TriMark Publications

May 2017
Volume: TMRIMG17-0501

MEDICAL IMAGING MARKETS

(SAMPLE COPY, NOT FOR RESALE)

Trends, Industry Participants, Product Overviews and Market Drivers

TABLE OF CONTENTS

APPENDIX

INDEX OF FIGURES

INDEX OF TABLES

1. Overview

1.1 Statement of This Report

The purpose of this TriMark Publications report is to describe the specific market segment of the diagnostics market sector called medical imaging. Medical imaging can be categorized into nine main modalities: X-ray, ultrasound, computed tomography (CT), positron emission tomography (PET), single photon emission computed tomography (SPECT), magnetic resonance imaging (MRI), nuclear medicine (NM), mammography, and fluoroscopy. Globally, the X-ray is the most frequently used imaging procedure with more than [redacted] X-ray exams per year. MRIs are second with [redacted] examinations per year. PET, SPECT, CT and nuclear medicine rank third with [redacted] examinations per year. Picture archiving and communication systems (PACS) and contrast agents are the sub-segments in medical imaging market that have gained significant growth in recent years. As a result of these medical imaging advancements, the multi-slice systems are generating large volumes of data, and this creates demand for data storage, three-dimensional (3-D) visualization and analysis. As such, the global medical imaging industry is primed to experience significant growth through the next decade. This report surveys almost all of the companies known to be marketing, manufacturing or developing medical imaging equipment and supplies in the world. Each company is discussed in extensive depth with a section on its history, product line, business and marketing analysis, and a subjective commentary of the company's market position. Detailed tables and charts with sales forecasts and market data are also included.

The huge revenue earning potential of the medical imaging industry is primarily due to the general cost of most imaging equipment and its functional benefits. The value of the global imaging industry has grown from $[redacted] in [redacted] to $[redacted] in [redacted]. The U.S. and Europe are the most mature markets for the medical imaging products, and they show a compounded annual growth rate (CAGR) hovering around [redacted]% growth. Product innovations will play a key role in further progression of the medical imaging in these two mature markets. For the existing medical imaging products, the vendors are now focusing on the regional markets such as China and India, which have shown to experience a CAGR of [redacted]% to [redacted]%. China's healthcare sector has witnessed a robust growth assisted by growing demand and government support. The medical devices market in India is anticipated to register an annual growth rate in the high double digits in the coming years and the medical imaging market will form a major part of it. Public hospitals in the Eastern European region are also seeking assistance from private finance companies to invest in the latest medical imaging modalities. The overall analysis of the growth pattern indicates that the private imaging centers are gaining momentum and most public sector healthcare services are focusing on outsourcing imaging diagnostics.

1.2 Scope of This Report

The main objectives of this analysis are:

- Estimate the current and future U.S. and global markets for medical imaging modalities.
- Assess market opportunities and the potential market for medical imaging products.
- Discuss the shift in trends towards portable devices in medical imaging.
- Analyze the need for medical imaging for the different disease indications.
- Examine the current utilization and future demand for radiopharmaceuticals used in nuclear imaging procedures.
- Review the impact of healthcare reforms on medical imaging procedures and the reimbursement rates available in the U.S. for the different imaging procedures.
- Identify the key players in medical imaging industry and their contribution to the continuing innovations in the development of new modalities.

Key questions answered in this study are:

- What disease conditions offer the greatest potential for medical imaging?
- What market drivers are responsible for the growth of medical imaging products?
- Which healthcare segments contribute more to the growth of medical imaging industry?
- What regulatory and technical challenges is the medical imaging industry confronting?

- How far has the industry progressed in developing portable imaging equipment?
- What is the reimbursement rate for the different imaging procedures in the U.S.?
- What impacts have U.S. healthcare reforms made on the growth of medical imaging industry?

This report contains:

- A brief introduction to the various medical imaging modalities, the market leading brands in each modality and the medical applications for each.
- Global, U.S., European, Chinese and Indian markets for medical imaging modalities.
- Estimated market for medical imaging products at the global and the U.S. level.
- The current status of the isotope supply to the global radiology market.
- One section of the appendix gives a detailed account of the global and regional markets for refurbished imaging modalities such as CT, MRI and ultrasound.

For more information on the U.S. and global markets for medical imaging equipment, please visit http://www.trimarkpublications.com to find this study's companion report called *European Medical Imaging Markets*. Other TriMark reports cover the specific sectors within the medical imaging market include: *Mammography World Markets*, *Nuclear Cardiology Markets*, *Picture Archiving and Communications Systems (PACS)*, *Positron Emission Tomography (PET) Markets* and *Ultrasound Markets*.

