The India cure

Remedying the challenges of the healthcare landscape

IBM Institute for Business Value

How IBM can help

IBM Healthcare is creating solutions to enable a smarter, more connected healthcare system that can assist clinicians to deliver better care and empower people to make better choices. In addition to the company's investment in health technology research and innovation, IBM's healthcare solutions and consulting enable organizations to achieve greater efficiency within their operations; collaborate to help improve outcomes; and integrate with new partners for a more sustainable, personalized and patient-centric system focused on value. For more information about IBM Healthcare solutions, visit **ibm.com**/healthcare.

Radically reconsidering healthcare

India's healthcare system has seen significant progress in recent years. A strong economy, expanding medical options and longer lifespans are contributing to greater demand for high-quality healthcare services. But to fulfill this demand, the major stakeholders in India's healthcare system must address shortcomings in areas such as infrastructure, insurance coverage and availability of skilled medical professionals. In this report, we propose a three-pronged approach that combines technology, innovation and ecosystems to help meet the rising costs and growing demand for healthcare in India.

Executive summary

Healthcare in India has advanced significantly over the past decades. As a result, more people can benefit from improved healthcare outcomes than ever before. At the same time, India has experienced both substantial corporatization of the healthcare sector as a whole, and world-leading innovation in areas such as remote care and affordable care at scale.

But despite these achievements, major impediments to broader care persist, including inadequate infrastructure and a high concentration of quality care in wealthy urban centers. What's more, most Indians lack insurance coverage, many living in rural areas do not have access to medical services and there is a shortage of skilled medical professionals. Without radical reconsideration of how healthcare is practiced and delivered, India is unlikely to have sufficient resources to service its population with the level of care available in other developed nations.

To further explore the Indian healthcare landscape, the IBM Institute for Business Value conducted a survey of 150 Indian medical professionals (see "Study approach and methodology" at the end of this report). We also referred to a previous study of over 1,000 Indian cross-industry executives.[1] For the purposes of this study, we limited our research to the challenges of managing rising healthcare demand and costs. We then applied our findings to outlining actionable strategies for India's healthcare stakeholders to better manage these challenges.

92% of India's healthcare executives expect costs to significantly increase in the next five years

85% of India's healthcare executives say existing infrastructure is inadequate to meet growing demand

74% of India's healthcare executives report increased disposable income is contributing to greater demand for services

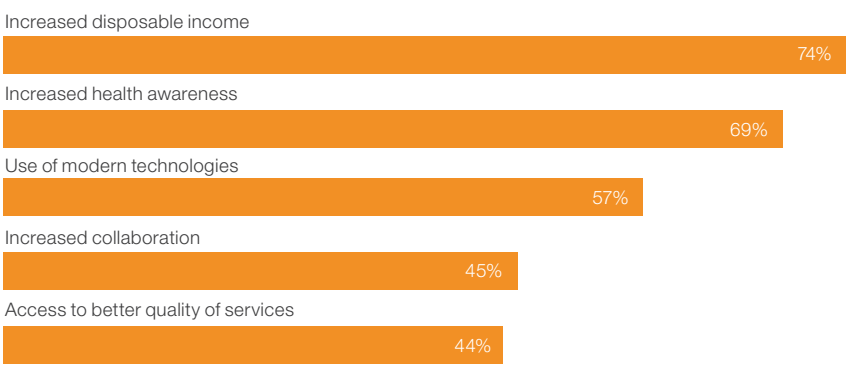
An opportunity and challenge

Demand for healthcare in India is growing significantly. Increased awareness of underlying healthcare drivers and better lifestyle choices – along with vastly improved pharmacological treatment of chronic diseases and higher standards of living – are dramatically extending the life expectancies of Indians in urban areas. Consequently, citizens expect more and better healthcare options as access to disposable income increases (see Figure 1). Healthcare spending in the Indian economy is forecasted to grow 16 percent per year, from INR 5 trillion in 2011 to INR 19 trillion by 2020.[2]

If India's economy grows at a faster pace, healthcare spending may be even greater. India's consumers prioritize healthcare spending only after their other immediate needs are addressed. With that in mind, India's healthcare executives are preparing for a potential surge in spending.

