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BGM Associates Working Paper

How to Organize State-of-the-Art Medical Diagnosis

Will large diagnostic imaging providers help and is Private Equity a welcome driving force to advance high-quality imaging and diagnostics?

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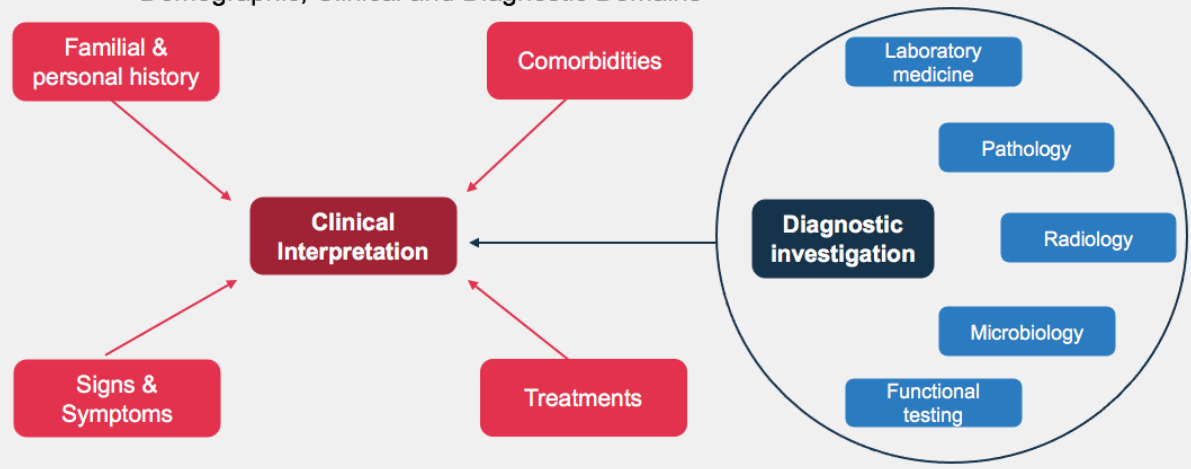
Introduction

BGM Associates recently supported Swedish Private Equity firm EQT in the acquisition of two German radiology networks, “Meine Radiologie Holding (MRH) ” and “Blikk”, creating the largest imaging network in Germany[1]. We believe that the trend towards larger imaging networks will inevitably continue and that this trend provides significant opportunities to further improve quick access to high-quality yet affordable medical services in radiology and maybe even foster a new form of “integrated diagnostics”.

It is undisputed that reliable and early diagnosis is an indispensable prerequisite for better therapy guidance and monitoring and ultimately for a successful therapy[2,3]. Few medical specialties have made greater progress over the past decades than radiology, mainly driven by broad application of breakthrough innovations in CT, MRI, Ultrasound and hybrid imaging technologies in daily medical routine. More recently, diagnostic imaging has been increasingly complemented by rapid advances in laboratory diagnostics including pathology and genetics, which provide the opportunity for an “integrated diagnostics”[4] approach that combines in vivo imaging, pathology, and in vitro laboratory tests with advanced information technology, thus paving the way to a new model of healthcare[5] (Figure 1).

Figure 1 Clinical Interpretation as a Process Based on Multifaceted Reasoning and Many Demographic, Clinical and Diagnostic Domains



Source: Lippi and Plebani (2020). Integrated diagnostics: the future of laboratory medicine? Biochemia medica, 30(1), 010501.

In addition to the established imaging infrastructure provided by private radiology practices as well as larger (university) hospitals, we have witnessed the emergence of regional and national diagnostic imaging networks which operate multiple sites under one umbrella organization over the course of the past decade*.

