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BY HOLLY KEATS

# East meets West on the path to x-ray upgrade

It has been a challenging time in the general radiography world: with stagnating healthcare spending in Western Europe and the US, combined with acute price erosion caused by the influx of lower-price products from the Asian market, there has been little to shout about. But, with global economic forecasts improving for 2018, here are some of the geographical opportunities that could shape this upcoming year for general radiography.

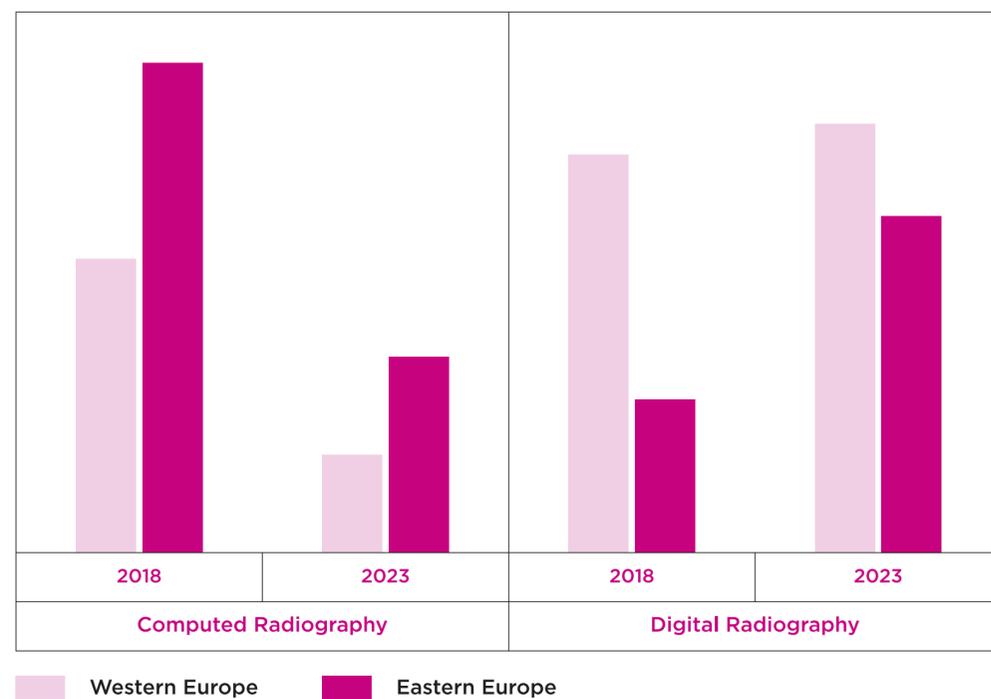


Chart showing the transition from computed radiography (CR) to digital radiography (DR) over time, between Eastern and Western Europe (Market revenues).

## Western European trends

The market performance for medical imaging technology in Western Europe has been somewhat subdued of late – trying to find a positive spin on anaemic GDP growth and restrictions on healthcare spending has been tough for market commentators. However, pent-up demand from healthcare providers will see a revival in revenue over the next few years. Markets in Spain and Portugal have seen an increase in demand for x-ray systems over the past 12 months, as the necessity of the replacement cycle becomes a higher priority. This will also be the case in other regions, although the outlook for Western European countries in terms of GDP looks set to progress cautiously, the ongoing replacement cycle and pent up demand will keep the x-ray market buoyed.

## Eastern European trends

Central and Eastern Europe are the areas which will see the sharpest growth in installed base over the next five years. Poland has an expanding middle-class population, who expect a higher standard of healthcare, driving demand in the

private sector. Although most of the region is still serviced by analogue or computed radiography (CR) systems, sales of digital radiography (DR) have been increasing, with retrofit kits having a big impact on the market last year.