Figure 1

Healthcare executives see reasons for growing consumer demand for healthcare services in India



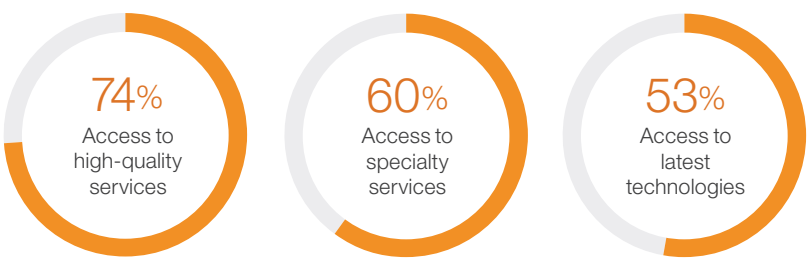
Source: IBM Institute for Business Value India Healthcare Survey 2016

Through engagement in social media and deep integration with a vast Indian diaspora, India's citizens are also highly aware of the latest advances in medical and other digital innovations (see Figure 2). Fitbit, the U.S.-based digital fitness tracker business, for example, has launched fitness wristbands across 300 towns in India and expects the nation to become one of its top five markets within the next two years.[3]

Other global companies are also zeroing in on India as a key market by engaging in local partnerships. For example, GE Healthcare, a unit of global technology behemoth General Electric Company, has partnered with Max Healthcare Institute, a leading Indian healthcare provider, to treat cancer in India through collaborative research and co-development of new disease management solutions.[4] But to meet inevitable demand for high-quality healthcare across ever-growing segments of the Indian population, the sector will need to address significant constraints to growth.

Figure 2

Indian healthcare executives identify top influences on patient spend



Source: IBM Institute for Business Value India Healthcare Survey 2016

As many as 85 percent of India's healthcare professionals say that existing infrastructure and facilities in India are inadequate to meet growing demand, ranking it the most significant challenge facing the industry. India currently possesses half of one hospital bed per thousand of its population, with almost three million new hospital beds expected to be required to meet demand by 2025.[5]

Less than 25 percent of India's population currently has any form of health insurance coverage.[6] Such access challenges are even greater among India's rural populations, which often struggle to have basic healthcare needs met – and healthcare challenges are further compounded by poor living and sanitary conditions. Only 13 percent of rural populations have access to primary healthcare centers, and fewer than 10 percent have access to a hospital.[7]

Healthcare executives identified over-regulation of health and medical supplies as the second most significant challenge, with 59 percent rating it as significant. As many as three-quarters of healthcare devices used in India are imported, and therefore subject to duties and sometimes lengthy custom clearance processes.[8]

While exposing India to the latest in innovative healthcare, devices also can be subjected to extensive approval processes. For example, manufacturers wishing to register a medical device in India must have obtained regulatory authorization in the United States, Canada, Europe, Australia or Japan, as well as their home markets.[9]

Half the healthcare executives surveyed cited a shortage of skilled medical professionals as a key challenge in delivering quality healthcare. India maintains fewer than one physician per one thousand of its population, compared to almost three physicians per one thousand in the United States and United Kingdom.[10] Surgeons are reported to be in particularly short supply. [11]

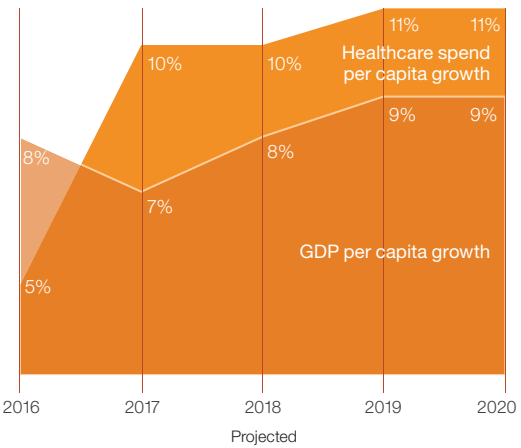
One of the biggest challenges is retention of skilled medical professionals. Emigration of India's medical professionals has been significant for many decades and threatens to grow more intense as aging demographics create increasing demand for medical services in wealthier countries. Indian-born medical professionals already account for 5 percent of British-based physicians and as many as 11 percent of U.S.-based physicians.[12]

Finally, almost half of the professionals surveyed say that poor preventative medicine significantly exacerbates challenges in India's healthcare system. As with many other countries, demand for treatment of chronic disease in India is expected to grow dramatically over the coming decade.[13] And this demand will intensify if patients receive poor post-operative care.