Imaging networks** benefit from a number of significant competitive advantages over private run stand-alone practices:

- **Economies of scale** in procurement and maintenance of a cost-intensive imaging infrastructure
- **Standardization** and sharing of routine protocols and workflow procedures
- **Image interpretation and reporting**, if required, separated with access to sub-specialty opinion irrespective of location (teleradiology within the network)
- **Continuous professional exchange** within larger teams and across sites; sharing of best practices and second opinions
- **Recruitment** of highly qualified and specialized radiologists and technicians
- **Staff retentio**n through flexible working time arrangements
- **Professional training and sub-specialization** within a large umbrella organization providing the administrative und educational backbone structure
- **Framework** for an **information system** that combines large datasets from imaging, pathology and laboratory tests in a fully integrated electronic health report***.

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* Like in other healthcare areas, the USA has led the charge towards large radiology network organizations, in some cases comprising hundreds of radiology practices (e.g., RadNet as one of the biggest outpatient imaging networks in the USA, nowadays operates more than 350 imaging centers and employs over 500 radiologists across the USA). As a consequence, today more than 50% of radiologists in the USA and close to 50% of radiologists in Germany are already working in outpatient imaging networks. See Kane, C.K. (2021). Policy Research Perspectives - Recent Changes in Physician Practice Arrangements: Private Practice Dropped to Less Than 50 Percent of Physicians in 2020. American Medical Association. See also Ärztestatistik (2020). Bundesärztekammer. Table 3, Pg 19.

** We use the term imaging networks or radiology networks here for privately run for-profit companies. The term is also used for publicly run or initiated collaborative imaging networks, such as the National Health Service (NHS) initiated networks in England.

*** Currently, individual hospitals, laboratories, and private practices still suffer from highly fragmented and largely disconnected information systems with minimal sharing of information.

Against the backdrop of high capital expenditure requirements for state-of-the-art scanner infrastructure as well as a notoriously competitive labor market for highly qualified radiology assistants/radiographers, the competitive advantages of imaging networks mentioned above led to consolidation among private radiology practices in the USA, Australia* and Europe.

Private Equity firms have long since focused on buy-and-build strategies, especially in highly fragmented, regional healthcare markets. While the emergence of Private Equity-backed large imaging networks can be observed in both the USA, Australia and Europe, both markets are still highly fragmented with a foreseeable transformation of the radiologist employment landscape in the next decade. Imaging networks will continue to present attractive investment opportunities for financial investors, given the large number of available targets and the stable growth in demand for high-quality imaging services.

At BGM Associates, we see significant opportunities to further develop and improve imaging and diagnostic services at large and even embark towards 'integrated diagnostics' and 'comprehensive care' platforms in the mid- to long-term. There may even be the opportunity for imaging networks to make inroads into more comprehensive care services in defined medical areas with high demand but insufficient medical care (e.g., the surveillance, follow-up, and therapeutic monitoring of oncological diseases such as breast and prostate cancer, preventive cardiology, dementia, multiple sclerosis, and other debilitating chronic diseases).

We believe that several distinct opportunities for radiology in general and imaging networks in particular offer significant upside potential to financial investors. With a focus on the strategic development of imaging platforms and the opportunities outlined below, Private Equity firms combine the financial power and management skills

* I-MED, a leading diagnostic imaging clinic group with over 200 clinics and the largest outsourced provider to private and public hospitals in Australia, is a case of a private equity build-and-buy model. It is currently owned and managed by Permira, a British global investment firm. See https://www.permira.com/portfolio/i-med/. Permira Website. Last assessed: 15.10.2021. Previous owners of I-MED have been EQT and CVC Capital Partners.

