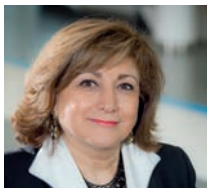
MEDICAL IMAGING EQUIPMENT
AGE PROFILE & DENSITY 2016 EDITION

RENEWAL & REPLACEMENT
NOW **ESSENTIAL** & LONG **OVERDUE**

COCIR
SUSTAINABLE COMPETENCE IN ADVANCING **HEALTHCARE**

European Coordination Committee of the Radiological, Electromedical and Healthcare IT Industry

FOREWORD



NICOLE
DENJOY

SITUATION DETERIORATING ON INSTALLED BASE OF IMAGING EQUIPMENT

This 2015 Medical Imaging Equipment Age Profile and Density report from COCIR provides worrying reading. Despite earlier COCIR publications highlighting the dramatic deterioration in the age of the installed base of medical imaging equipment, it continues to decline. It is now older than ever before, while the overall equipment density in Western Europe is declining. This should not be the case.

Advances in technology have allowed required radiation doses to be lowered, reducing the risk to patients. Despite this, one quarter of the Computed Tomography installed base falls below accepted standards for radiation dose optimisation. Meanwhile, more than 3000 scanners in Europe are now so old that they are no longer suitable for upgrade.

The risk to patients posed by a deteriorating equipment age profile and increasing obsolescence has also been further communicated during the ECR* 2015 and 2016; the EuroSafe campaign has also drawn attention to this alarming situation. This 2016 COCIR report provides supporting evidence that policymakers and healthcare providers need to act now in order to reverse this negative trend.

The industry is continuously innovating to develop equipment that optimises levels of radiation without affecting quality of images, as part of an ongoing dedication to continuously improving patient safety. This commitment should be shared by all stakeholders; the consistent and persistent deterioration in the age profile of the equipment base should not be allowed to continue. Embracing innovative financing models will make renewing the equipment base affordable.

There is no reason for further delay. The benefits to patients and clinicians of renewing the Medical Imaging Technology base are clear and irrefutable.

Nicole DENJOY,
COCIR Secretary General

* European Congress of Radiology

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1. INTRODUCTION

COCIR has been collating statistics and proactively supporting European Member States in monitoring their installed base of medical imaging equipment since the 1990s. COCIR use these parameters to monitor any changes in the age profile of the installed base in European Countries. In this edition, we have widened the scope of the analysis, including data from 33 new locations outside of Europe.

In 2003, COCIR drafted a set of pragmatic and prudent 'Golden Rules', on the basis that an appropriate mix in the age profile of installed equipment is essential for efficient and productive healthcare systems.

These rules support evaluation of the medical equipment installed base and aid procurement processes. They take into account the need to balance the benefits of innovation against the obligation to derive maximum value from capital investment.

THE COCIR GOLDEN RULES

1. AT LEAST 60% OF THE INSTALLED EQUIPMENT BASE SHOULD BE LESS THAN FIVE YEARS OLD.
Medical technology life-cycle averages suggest equipment that is up to five years old adequately reflects the current state of technology with opportunities for economically viable upgrade measures.

2. NO MORE THAN 30% OF THE INSTALLED EQUIPMENT BASE SHOULD BE BETWEEN SIX TO TEN YEARS OLD.
Medical technology that is between six to ten years old is still fit for purpose. However, systems replacement strategies should be developed to benefit from efficiency gains afforded by the latest technologies.

3. NO MORE THAN 10% OF THE AGE PROFILE SHOULD BE MORE THAN TEN YEARS OLD.
Medical technology more than ten years old is outdated and challenging to maintain and repair. Compared with current medical guidelines and best practices, it can be considered obsolete or inadequate for conducting some procedures; replacement is essential.

2. EXECUTIVE SUMMARY

OBSOLESCENT TECHNOLOGY IS UNDERMINING PATIENT SAFETY

Austerity measures imposed on healthcare systems mean that the installed base of medical imaging equipment in Europe is older than ever before. The continued use of this equipment is exposing patients to unnecessary risk.

In some countries, the installed base-age profile trend is improving. However, this is more than offset by the **fact that a quarter of the European Computed Tomography (CT) installed base** is unsuitable for 'radiation dose saving software upgrades'. This renders around 3000 units technologically obsolescent and immediate targets for replacement.

Increasingly rapid incremental innovation offers benefits for a larger, more mobile and ageing population. However, there is a serious lag in implementation. If we want societal benefits for all patients equally, then all stakeholders must urgently address this delay. This was highlighted in our 2013 report; it is clear that action is still required.

3. COCIR RECOMMENDATIONS

REPLACE OBSOLESCENT EQUIPMENT THAT CANNOT BE UPGRADED:
COCIR calls upon national and regional governments and EU policy-makers to support replacing technologically obsolescent equipment that cannot be upgraded, using cohesion policy funding to ensure comprehensive, coherent and sustained investment. This will transform the delivery of care for all.

ADOPT AND DIFFUSE MANAGED SERVICES:
COCIR calls upon Member States and regions to encourage hospitals and healthcare providers to use the European Fund for Strategic Investments to adopt and diffuse **Managed Services**. This will provide part of the solution for assuring long-term access to quality healthcare services for citizens.

ADOPT A PATIENT-CENTRIC APPROACH TO DOSE REDUCTION AND OPTIMISATION:
COCIR calls upon healthcare providers to become more patient-centric on dose reduction and dose optimisation when replacing ageing equipment. This will enhance patient safety.

4. AT A GLANCE: KEY INSTALLED BASE FINDINGS

1. One quarter of the CT installed base falls below accepted safety standards for radiation dose optimisation
2. There has been a decline in equipment density in Western Europe
3. The installed base age profile in Eastern Europe has improved vs. 2013 data
4. Despite improvements in density, Eastern Europe continues to lag far behind Western Europe.

TABLE A Age Evolution[1] of Installed Base vs. COCIR Golden Rules

		INSTALLED BASE				AGE VS 'GOLDEN RULES'		
		2008	2011	2013	2015	Mkt% by age 2013	Mkt% by age 2015	GOLDEN RULES
X-Ray Angiography	IB 1-5 years - units	2650	3811	3084	2361	43%	**49%**	60%
X-Ray Angiography	IB 6-10 years - units	1571	2163	2579	1641	36%	**34%**	30%
X-Ray Angiography	IB >10 years - units	1237	1780	1534	769	21%	**16%**	10%
X-Ray Angiography Total		**5458**	**7754**	**7197**	**4771**			
Computed Tomography	IB 1-5 years - units	6189	6569	5898	5669	50%	**48%**	60%
Computed Tomography	IB 6-10 years - units	3155	3627	4528	4574	38%	**39%**	30%
Computed Tomography	IB >10 years - units	933	1061	1477	1548	12%	**13%**	10%
Computed Tomography Total		**10277**	**11257**	**11903**	**11791**			
Magnetic Resonance Imaging	IB 1-5 years - units	3568	4287	4002	4081	47%	**47%**	60%
Magnetic Resonance Imaging	IB 6-10 years - units	2082	2546	2898	2947	34%	**34%**	30%
Magnetic Resonance Imaging	IB >10 years - units	808	1178	1653	1587	19%	**18%**	10%
Magnetic Resonance Imaging Total		**6458**	**8011**	**8553**	**8615**			
Molecular Imaging PET	IB 1-5 years - units	430	532	448	378	52%	**49%**	60%
Molecular Imaging PET	IB 6-10 years - units	118	294	325	332	38%	**43%**	30%
Molecular Imaging PET	IB >10 years - units	40	110	91	63	11%	**8%**	10%
Molecular Imaging PET Total		**588**	**936**	**864**	**773**			

1. Figures highlighted in red show deterioration in 2015 versus 2013

5. WHY INNOVATION MATTERS

Innovative medical technologies have always been a major driving force for improving healthcare quality. However, such technologies can now provide much more, driving integrated patient–centric care pathways that can improve the efficiency and productivity of healthcare. Investing in innovative products and solutions can improve medical consistency, patient safety, productivity or connectivity, or looking to maximise the use of human and financial capital.

Each year, engineering and IT advances, coupled with a greater understanding of disease at a molecular level, deliver innovation in medical technology. For the installed base of medical imaging equipment, advances are often incremental, improving current processes while extending the usefulness of medical imaging equipment. These developments often offer clinicians with unprecedented visual and functional information about their patients and faster more intelligent diagnostic imaging systems that support decision-making, reduce complexity and increase productivity.

Since these advances are often incremental, industry offers upgrades that help extend the life of equipment over a defined period. However, as equipment ages, increasing numbers of technical incompatibilities e.g. in equipment control and the redesign of components, renders updates uneconomical, even impossible.

The European Society of Radiology has recognised the clinical importance of planning for timely replacement of equipment. In 2014, it published a position paper[2] on renewal, stating that; **"Equipment less than five years old is state-of-the-art technology. Properly maintained equipment between six and ten years old is suitable for practice, but radiology departments should develop a strategy to replace them. Machines over ten years old must be replaced."**

The issue of 'technological obsolescence' can often go unnoticed; it is influenced by an imbalance between the pace of incremental innovation on the one hand and the rate of equipment replacement on the other. This forms the basis for COCIR's 'Golden Rules'.

A COMPUTED TOMOGRAPHY

In the case of **Computed Tomography (CT)** COCIR believes that the installed base should be renewed more quickly to improve patient safety. Specifically, COCIR recently identified 'significant' triggers in the technological, medical and regulatory areas. These include **CT Dose modulation** and **CT Reiterative reconstruction** algorithm technologies, which dramatically reduce the required X-Ray dose. For example, reductions of >50% in paediatric imaging without a loss of diagnostic quality have been published[3]. These software applications, available as upgrades, also improve hospital efficiency, clinical effectiveness and reduce costs.

Dose modulation technologies automatically calculate the optimum tube current for each anatomical area and the real-time current control for the X-Ray tube. This ensures patients receive the minimum dose necessary (ALARA principle – as low as reasonable achievable).

Reiterative reconstruction algorithm technologies reproduce higher dose protocol scans using raw low-dose scan data. This reduces the absorbed dose and provides higher quality images for the same exposure.

However, **a quarter of the European CT installed base is too old to be upgraded with these technologies.** This makes them inadequate from a dose optimisation and radiation safety perspective; they should be replaced.

This means approximately 2500 CT units in Western Europe and 500 CT units in Eastern Europe cannot be upgraded. The majority are in Poland, Germany, Italy and Spain.

2. "Renewal of radiological equipment" http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4195838/
3. C. Saidlear et al, ECR 2015 / C-1888, 2015 http://posterng.netkey.at/esr/viewing/index.php?module=viewing_poster&pi=128238

COCIR National Trade Associations members in Italy (Assobiomedica) and in Spain (Fenin) have conducted further studies. In Italy, Assobiomedica has shown that out of 470 CT scanners in the "up to 16 slices" segment currently in use, 222 are technologically obsolete and exceed the threshold of seven years old. This poses questions over safety, efficacy and value.

In Spain, most of the CT equipment installed cannot be considered "low dose" by today's standards. A Fenin study shows that 67% of CT scanners in use are older than five years. This is 27 percentage points higher than the COCIR Golden Rules and 17 percentage points higher than the European average.

COCIR believes that the patient benefits offered by these advances are clear and compelling. At the very least, this should drive upgrades to the current CT installed base and encourage investment in new and replacement low-dose CT technology throughout Europe.

B ADDRESSING THE FINANCIAL CHALLENGE OF IMPLEMENTING INNOVATIONS

The current delays in implementing innovative imaging technology leaves many advances stranded in manufacturers' warehouses; irrespective of their long-term 'value' or ability to improve clinical outcomes.

These delays in uptake show a disconnect stemming from both short-term policy constraints and silo budgeting. In addition, many Member States view innovative medical technologies as a cost, rather than an opportunity to improve quality, efficacy, patient safety and productivity. Currently, most purchase decisions are price-driven and fail to consider any 'incremental value' the technology or method provides.

Hospitals and healthcare providers need access to new business models that allow the financial flexibility to secure long-term access to these innovative technologies and/or broader healthcare solutions. This is essential in accelerating implementation.

New business models, such as Managed Services, shift funding from capital expenditure to a more predictable operational expenditure, while including an element of risk-sharing. This arguably provides the financial platform to allow innovative solutions to reach more patients.

The recent Commission Expert Panel on Effective Ways of Investing in Health[4] report on 'Disruptive Innovation: Considerations for health and health care in Europe' [5] supports this approach. It highlighted the importance of innovative financial models, such as Managed Services, in implementing and disseminating innovation. The report also suggested that these models should be considered 'disruptive innovations' in their own right.

Given appropriate incentives and investment, more hospitals and patients in Europe will benefit from greater efficiencies and improved outcomes afforded by ongoing advances in medical technology. The drivers of change will be universal; – increased efficiencies, increased access and improved clinical outcomes. However, adapting funding mechanisms will be also be fundamentally important.

However, the detail in this report is overshadowed by the glaring disparities between Western and Eastern Europe. This long-term challenge, to balance the current inequity, is a long-term one and highlights the significant infrastructure challenges in Eastern Europe. Clearly, Structural Funds can play a huge role here. Given the innovative trend of shifting from capital to operational budgeting for appropriating medical technology, COCIR believes it is time to relax of the current ESIF rules to support this.

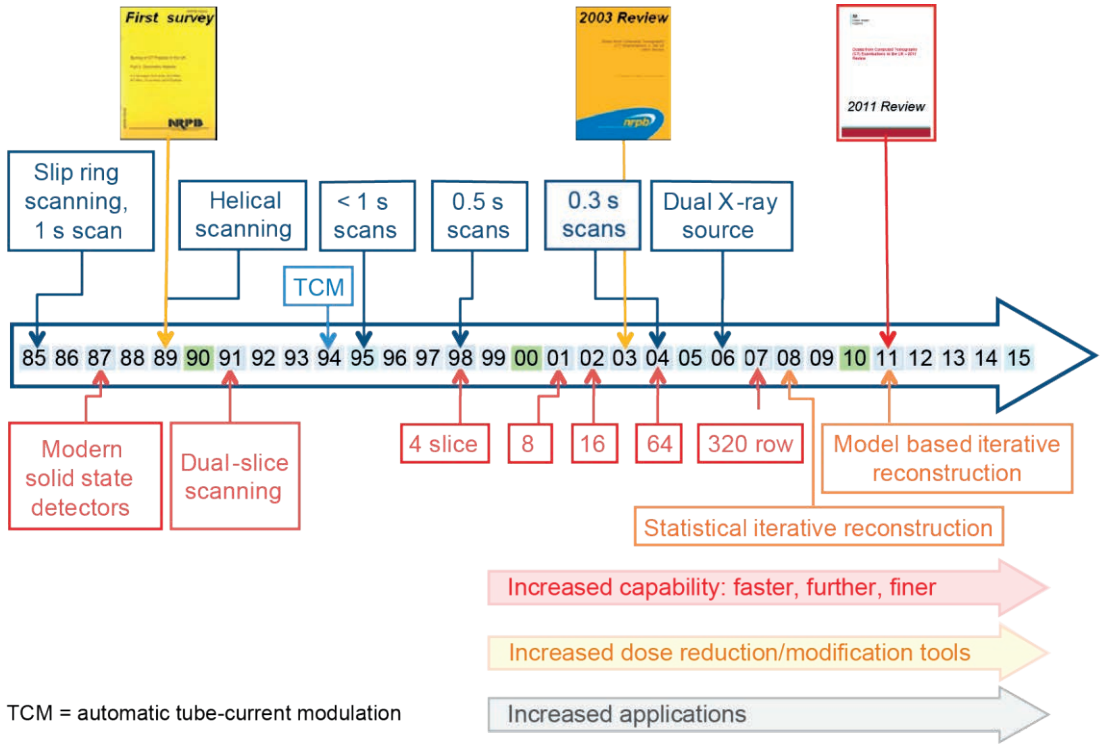
4. http://ec.europa.eu/health/expert_panel/index_en.htm
5. http://ec.europa.eu/health/expert_panel/sites/expertpanel/files/012_disruptive_innovation_en.pdf

C ADVANCES IN COMPUTED TOMOGRAPHY TECHNOLOGY

Over the last 10 years, advances in CT technology have delivered enhancements for clinicians and patients.