For example, a recent study by Swiss Re, the Swiss-based global insurer, estimates that as many as 80 percent of Indian patients are not taking proven pharmacological treatments following stroke or heart attack, leading to complications and potential hospital readmission.[14]

Figure 3

Healthcare spend in India is outpacing gross domestic product growth



Source: IBM Institute for Business Value analysis 2016. "India Pharmaceuticals and Healthcare report." BMI report, Q3 2015

When the current model won't support future need

India's healthcare leaders are almost unanimous in forecasting a dramatic spike in healthcare costs, with 92 percent indicating costs will spiral upwards through 2020 and beyond. Healthcare costs per capita in India are predicted to grow significantly faster than gross domestic product per capita. As such, future healthcare needs threaten to increasingly soak up the benefits and resources associated with economic growth, accounting for a large and growing share of the macro economy (see Figure 3).

Fundamental services such as health insurance are underutilized and often unavailable in India. More than 75 percent of India's population is not covered by any form of insurance support.[15] Almost 90 percent of rural populations have no access to medical insurance at all.[16] The burden of paying for healthcare typically falls back to individuals. Millions of people fall into or retreat further into poverty each year due to illness or poor health.[17]

A new model for healthcare in India

Improved wellness, better management of chronic diseases and more uniform well-being of populations across all regions and socio-economic brackets are key objectives for India's healthcare system. To achieve these objectives while addressing rising demand and cost challenges, India requires a new model of healthcare. Based on our research, we propose a model that relies on new technology, including cognitive, cloud, big data and digital; expanded innovation across business models, processes and products; and extensive collaboration across a new ecosystem (see Figure 4).

Technology to influence healthcare value and care delivery

Advances in technology are bringing unprecedented benefits to healthcare in terms of quality, availability and cost. Digitization enables care delivery – including through hospitals – to become significantly more efficient, while at the same time dramatically improving the patient experience.

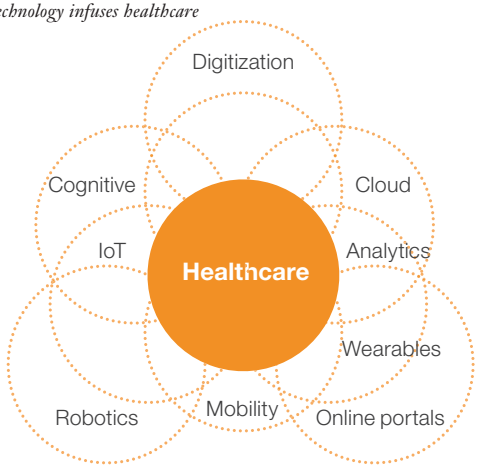
Analytics supports data mining that draws immediate prescriptive and predictive insights from patient data. Cloud provides the platform and supports the ecosystem that gives physicians appreciably better management of information and processes. Remote monitoring removes the constraint of physical proximity, enabling remote consultation and follow-up with specialists. In addition, it acts as a channel for essential healthcare education to help prevent diseases, especially for rural populations.

Figure 4

Technology, innovation and business ecosystems are key to addressing increasing demand and costs

Source: IBM Institute for Business Value India Healthcare Survey 2016

Figure 5
Technology infuses healthcare



Source: IBM Institute for Business Value India Healthcare Survey 2016

The Internet of Things (IoT) facilitates real-time analytics and insights through nanotechnology, wearables and other devices. And cognitive provides an environment that can grant individual physicians easy, usable access to global medical journals and research conclusions (see Figure 5).