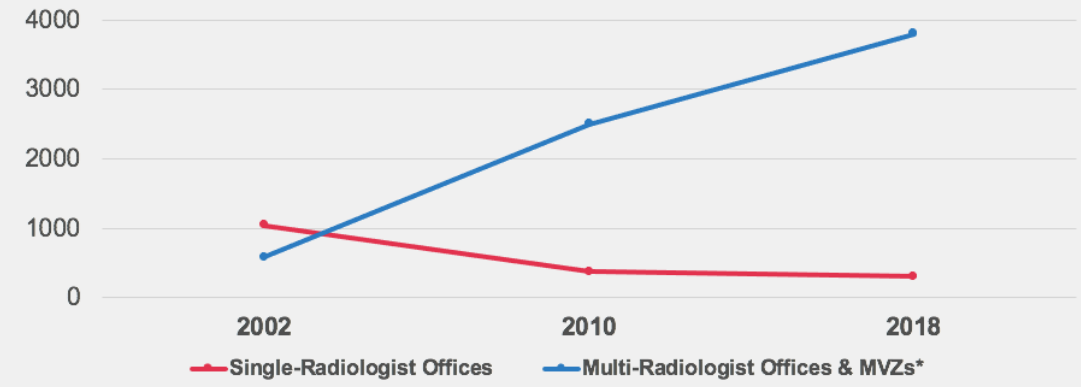
necessary to break new ground in “integrated diagnostics” and “comprehensive care” and thus could greatly contribute to better, cost-efficient healthcare while unlocking substantial value for their investors. In order to do so, Private Equity firms may need to develop new ownership structures more suited to longer holding periods.

In a recent interview, Conni Jonsson, Chairman of the board of EQT, outlined the following thought: *‘We are looking at investment strategies that have a longer lifespan, the whole industry does. It may be that funds are not the final form of ownership, you have to think a little freely outside funds as well. Exactly what that means we have to think about. Both we and our customers want a longer ownership horizon and that also increases our legitimacy’* (Hägerstrand, 2021)[6]. It is becoming clear that financial investors may need to adapt their modus operandi to realize the full potential of healthcare investments. Developing Imaging networks towards comprehensive and integrated platforms will require a strong understanding of and focus on the following opportunities and challenges.

Opportunities and Challenges for Running and Developing Imaging Network Platforms

Following the trend in the USA, the obvious competitive advantages of larger imaging platforms have already led to a strong consolidation process among private stand-alone radiology-owned practices in Europe. In Germany, the largest radiology market in Europe, the number of private stand-alone radiologist-owned practices is in steady decline (Figure 2).

Figure 2 Set-Up of Outpatient Radiologists in Germany (2002 - 2018)

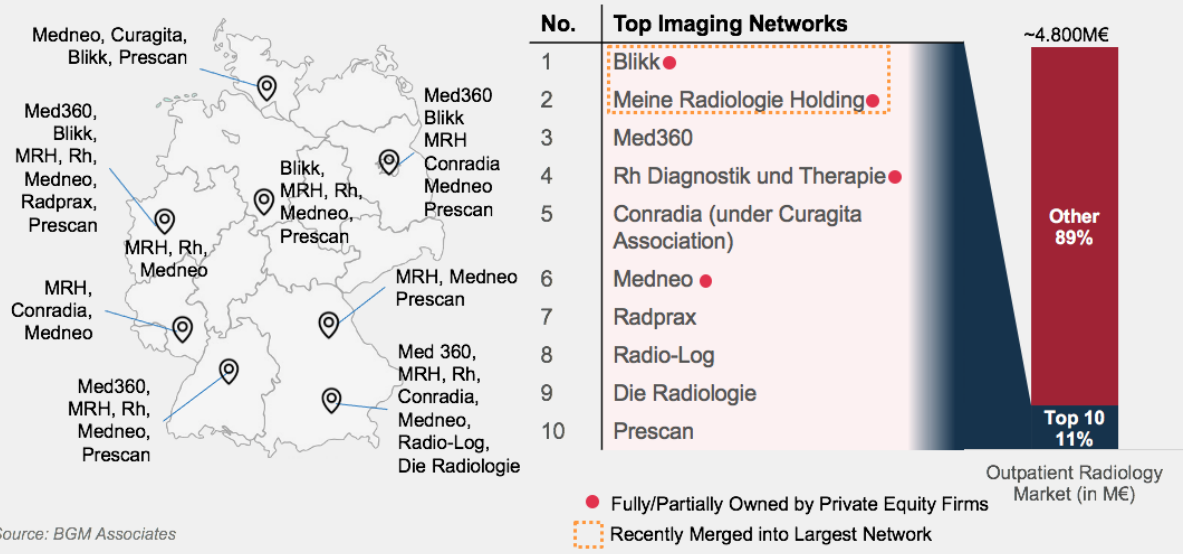


**MVZs (Medizinische Versorgungszentren in German) refer to groups of licensed independent service providers in which multiple outpatient doctors work together under one roof*