TABLE B[6] Timeline of technological advances vs. national CT dose surveys

Source: Doses from Computed Tomography (CT) Examinations in the UK – 2011 Review (PHE-CRCE-013), Shrimpton et al for Public Health England, PHE publications gateway number: 2014179



A NEWER CT SCANNER HAS SEVERAL ADVANTAGES OVER ONE TEN YEARS OLDER:

> Newer, more advanced scanners enable high-resolution cardiac imaging through high spatial resolution, wide coverage and high-speed imaging. This ability to image the heart in a single beat allows improved imaging in patients with, for example, arrhythmias, elevated heart rates or atrial fibrillation. This would not be possible on earlier generation scanners[7].

> One of the most important advances in CT technology is the improvements in patient safety achieved by reducing the radiation dose. Scanning patients at the lowest possible radiation dose is important, as the data suggests that high doses increase the likelihood of developing cancer. Low-dose CT scanners are particularly beneficial in higher risk populations, such as children and young females, where the higher sensitivity of growing tissues makes strict dose limitation a necessity. Cancer patients that have frequent follow-up scans benefit immensely from low-dose scanners. Improvements in dose-reduction technologies can now continually optimise dose while maintaining diagnostic image quality, while advances in data acquisition, image reconstruction and optimisation processes reduce the effective dose levels for routine CT. Techniques such as iterative reconstruction provide the same image quality at up to 82% lower radiation doses than conventional image reconstruction.

6. https://www.gov.uk/government/publications/doses-from-computed-tomography-ct-examinations-in-the-uk
Contains public sector information licensed under the Open Government Licence v3.0 https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/
7. NICE DG3 guidance http://guidance.nice.org.uk/DG3

> Other new features enable dose setting, monitoring and tracking to manage and record patient dose. For example, Dose Check allows users to set limits for every scan, alerting the user if they are prescribing a dose that is outside their usual range.

> A hospital study in the US showed that dose reduction strategies (protocols and new technology) delivered in 30% to 52% decreases in radiation exposure for the targeted body areas. *[Reference: Rayo et al Journal of the American College of Radiology Volume 11, Issue 7, July 2014, Pages 703–708]*

CT SCANNERS ARE BECOMING FASTER, MORE SENSITIVE AND ACCURATE WHILE OCCUPYING A SMALLER FOOTPRINT. THIS IMPROVES BOTH EFFICIENCY AND EFFECTIVENESS:

> CT scanners have been shown to reduce mortality by 20% when used for lung cancer screening in place of digital X-Ray. Lung screening requires a scanner with at least 16-slices and a 0.5 s rotation speed. All current 16-slice and above CT scanners are capable of lung screening; some of the 16-slice scanners from ten years ago are capable. The majority of scanners more than ten years ago are not 16-slice scanners and thus not capable.

> Advances in CT technology over the last 10 years have provided faster, better quality images, improving many types of examination. These include circulatory system disorders, aneurysms, blood clots, spinal conditions, kidney and bladder stones, abscesses, inflammatory conditions and head, skeletal system and internal organ injuries.

> CT scanning is increasingly used in Oncology for Radiation Therapy planning. As therapy devices become more targeted, the accuracy and image quality of CT is increasingly important. CT has also become a vital tool for physicians in tracking treatment response. It has become the “tracking tool” for monitoring any potential recurrence of cancer and for the evaluation of suspected abnormalities in other scans. For example, if an ultrasound scan shows a suspected liver mass, the next step would likely be a CT scan to better visualise the mass and to assess next steps.

> CT colonography (CTC) is a non-invasive procedure and offers a good alternative where patients cannot undergo a colonoscopy.

> Low-dose CT screening shows a 20% reduction in lung cancer mortality in high-risk patients[8]. CT provides the high resolution needed to detect nodules, increasing early detection in high-risk patients.

8. Reference: The National Lung Screening Trial Research Team. Reduced Lung-Cancer Mortality with Low-Dose Computed Tomographic Screening. N Engl J Med 2011;365:395-409

IN ADDITION TO ITS GOLDEN RULES ANALYSIS, COCIR HAS CONDUCTED AN IN DEPTH ANALYSIS ON THE TWO TECHNOLOGY BREAKTHROUGHS THAT NECESSITATE A FASTER PACE OF RENEWAL TO IMPROVE PATIENT SAFETY:

CT DOSE MODULATION
CT REITERATIVE RECONSTRUCTION ALGORITHMS

This shows that a quarter of the European CT installed base cannot be upgraded with these important advances. This renders them obsolete from a dose optimisation and radiation safety perspective and should be considered for replacement.

This is equivalent to approximately 2500 units in Western Europe and 500 units in Eastern Europe.

The highest levels were found in Poland, Germany, Italy and Spain[9].
COCIR National Trade Associations members in Italy (Assobiomedica) and in Spain (Fenin) have conducted further studies in both countries.

In Italy, Assobiomedica has shown that out of 470 CT scanners in the "up to 16 slices" segment currently in use, 222 are technologically obsolete and exceed the threshold of seven years old. This poses questions over safety, efficacy and value.

In Spain, most of the CT equipment installed cannot be considered "low dose" by today's standards. A Fenin study shows that 67% of CT scanners in use are older than five years: 27 percentage points higher than the COCIR Golden Rules and 17 percentage points higher than the European average.

6. 2016 AGE PROFILE: DETAILED ANALYSIS OF RESULTS

Comparing the 2015 and historical data to the Golden Rules criteria

A COMPUTED TOMOGRAPHY

COCIR Companies participating in Age Profile reporting; GE, Hitachi, Philips, Siemens, Toshiba

EUROPE:

COCIR has monitored the Age Profile of CT equipment since 1998. It began with Western Europe, subsequently expanding its coverage to include Eastern Europe.
The most alarming finding is that the number of countries with more than 10% of CT machines older than ten years has **trebled in the last 7 years**.

Western Europe:

> AGE PROFILE CONTINUES TO DECLINE

> EQUIPMENT DENSITY HAS ALSO DECLINED

> Overall, the observed CT scanner age profile **continues to deteriorate** against the Golden Rules criteria. The percentage of systems over five years old has increased from 40% in 2008 to **53 % in 2015**.

> In spite of earlier warnings, Western Europe regularly and **significantly infringes** COCIR's Golden Rule that no more than

9. Tables 4,5,6

10% of the installed base should be more than ten years old.

> The CT scanner age profiles show fall appreciably short of the Golden Rules criteria, notably in **Italy, Spain, Portugal, Finland, Ireland and Greece**.

> In these countries, the "six years and older" proportion of the age profile is in the range of **62% to 68%** of the installed equipment. This deviates sharply from the Golden Rule of not exceeding 30%.

> Average CT density *(number of systems in use per million inhabitants)* in Western Europe has **decreased** slightly from to 24.9 in 2013 to **24.1 in 2015**. Denmark (42), Austria (36.1), Germany (32.8) and Portugal (32.5) had densities greater than 30. Meanwhile **Belgium, Finland, Netherlands** and **UK** have densities lower than 20.

Central and Eastern Europe:

> SLIGHT IMPROVEMENT IN BOTH AGE PROFILE AND EQUIPMENT DENSITY

> Although the overall CT equipment age profile has shown a **slight improvement**, it still falls short of the COCIR Golden Rules.

> The age profile in **Albania, Bulgaria, Macedonia and Romania**, **meet or surpass the Golden Rules**.

> **The three Baltic** countries and **Ukraine** also **marginally improved** the age profile of their equipment.

However, the age profiles in several other countries deviate from the "six years and older" Golden Rule, with **Czech Republic (over 60%) and Slovenia (78%)**.

> The average CT density in Central and Eastern Europe **increased slightly** from 12.6 in 2013 to 13. However, this remains significantly **lower than the Western European average**. The lowest densities were in Serbia (3.9) and Ukraine (4.4).

RUSSIAN FEDERATION:

In 2013, the CT equipment age profile fell just short of the Golden Rules. It has subsequently deteriorated, with the "six years and older" portion representing 40% of installed equipment.
CT density is higher than the Eastern European average at 16.6.

TURKEY:

The CT age profile has deteriorated since the 2011 and 2013 surveys; 60% of CT systems are now more than six years old. Average density is 14.

REST OF THE WORLD[10]:

Brazil fails to meet the Golden Rules criteria. The proportion within the installed base deteriorated, with the percentage of machines six years and older increasing from 48% in 2013 to 56% in 2015.

10. Equipment density data does not include local vendors. **Estimated** COCIR coverage for CT is 98% in Russia; 90% in Greater China and 92% -94% in the Indian Subcontinent

Data for **Greater China** and the **Indian subcontinent** also show progressive ageing of equipment.

Within the Middle East region, the **Emirates (UAE), Oman, Yemen and Iraq** meet COCIR Golden Rules criteria. All have shown a marked improvement since 2013.

From the Commonwealth of Independent States (CIS) countries, **Azerbaijan and Uzbekistan** meet the Golden Rules.

Equipment density ranges from 2.4 in the Indian Subcontinent to an average of 7.1 in the Middle East (mainly driven by 19.1 in Saudi Arabia), 9.4 in the Greater China area, 12.5 in CIS (16.6 in Russia) and 14.1 in Brazil.

B MAGNETIC RESONANCE IMAGING

COCIR COMPANIES PARTICIPATING IN AGE PROFILE REPORTING: GE, HITACHI, PHILIPS, SIEMENS, TOSHIBA

EUROPE:

COCIR has monitored the Age Profile of MRI since 1998. It began with Western Europe, subsequently expanding its coverage to include Eastern Europe.

Western Europe:

> AGE PROFILE STABLE BUT STILL NOT MEETING THE COCIR GOLDEN RULES

> EQUIPMENT DENSITY IN DECLINE

> Overall, the MRI equipment age profile does not meet the COCIR Golden Rules. The situation has **not improved** since previous studies. As in 2013, 54% of all installed MRI systems still exceed five years of age. One in five MRI systems is more than ten years old.

> Only **France** and **Switzerland** meet all Golden Rules criteria, with Sweden and Ireland falling just short.

> The age profile in several individual countries, **Spain, Greece and Italy** fail to meet the "six years and older" Golden Rule. There has been extensive ageing since the 2011 study, reaching 65% with peaks of **74%.** Germany has deteriorated from 56% in 2013 to 58% in 2015.

> The average MRI density *(number of systems in use per million inhabitants)* in Western Europe amounted to 18.5, a **slight decrease** from 18.9 in 2013.

> Switzerland (43.2), Norway (29.6), Germany (29.4) Denmark (25.2), Austria (23.8), Finland (23.2) and Spain (20.2) achieved densities greater than 20.

Central and Eastern Europe:

> MARGINAL IMPROVEMENT IN AGE PROFILE AND IN EQUIPMENT DENSITY

> Only two countries, **Bulgaria and Romania**, meet all Golden Rules criteria

> Several countries fall just short, having improved since from 2013; the three **Baltic** countries, **Bosnia, Hungary, Macedonia** and **Poland**

> The average MRI density in Central and Eastern Europe has **improved** from 5.5 in 2013 to 6.5. However, it remains significantly **below the all-European average** of 15.1 systems. The lowest densities were in Serbia (1), Ukraine (1.9), Albania (3) and Slovakia (4).

RUSSIAN FEDERATION:

The MRI equipment age profile in Russia has shown **steady improvement** since COCIR began monitoring in 2006, meeting the Golden Rules since 2013.

TURKEY:

The equipment age profile has **considerably deteriorated** since 2013. Notably, the numbers of "six years and older" systems have increased from 42% to 54%.

REST OF THE WORLD[11]:

Brazil fails to meet the Golden Rules and the proportion within the installed base deteriorated, even though the percentage of machines older than six years decreased slightly from 48% in 2013 to 46% in 2015.

Greater China and the **Indian subcontinent** met the Golden Rules in 2013; however, the 2015 figures show a slight deterioration.

Within the Middle East region, **Bahrain**, **Emirates (UAE), Kuwait, Oman** meet the COCIR Golden Rules. All have shown a marked improvement since 2013.

In the Commonwealth of Independent States (CIS) countries, only **Uzbekistan** meets the Golden Rules.

Equipment density ranges from 1.1 in the Indian Subcontinent to an average of 4.4 in the Middle East. This is mainly driven by the UAE (24.9) and the Lebanon (24). Greater China area achieves 3.5, CIS 5.3, driven by Russia (6.9), Brazil 9.7 and Turkey 13.1.

11. Equipment density data does not include local vendors. **Estimated** COCIR coverage for MRI is 94-95% in Russia; 88-89% in Greater China; 97% in the Indian Subcontinent

C X-RAY ANGIOGRAPHY

COCIR COMPANIES PARTICIPATING IN AGE PROFILE REPORTING: GE, PHILIPS, SHIMADZU, SIEMENS, TOSHIBA

EUROPE:

Western Europe:

> DETERIORATION OF AGE PROFILE

> MARKED DETERIORATION OF EQUIPMENT DENSITY

> The X-Ray Angiography equipment age profile falls a long way short of the Golden Rules criteria, with many countries deteriorating compared to their 2013 levels.

> The only countries in Western Europe to improve slightly are **Finland, Ireland and the UK**.

> The "six years and older" fails to meet the Golden Rules 60% criteria in a number of countries, including Italy (70%), Spain (66%), Denmark (65%), Portugal (63%).

> The average X-Ray Angiography density (number of systems in use per million inhabitants) in Western Europe amounted to 13.4, **deteriorating from** 15.6% in 2013. There were densities of 20 or higher in Norway and Sweden (20), Netherlands (21.1) Germany (23.7) and Switzerland (25.7). France (9.8), Spain (9.6), UK (7.4) Portugal (6.7) and Greece (3.7) had densities below ten.