Of the healthcare executives surveyed, the most successful in terms of operating efficiency and performance are 193 percent more likely to use digitized business processes. For example, Apollo Hospitals, one of India's largest hospital networks, adopted digital healthcare solutions in its specialty hospital. The digitization process comprised fully electronic medical records that can be accessed anywhere, convenient e-payment systems, an automated medication safety shield and an "I SEE U" feature enabling virtual-patient hospital visits.[18]

The most successful healthcare organizations surveyed are also 50 percent more likely to fully utilize the power of data and analytics. For example, L V Prasad Eye Institute uses advanced analytics and machine learning to tackle eye disease more effectively. As part of this initiative, physicians helped collect patient clinical data from over 120 centers to map geographies and plan for harm reduction as well as eye disease and injury treatment.[19]

Cognitive technologies are enabling healthcare providers to design treatment protocols for improved patient outcomes. Manipal Hospitals, one of India's leading medical providers, is using cognitive computing to aid doctors with better treatment options. With access to the latest research, physicians are making significant strides in oncology, cancer treatment improvements and risk reduction.[20]

Data security is a major concern for over three-quarters of survey respondents. Implementing measures such as data encryption and better data privacy regulations can help allay these fears. Healthcare executives also expressed concern about ensuring a good fit between technology and an organization's business model (see Figure 6).

Innovation to address skills and cost challenges

Embracing innovation enables healthcare providers and the industry as a whole to improve efficiency, conceive new products and services, and introduce better and more productive business and operating models. Many in India cannot afford even basic healthcare. To address this challenge, some organizations are adopting radically innovative practices to provide high-quality, low-cost services to a broader range of patients.

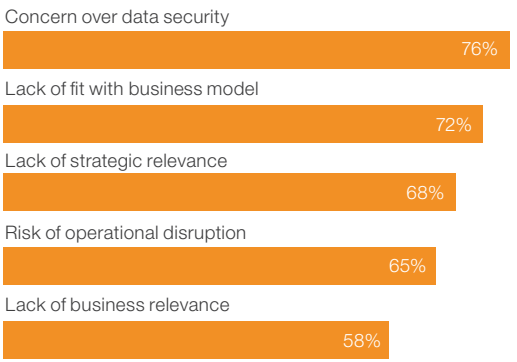
For example, India is home to one-quarter of the world's blind, and every year more than four million Indians develop new cataract issues. Aravind Eye Care System is standardizing end-to-end patient care – from initial diagnosis to surgery, recovery and discharge – with dramatically higher efficiency. Offering no-cost or highly subsidized procedures to the neediest, Aravind Eye Care's doctors each perform 2,000 surgeries per year versus a national average of 400.[21]

The most effective healthcare businesses are conceiving and developing new products that provide better screening, monitoring and treatment options. For instance, Indian healthcare innovator Biosense Technologies has introduced low-cost diagnostic equipment that can screen for anemia without using a needle to draw patient blood. The company has also introduced UChek, a smartphone-based diagnostic system for urine analysis.[22]

According to an IBM Institute for Business Value study on global innovation, Indian executives lag in their innovation efforts compared to their global peers: 28 percent of respondents told us they have no formal processes to manage innovations.[23] Interestingly, executives also reported that their organizations are not prepared to accept failure in innovation or to suitably reward success.[24] Innovating in collaboration with ecosystem partners may be one solution.

Figure 6

Healthcare stakeholders identify key challenges to adopting technology



Source: IBM Institute for Business Value India Healthcare Survey 2016

Business ecosystems to help embrace transformation

Ecosystems provide an economic and business environment for healthcare in which participants – such as hospitals, physicians, insurers, appliance or supporting service providers, governments and patients – can collaborate in new ways to promote better outcomes. Ecosystems offer opportunities for healthcare participants to utilize infrastructure, skills and other capabilities in new, better ways. By promoting collaboration across and beyond the industry, healthcare participants can position themselves to manage innovation more effectively, adopt technology more quickly, enhance agility and improve the patient experience.

Fifty-five percent of India's healthcare executives surveyed report that ecosystems provide a path forward for the global economy. And more than half want to collaborate more with organizations in non-healthcare industries.

Fifty-nine percent of the executives say that ecosystems will help them more effectively identify organizations to partner with, and 60 percent report that ecosystems will help them utilize otherwise inaccessible human skills. Almost fifty percent say ecosystems will help them access new finance sources and promote better organizational alignment.