Source: BGM Associates, adapted from Berufausübungsgemeinschaft: GKK Steuerberatung.de

Multi-Radiology Offices and MVZs have almost become the norm. At the same time, large imaging networks have emerged and more recently, the space has become increasingly attractive for Private Equity investors (Figure 3).

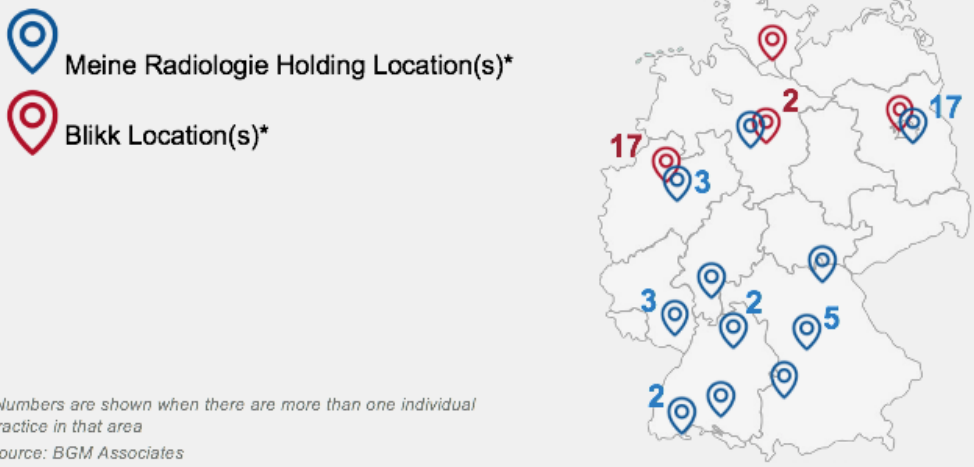
Figure 3 Top 10 Imaging Networks in Germany (in Terms of Market Share)



Source: BGM Associates

The merger of MRH and Blikk will form the largest imaging network in Germany with a relatively broad geographic coverage (Figure 4).

Figure 4 Meine Radiologie Holding and Blikk Geographical Coverage



*Numbers are shown when there are more than one individual practice in that area
Source: BGM Associates

What are the opportunities and challenges that lie ahead in building and maintaining state-of-the-art imaging and, in a wider sense as outlined, "integrated diagnostics" platforms?

1. "The War for Talent"[7]

Financial investors not so familiar with Radiology and Medical Imaging may think the most important investment is that in excellent scanner infrastructure, i.e. CT and MRI equipment, hybrid scanner technologies or high-end Ultrasound machines. However, these investments in hardware and supporting, complementary software, though very important, are not more than a prerequisite to allow highly qualified radiologists, supported by equally qualified technicians/radiographers to produce reliable images. The real competitive edge in medical imaging is provided by specialists who are capable of (post-)processing, reading and interpreting images in a reliable state-of-the-art manner and are able to translate the results into a clearly structured radiology report which provides guidance for medical specialists treating the patient.

Against the backdrop of a general shortage of radiologists and radiographers, not to mention an insufficient number of radiologists in sub-specializations, such as breast-,

prostate- or cardiac imaging, the real challenge is to attract, recruit, continuously train and retain them. Therefore, investing in imaging networks is, first and foremost, an investment in highly qualified human resources.

A potential advantage of well managed imaging networks could be that in particular younger, yet ambitious, radiologists have increasingly less appetite for running their own practice with debt-financed high capital investments and little flexibility in work-life balance. For many it could be more attractive to be employed by an imaging network, which enables flexible working hours and provides an attractive work environment with a state-of-the-art equipment infrastructure, established workflows and possibly clinical study opportunities.

