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FROM HEARTS TO HIPS

Indiana's Leadership in Medical Devices

BioCrossroads®

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Indiana's medical device industry is one of the state's most valuable economic assets and has made Indiana a nationally recognized leader in the health care sector. The sector employs over 20,000 people, accounting for more than 40 percent of the jobs in the state's life sciences industry,[1] and has propelled Indiana to the fifth largest state in percentage of medical technology industry employment.[2] The industry generates more than $10 billion of annual economic output, and its reach extends far beyond direct employees because of its extensive supply chain and heavy concentration of manufacturing operations.[3]

The industry is extraordinarily productive. In 2010, Indiana's medical device companies manufactured more than $2 billion worth of exports or approximately $100,000 per employee.[4] It also provides high-paying jobs with the average medical device company employee being paid nearly $60,000 annually – more than 56 percent higher than the amount earned by the state's average private sector worker.[5]

As the nation continues to navigate a deep and prolonged recession, Indiana's medical device sector is robust and provides a solid foundation for growth in the decades to come. Key attributes of the sector responsible for this success include:

- **Manufacturing Intensity:** The medical device industry is able to leverage legacy skill sets and expertise resulting from the state's deep roots as a manufacturing powerhouse. This history provides employers with a well-trained employee base and state residents with stable and highly desirable jobs.
- **Statewide Impact:** While some pockets of the state have higher concentrations of employers and jobs than others, the industry is relatively well-distributed throughout Indiana.
- **High-Paying Jobs, Rising Educational Needs:** Indiana's medical device sector provides above-average wages for tens of thousands of residents. Salaries are particularly high given the relatively modest – yet steadily increasing – level of education required for many of the sector's manufacturing jobs. These jobs also span a number of disciplines ranging from advanced engineering, product design and manufacturing to business, regulatory, and sales functions.
- **Highly Diversified:** From complex implantable replacement joints and precision instruments to simpler surgical tools, medical device companies in Indiana develop and manufacture a wide variety of products.

Challenges on the Horizon

While a number of favorable factors continue to contribute to this foundation, the sector also faces clear challenges. The current economic conditions have lowered demand for certain medical devices and have led some companies to modify their business models. Beyond economic challenges, the industry is facing:

- A rapidly changing health care market;
- Tax policies that discourage innovation;
- Increasing regulatory uncertainty;
- A shift both to overseas production as well as an expansion to overseas markets by device manufacturers;
- Technological changes requiring more worker education; and
- An increasingly competitive global device marketplace.

IN 2010, INDIANA MEDICAL DEVICE COMPANIES EXPORTED OVER $2 BILLION OF PRODUCTS WORLDWIDE

From Hearts to Hips – Indiana's Leadership in Medical Devices is the first report focused specifically on documenting the size, scope and economic impact of the medical device sector within Indiana. Compiled through a review of multiple sources of quantitative data, a survey of the state's medical device enterprises, and interviews with industry executives, this report provides baseline data on the sector and places it in national perspective. The report concludes with a summary of current and future challenges facing Indiana's substantial share of this increasingly global industry.

A Growing National Industry

Medical devices are a highly diverse class of products that provide benefits to all patients, from those facing highly complex health care challenges to those needing basic care. A medical device can be as simple as a bandage or as complex as an implantable electronic device such as a cardiac pacemaker. Medical device manufacturers produce health care products and supplies for diagnostics, surgery, patient care, and laboratories.[6] Examples of medical device products include:

- Dental instruments and orthodontics;
- Diagnostic products such as blood glucose testing strips and larger testing equipment for hospital and laboratory use;
- Orthopedic implants and devices;
- Surgical supplies and instruments; and
- Vascular stents and other implantable devices used in cardiac procedures.