Although at a formative development stage, new ecosystems are beginning to redefine the way healthcare is organized and delivered in India. For example, Apollo Hospitals has established a collaboration with The Emirates Group airlines to more effectively orchestrate international medical tourism to India. This allows patients and their caregivers to access good quality healthcare facilities cost-effectively.[25]

Healthcare Federation of India (NATHEALTH), a confederation of healthcare stakeholders and the National Association of Software and Services (NASSCOM), a consortium of India's high technology and startup businesses, are partnering to develop new, better and more efficient healthcare infrastructure.[26]

Startups also play a major role in the ecosystem trying to solve core issues in India across healthcare – from medical devices to diagnostics. Practo Technologies, the Bangalore-based healthcare management startup, has successfully developed the largest and most successful healthcare platform in Asia. The platform enables patients to seamlessly connect with over 200,000 doctors, 5,000 diagnostic centers and 10,000 hospitals.[27]

Establishing collaborative ecosystems can accelerate innovation across the healthcare industry. However, the Indian government needs to recognize the possible benefits of dynamic innovation, and address key roadblocks to ecosystem formation and development (see Figure 7).

Figure 7

Indian healthcare executives recognize potential roadblocks to ecosystem participation

Source: IBM Institute for Business Value India Healthcare Survey 2016

What it all means to your organization

Each major stakeholder group in India's healthcare system can take immediate steps to introduce new technologies, accelerate innovation, and create and embrace new business ecosystems.

Healthcare providers

Technology	• Establish a cognitive computing platform to improve the patient experience and provide physicians insights to help them identify personalized, evidence-based treatment options. • Develop an architecture and roadmap to support the adoption of enterprise-wide digital solutions across your hospital. • Apply analytical techniques (such as predictive modeling) to enhance healthcare outcomes, provide patient-centric care, reduce healthcare costs and build patient loyalty.
Innovation	• Encourage, support and leverage innovative healthcare products designed by domestic R&D companies. When possible, co-own product development. • Continuously innovate the design of hospital operations to optimize and efficiently leverage skilled medical professionals. • Adopt unique care delivery models to improve patient satisfaction and enable better treatment outcomes.
Ecosystem	• Create cooperative networks among healthcare ecosystem stakeholders to increase cost savings, enhance patient experiences, improve health insurance penetration and foster innovation. • Expand the reduced-cost treatment base to include a greater number of poor patients, and engage with pharma and medical device organizations to subsidize essential drugs and devices. • Collaborate and invest in dynamic healthcare/medical device start-ups to make healthcare more advanced, accessible and affordable, and to bring products to market faster.

Healthcare payers

Technology	• Use cloud computing to implement low-cost data storage to enhance customer experiences, improve service levels and reduce insurance costs. • Explore blockchain technology to settle transactions faster, increase transparency, lower costs and better detect fraud. • Adopt big data and analytics technologies extensively to manage underwriting and risk functions.
Innovation	• Forge innovative partnerships with other healthcare stakeholders to develop a clear understanding of the latest health and disease patterns. • Develop new approaches to customizing insurance plans, including economically priced disease-specific plans, while managing your organization's risk profile. • Adopt innovative marketing techniques across all channels, including social media, to expand your target-audience base.
Ecosystem	• Collaborate with other healthcare stakeholders to promote preventative healthcare and wellness programs to manage risk profiles of insurers. • Partner with government and healthcare providers in Tier 2 and Tier 3 cities to increase health insurance penetration in semi-urban and rural areas. • Develop education programs with IRDA (Insurance Regulatory and Development Authority) to increase health insurance awareness.

Government

Technology	• Update your IT strategy to support a new business strategy using emerging technologies, such as cloud and cognitive. • Improve efficiency of government-funded programs, such as adoption of primary data collection devices. • Implement technology capabilities at a public-sector hospital level to enhance healthcare outcomes.
Innovation	• Encourage investment in R&D, and remove regulatory hurdles for drug development. • Proactively encourage innovative research among students and faculty in medical colleges and implementation of outcomes in aligned hospitals. • Recognize and reward innovative ideas, partner with the private sector (including pharma companies) to manage innovation efficiently.
Ecosystem	• Create attractive frameworks to encourage private healthcare stakeholders to work with the government, such as sharing data with payers and pharma organizations. • Develop platforms for other stakeholders to collaborate among themselves for efficient exchange of information. • Develop training programs for ancillary healthcare workforce, improve medical education and increase seats in medical colleges to bring more healthcare professionals into the workforce.