2. Get Access to and Manage Your Referrer Network

Radiology networks depend on an excellent network of referring physicians, both in primary care as well as in medical specialties such as Cardiology, Neurology, Gastroenterology, Orthopedics, Urology and Gynecology. Successful Radiology practices and networks have superior referral networks which rely on the high quality of the radiology services provided. First and foremost, this requires high-quality radiology reports but also continuous communication and promotion of the latest imaging innovations and skills to interact with referring physicians as well as other imaging experts.

The combination of imaging services with laboratory diagnostics could be an avenue very large “integrated diagnostic” groups could go*. For referring physicians such a one-stop approach would be attractive both in terms of work-efficiency as well as quality but would require the imaging network to integrate imaging and laboratory data in a holistic diagnostic report.

* Companies such as Unilabs, Synlab and Sonic Healthcare have integrated both in vivo imaging services with laboratory diagnostics, in principle offering a ‘one-stop-shop’ platform.

Excellent imaging networks also collaborate with specialized radiologists in University Hospitals and teleradiology companies* to obtain a second opinion or consensus reading of difficult to interpret images. This requires imaging networks to be embedded in the respective medical-scientific community, increasingly even on an international scale. Radiologists have a high affinity for technology and are part of a global digital community which shares images, medical imaging software solutions and the latest information on the application of existing and emerging imaging technologies.

3. Jockey for Reimbursement

Today, many clinically meaningful imaging procedures are not (yet) reimbursed. Besides an excellent interaction with private health insurances, this increasingly also requires proactive interaction with statutory as well as corporate, health insurances, which offer regular health checkups for their employees as a fringe benefit and to negotiate special reimbursement packages for specialized and/or complementary diagnostic services (e.g. PET-CT for early diagnosis of recurrent prostate cancer or heart check-up programs**).

It is inevitable for large imaging networks to proactively engage with the medical-scientific community in order to influence and advance medical guidelines together. Private equity companies with a typical investment horizon of four to seven years may find this difficult.

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* Outside of the biggest teleradiology market in North America, there is already a growing field of teleradiology companies in the EU, with some emerging players having double-digit sales growth. Source: Murray.C. 2019. Europe's 10 Fastest-Growing Teleradiology Companies. https://www.healthcarebusinessinternational.com/europes-10-fastest-growing-teleradiology-companies/. Last accessed: 06.10.2021.

** One example is the 'HerzCheck' project, carried out under the medical direction of the 'Deutsches Herzzentrum Berlin' (DHZB). It is funded by the 'Innovationsfonds des Gemeinsamen Bundesauschusses' (G-BA), in collaboration with AOK Nordost, for a period of 3 years. The project offers cardiac MRI imaging in mobile units across Brandenburg and Mecklenburg-Vorprommern to detect heart insufficiencies in patients with risk factors at an early stage. All scans are getting reimbursed by AOK Nordost and only people insured by it can be enrolled in the study. Imaging procedues (i.e. non-enhanced 1.5T MRI) are done in a mobile unit, the results are sent via teleradiology to DHZB for image reading and interpretation.

4. Standardize, Optimize and Renew Equipment

The acquisition of existing imaging networks or the step-by-step development of an imaging network through acquisition of private practices usually provides the challenge of heterogenous imaging equipment and diverse workflow and reporting standards. Furthermore, acquired equipment may not fulfill the standards of state-of-the-art equipment and care. This is particularly critical in X-ray and CT equipment which undergoes constant improvement in terms of reducing radiation exposure of patients and medical personnel[8]*. Therefore, it is always necessary to critically assess the imaging equipment in place and not to shy away from replacing it ahead of time, particularly if this allows for standardization of equipment across several or all imaging network sites, including service agreements with OEMs or other maintenance providers.

The guidelines for capital equipment replacement of the European Society of Radiology (ESR) recommend replacement of both CT and MRI scanners after 8-12 years[9]. Current guidance from the Biomedical Engineering Advisory Group (BEAG) recommends such equipment should be replaced after 7 years[10]. Above this age equipment is less efficient and prone to breakdown and the radiation dosage is likely to be higher than for similar newer devices[11]**.