Central and Eastern Europe:

> MARKED IMPROVEMENT OF AGE PROFILE

> SLIGHT INCREASE IN EQUIPMENT DENSITY

> Overall, the X-Ray Angiography age profile shows a **marked improvement, with Albania, Croatia, Macedonia and Ukraine** meeting the criteria for the Golden Rules

> **Romania** continues its improvement since 2011, with 75% of its Angiography systems aged five years or less

> Hungary, Serbia and Slovakia registered a slight improvement, but still fell short of the Golden Rules criteria

> The average X-Ray Angiography density in Central and Eastern Europe was 5.8, a slight increase over the 2013 level of 5.7 in 2013 and well below the all-European average of 11.2. Serbia (1), Ukraine (1.3) and Slovakia (2.2) had the lowest densities.

RUSSIAN FEDERATION:

The X-Ray Angiography age profile has deteriorated sharply, with the percentage of "six years and older" systems increasing from 32% to 40%.

TURKEY:

The X-Ray Angiography age profile has **increased**, falling **well short** of the Golden Rules criteria. The "six years and older" segment of the installed equipment increased from 56% in 2013 to 57%.

REST OF THE WORLD[12]:

Brazil fails to meet the Golden Rules criteria. The percentage of machines "6 years and older" increased from 43% (2013) to 49% (2015).

Greater China continues its improvement since 2013, with 65% of its X-Ray angiography systems now five years old or less.

The **Indian subcontinent** met the Golden Rules in 2013, but has deteriorated since then, with 2015 figures showing the percentage of "six years and older" systems increasing from 38% to 66%.

In the Middle East region, **Bahrain**, **UAE, Oman and Yemen** meet the Golden Rules criteria. The latter shows a marked improvement over 2013.

In the Commonwealth of Independent States (CIS) countries, **Azerbaijan**, **Kazakhstan** and **Uzbekistan** comply with the Golden Rules.

Equipment Density ranges from 0.9 in the Indian Subcontinent to 2.4 in the Greater China area, 3.2 in CIS (driven by 4.0 in Russia). Average in the Middle East is 3.7, driven by Lebanon (20.1) and UAE (20.6), Brazil (3.9) and Turkey (7.9).

D MOLECULAR IMAGING PET

EUROPE:

COCIR COMPANIES PARTICIPATING IN AGE PROFILE REPORTING: GE, PHILIPS, SIEMENS

Western Europe:

> SLIGHT IMPROVEMENT IN AGE PROFILE

> DECREASE IN EQUIPMENT DENSITY

> Overall, the MI-PET equipment age profile has improved slightly since 2013, with a **slight improvement** in meeting the Golden Rules criteria.

> **France** and **Greece** have **substantially renewed** their installed base with 63% and 60% (respectively) currently aged five years or less

> **Sweden, UK, Belgium** and **Netherlands** also show a **moderate amount renewal**, however they still fail to meet the Golden Rules criteria

> The age profiles of a number of countries, notably Norway (63%), Germany (67%), Ireland and Portugal (both 88%), show extensive ageing since 2013 and now deviate markedly from the "six years and older" Rule

12. Equipment density data does not include local vendors. **Estimated** COCIR coverage for X-Ray Angio is 98-99% in Russia; 98% in Greater China; 98% in the Indian Subcontinent

> The average MI-PET density (*number of systems in use per million inhabitants*) for Western Europe is 1.7, a **small decrease** from 1.9 in 2013

> Denmark (6.3) and Switzerland (3.9) have the highest MI-PET densities.

Central and Eastern Europe:

> SLIGHT DETERIORATION OF AGE PROFILE
> EQUIPMENT DENSITY STABLE

> The MI-PET equipment age profile has deteriorated slightly since 2013 and now fails to meet the Golden Rules criteria

> The few Eastern European countries that still meet the criteria are: the three **Baltic** countries**, Bosnia, Bulgaria** and **Romania**

> A number of other countries have deteriorated since 2013. **Hungary**, **Slovenia** and **Croatia**, at 50% and above of the installed base, fall significantly short of the "six years and older" Rule

> The average Central and Eastern European MI-PET density is 0.4 (the same as 2013), **only a quarter of that of Western Europe**.

RUSSIAN FEDERATION:

The MI-PET equipment age profile has improved remarkably, with 87% of systems less than five years old. Average density is 0.4, in line with Central and Eastern Europe.

TURKEY:

Turkey continues to fall short of the Golden Rules criteria. However, it has improved, with systems aged five years or less increasing from 48% in 2013 to 54% in 2015. Average density is 1.7, **in line with Western Europe**.

REST OF THE WORLD[13]:

Brazil continues to meet Golden Rules criteria. It is also improving, with systems aged five years or less increasing from 68% in 2013 to 74% in 2015.

Equipment in Greater China and the Indian subcontinent is deteriorating and progressively ageing.

Within the Middle East region, most countries meet the Golden Rules criteria, with the exception of **Yemen, Syria and Israel**.

In the Commonwealth of Independent States (CIS) countries, **Belarus and Uzbekistan** meet the Golden Rules criteria.

Equipment Density in the Indian Subcontinent is 0.14, 0.21 in Greater China and 0.25 in the Middle East (driven by 0.59 in Saudi Arabia), reaching 0.6 in Brazil.

13. Equipment density data does not include local vendors. **Estimated** COCIR coverage for MI-PET is 99% in Russia; 97% in Greater China; 100% in the Indian Subcontinent

7. ANNEX 1: DETAILED RESULTS

A COMPUTED TOMOGRAPHY

TABLE 1 COMPLIANCE WITH GOLDEN RULES – CT

DOES NOT AT ALL MEET GOLDEN RULES
CLOSE BUT NOT MATCHING GOLDEN RULES
EQUAL OR BETTER THAN GOLDEN RULES

	END 2015				END 2013				END 2011				END 2008			
		COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS		
	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS
Albania		61%	29%	10%		65%	22%	12%								
BALTICS		64%	23%	13%		43%	47%	9%		68%	24%	8%		70%	26%	4%
Bosnia		51%	36%	13%		46%	40%	14%								
Bulgaria		67%	28%	5%		76%	16%	8%		33%	52%	15%		52%	24%	24%
Croatia		40%	47%	14%		34%	43%	24%								
Czech Republic		35%	49%	16%		46%	38%	16%		66%	22%	12%		60%	30%	9%
Hungary		58%	19%	22%		41%	42%	17%		43%	52%	5%		52%	43%	6%
Macedonia		72%	20%	8%		61%	21%	18%								
Poland		52%	34%	14%		61%	33%	6%		68%	27%	5%		69%	22%	9%
Romania		61%	34%	5%		66%	27%	6%		79%	17%	4%		70%	20%	11%
Serbia		46%	39%	14%		36%	44%	20%								
Slovakia		42%	38%	20%		48%	40%	11%		62%	28%	10%		55%	27%	18%
Slovenia		22%	51%	27%		26%	51%	23%		52%	24%	24%		52%	22%	26%
Ukraine		54%	36%	10%		51%	36%	14%		66%	26%	8%		54%	13%	33%
EASTERN EUROPE		52%	35%	13%		54%	35%	11%		66%	26%	8%		63%	24%	13%
Portugal		38%	43%	19%		45%	43%	12%		52%	38%	10%		64%	29%	7%
Spain		35%	46%	19%		35%	41%	24%		50%	33%	17%		54%	32%	15%
IBERIA		36%	45%	19%		38%	42%	21%		50%	34%	16%		56%	31%	13%
Denmark		61%	35%	3%		63%	31%	6%		67%	27%	6%		63%	31%	6%
Finland		36%	48%	17%		45%	44%	11%		63%	28%	9%				
Norway		53%	37%	10%		42%	46%	12%		51%	43%	6%		63%	31%	7%
Sweden		55%	38%	7%		61%	31%	8%		63%	34%	4%				
SCANDINAVIA		54%	38%	8%		55%	37%	9%		61%	33%	6%		60%	35%	5%
Ireland		34%	51%	15%		34%	55%	11%		57%	37%	5%		72%	24%	4%
UK		54%	38%	8%		44%	46%	10%		62%	36%	1%		60%	36%	4%
UK & IRELAND		52%	40%	9%		43%	47%	10%		62%	37%	2%		61%	35%	4%
Austria		43%	44%	12%		39%	45%	16%		52%	36%	12%		59%	32%	9%
Belgium		55%	37%	8%		49%	43%	8%		25%	72%	3%		70%	27%	3%
France		70%	26%	4%		71%	26%	4%		71%	27%	3%		73%	25%	2%
Germany		45%	42%	13%		49%	39%	12%		60%	31%	9%		58%	31%	12%
Greece		32%	51%	17%		38%	43%	19%		62%	28%	10%		62%	30%	8%
Italy		36%	43%	21%		43%	40%	18%		49%	35%	16%		53%	35%	12%
Netherlands		47%	35%	18%		50%	39%	11%		50%	40%	10%		62%	35%	3%
Switzerland		57%	36%	7%		52%	39%	9%		59%	38%	4%		71%	27%	2%
WESTERN EUROPE		47%	40%	13%		49%	39%	13%		56%	35%	9%		60%	31%	9%
EUROPE		48%	39%	13%		50%	38%	13%		57%	34%	9%		60%	31%	9%
CYPRUS		50%	31%	19%		29%	43%	29%		47%	47%	5%		67%		
RUSSIA		60%	28%	13%		68%	22%	10%		66%	19%	14%		58%	23%	19%
TURKEY		40%	47%	13%		48%	42%	10%		60%	25%	16%		72%	13%	14%
Brazil		44%	33%	24%		52%	29%	19%								
Greater China		56%	28%	16%		54%	32%	14%								
India		51%	23%	25%		51%	41%	8%								
MIDDLE EAST		56%	32%	11%		58%	27%	15%								