Pharmaceuticals

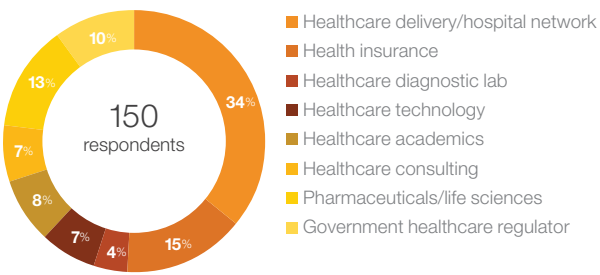
Technology	• Leverage big data and analytics to manage drug lifecycles efficiently and reduce product time to market. • Adopt solutions, such as cognitive, to transform pharmacovigilance operations. • Streamline supply chain operations and manufacturing capabilities to optimize cost of products across bulk drug, intermediate and branded generics markets.
Innovation	• Implement innovative methods and processes to develop synergies between drug manufacturing and the supply chain. • Encourage innovation in R&D activities to come up with more effective drug compositions. • Promote a culture of innovation across the organization by creating a business case for innovation, recognizing and rewarding innovative ideas, and ensuring top management buy in.
Ecosystem	• Collaborate extensively with other life sciences organizations and academia to exchange information and research knowledge. • Proactively create platforms and governance for healthcare stakeholders to share data on disease trends, treatment outcomes and effectiveness of treatment protocols. • Communicate and collaborate among ecosystem stakeholders, using trusted evidence to individualize and improve care delivery to patients.

We invite you to continue the discussion on this topic by joining our blog at **ibm.com**/blogs/insights-on-business/healthcare/

Study approach and methodology

The IBM Institute for Business Value, in collaboration with Oxford Economics, surveyed 150 healthcare professionals in India. Survey conversations occurred in 2016 with over 80 percent of respondents based in Tier 1 cities in India. Healthcare executives comprised eight major roles.

India's healthcare professionals surveyed



For more information

To learn more about this IBM Institute for Business Value study, please contact us at iibv@us.ibm.com. Follow @IBMIBV on Twitter, and for a full catalog of our research or to subscribe to our monthly newsletter, visit: **ibm.com**/iibv.

Access IBM Institute for Business Value executive reports on your mobile device by downloading the free "IBM IBV" apps for phone or tablet from your app store.

The right partner for a changing world

At IBM, we collaborate with our clients, bringing together business insight, advanced research and technology to give them a distinct advantage in today's rapidly changing environment.

IBM Institute for Business Value

The IBM Institute for Business Value (IBV), part of IBM Global Business Services, develops fact-based, strategic insights for senior business executives on critical public and private sector issues.

Authors

Partha Dey is the Healthcare Leader for India and South Asia at IBM. He has over 20 years of experience working with healthcare providers and payers, both in domestic and global markets. Partha can be contacted at parthadey@in.ibm.com.

Madhuri Banda is Senior Managing Consultant and leads IBM Institute for Business Value studies in India. Madhuri has more than 17 years of experience across corporate strategy, consulting and solutioning. Madhuri can be reached at madhuri.banda@in.ibm.com.

Dr. Sumeet Kad is the Global Portfolio Marketing Manager, Healthcare and Life Sciences at IBM. He has over 10 years of marketing and consulting experience in the healthcare industry. He can be contacted at sumeet.kad@in.ibm.com.

Heather Fraser is a pharmacist with over 30 years of industry experience in pharmaceutical R&D, consultancy and community pharmacy. She leads the global Healthcare and Life Sciences team at the IBM Institute for Business Value and can be contacted at hfraser@uk.ibm.com.