In contrast to the USA, structured reporting** is still in its infancy in Europe. Structured reporting, however, does not only significantly improve the quality and readability of radiology reports, it also is an important tool to reduce reporting time and significantly

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* Germany is one of the countries in which (unnecessary) radiation exposure is very critically reviewed by authorities (Bundesamt für Strahlenschutz, BfS) and a broader public and where, as a consequence, MRI is very widely used.

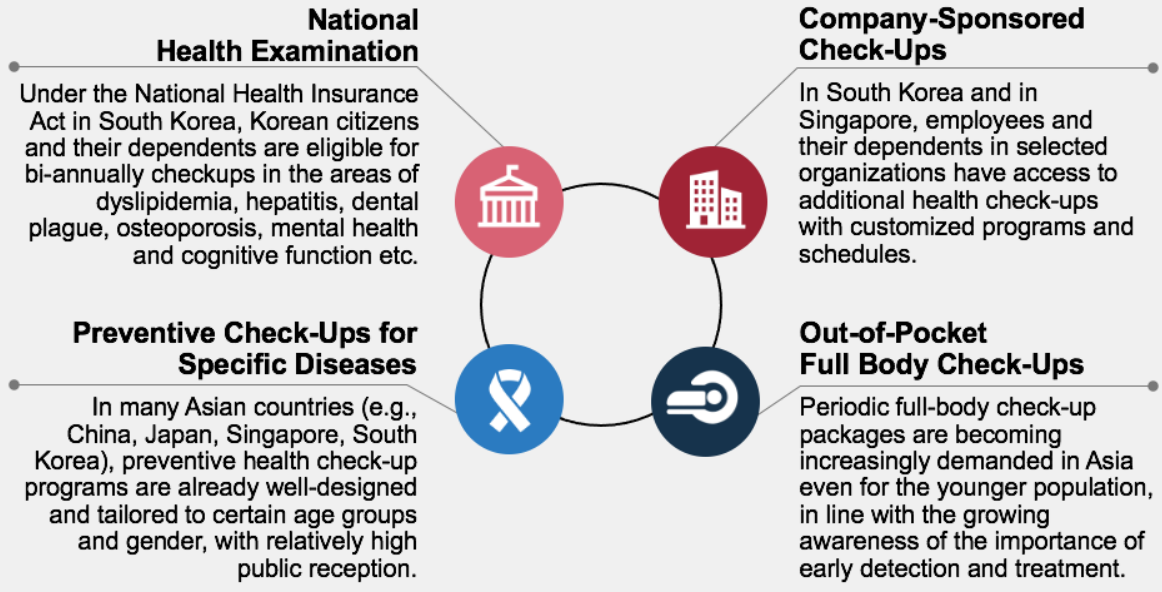
** In the U.S., structured radiology reporting is already widely adopted, with preset templates with defined terminology and incorporated guidelines to report specific findings and recommendation (e.g., BiRADS, PiRADS, LungRADS). In the EU, this is still an emerging space with players such as RadioReport and SmartReporting looking to gain a more stable foothold in the local market. See company websites https://radioreport.com and https://www.smart-reporting.com/en/. For more background information on structured reporting, refer to Langlotz, C.P., Professor of Radiology and Biomedical Informatics, Standford University. The Radiology Report, A Guide to Thoughtful Communication for Radiologists and Other Medical Professionals. ISBN: 978-1515174080. Published on November 2, 2015.

improve efficiency (i.e., avoid misunderstandings and recalls) and eventually saves costs. Structured reporting, particularly of quantitative data, is also a prerequisite for integration with other quantitative biomarkers (e.g., biochemical, genetics).

5. Expand Beyond Reimbursement & Attract Private Out-of-Pocket Payments

We believe that beyond reimbursed imaging and healthcare services, an increasingly affluent, active population of above 50-year-old women and men are willing and capable to pay for well-designed health checkups, as already established in wealthy Asian countries such as Japan, South Korea, Singapore, or Taiwan and increasingly in China (Figure 5).