### Installed base gains

Broadly speaking the number of general radiography systems in use will increase over the next five years, with DR superseding CR technology across the region. Although the geographical and technological trends tell a more detailed story:

### Technology transition

– Implementation of governmental incentives and legislation which prioritises the use of digital x-ray over CR or analogue systems (such as seen in the US) have not occurred within Europe, yet. Therefore, the change-over from legacy systems to DR is a more gradual process, with countries such as Romania seen as, until recently, being 'not ready' for the transition. This rate of change to DR will be heavily dependent on the price of digital systems.

### Impact of efficiency gains

– As healthcare centres transition from older technology such as CR or analogue to DR, productivity and patient throughput will increase. This increased efficiency can result in one DR system replacing a number of older systems, meaning a decline in overall installed systems volume.

### Increase in system sales factor

– Countries such as the Czech Republic are largely skipping computed radiography (CR) technology entirely and transitioning from analogue x-ray systems straight to digital radiography (DR). These countries are also improving their healthcare system with new medical centres, increasing the overall size of the x-ray install base.

### Conclusions

It will be the 'where' and the 'how' DR is rolled out across Europe which will be the talking points this year. Vendors need to harness opportunities for new installs due to the increased healthcare spending and improved economic stability in Eastern European countries. Demand in these countries will not just be for low-end systems either,

but increasingly for the high-end models as well. However, in markets like Russia, vendors will have to navigate political and legislative hurdles to secure a stake.

Increasingly vendors may no longer need to look to the West as the main indicator for demand and market trends, as Eastern economies (both inside and outside of Europe) are on the cusp of being revitalised. 2018 will be the year that the transition towards digital radiography becoming the prevailing technology across all of Europe, not just the West. This push towards digital dominance will see an impact on system sales and installed-base, as legacy systems are gradually replaced by DR in Eastern Europe. These emerging markets could just be the antidote to soothe the pain felt by global general radiography vendors in recent years.

*Dr. Holly Keats is Senior Analyst at Signify Research, a UK-based independent supplier of market intelligence and consultancy to the global healthcare technology industry.*

BY PETER GORDEBEKE

# CoSTREAM project investigates the link between stroke and Alzheimer's disease

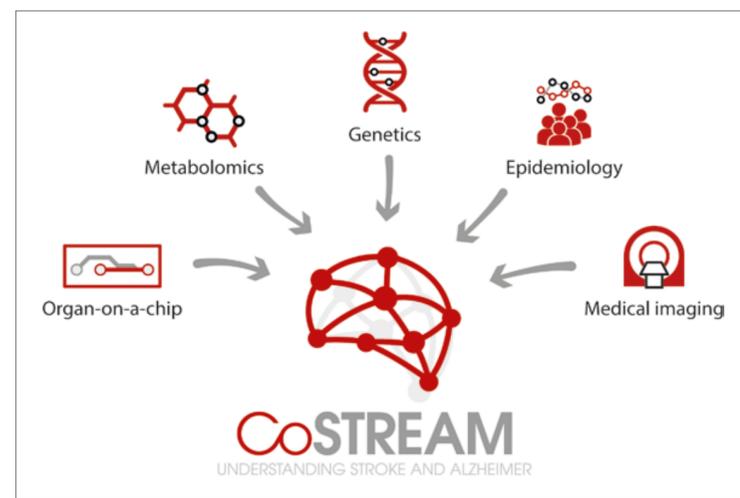
Stroke and Alzheimer's disease are on the rise and impose a huge burden on aging societies. Interestingly, they often occur in the same patient, and both diseases have long been considered 'partners in crime', with overlapping mechanisms causing the diseases.

The Common Mechanisms and Pathways in Stroke and Alzheimer's disease (CoSTREAM) project, funded by the European Commission's Horizon 2020 framework programme and coordinated by Prof. Cornelia van Duijn from Erasmus MC, Rotterdam, the Netherlands, aims to address the major gaps in our understanding of the relationship between these diseases. Current research and model systems are focused on each disease separately, while the interplay between the two remains unexplored.