TABLE 2 COMPLIANCE WITH GOLDEN RULES – EU – CT

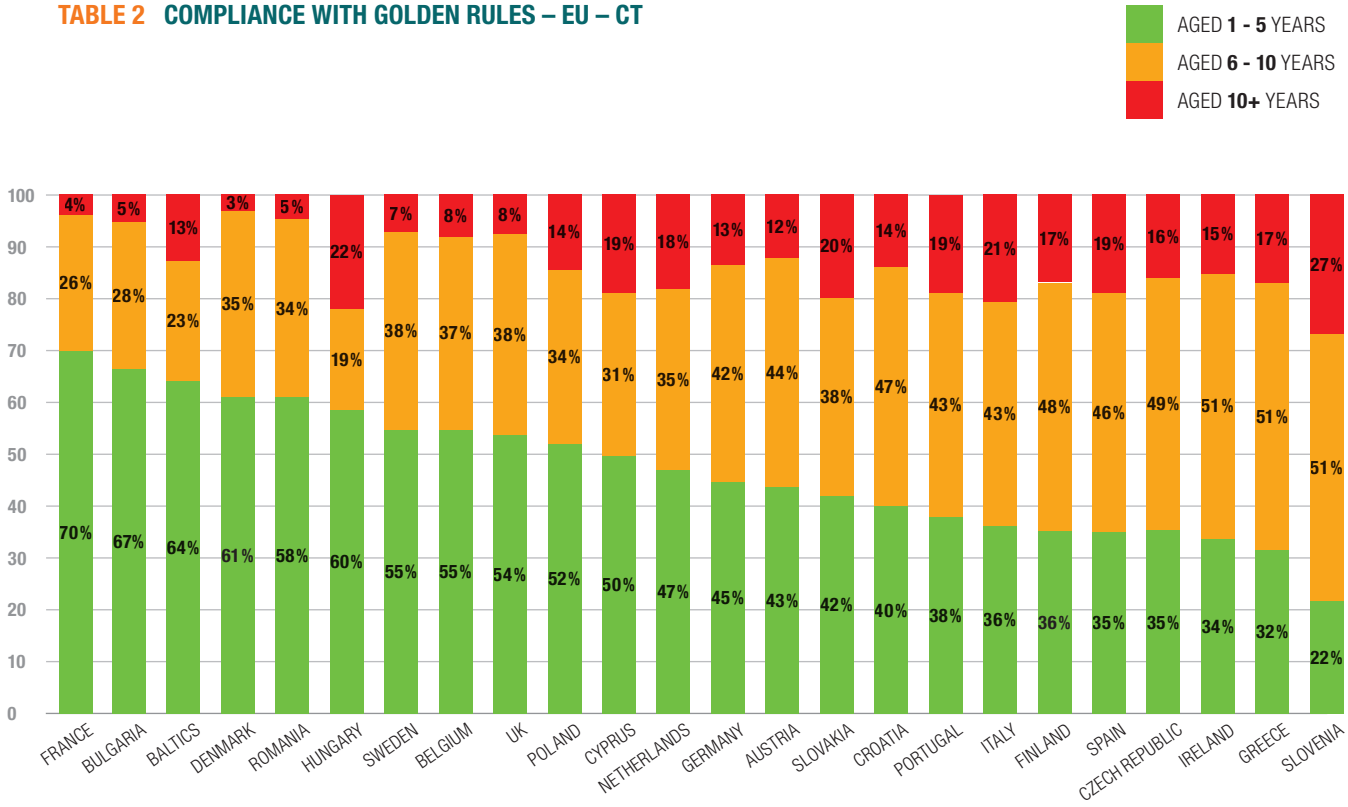


TABLE 3 COMPLIANCE WITH GOLDEN RULES – EUROPE VS. BRIC, ME-CIS – CT

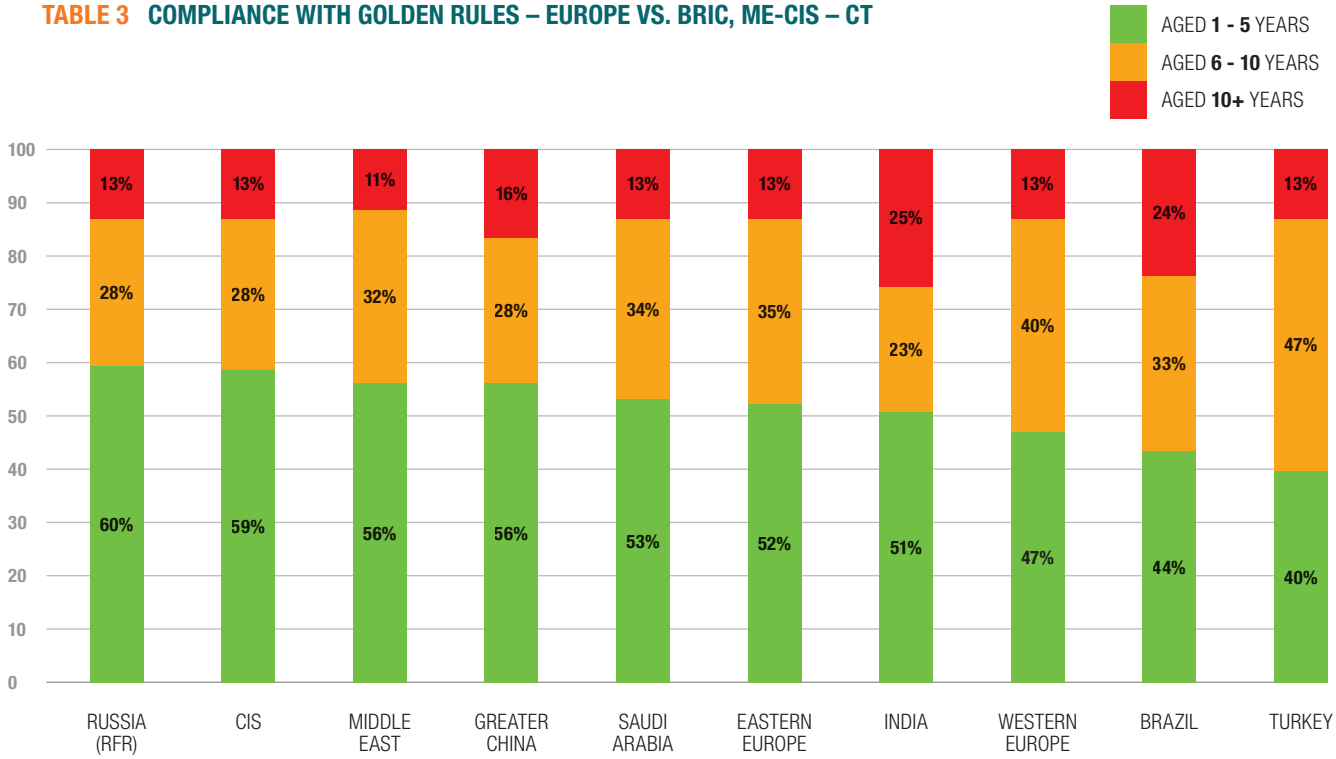


TABLE 4 Units CT – EUROPE

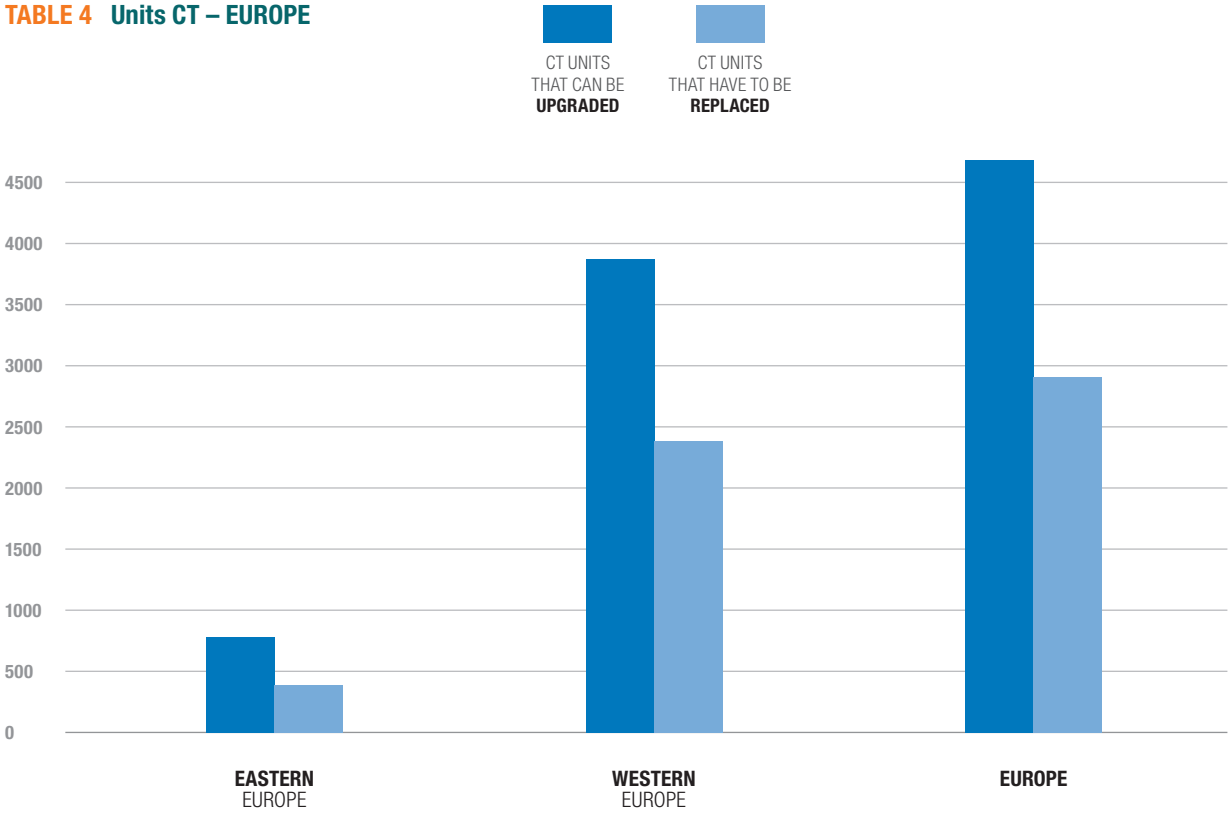


TABLE 5 Units CT – WESTERN EUROPE

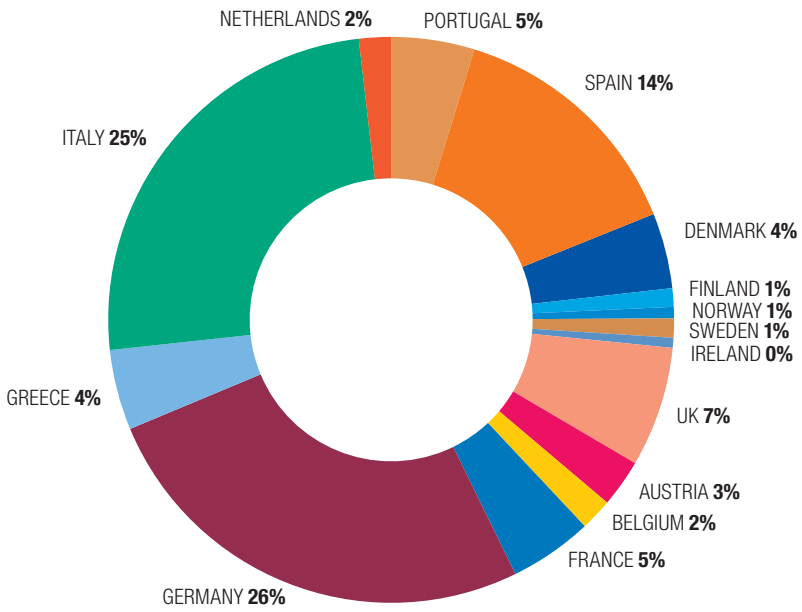


TABLE 6 Units CT – EASTERN EUROPE

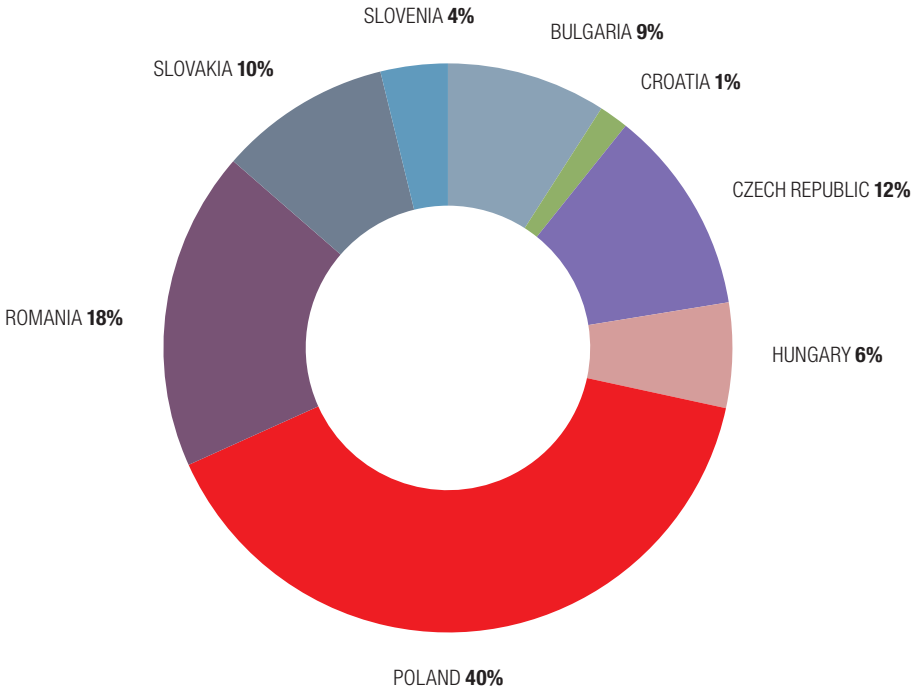


TABLE 7 Density – EU – CT

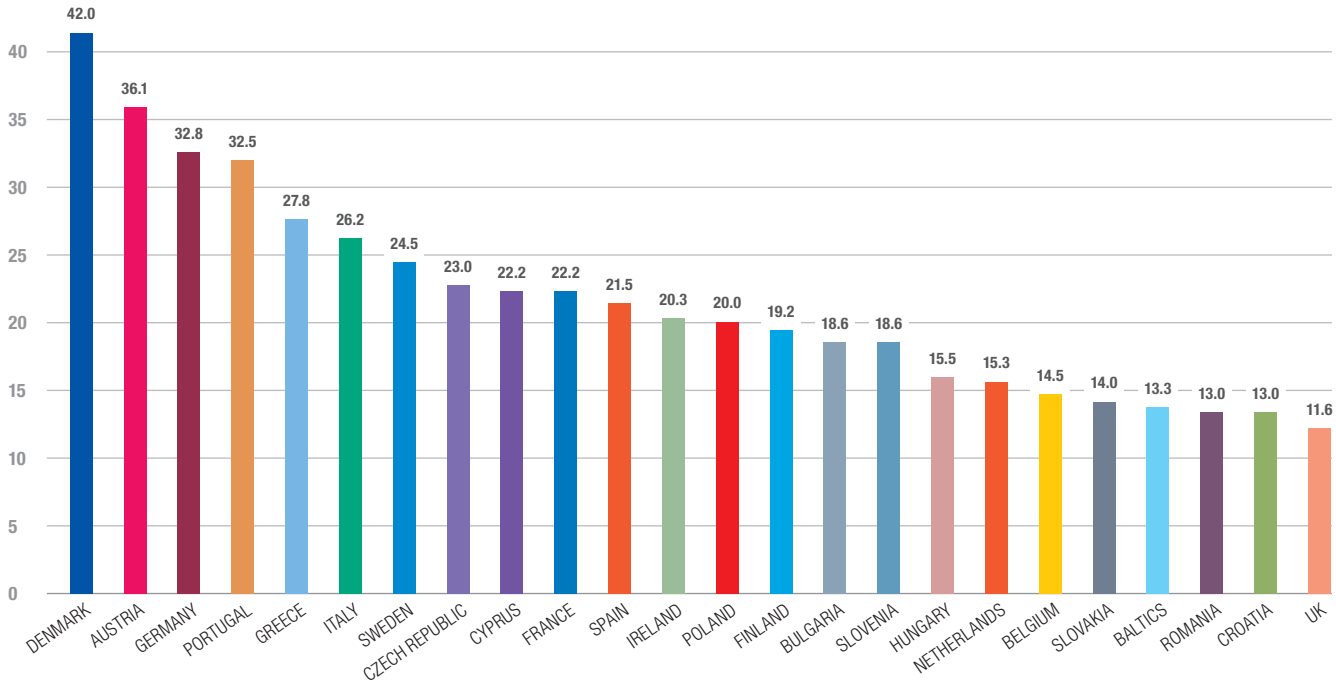
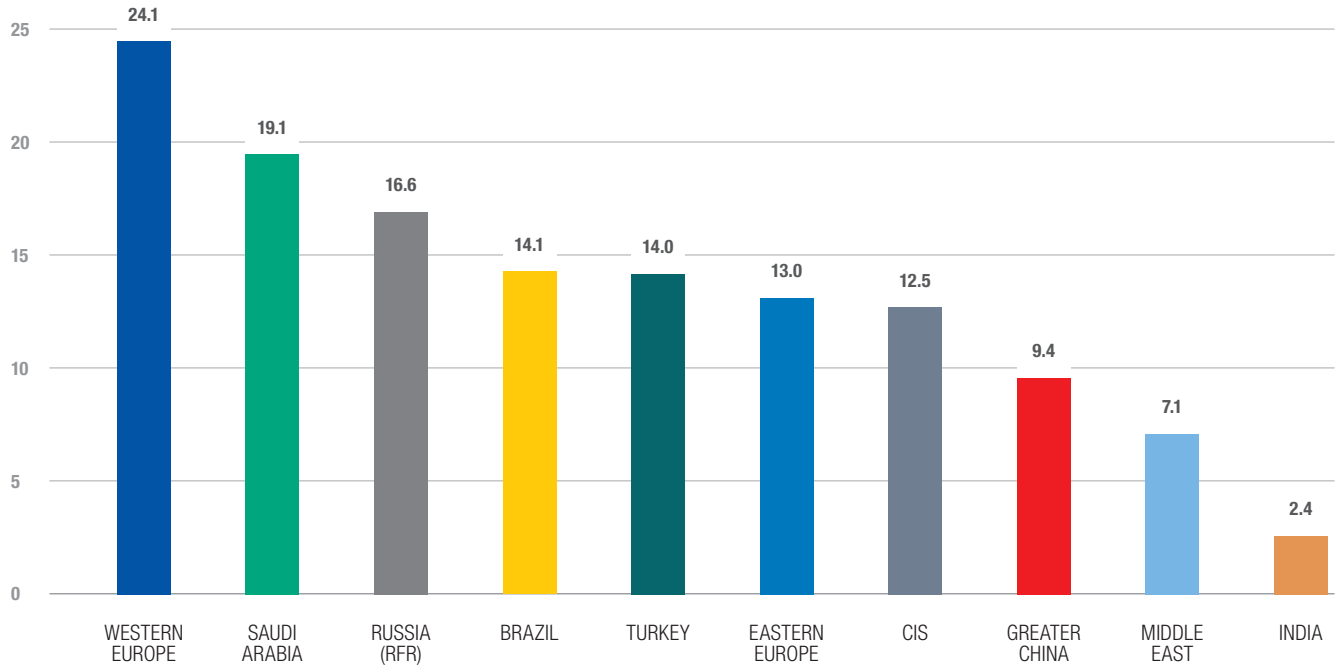