Figure 5 Established Health Check-Up Schemes in Asian Economies



Source: BGM Associates

This growing pool of potential customers is not confined to the currently 10% privately insured in Germany. In all likelihood there is opportunity for imaging networks to participate in the “silver economy”*.

6. Embark Towards “Comprehensive Care”

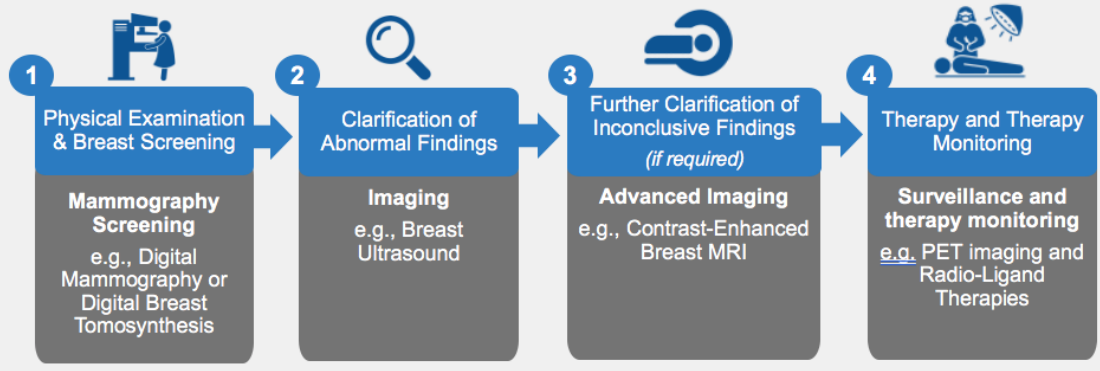
Medical imaging has made dramatic progress over the past three decades and is still one of the most dynamic and innovative medical specialties. AI and digital solutions are being adopted and radio-ligand therapies are added to the therapeutic arsenal in oncology and will make “Theranostics**” a reality in medical practice. Thus, the field of nuclear medicine in both diagnosis and therapy may be a new important specialty to be added to imaging network services. Besides radiation therapy, which is well-established in breast and prostate cancer therapy and offered by some imaging networks, radio-ligand therapies may provide an interesting new field for specialized Comprehensive Care Centers.

Figure 6 below exemplifies ‘Comprehensive Care’ in a simplified breast cancer ‘patient journey’.

* The ‘silver economy’ refers to consumer groups above the age of 50, living on average a decade longer than in the 1960s and with high spending power. Source: Daneshkhu.S. (2014). The Silver Economy: Baby Boomers Power New Age of Spending. The Financial Times. https://www.ft.com/content/e9fc95c0-44b1-11e4-ab0c-00144feabdc0. Published November 7, 2014. Last accessed: 06.10.2021.

** Theranostics refers to the pairing of diagnostic biomarkers with therapeutic agents that share a specific target in diseased cells or tissues. See Marin et al. (2020). Theranostics in Nuclear Medicine: Emerging and Re-emerging Integrated Imaging and Therapies in the Era of Precision Oncology. RSNA RadioGraphics 2020; 40:1715-1740. https://doi.org/10.1148/rg.2020200021.

Figure 6 Case of Comprehensive Care in Breast Cancer and Contribution of Imaging Networks: Stages in the Patient Journey



Role of Imaging Networks in the Patient Journey

Source: BGM Associates

7. Foster AI Applications and Make the Best Use of Your Patient Data Pool

In the application of novel software and AI solutions, Radiology is a trail blazer. There are hundreds of software solutions and AI applications under development in nearly all medical specialties and sub-specialties. However, only few of them have proven that they provide sufficiently reliable image-interpretation or simplify workflows (e.g., in breast screening) in a meaningful way. There is no doubt however, that AI based image-interpretation and pattern recognition will make massive inroads in Radiology over time and will eventually improve workflows as well as diagnostic quality. When compared to stand-alone Radiology practices, large imaging networks have a tremendous advantage to test and apply such solutions on a broad scale and even participate in their clinical development*.