Anthony Marshall is Research Director at the IBM Institute for Business Value. Anthony is responsible for directing thought-leadership research on a variety of issues related to the public and private sectors. Anthony can be reached at anthony2@us.ibm.com.

Acknowledgements

The authors would like to thank the following for their support, expertise and contributions: Neha Aggarwal, Abhraneel Sarkar, Pravat Jena, Farhana Nakhooda, Susan Noack, Kristin Fern Johnson, Angela Finley, and the Oxford Economics and IBM Institute for Business Value Research Hub.

Related reports

Fraser, Heather, Dr. Sandipan Sarkar and Dave Zaharchuk. "A booster shot for health and wellness: Your cognitive future in the healthcare industry." IBM Institute for Business Value. September 2015. https://www-01.ibm.com/common/ssi/cgi-bin/ssialias?subtype=XB&infotype=PM&htmlfid=GBE03689USEN&

Patrao, Clifford, Madhuri Banda, Rachna Handa and Anthony Marshall. "Innovating India: In pursuit of global leadership." IBM Institute for Business Value. July 2015. https://www-935.ibm.com/services/us/gbs/thoughtleadership/innovatingindia/

Patrao, Clifford, Madhuri Banda and Anthony Marshall. "Indian Century: Defining India's place in a rapidly changing global economy." IBM Institute for Business Value. August 2015. http://www-935.ibm.com/services/us/gbs/thoughtleadership/indiancentury/

Notes and sources

1 Patrao, Clifford, Madhuri Banda and Anthony Marshall. "Indian Century: Defining India's place in a rapidly changing global economy." IBM Institute for Business Value. August 2015. http://www-935.ibm.com/services/us/gbs/thoughtleadership/indiancentury/

2 "India Pharmaceuticals & Healthcare Report Q3 2015." BMI Research. June 2015.

3 "Indian Consumer Market." India Brand Equity Foundation web site, accessed January 2017. http://www.ibef.org/industry/indian-consumer-market.aspx.

4 "Max Healthcare and GE Healthcare Join Hands to Advance Cancer Care in India." *ETHealthworld*. January 2015. http://health.economictimes.indiatimes.com/news/max-healthcareand-ge-healthcare-join-hands-to-advance-cancer-care-in-india/45980620.

5 "OECD Health Statistics 2014 - Frequently Requested Data." The Organisation for Economic Co-operation and Development (OECD) web site, accessed February 14, 2017. November 2014. http://www.oecd.org/els/health-systems/oecd-health-statistics-2014-frequently-requested-data.htm; "Healthcare." Indian Brand Equity Foundation download, accessed January 25, 2017. January 2017. http://www.ibef.org/download/Healthcare-January-2017.pdf

6 Ibid.

7 Panagariya, Ashok. "The Challenges and innovative solutions to rural health dilemma." National Center for Biotechnology Information. *Annals of Neurosciences.* October 2014. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4248476/

8 "75% of medical devices in India imported." iGOVERNMENT web site, accessed January 25, 2017. December 12, 2013. http://www.igovernment.in/articles/36755/75-of-medical-devices-in-india-imported-report

9 "Medical device regulations in India." Emergo web site, accessed January 25, 2017. http://www.emergogroup.com/services/india/india-medical-device-registration

10 "The World Factbook." Central Intelligence Agency web site, accessed January 25, 2017. https://www.cia.gov/library/publications/the-world-factbook/fields/2226.html

11 Sharma, Dinesh C. "India still struggles with rural doctor shortages." *The Lancet.* December 12, 2015. http://www.thelancet.com/journals/lancet/article/PIIS0140-6736%2815%2901231-3/fulltext?rss%3Dyes

12 Sinhal, Kounteya ."1,333 doctors migrated abroad last year." *The Times of India*. May 14, 2012, http://timesofindia.indiatimes.com/india/1333-doctors-migrated-abroad-last-year/articleshow/13128728.cms

13 Sehgal, Charu, Prateek Goel, Amit Kumar Goyal and Heena Gadhok. "Cardiovascular diseases in India: Challenges and way ahead." International Heart Protection Summit. September 2011. http://www2.deloitte.com/content/dam/Deloitte/in/Documents/life-sciences-health-care/in-lshc-cardio-noexp.pdf

