafness, psychosis, and neuropathy.

Given this desperate state of affairs and

at a unique moment in time with two new drugs available, MSF has taken matters into its own hands. We are currently running two clinical trials, endTB and TB-PRACTECAL, in partnership with leading medical organizations. The aim is to find simpler, shorter (six-nine months), less toxic, all oral, and more effective treatments mainly based on new and repurposed drugs.

Beyond drug-resistance, what are the prospects for TB treatment in general?

Broadly, it's the same problem: very limited research and innovation, and it's still too hard or expensive to reach more patients and treat them as quickly as we would like. Take diagnostics: the world now has rapid tests to diagnose pulmonary TB in a matter of hours, which is revolutionary. But these [rapid tests] require constant power supply, air conditioning and dedicated lab facilities with trained staff. This isn't adapted to a typical MSF operation or the settings of most TB patients. And we still don't have an appropriate test for children and for extra-pulmonary forms of the disease.

TB vaccines are still probably two or three decades away.

And while we mention it less, the treatment for uncomplicated, drug-sensitive TB (DS-TB) is still difficult to implement,



at six months and with four different drugs involved.

Well-funded health services with few patients can bear this kind of burden, but not weaker ones weathering a TB emergency. Moreover, there's a worrying lack of research into new drugs: just five in the current TB pipeline compared to dozens in development for hepatitis C and HIV.

In that challenging context, where does MSF go from here?

By 2025, our goal is that every patient presenting any form of TB in any MSF project should access simple and reliable diagnostics, as well as effective and well-tolerated treatment, and to act as a force for change at the global level.

To help achieve this, MSF's TB projects need to reflect that ambition. First, we should diversify the categories of patients we treat: for instance, our DS-TB cohort has halved in size in the past ten years; we will take on more of these patients. HIV co-infected patients are a group with specific needs—as are children, who represent one in ten new TB patients worldwide. They will need dedicated attention in our programs. We also should address the issue of latent TB infection in our projects. In parallel, we plan to stimulate and promote research for better treatments and better diagnostic tools.

For instance, we remain engaged in re-

search through our DR-TB clinical trials. Beyond these, we will push for innovation on better-adapted diagnostic tests. In the mid-term, we want diagnoses to be possible at the “point of care”—meaning wherever we see patients, even in rural and remote settings—and on the spot. Following diagnosis, DS-TB should be treatable in two months, and any drug-resistant strand in six months.

And because the issue of drug-resistance is unavoidable when antibiotics are involved, we want to see a healthy pipeline of new drugs, diagnoses, and approaches for the future.

But let us not forget that this is first, and above all, a political issue. New tools already exist that should be scaled up, and research, which is today shockingly limited, must be developed and accelerated with the necessary funds. It's about ramping up the resources to bring them to where TB still prevails and kills.

The TB crisis shows no sign of slowing down, neither can we. We will keep using our medical experience and commitment to fight for TB patients.

Source: www.doctorswithoutborders.org/article/fighting-tuberculosis-global-health-emergency

About Médecins Sans Frontières (MSF),

MSF, known internationally in English as Doctors Without Borders, was officially created on December 22, 1971. At the time, 300 volunteers made up the organization: doctors, nurses, and other staff, including the 13 founding doctors and journalists.

MSF was created on the belief that all people have the right to medical care regardless of gender, race, religion, creed, or political affiliation, and that the needs of these people outweigh respect for national boundaries.

Since 1980, MSF has opened offices in 28 countries and employs more than 30,000 people across the world. Since its founding, MSF has treated over a hundred million patients—with 8.25 million outpatient consultations being carried out in 2014 alone. MSF has also maintained its institutional and financial independence, and the organization has continued to be critical of both itself and the broader aid system when appropriate, all in the name of trying to help direct more effective and timely aid to those who need it most.

www.doctorswithoutborders.org/

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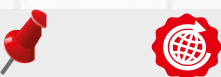
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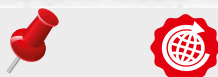
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Website: bulmedica.bg/en
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Brazil
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29-31 05 2018

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Caroline BONDY (Marketing & Communication Director)
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30-05 01-06 2018

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Australia

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Website: www.reedexpo.com.au

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Perth - Australia



28-29 07 2018

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Perth - Australia

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We are excited to develop an innovation in our Infomedix magazine. Starting from this issue our focuses are changing, nevertheless remaining loyal to our articles on the economic and medical markets as well as worldwide industry news.



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