TABLE 8 Density – Europe vs. BRIC, ME- CIS – CT



B MAGNETIC RESONANCE IMAGING

TABLE 9 Compliance with Golden Rules – MRI

DOES NOT AT ALL MEET GOLDEN RULES

CLOSE BUT NOT MATCHING GOLDEN RULES

EQUAL OR BETTER THAN GOLDEN RULES

	END 2015				END 2013				END 2011				END 2008			
		COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS		
	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS
Albania		56%	33%	11%		50%	40%	10%								
BALTICS		38%	58%	4%		32%	64%	4%		77%	21%	2%		84%	8%	8%
Bosnia		35%	55%	10%		45%	35%	20%								
Bulgaria		71%	24%	5%		81%	9%	11%		56%	12%	32%				
Croatia		30%	55%	15%		53%	28%	19%								
Czech Republic		46%	40%	14%		47%	45%	8%		76%	20%	4%		60%	33%	7%
Hungary		62%	22%	16%		31%	37%	33%		39%	44%	17%		50%	50%	0%
Macedonia		62%	23%	15%		54%	0%	46%								
Poland		60%	30%	10%		73%	22%	4%		78%	16%	6%		60%	27%	13%
Romania		61%	33%	6%		66%	27%	7%		75%	16%	9%				
Serbia		43%	43%	14%		33%	56%	11%								
Slovakia		41%	27%	32%		43%	48%	10%		65%	35%	0%		77%	16%	6%
Slovenia		20%	48%	32%		38%	46%	15%		56%	22%	22%		75%		
Ukraine		48%	37%	15%		30%	56%	14%		66%	28%	6%				
EASTERN EUROPE		54%	34%	12%		56%	33%	11%		72%	20%	8%		67%	25%	8%
Portugal		37%	39%	24%		41%	32%	27%		54%	29%	18%		53%	34%	12%
Spain		26%	42%	32%		29%	41%	30%		43%	36%	20%		52%	33%	15%
IBERIA		27%	42%	31%		31%	40%	30%		45%	35%	20%		52%	33%	14%
Denmark		48%	38%	14%		49%	36%	15%		41%	43%	16%		65%	30%	6%
Finland		53%	36%	11%		50%	45%	6%		62%	25%	13%		55%	23%	23%
Norway		49%	28%	23%		39%	36%	25%		46%	40%	13%		53%	45%	2%
Sweden		62%	27%	11%		58%	32%	11%		63%	25%	12%		60%	29%	11%
SCANDINAVIA		53%	32%	15%		50%	36%	14%		53%	33%	14%		59%	32%	10%
Ireland		40%	38%	22%		36%	49%	15%		52%	37%	11%				
UK		47%	40%	13%		45%	41%	14%		52%	37%	11%				
UK & IRELAND		46%	40%	14%		45%	42%	14%		52%	37%	11%		63%	25%	12%
Austria		49%	36%	14%		36%	38%	27%						55%	35%	11%
Belgium		52%	29%	19%		37%	45%	18%						64%	34%	2%
France		79%	17%	4%		74%	23%	3%		73%	23%	3%		70%	26%	3%
Germany		42%	36%	22%		44%	31%	25%		53%	31%	16%		47%	37%	16%
Greece		27%	55%	18%		37%	39%	24%		56%	29%	15%		61%	32%	7%
Italy		35%	37%	28%		40%	37%	23%		42%	38%	20%		50%	34%	16%
Netherlands		49%	35%	16%		49%	33%	18%		46%	33%	21%		49%	28%	23%
Switzerland		68%	26%	6%		51%	32%	17%		58%	27%	14%		61%	32%	7%
WESTERN EUROPE		46%	34%	19%		45%	34%	20%		52%	33%	15%		55%	33%	13%
EUROPE		47%	34%	18%		47%	34%	19%						55%	32%	13%
CYPRUS		23%	62%	15%		50%	33%	17%		62%	15%	23%		60%		
RUSSIA		65%	27%	8%		70%	22%	8%		71%	15%	15%		64%	25%	11%
TURKEY		46%	43%	11%		58%	33%	9%		57%	27%	15%		72%	18%	10%
Brazil		54%	31%	16%		52%	30%	18%								
Greater China		63%	26%	12%		65%	28%	8%								
India		39%	26%	35%		64%	27%	9%								
MIDDLE EAST		59%	30%	12%		63%	23%	13%								

TABLE 10 Compliance with Golden Rules – EU – MRI

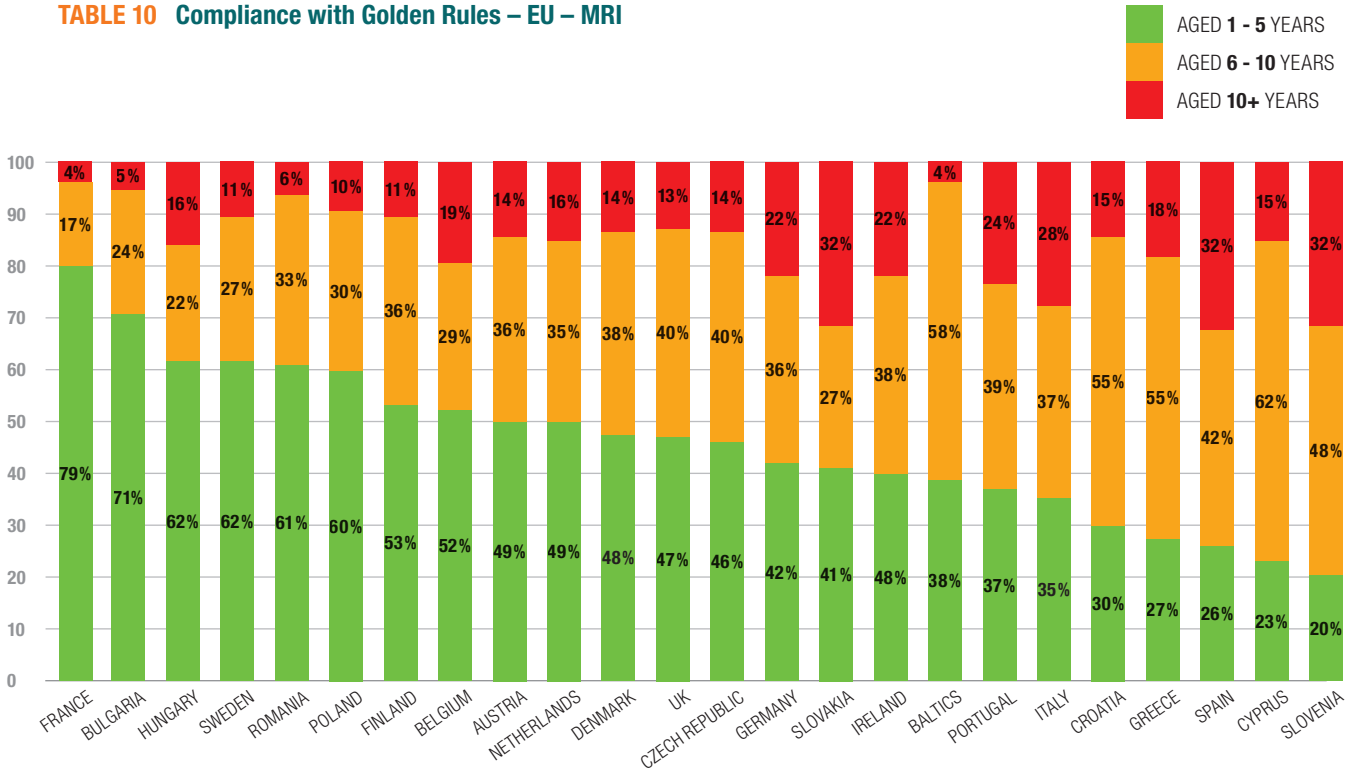


TABLE 11 Compliance with Golden Rules – Europe vs. BRIC, ME-CIS – MRI

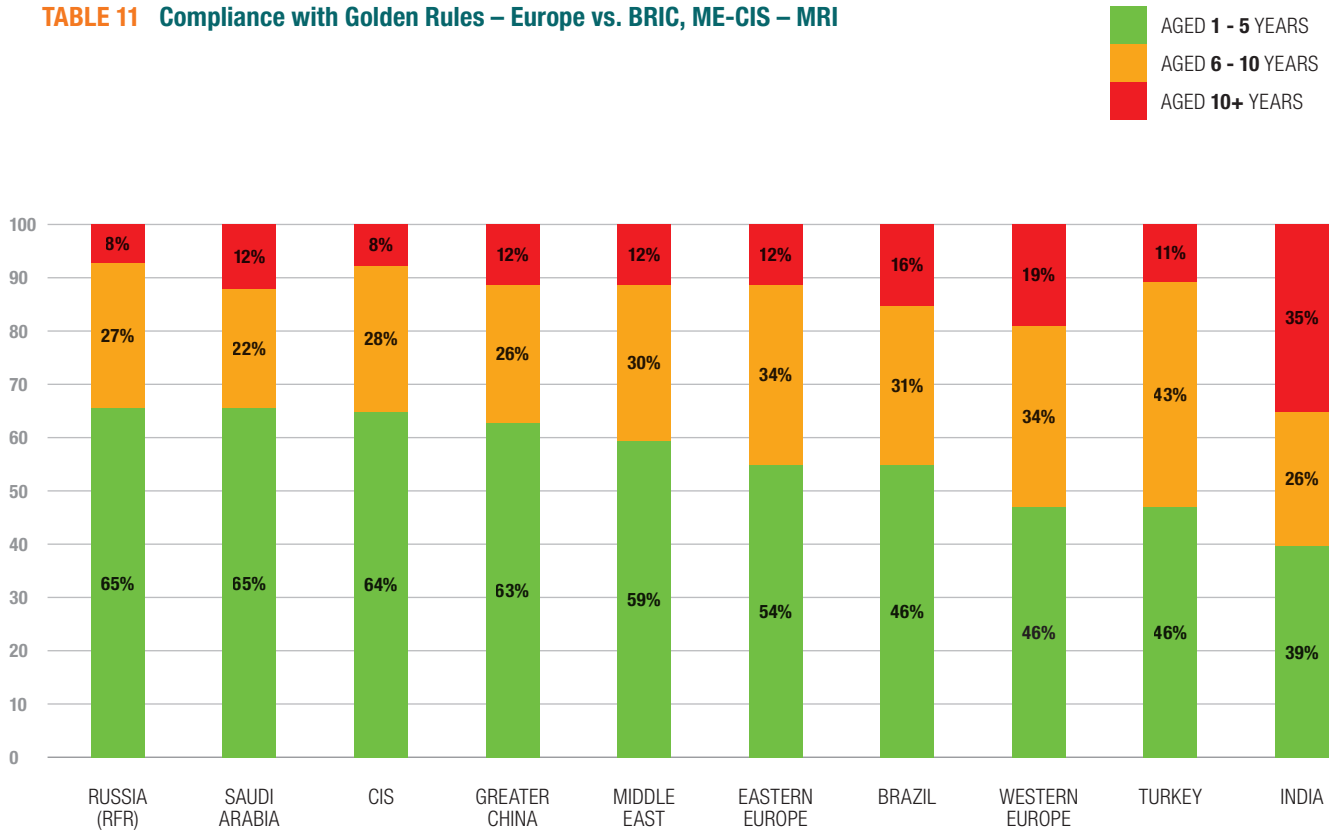


TABLE 12 Density – EU – MRI

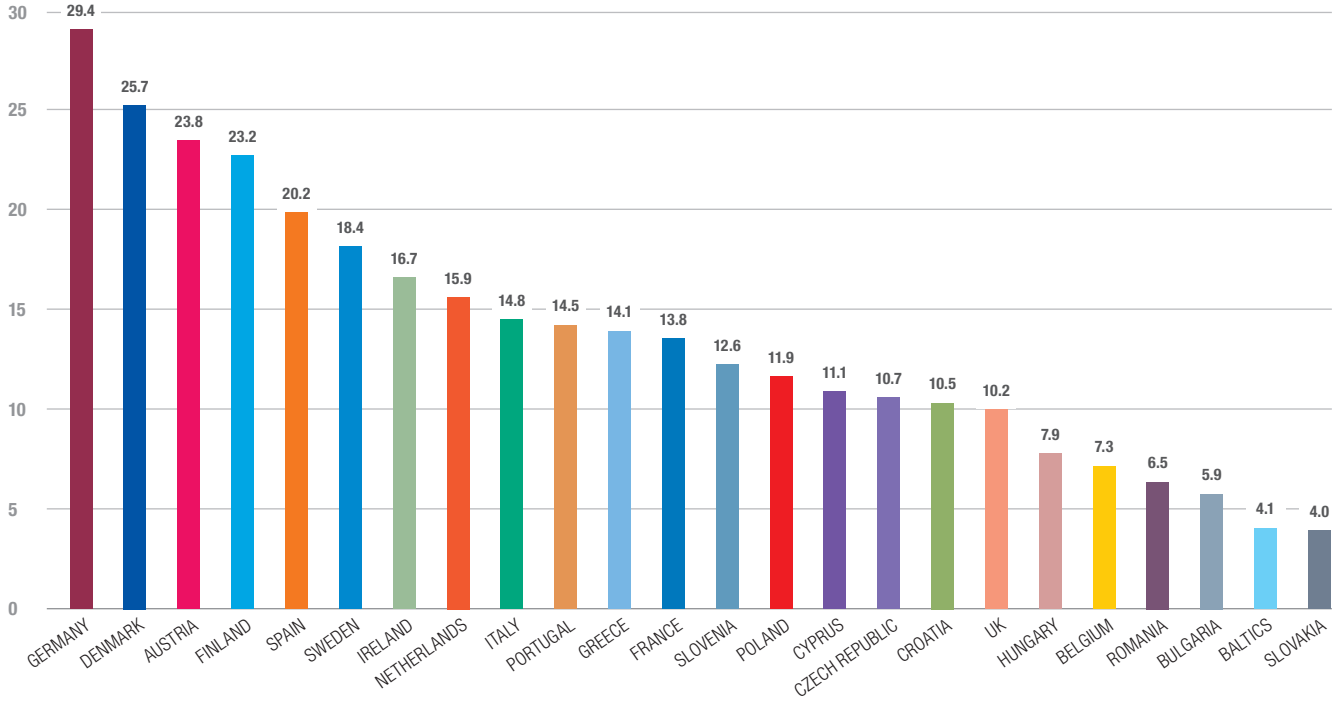
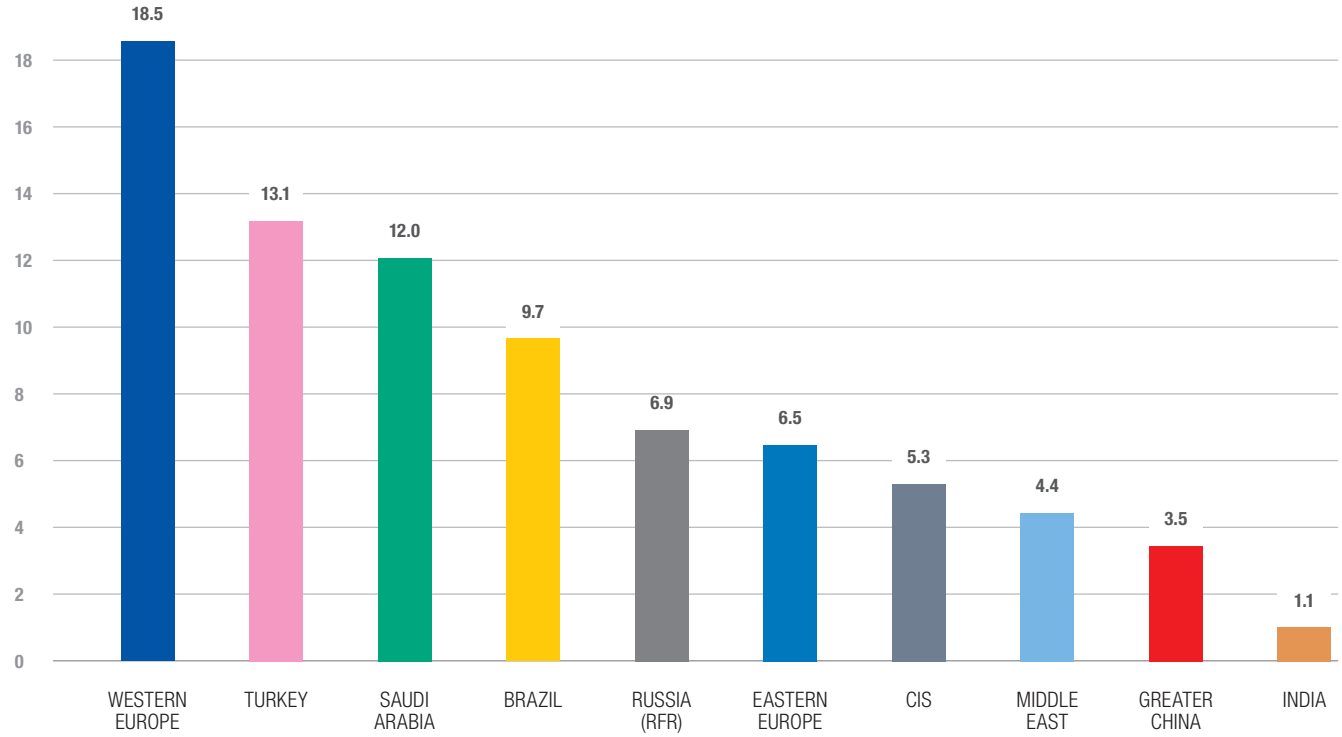