14 Mohan, Sailesh, Srinath Reddy. "Chronic diseases in India: Burden and implications." Swiss Re web site, accessed January 25, 2017. January 2014. http://cgd.swissre.com/risk_dialogue_magazine/Cardiovascular_risks_in_HGM/Chronic_Diseases_in_India_Burden_and_Implications.html

15 Bansal, Samarth. "Health cover: Too little, too scarce." *The Hindu.* September 12, 2016. http://www.thehindu.com/sci-tech/health/policy-and-issues/health-insurance-in-india-too-little-too-scarce-reveal-national-sample-survey-data/article8462747.ece

16 Ibid.

17 "National Health Policy 2015 Draft." Ministry of Health & Family Welfare web site, accessed January 25, 2017. December 2014. http://www.mohfw.nic.in/showfile.php?lid=3014

18 "Apollo opens new digital hospital in Chennai, India." hospital-management.net, accessed January 25, 2017. February 2015. http://www.hospitalmanagement.net/news/newsapollo-digital-hospital-chennai-india-4513753

19 Vijayakumar, N V. "Microsoft India to focus on machine learning and advanced analytics." *Deccan Herald.* January 22, 2016. http://www.deccanherald.com/content/524380/microsoft-india-focus-machine-learning.html; Sangani, Priyanka. "Microsoft helping Indian healthcare providers adapt cloud." *The Economic Times*. April 12, 2016. http://economictimes.indiatimes.com/industry/healthcare/biotech/microsoft-helping-indian-healthcare-providers-adapt-cloud-analytics/articleshow/51786270.cms

20 Sood, Varun. “Manipal Hospitals to tap IBM’s Watson for superior cancer care.” Livemint. December 3, 2015. http://www.livemint.com/Home-Page/AAMu0uSleyjDLJyVBAGT7I/Manipal-Hospitals-to-tap-IBMs-Watson-for-superior-cancer-ca.html; Ahmed, Tanveer. “Bringing cognitive computing to healthcare in the developing world.” LinkedIn web site, accessed January 25, 2017. January 9, 2015. https://www.linkedin.com/pulse/bringing-cognitive-computing-healthcare-developing-world-ahmed

21 Ehrbeck, Tilman, Nicolaus Henke and Thomas Kibasi. “The emerging market in health care innovation.” McKinsey and Company web site, accessed January 25, 2017. May 2010. http://www.mckinsey.com/industries/healthcare-systems-and-services/our-insights/the-emerging-market-in-health-care-innovation; Karmali, Naazneen. “Aravind Eye Care’s Vision for India.” *Forbes*. March 5, 2010. http://www.forbes.com/global/2010/0315/companies-india-madurai-blindness-nam-familys-vision.html

22 Kaushik, Preetam. “Low-cost Innovation May Transform India’s Healthcare Industry.” *Business Insider India*. May 16, 2014. http://www.businessinsider.in/Low-cost-Innovation-May-Transform-Indias-Healthcare-Industry/articleshow/35202576.cms

23 Ikeda, Kazuaki, Anthony Marshall and Abhijit Majumdar. “More than magic: How the most successful organizations innovate.” IBM Institute for Business Value. April 2016. https://www-935.ibm.com/services/us/gbs/thoughtleadership/morethanmagic/

24 Ibid.

25 “Apollo Hospitals, Emirates join hands to bring Intl patients.” Business Standard. July 14, 2014. http://www.business-standard.com/article/companies/apollo-hospitals-emirates-join-hands-tobring-intl-patients-114071400502_1.html 25

26 “NASSCOM partners with NATHEALTH to focus on developing and optimizing healthcare infrastructure enabled by Technology.” NASSCOM web site, accessed February 23, 2017. http://www.nasscom.in/nasscom-partners-nathealth-focus-developing-and-optimizing-healthcare-infrastructure-enabled-technol

27 Tiwari, Amit. “How To Disrupt An Industry – The Practo Story.” *Tech Story*. September 16, 2015. http://techstory.in/practo/

IBM Corporation
Route 100
Somers, NY 10589

Produced in the United States of America
March 2017

GBE03810USEN-00