The five-year project, which started in December 2015, uses a multidisciplinary approach that incorporates new analytical strategies and emerging technologies in the fields of genetics, metabolomics, brain imaging, clinical prediction and biotechnology.

During its first two years, the project focused on establishing methods and gathering data from preliminary genetics, metabolomics and radiological imaging analyses. These results were used to investigate to what extent the early pathology seen by imaging could be explained by genes. This involved not only clinical and genetic observations, but also extensive statistical modelling which led to the estimation of the genetic overlap between the stroke and Alzheimer's disease.

The initial findings imply that the human genome by itself is not a strong determinant of the co-occurrence of stroke and Alzheimer's disease. However, it is still being explored whether there are genes involved in subtypes of stroke that are relevant to both diseases. For Alzheimer's disease, new variants in genes that play a key role in the human innate immune defence were identified. The project has been successful in finding metabolites that determine general cogni-



CoSTREAM combines multiple disciplines for a better understanding of the underlying causes of the co-occurrence of stroke and Alzheimer's disease.

tive ability and the risk of dementia and Alzheimer's disease. These involve metabolites in regulating the amount of 'good' cholesterol in the blood (HDL), as well as amino acids and lipids that may be modified by nutrition.

Two clinical studies with a strong focus on brain imaging were set up to investigate the physiological changes in the brain and to study the effect of compensatory mechanisms using epidemiological research. After harmonising the neuropsychological measurements and imaging procedures, data collection started for both clinical studies. Both 3T and ultra-high field 7T MRI are used to study morphological changes and vascular pathologies in the brain, the hip-

pocampal subfields and the locus coeruleus are particular regions of interest, with amyloid and Tau PET used for in-depth assessment of Alzheimer's pathology.

The validation of the first predictors of disease has been started within the project. CoSTREAM researchers have found that amyloid levels in the blood can be used for the prediction of Alzheimer's disease in addition to the gene variants already identified. Based on preliminary results, statistical methods and a set of markers to be used for stroke and Alzheimer's disease risk prediction have been defined. In light of future treatment, the genetic data on stroke and Alzheimer's disease have also been used to study the causal rela-

tion of risk factors through Mendelian randomisation.

A major barrier in the development of novel evidence-based treatment of stroke or Alzheimer's disease is the lack of animal or cellular models. To overcome this obstacle, CoSTREAM is developing an in vitro model of the neurovascular unit that can be used for mechanistic and therapeutic research. The project is currently ahead of schedule in developing an organ-on-a-chip model of the neurovascular unit. Such a model could potentially revolutionise the development of targeted therapeutic strategies against stroke or Alzheimer's disease by providing a model to rapidly investigate molecular pathways, such as the ones identified during the pro-

ject. The culture conditions for the cells used in the model system were optimised to successfully co-culture neurons, astrocytes and pericytes and obtain endothelial barrier formation.

The CoSTREAM project marks the first time a consortium has sought to combine unique clinical, epidemiological, genetic and metabolic research with state-of-the-art pre-clinical genetic, metabolomic and imaging data to understand the link between stroke and Alzheimer's disease. The consortium is working to identify novel biomarkers related to specific pathways underlying the co-occurrence of both diseases. These may also open the door to treatment monitoring, improving the chances of success and enabling effective precision medicine and prevention by targeting specific pathways.

The ambition of CoSTREAM is that stroke patients will undergo comprehensive Alzheimer's disease risk modelling based only on a blood sample and a brain scan, and that through CoSTREAM the opportunities to prevent progression of vascular and Alzheimer's pathology can be exploited. Overall, the research conducted by CoSTREAM will facilitate the early identification of persons at risk and provide strategies for optimal prevention, while providing important insights into effective therapies. This will lead to significant health benefits at an individual and societal level by better informing decisions on therapy development and coordinated therapeutic management aimed at reducing co-morbidity.

*The CoSTREAM project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 667375.*

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