TABLE 13 Density – Europe vs. BRIC, ME- CIS – MRI



C X-RAY ANGIOGRAPHY

TABLE 14 Compliance with Golden Rules – X-Ray Angiography

DOES NOT AT ALL MEET GOLDEN RULES

CLOSE BUT NOT MATCHING GOLDEN RULES

EQUAL OR BETTER THAN GOLDEN RULES

	END 2015				END 2013				END 2011				END 2008			
		COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS		
	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS
Albania		88%	13%	0%		54%	31%	15%								
BALTICS		33%	50%	17%		37%	47%	16%		45%	39%	16%		60%	27%	13%
Bosnia		46%	38%	15%		27%	36%	36%								
Bulgaria		59%	32%	10%		63%	31%	6%		50%	23%	27%				
Croatia		73%	19%	8%		45%	25%	30%								
Czech Republic		57%	28%	15%		49%	30%	22%		53%	27%	20%		37%	33%	31%
Hungary		66%	14%	21%		31%	49%	20%		28%	41%	31%		51%	27%	22%
Macedonia		82%	12%	6%		59%	18%	23%								
Poland		54%	28%	18%		48%	39%	13%		58%	31%	12%		64%	25%	11%
Romania		75%	25%	0%		63%	31%	6%		75%	19%	6%		55%	21%	24%
Serbia		29%	71%	0%		29%	56%	15%								
Slovakia		33%	58%	8%		24%	35%	41%		43%	27%	30%				
Slovenia		22%	67%	11%		32%	29%	39%		33%	56%	11%				
Ukraine		65%	28%	7%		46%	46%	9%		75%	18%	7%		71%		
EASTERN EUROPE		58%	28%	14%		45%	37%	17%		55%	30%	16%		54%	27%	19%
Portugal		38%	28%	35%		29%	37%	34%		41%	22%	37%		41%	26%	33%
Spain		34%	39%	27%		33%	37%	29%		45%	26%	29%		51%	29%	19%
IBERIA		35%	37%	28%		33%	37%	30%		44%	25%	30%		50%	29%	21%
Denmark		35%	48%	17%		31%	60%	9%		63%	21%	16%				
Finland		52%	41%	7%		48%	45%	7%		59%	30%	11%				
Norway		40%	45%	14%		42%	35%	23%		46%	27%	28%		56%	21%	23%
Sweden		53%	36%	11%		45%	35%	20%		47%	30%	23%		44%	36%	20%
SCANDINAVIA		46%	41%	13%		41%	44%	15%		52%	27%	21%		49%	31%	20%
Ireland		56%	36%	8%		32%	36%	31%		36%	45%	19%		59%	29%	13%
UK		52%	43%	5%		41%	40%	19%		44%	34%	22%		56%	28%	16%
UK & IRELAND		52%	42%	6%		40%	40%	20%		43%	35%	22%		56%	28%	15%
Austria		52%	38%	11%		34%	42%	24%		51%	23%	26%		47%	27%	27%
Belgium		48%	28%	23%		40%	30%	30%		41%	27%	32%		42%	35%	23%
France		51%	34%	15%		47%	35%	18%		50%	27%	23%		43%	29%	28%
Germany		54%	33%	14%		47%	30%	22%		52%	26%	21%		48%	26%	26%
Greece		45%	33%	23%		23%	39%	39%		39%	30%	30%		37%	39%	25%
Italy		30%	34%	35%		40%	36%	25%		44%	29%	28%		43%	35%	22%
Netherlands		48%	35%	16%		44%	38%	18%		60%	18%	22%		52%	22%	26%
Switzerland		49%	38%	13%		40%	40%	20%		46%	33%	21%		53%	26%	21%
WESTERN EUROPE		47%	36%	17%		42%	36%	22%		49%	28%	24%		48%	29%	23%
EUROPE		49%	34%	17%		43%	36%	21%								
CYPRUS		63%	13%	25%		38%	**25%**	38%		49%	28%	23%				
RUSSIA		60%	27%	13%		69%	20%	11%		38%	25%	38%		56%	29%	15%
TURKEY		43%	43%	14%		44%	45%	12%		64%	18%	17%		63%	17%	21%
Brazil		51%	24%	25%		57%	24%	19%								
Greater China		65%	25%	10%		61%	29%	10%								
India		34%	20%	46%		62%	31%	8%								
MIDDLE EAST		64%	24%	12%		51%	34%	16%								