Needless to say, that (large) Imaging Networks have access to large data pools, which may allow for AI based interpretation and even prognostic analysis. Naturally, such Imaging Networks are interesting partners for the medical-scientific community as well

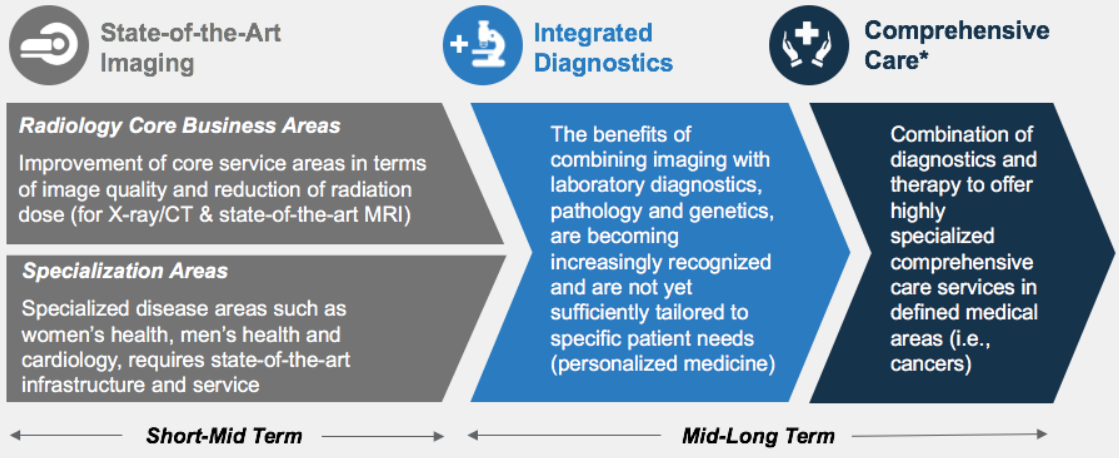
* For example in Breast Cancer, one of the cancers with the highest death rates, a large variety of AI imaging solutions is offered e.g., Transpara® by Screenpoint (FDA approved), Merantix/Vara, INSIGHT MMG by Lunit. Nevertheless, none of these as of now are widely used and yet commercially successful. From our consulting practice, we know that many healthcare AI start-ups working in that space grossly underestimate the importance and the costs to prove reliability in clinical studies and application in medical practice. Large imaging networks, in principle, would have the capacities and capabilities to support necessary clinical development and pilot applications in medical practice.

as for healthcare and more specifically biopharma companies. All this means that the medical-scientific capabilities, the need for ongoing educational efforts and adaptation of organizational setups to new technologies and in general partnering skills, will be of utmost importance.

The Time Horizon of the Investment and the Quest to Add Real Value Going Forward

The outlined challenges and opportunities provide evidence that extended investment horizons are necessary to bring about the much needed change towards more integrated diagnostics and comprehensive care models, which are at the core of patient-centered value-based healthcare. We believe that such investments require Private Equity companies to implement the foundation for long-term growth and establish a smart, focused buy-and-build strategy to add value for a future investor who is willing to further invest in the quality of medical diagnostics and comprehensive care in the interest of the patient (Figure 7).

Figure 7 Under-Tapped Potential in Medical Imaging: State-of-the-Art Imaging, Integrated Diagnostics and Comprehensive Care



Source: BGM Associates

The unmet need for state-of-the-art medical services in areas such as breast cancer and women's health overall, prostate cancer and men's health, early detection of heart insufficiency in cardiology and general health-checkups, to address only a few, are

obvious and provide significant business opportunities. A prerequisite is however, that investors are willing to not only acquire deep knowledge about the competitve dynamics, but also in-depth know-how in medical care and its adjacencies, combined with a commitment for long-term investment.

Literature

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