1.3 Methodology

The author of this report is a Ph.D. in biochemistry from the University of Minnesota with many decades of experience in science writing and as a medical industry analyst. He has been a senior director of several large regional and national healthcare laboratories. The editor of this report is a retired college professor with three decades of experience in teaching biochemistry, biotechnology, pharmacology, environmental biology and horticulture. Additionally, important data sources include the American Hospital Association (AHA), American College of Radiology (ACR), World Health Organization (WHO), National Cancer Institute, American Cancer Society (ACS) and Medical Imaging & Technology Alliance (MITA). Where possible and practicable, the most recent data available have been used.

Some of the statistical information was taken from Biotechnology Associates' databases and from TriMark's private data stores. The information in this study was obtained from sources that TriMark believes to be reliable, but TriMark does not guarantee the accuracy, adequacy or completeness of any information or omission or for the results obtained by the use of such information. Key information from the business literature was used as a basis to conduct dialogue with and obtain expert opinion from market professionals regarding commercial potential and market sizes.

Primary Sources

TriMark collects information from hundreds of database tables and many comprehensive multi-client research projects and Sector Snapshots published annually. TriMark extracts relevant data and analytics from its research in the past three years as part of this data collection. TriMark also extracts qualified data feeds from e-questionnaire responses and primary research responses for this compilation.

Secondary Sources

TriMark uses research publications, journals, magazines, newspapers, newsletters, industry reports, investment research reports, trade and industry association reports, government affiliated trade releases, and other published information as part of its secondary research materials. The information is then analyzed and translated by the Industry Research Group into a TriMark study. The Editorial Group reviews the complete package with product and market forecasts, critical industry trends, threats and opportunities, competitive strategies and market share

determinations. The report conclusions are verified through intensive interviewing of the top-ranking companies in the industry.

TriMark Publications Report, Research and Data Acquisition Structure

The general sequence of research and analysis activity prior to the publication of every report in TriMark Publications includes the following items:

- Completing an extensive secondary research effort on an important market sector, including gathering all relevant information from corporate reporting, publicly-available data and proprietary databases.
- Formulating a study outline with the assigned writer, including important items, as follows:
  - Market and product segment grouping, including evaluating their relative significance.
  - Evaluation of key competitors, including their relative positions in the business and other relevant facts to prioritize diligence levels and assist in designing a primary research strategy.
  - End-user research to evaluate analytical significance in market estimation.
  - Supply chain research and analysis to identify any factors affecting the market.
  - New technology platforms and cutting-edge applications.
- Identifying the key technology and market trends that drive or affect these markets.
- Assessing the regional significance for each product and market segment for proper emphasis of further regional/national primary and secondary research.
- Completing a confirmatory primary research assessment of the report's findings with the assistance of expert panel partners.

1.4 Executive Summary

The medical imaging industry is on the brink of a major new phase of growth. The growth in the market will be propelled by the availability of new technology coming from the digital information segment and by the aging population. Equipment vendors are being forced to design smaller and lower cost modalities. Recent innovations in the continued integration of technologies are showing much promise. Advances in PET/CT systems enable images to be seen that have never been seen before simultaneously. Another area showing promise is functional MRI (fMRI), which can enable advances in diagnostics for diseases such as Alzheimer's and other diseases that are becoming more prevalent with an aging population. The global market for medical imaging is worth about $[redacted] in [redacted], and is expected to grow to $[redacted] by [redacted]. Currently, Asia/Pacific is the largest market that is worth about $[redacted] and it is followed by North America and Europe with shares of $[redacted] and $[redacted] respectively.

CT continues to be a much sought after equipment in both inpatient and outpatient care. In mature markets, such as the U.S. and Europe, the purchase of new equipment is driven by an additional need for capacity. One week's backlog justifies the investment in another unit for CT because the facilities do not want their clients to go to their competitors. Another factor is obsolescence. Some clinicians still use a one-slice CT and manage to perform well. Some think that they need to have a 16-slice CT to do a good job. This perception of obsolescence varies among the institutions. The global CT market is controlled mainly by five major players, namely GE Healthcare, Hitachi Medical Systems, Philips Medical Systems, Siemens Medical Solutions, and Toshiba Medical Systems. The global CT scanners market was valued at $[redacted] in [redacted] with a potential to reach $[redacted] in [redacted].