TABLE 15 Compliance with Golden Rules – EU – X-Ray Angiography

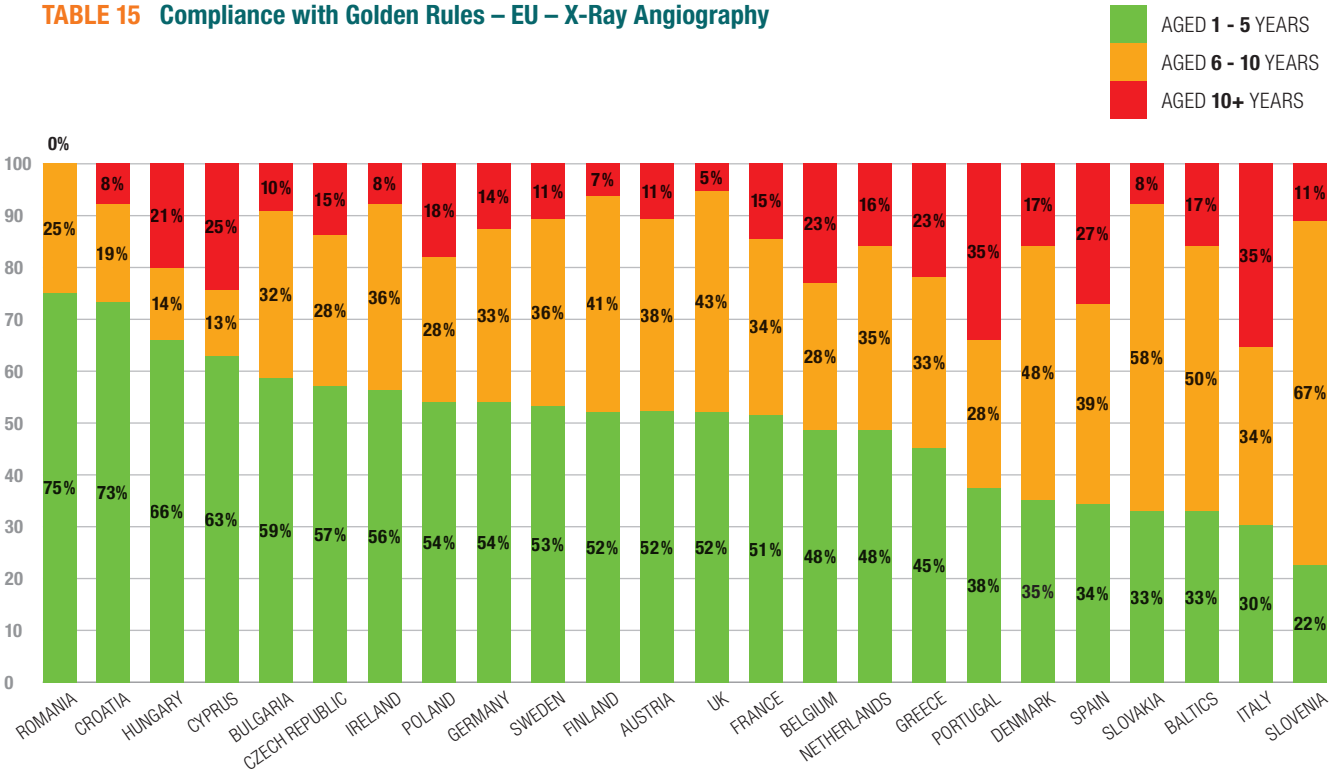


TABLE 16 Compliance with Golden Rules – Europe vs. BRIC, ME-CIS – X-Ray Angio

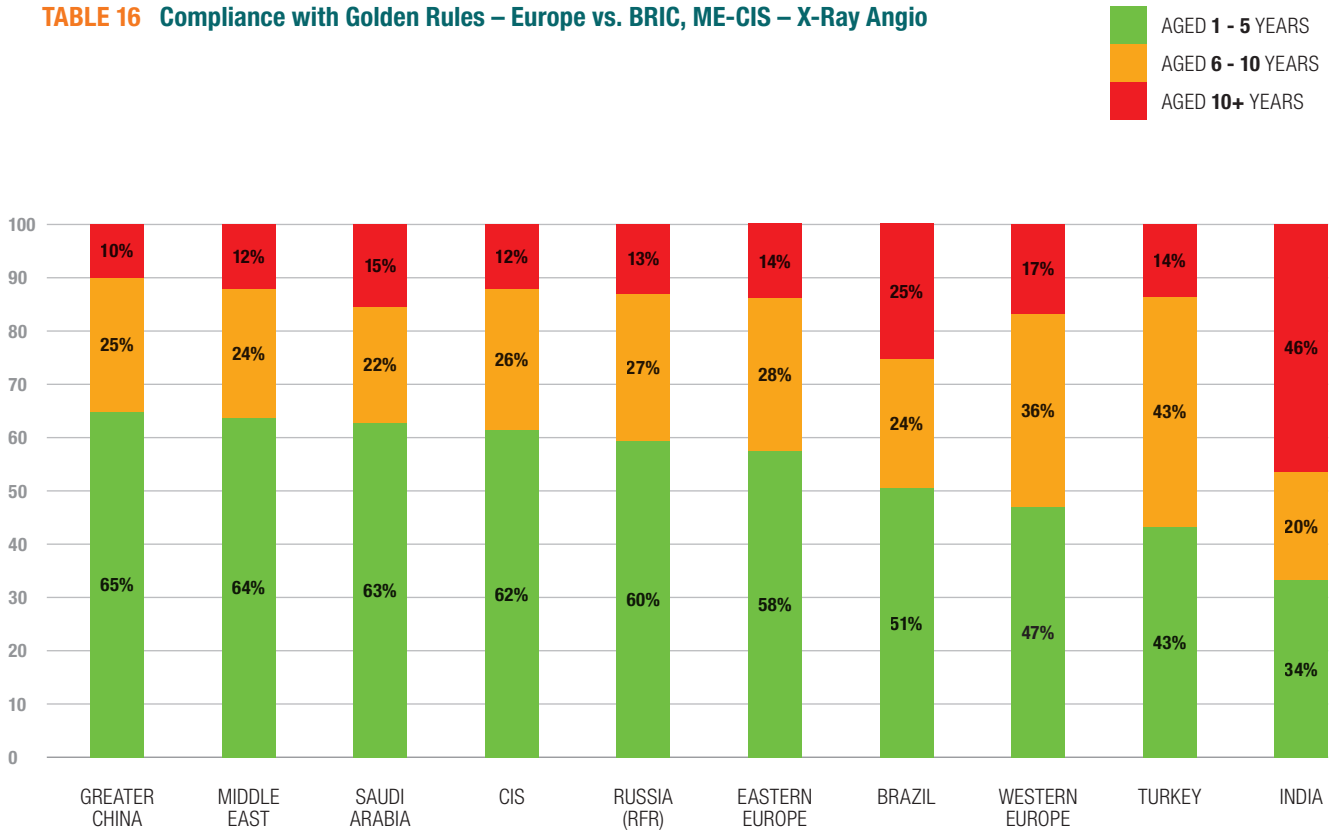


TABLE 17 Density – EU – X-Ray Angio

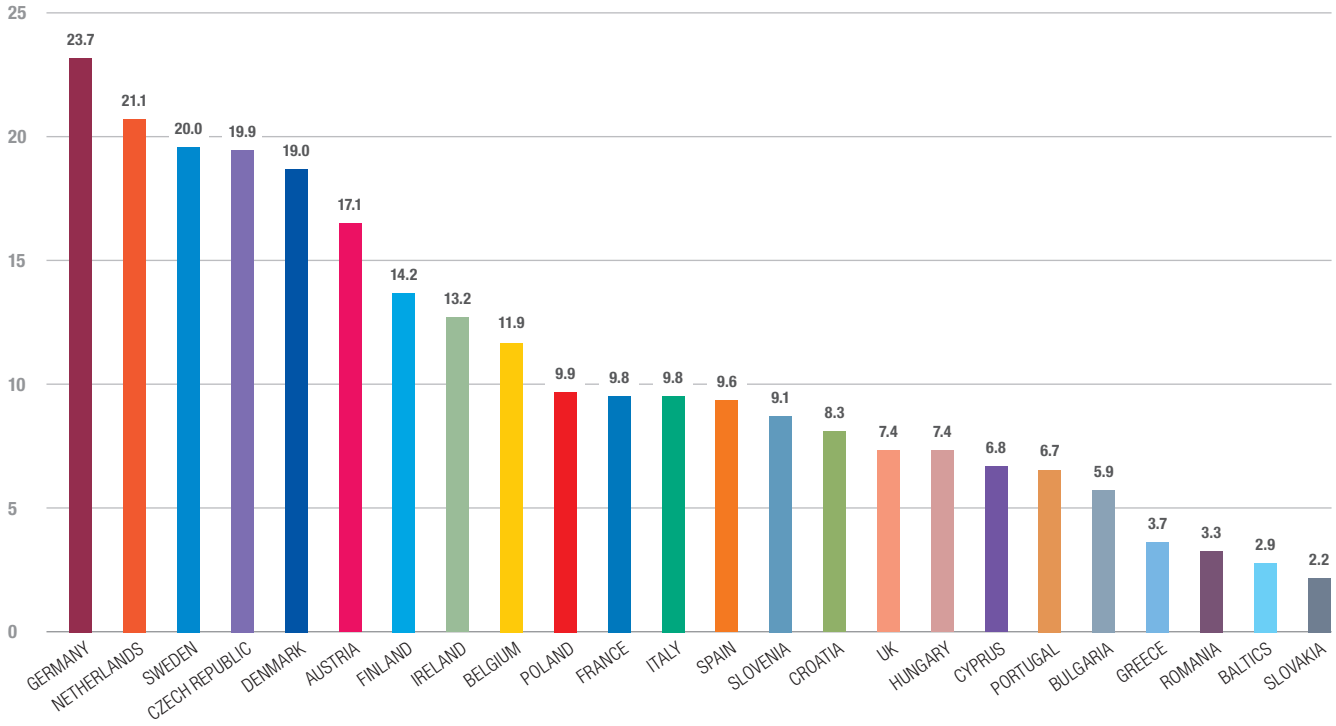
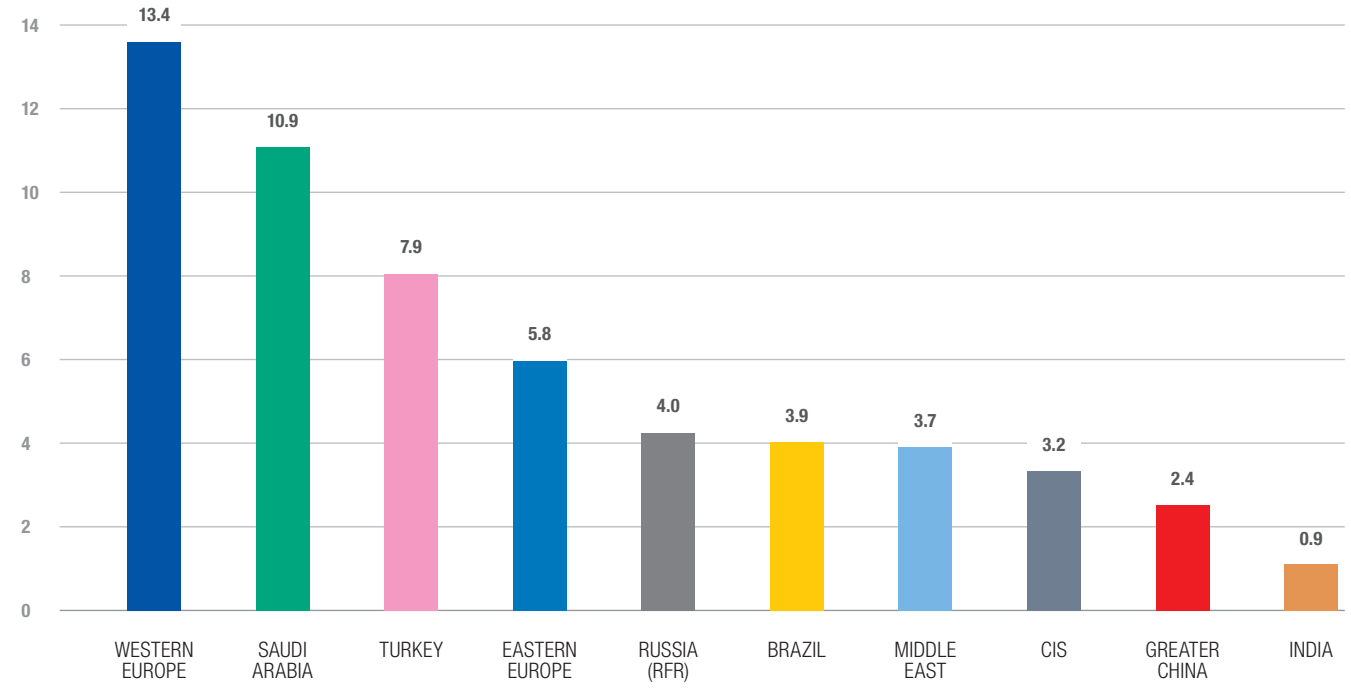


TABLE 18 Density – Europe vs. BRIC, ME- CIS – X-Ray Angio



D MOLECULAR IMAGING PET

TABLE 19 Compliance with Golden Rules – MI-PET

DOES NOT AT ALL MEET GOLDEN RULES

CLOSE BUT NOT MATCHING GOLDEN RULES

EQUAL OR BETTER THAN GOLDEN RULES

	END 2015				END 2013				END 2011				END 2008			
		COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS				COCIR GOLDEN RULES ANALYSIS		
	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS	RATING	AGED 1-5 YEARS	AGED 6-10 YEARS	AGED 10+ YEARS
Albania		0%	0%	100%		0%	0%	100%								
BALTICS		100%	0%	0%		100%	0%	0%		50%	50%	0%				
Bosnia		100%	0%	0%		100%	0%	0%								
Bulgaria		75%	25%	0%		100%	0%	0%		33%	33%	33%				
Croatia		40%	60%	0%		60%	40%	0%								
Czech Republic		56%	22%	22%		40%	40%	20%		46%	41%	14%				
Hungary		50%	38%	13%		20%	80%	0%		75%	25%	0%		100%	0%	0%
Macedonia		N/A	N/A	N/A		0%	0%	0%								
Poland		58%	42%	0%		79%	21%	0%		56%	32%	12%		100%	0%	0%
Romania		88%	13%	0%		86%	14%	0%		60%	32%	8%				
Serbia		N/A	N/A	N/A		50%	50%	0%								
Slovakia		67%	0%	33%		57%	29%	14%		50%	33%	17%				
Slovenia		50%	50%	0%		67%	33%	0%		50%	33%	17%				
Ukraine		0%	100%	0%		33%	67%	0%		100%	0%	0%				
EASTERN EUROPE		60%	33%	7%		64%	31%	6%		54%	34%	12%		86%	14%	0%
Portugal		13%	63%	25%		45%	36%	18%		55%	36%	9%				
Spain		42%	46%	12%		44%	35%	21%		55%	31%	15%				
IBERIA		39%	48%	13%		44%	35%	20%		55%	31%	14%		73%	24%	3%
Denmark		49%	51%	0%		55%	39%	6%		75%	13%	13%				
Finland		50%	38%	13%		62%	38%	0%		78%	22%	0%				
Norway		38%	50%	13%		57%	43%	0%		83%	17%	0%				
Sweden		46%	46%	8%		29%	50%	21%		56%	13%	31%		75%		
SCANDINAVIA		47%	48%	5%		51%	42%	7%		71%	14%	14%		82%		
Ireland		13%	75%	13%		25%	75%	0%		22%	78%	0%		89%		
UK		47%	48%	5%		49%	45%	5%		68%	29%	3%		91%		
UK & IRELAND		43%	51%	6%		47%	48%	5%		62%	35%	3%		91%	8%	2%
Austria		58%	26%	16%		41%	41%	18%		72%	28%	0%		56%	31%	13%
Belgium		33%	67%	0%		40%	33%	27%		47%	25%	28%				
France		63%	30%	7%		66%	30%	4%		50%	32%	18%				
Germany		33%	55%	12%		50%	32%	18%		67%	19%	14%		59%	20%	21%
Greece		60%	40%	0%		50%	50%	0%		43%	38%	20%				
Italy		44%	46%	10%		49%	45%	6%		45%	52%	3%		76%	24%	0%
Netherlands		54%	40%	6%		43%	47%	10%		63%	35%	3%				
Switzerland		69%	31%	0%		56%	44%	0%		78%	22%	0%				
WESTERN EUROPE		48%	44%	8%		51%	38%	11%		58%	31%	12%		73%	20%	7%
EUROPE		49%	43%	8%		52%	38%	11%		57%	31%	12%				
CYPRUS		0%	0%	0%		0%	0%	0%		0%	0%	0%				
RUSSIA		87%	13%	0%		71%	12%	17%		82%	18%	0%		36%		
TURKEY		54%	41%	5%		48%	51%	0		61%	36%	2%		89%	11%	0%
Brazil		74%	16%	10%		68%	28%	4%								
Greater China		55%	34%	11%		55%	37%	8%								
India		47%	22%	31%		80%	20%	0%								
MIDDLE EAST		79%	19%	2%		67%	33%	0%								

