

Economic Analysis - Consulting Report

Economics of Mobile Magnetic Resonance Imaging Services

Brian P. Hogan

IST-618 – Information Policy

Syracuse University

2020

Author Note

This paper prepared for Information Policy taught by Professor Ian MacInnes, Ph.D.

Background

Magnetic resonance imaging (MRI) is a profusely growing business because of its ability to assist in patient diagnosis and care planning with non-invasive technology. Referring to Figure 1, according to Fortune Business Insights the United States market will grow 63% to \$11.7 million (M) in 2025 from \$7.1M in 2017 with top manufacturers, such as GE, Hitachi, and Siemens, offering both in-house and mobile systems (Medgadet, 2020). Key driving factors include increased power of superconducting magnets, advanced machine learning (ML) imaging software, and real time diagnostics encompassing a multitude of body systems. MRI machines are at the top of hospital equipment expenditures (Hough, 2019) and demand is both elastic and inelastic depending on a hospital's population density. This report assesses the economics of "mobile MRI" systems versus with brick and mortar installations based on data from a Harvard affiliated teaching hospital in Boston, Massachusetts.

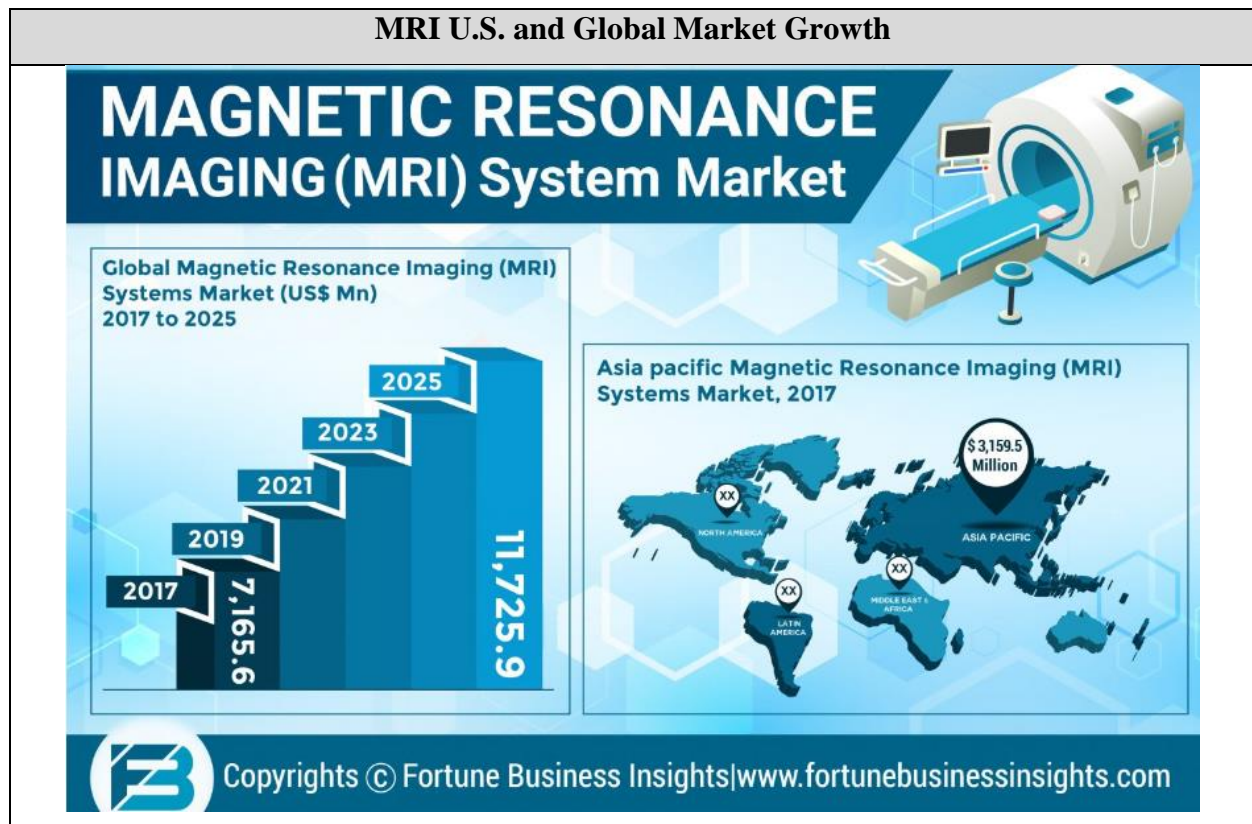


Figure 1

Competition Issues

Hospitals generally have higher MRI fixed cost versus mobile MRIs facilities (Vanvuren, 2020). Mobile MRI facilities are the main competitor to brick and mortar installations and range between 30-55% in cost savings (New Choice Health, 2020). Whether hospitals outsource to mobile MRI units is based on a combination of factors such as patient scan demand, machine substitutes, and access to up-to-date image technology. A creative destructive process exists in MRI image technology through continuous software improvements, generation of real-time high-quality image information, and elimination of MRI film printing in lieu of flat screen image viewing. Software is generally not transferable across physical machine units and manufacturers build competitive advantages primarily through software releases and offering cost-effective mobile MRIs for routine scans such as ankles or arms.