MRI is the ideal system for imaging soft tissues. Yet, for several years, the small bore had been a disadvantage for both obese and claustrophobic patients. In [redacted], many MRI vendors launched systems with a wide bore. Hitachi received FDA approval for its Echelon Oval 1.5T wide-bore system in [redacted] and it is the only system in the industry to provide a 74 cm bore. Nearly two-thirds of the customers are likely to opt for wide bore units. Another boon for the MRI market is the advent of MRI-compatible pacemakers and other devices. Technological advances such as ultra-high-field MRI, innovative software applications, and novel detection of multiple sclerosis and breast cancer also contribute to boost the MRI market.

In the U.S., the MRI utilization rate has increased and yet there is revenue drop because of reimbursement cuts. Much of the procedure growth has been due to growth in lower and upper extremity procedure growth. According to

AllTech Medical Systems, there are approximately [redacted] fixed MRI systems in operation in the U.S. and scanning is performed in more than [redacted] hospitals, [redacted] hospital-owned outpatient locations and nearly [redacted] freestanding imaging centers. Over [redacted] MRI scans are performed in the U.S. each year, with increased applications in chest, vascular, breast and cardiac imaging procedures. The global market for MRI systems in [redacted] was valued at $[redacted] and it has the potential to reach $[redacted] in [redacted].

PET scanners are used to assess cancers and neurological and cardiovascular disorders. These scanning systems are capable of revealing changes in metabolism and thus different types of cancers can be detected using PET before they can be detected by other imaging techniques. PET can scan the entire body and thus it can be used to show whether cancer is spreading to other parts of the body. PET is a more advanced and accurate technology for cardiac perfusion imaging and it has been shown to provide a [redacted]% reduction in invasive coronary arteriography and coronary artery bypass grafting, resulting in [redacted]% cost savings and superior clinical outcomes. New procedures combine PET with computed X-ray tomography (CT) scans to give co-registration of the two images (PETCT) result in better diagnosis than with a traditional gamma camera alone. It is a very powerful and significant tool which provides unique information on a wide variety of diseases from dementia to cardiovascular disease and oncology.

Single Photon Emission Computed Tomography (SPECT) is a tomographic technique. Radioactive gamma rays are emitted from the human body by the injected radiopharmaceuticals. A gamma ray detection camera captures two-dimensional images from more than one angle. The tomographic reconstruction algorithm is applied to the two-dimensional images to form a three-dimensional image. The final image is manipulated to view images of the human body along a desired axis. The majority of SPECT usage in the U.S. is for cardiac imaging. The global market for nuclear imaging, which encompasses PET, PET/CT, and SPECT instruments, was worth $[redacted] in [redacted] and it is likely to have a value of $[redacted] in [redacted].

The ultrasound market has been a stable presence that continues to expand. While 2D ultrasounds have the largest market share due to its wide use in brain tumor and fetal screening and its low cost, 3D and 4D imaging has grown as new applications are developed. Traditionally, ultrasound is primarily used to capture images for gynecology, vascular, and cardiac care. However, its application has broadened into orthopedics, critical care, sports medicine, rheumatology, pain clinics and numerous other medical specialties and has contributed to market expansion. For instance, high-intensity focused ultrasound (HIFU) is being used for treating prostate cancer. The other therapeutic use of ultrasound is for treating kidney stones and gallstones using extracorporeal shockwave lithotripsy. Point of care ultrasound, which saw double-digit growth in [redacted], is another major driver. The global market for ultrasound systems in [redacted] was worth about $[redacted] and it has the potential to reach $[redacted] by [redacted].

Mammography has come a long way: from the first breast-specific X-ray unit (Sénographe), to the modern second-generation digital mammography systems such as the Mammomat Inspiration. The modern digital mammography systems can detect lesions as small as 0.2 cm in size allowing early treatment and improving overall breast cancer survival statistics substantially. Growth is being driven by the incidence of breast cancer as the population ages and the increase in early detection throughout the world. Technological advances contributing to growth include the greater use of 3D systems and advanced systems that can overcome issues of imaging dense breast tissue. The global market for breast imaging systems was valued at $[redacted] in [redacted], and it will be worth about $[redacted] in [redacted].

The worldwide market for mobile C-arms and fluoroscopy is to grow at slow but steady CAGR of [redacted]% during the forecast period. Increasing number of hospitals and diagnostic units are the important factors driving the demand for fluoroscopy and mobile C-arms. Rapidly growing aging population in almost all geographic regions has been the major cause of increased number of orthopedic surgeries. The introduction of innovative C-arms for multiple applications is expected to increase the demand for C–arms. Full mobile C-arms have a greater demand than the mini mobile C-arms. The global market for fluoroscopy and C-arm systems in [redacted] had a value of $[redacted] and this value is likely to reach $[redacted] in [redacted].