TABLE 20 Compliance with Golden Rules – EU – MI-PET

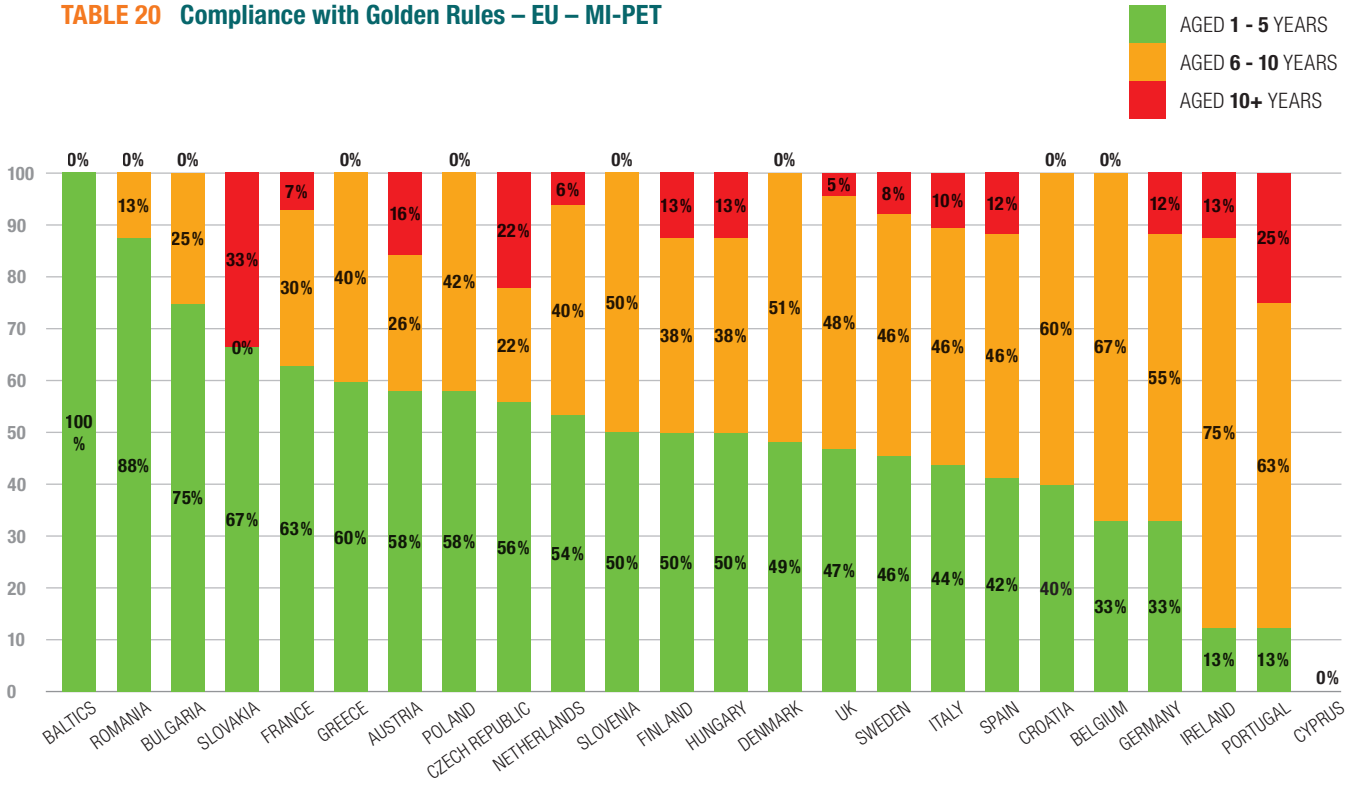


TABLE 21 Compliance with Golden Rules – Europe vs. BRIC, ME-CIS – MI-PET

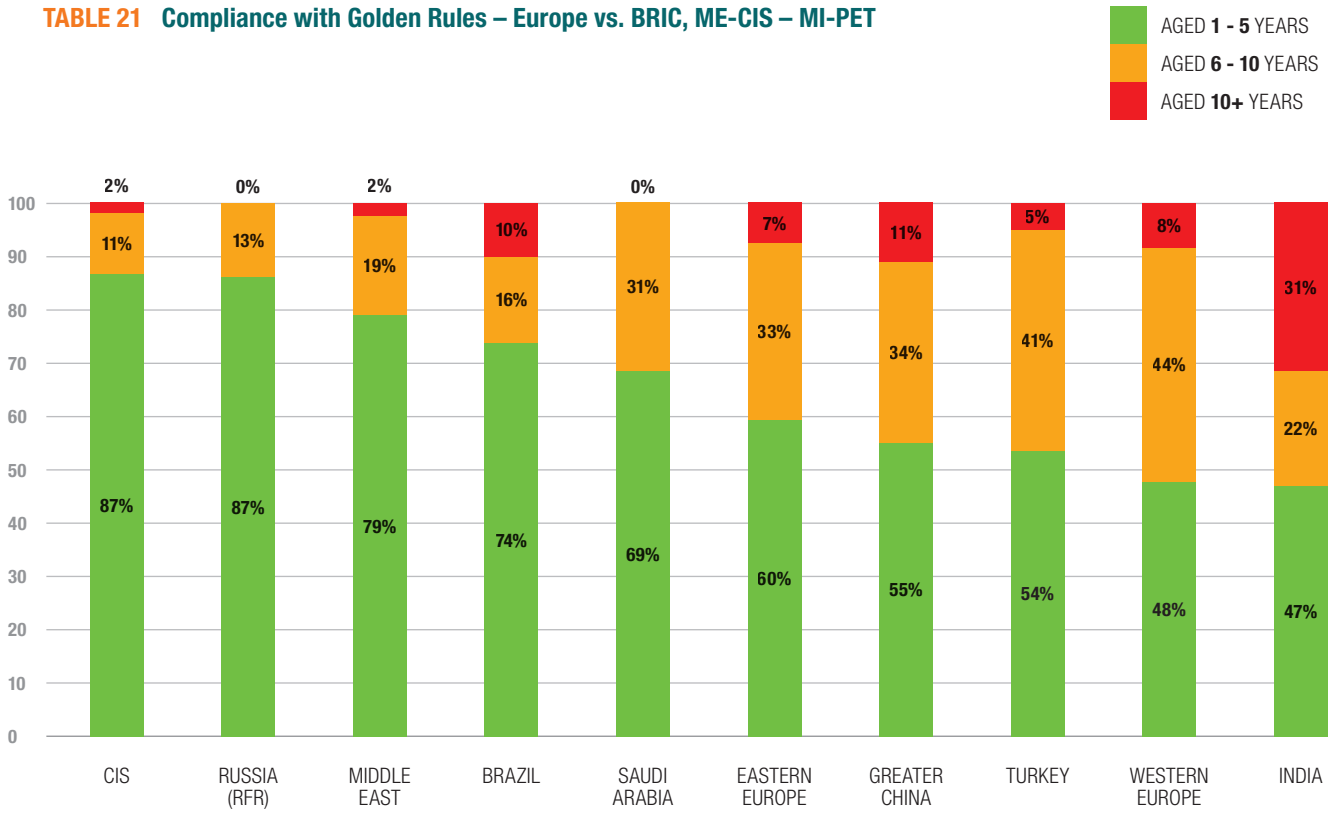


TABLE 22 Density – EU – MI-PET

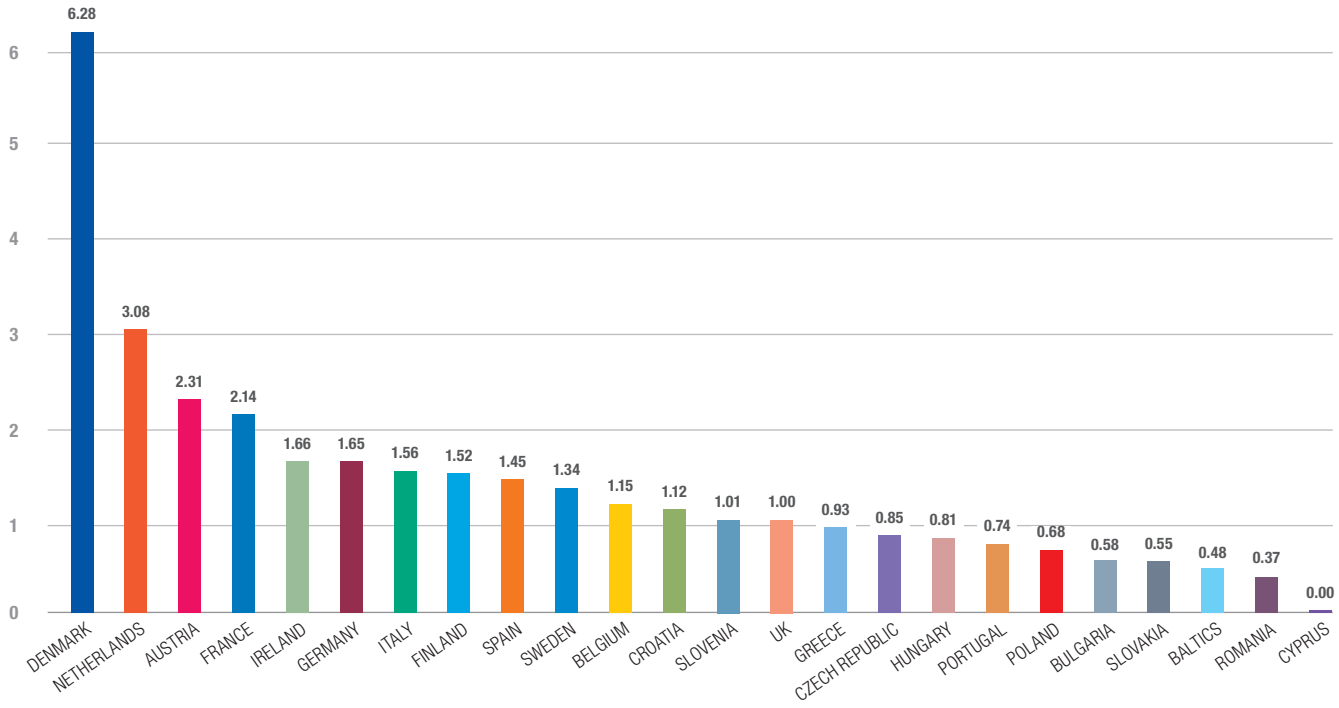
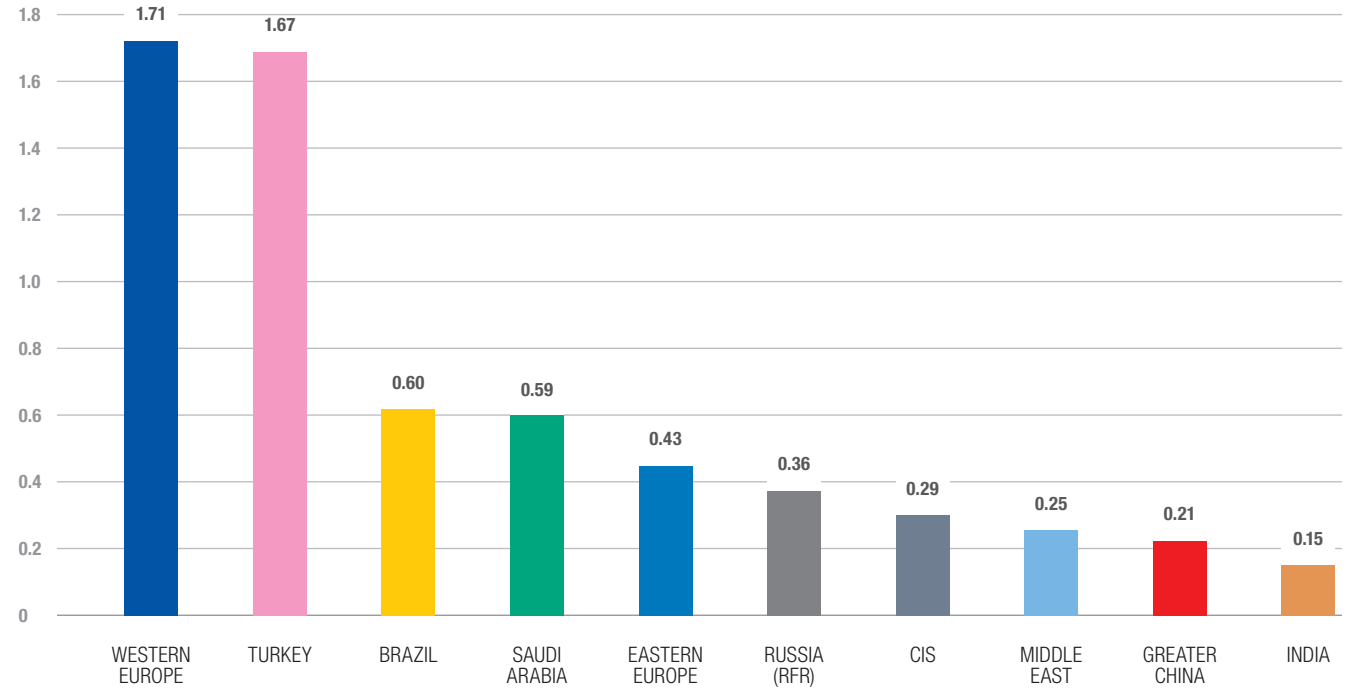
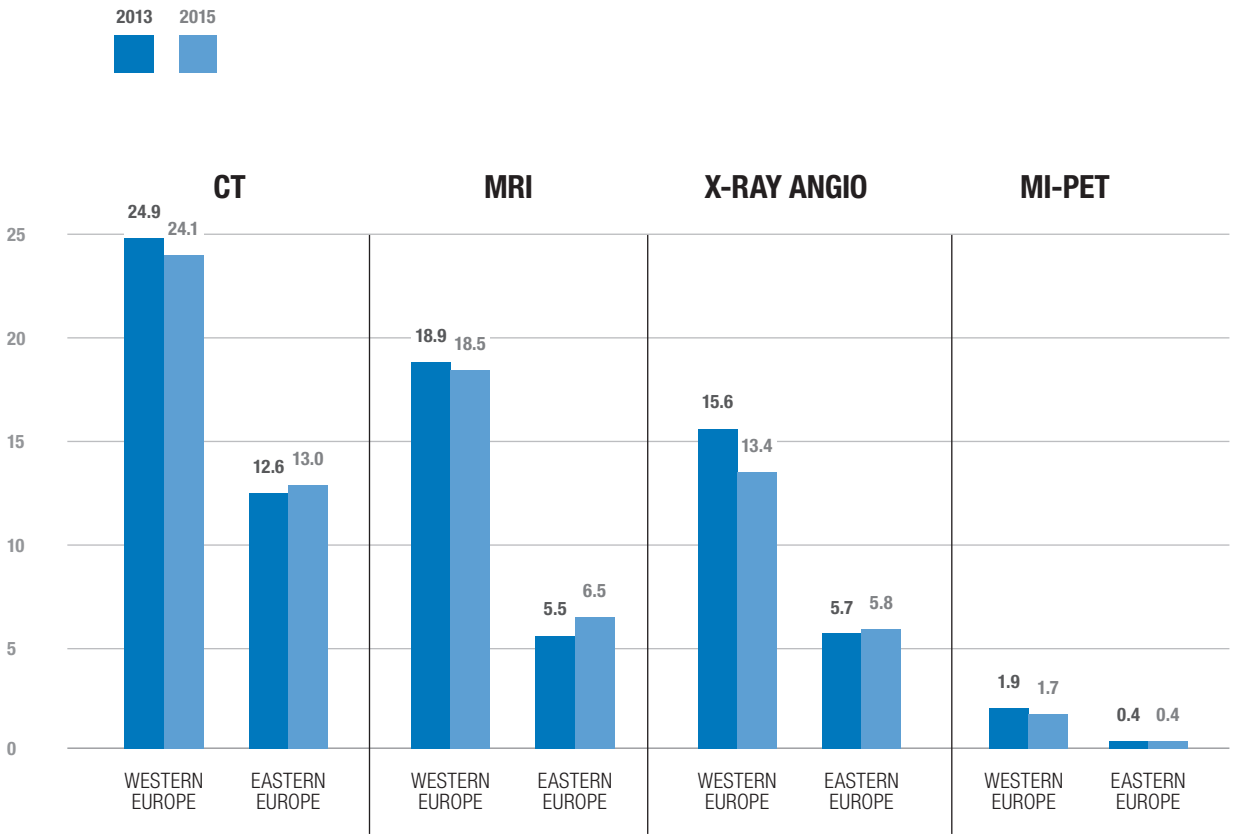


TABLE 23 Density – Europe vs. BRIC, ME- CIS – MI-PET



D EQUIPMENT DENSITY TRENDS

TABLE 24 Equipment density trends in Western and Eastern Europe



8. ANNEX 2: MEDICAL IMAGING TECHNOLOGIES

A COMPUTED TOMOGRAPHY

Also commonly referred to as a CT scan, Computed Tomography is an imaging technique that combines multiple X-ray images taken from different angles. This produces detailed cross-sectional internal images. The first CT scanner for medical use dates from 1972.

The resulting images provide greater information than regular X-rays, allowing doctors to examine individual slices within the 3-D images. Contrast agents are commonly used in combination with CT scans to perform angiographies and other specific tissue examinations.

CT SCANS ARE OFTEN USED TO EVALUATE:

> Organs in the pelvis, chest and abdomen
> Colon health (CT colonography)
> Presence of tumours
> Pulmonary embolism (CT angiography)
> Abdominal aortic aneurysms (CT angiography)
> Spinal injuries
> Cardiology.

Technological improvements in CT such as **dose modulation acquisition techniques** and **iterative reconstruction algorithms** dramatically reduce the required X-Ray dose, improve hospital efficiency and clinical effectiveness and reduce costs.

B MAGNETIC RESONANCE IMAGING

Magnetic Resonance Imaging (MRI) is a technology that uses radio waves and a magnetic field to provide detailed images of organs and tissues. The first magnetic resonance image was taken in 1973 and the first MRI scanner for medical imaging was developed in 1977.

The type of radiation in this kind of imaging technique generates images of the soft tissues, omitting the bones. This characteristic has proven highly effective in diagnosing a number of conditions by showing the difference between normal and diseased tissues. MRI is often used to evaluate:

> Blood vessels
> Breasts
> Major organs

C X-RAY

X-rays are the oldest and most commonly used medical imaging technique. X-rays were discovered in 1895 and first used to image human tissue in 1896. X-rays use ionizing radiation to produce images of a person's internal structure by sending beams through the body. These are absorbed at different levels depending on the density of the tissue.

X-ray radiation can generate three kinds of medical images; conventional X-ray imaging, angiography and fluoroscopy.

Conventional X-ray imaging generates an image of a localised part of the body, which will be analysed for anatomical abnormalities. This kind of imaging usually evaluates:

> The skeletal systems
> The oral cavity (bone and teeth)
> Any ingested objects
> The lungs

> The breast (Mammography)
> The digestive system.

Angiography uses X-rays in combination with a contrast agent (chemical substances used to enhance specific structures in images) in order to visualise blood vessels, particularly the coronary arteries.

Fluoroscopy uses X-rays to visualise the internal structure in real-time, providing moving images of the interior of an object, such as hearts beating or throats in the process of swallowing.

D MOLECULAR IMAGING PET

Molecular Imaging is a diagnostic tool where metabolic processes can be visualised by administering small amounts of radioactive pharmaceuticals to patients. These accumulate in a specific part of the body in a controlled way.

Unlike other ionizing radiation techniques, which can only generate anatomical images, this technique generates functional images. Some conditions initially have a physiological effect, rather than an anatomical change in the body. Molecular imaging allows for an earlier diagnosis.
Combining molecular imaging with CT or MRI images can provide clinicians with superior images. AIPES[1] has developed a comprehensive tool on nuclear medicine. See website[2] for further information.

1. http://www.aipes-eeig.org/
2. http://www.whatisnuclearmedicine.com/Home

GENERAL INFORMATION ABOUT COCIR

COCIR is the European Trade Association representing the medical imaging, radiotherapy, health ICT and electromedical industries.

Founded in 1959, COCIR is a non-profit association headquartered in Brussels (Belgium) with a China Desk based in Beijing since 2007. COCIR is unique as it brings together the healthcare, IT and telecommunications industries.

Our focus is to open markets for COCIR members in Europe and beyond. We provide a range of services in the areas of regulatory, technical, market intelligence, environmental, standardisation, international and legal affairs.

COCIR is also a founding member of DITTA, the Global Diagnostic Imaging, Healthcare IT and Radiation Therapy Trade Association (*www.globalditta.org*).

COCIR COMPANY MEMBERS:

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NATIONAL TRADE ASSOCIATIONS MEMBERS:

AGORIA no future without technology — BELGIUM

FiHTA — FINLAND

snitem creating the tools for medical progress — FRANCE

bvitg — GERMANY

SPECTARIS German Industry Association for Optical, Medical and Mechatronical Technologies — GERMANY

ZVEI — GERMANY

ETOSZ Association of Health Technology Suppliers and Medical Device Manufacturers — HUNGARY

ASSOBIOMEDICA — ITALY

apormed — PORTUGAL

FHI Medical Technology — THE NETHERLANDS

Holland HealthTech — THE NETHERLANDS

federación española de empresas de tecnología sanitaria fenin — SPAIN

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