Software is a substantial competitive advantage as it enables faster scan contrasts, simplified images and scanning of more complex areas, such as lungs (ITN, 2016). The incorporation of ML algorithms into image scanning has provided clinicians with disease progression characterizations facilitating early diagnosis and potentially more successful treatments. There is limited research on economic benefits of ML but a wide range of research articles speak to their advanced diagnostic capabilities and future use assisting doctors with diagnosis confirmation or alternatives based on training data depositories.

Economic externalities are minimally present with MRI systems, but network externalities play a major role in hospital dense areas, such as Boston, MA or Houston, TX. Hospital rich areas provide patients with greater access to MRI machines of various types and differing software to assist with diagnosis assessments. The presence of mobile MRI technology does not make a market more competitive as much as it substitutes more costly brick and mortar installations. In five years mobile MRI will remain very competitive as it remains the fastest growing and most versatile image modality (IHS, 2018).

Costs

Referring to Figure 2, brick and mortar installations are up to eight times greater the cost of a mobile unit excluding maintenance mobile MRI costs which are difficult to factor. Mobile MRI technology is successful because it is able to service multiple facilities in a geographic area with nominal transport and “power-on” cycle times justifying lease or unit purchases.

Machine Type		Low	High
Brick / Mortar	Tesla 1.5	\$1M	\$1.5M
	Tesla 3.0	\$1.2M	\$2.1M
Mobile		\$150k	\$400K

Figure 2

Tipping point costs are increasingly driven by necessity to satisfy scan demand boluses rather than one technology dominating or substituting another. Mobile MRI units also help offset switching costs or hospitals being locked into brick and mortar MRI choices. Mobile MRI also enables hospitals to offer ongoing competitive pricing with current technology rather than have patients wait prolonged times associated brick and mortar installations.

Demand and Prices

From a demand perspective the market system is a hybrid between elastic and inelastic. It is elastic in markets with greater hospital density and can be inelastic in those markets with fewer hospitals and variations in Medicare/Medicaid and private payer patient populations. Figure 3 illustrates MRI pricing for common scan types comparing mobile to brick and mortar pricing in a Boston market averaging a 44% difference (BIDMC Radiology Interview 2020; New Choice Health 2020). While MRI mobile cost ranges 28 to 56% less than brick and mortar a cost/benefit analysis was not achievable given the lack of reliable data on Boston hospital installations.

MRI Price Comparison	Mobile			Large Teaching Hospital			Delta ↑↓ %
	Min	Max	Avg	Min	Max	Avg	
Foot, Ankle, Leg, Hip	430	1150	790	1400	2200	1,800	56%
Cervical Spine	575	1450	1,013	2000	2500	2,250	55%
Brain	750	1950	1,350	2300	2500	2,400	44%
Neck	850	2250	1,550	1800	2500	2,150	28%
Abdominal	975	2550	1,763	2600	2800	2,700	35%
Pelvie	650	1700	1,175	1900	2500	2,200	47%

Figure 3

Fast Facts

Referring to Figure 4, the U.S. medical imaging market is projected to expand 43% exponentially by 2025. Data is not specific by image type, such as MRI or X-ray equipment, without paying for an industry report (CISION, 2019).

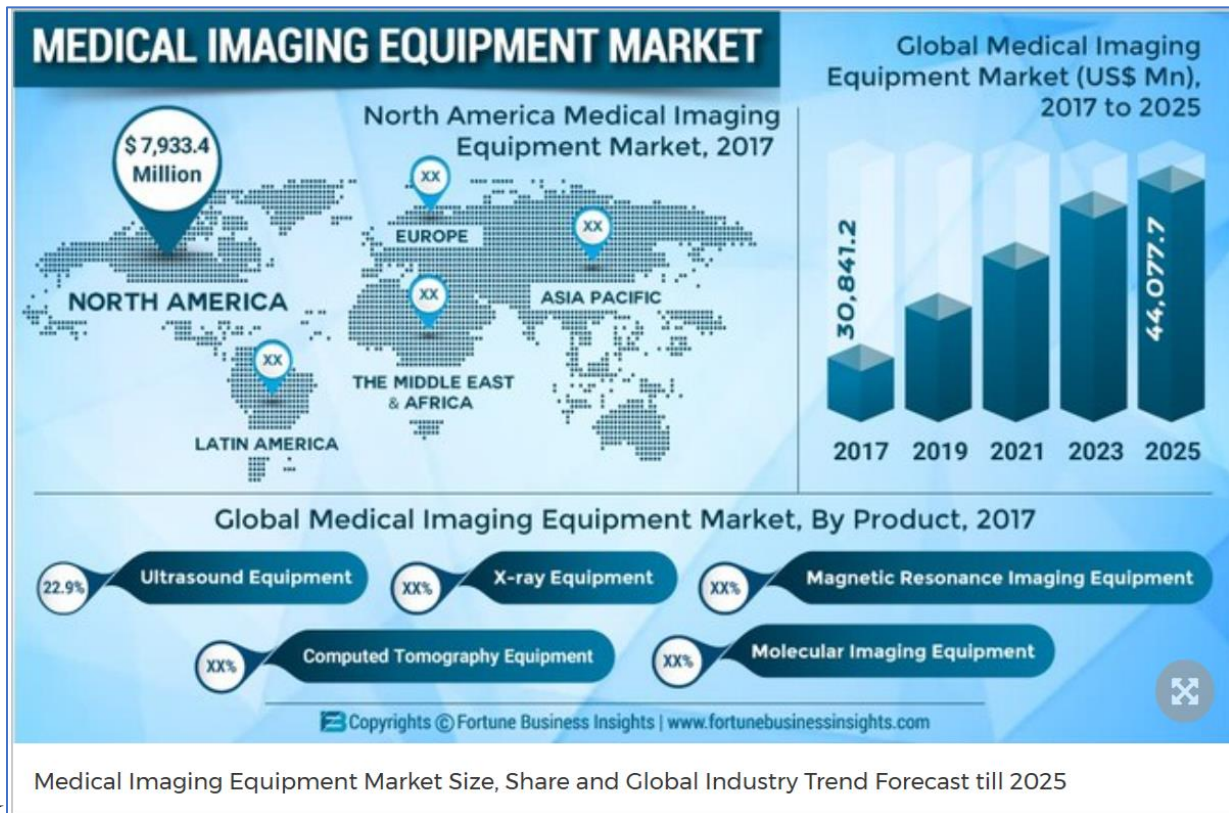


Figure 4

Conclusion

Mobile MRI units assist meeting patient demand across a hospital's geographic landscape. Mobile MRI pricing is also lower than brick and mortar counterparts, in the Boston market, and provides inelastic demand patients the potential for access to critical health management technology. Finally, MRI machine learning will continue to grow in prominence as data banks collect higher quality labeled images to assist and improve disease type prediction.

References

- BIDMC. Magnetic Resonance Imaging at BIDMC. Retrieved February 12th, 2020, from <https://www.bidmc.org/centers-and-departments/radiology/radiology-exams/mri>
- BIDMC Radiology Interview (2020). MRI onsite interview pricing. Boston, MA Harvard Teaching Hospital.
- Hough, J. (2019). MRI machine buyers guide: options and pricing. Retrieved February 10th, 2020, from <https://www.meridianleasing.com/blog/medical-equipment-blog/mri-machine-buyers-guide-options-and-pricing>
- ITN. Recent advances in MRI Technology. Retrieved February 12th, 2020, from <https://www.itnonline.com/article/recent-advances-mri-technology>
- IHS Markit. Moving on up: mobile MRI system demand is increasing as provisions expand. Retrieved February 13th, 2020 from: <https://technology.ihs.com/606516/moving-on-up-mobile-mri-system-demand-is-increasing-as-provisions-expand>
- CISION PR Newswire. Medical imaging equipment market to value US \$44,077.7M at CAGR of 4.6% by 2025 | Exclusive Report by Fortune Business Insights. Retrieved February 13th, 2020, from: <https://www.prnewswire.com/news-releases/medical-imaging-equipment-market-to-value-us-44-077-7-mn-at-cagr-of-4-6-by-2025--exclusive-report-by-fortune-business-insights-300858954.html>
- Medgadget. MRI market size, global industry share, SWOT Analysis and Forecast report 2018 – 2025. Retrieved February 11th, 2020, from <https://www.medgadget.com/2019/10/mri-market-size-global-industry-share-swot-analysis-forecast-report-2018-2025.html>
- New Choice Health. Mobile MRI Cost Comparison. Retrieved February 11th, 2020, from <https://newchoicehealth.com/places/alabama/mobile/mri>
- Vanvuren, C. (n.d.). What can affect the cost of an MRI? *New Choice Health*. Retrieved February 11th, 2020, from <https://www.newchoicehealth.com/mri/cost>