The United States is the world's single largest medical device market with $138 billion in revenues annually, representing nearly 45 percent of all global medical device market revenue.[7] Within the U.S., the medical device and equipment sector represents the second-largest component of the U.S. bioscience sector, operating nearly 15,000 facilities nationwide and providing nearly a half million jobs in 2008.[8] Even in the midst of a weakening economy, the U.S. medical device sector has grown steadily since 2004, with an annual growth rate of 1.5 percent.[9]

Indiana as a National Leader

Indiana is a leader in medical device-related employment, with a diverse set of major companies such as Biomet, Boston Scientific, Cook Medical, DePuy, Medtronic, Roche Diagnostics, and Zimmer headquartered and/or maintaining major operations in the state. Indiana medical device companies produce orthopedic, cardiovascular, diagnostic and urological products utilized by patients and clinicians throughout the world.

According to a 2010 study, Indiana held the fifth highest percentage of medical technology industry jobs of the 50 states[10] and is 2.2 times more specialized in medical devices than the national average.[11] Additionally, Indiana is one of only eight states that gained a significant number of medical device industry jobs (more than 1,000) from 2001-2008.[12]

From a regional perspective, Indianapolis is the 15th largest metropolitan statistical area (MSA) in terms of medical device sector employment in the country. Bloomington has the most medical device workers of any small MSA in the United States,[13] and Warsaw remains the global hub of the orthopedic industry.

The economic output of Indiana's medical device sector was $6.2 billion in 2009.[14] This economic impact is far greater when extended beyond direct employment to the supply chain and ancillary jobs. This "ripple effect" is substantial, leading to a total medical device-related economic output of over $10 billion in 2009.[15]

COOK MEDICAL SELLS OVER 15,000 PRODUCTS AROUND THE WORLD

Why Indiana?

BioCrossroads recently carried out a survey of Indiana's medical device companies on their operations, future business prospects and views on the industry. Respondents were asked to choose only the single most important factor for each category and the data below are indicative of relative importance as compared to the choices allowed.

Low-operating costs, low taxes and access to an experienced workforce are the top reasons why medical device companies choose to call Indiana home.[16] In evaluating the state's major strengths, 45 percent of BioCrossroads survey respondents cited proximity to higher education institutions; 41 percent identified access to qualified labor; 27 percent noted the competitive labor costs; and 23 percent recognized the impact of lower state and local taxes.[17]

Through a series of interviews with industry leaders, respondents cited a number of benefits with the most frequent responses including a logistics network that facilitates finished product distribution, proximity to suppliers, and access to well-trained employees.

"Indiana has a great labor pool, a strong life sciences focus, outstanding manufacturing, and production outsourcing capabilities, a community that is very supportive, and strong university involvement," said Jim Pearson, President & CEO of NICO Corporation in Indianapolis.

"Indiana is the most manufacturing-intensive state in the country. Our state also has a favorable policy environment for manufacturing and the central location in the country is a competitive advantage," added Dan Peterson, Vice President-Industry and Government Affairs for Cook Group.

Dr. Bruce Molitoris, Director, Division of Nephrology, Indiana University School of Medicine, who has founded two start-up life sciences companies based on technology developed at the School of Medicine, noted the impact of Indiana's 21st Century Fund for commercialization of emerging companies, as well as the funding and assistance provided by BioCrossroads. "Those two things from a state perspective were critical and extremely important early on in the evolutionary period," he said.

Molitoris also lauded the engineering schools at Purdue University and the Rose-Hulman Institute of Technology, and noted that the state possesses a high number of well-qualified CEO candidates, such as managers and retirees from the region's large companies.

At the same time, operating in Indiana is not without challenges. For example, while many interviewees praised the state's logistics network, they also were critical of commercial aviation challenges, particularly for people traveling to and from international locations. "No direct international flights from Indianapolis means we often don't host global meetings here," said Wayne Burris, Chief Financial Officer of Roche Diagnostics.

Molitoris noted that the Midwest geography can pose a challenge to collaboration, particularly when compared to companies operating on the coasts that have high concentrations of scientists and physicians and that operate in a more integrated manner.

And, while multiple generations of workers have been employed in the industry, there is concern that Hoosiers must do more to meet the rising standards of the technical aptitude required by many of these jobs. Importing those skills may not be a simple solution either. Many of those interviewed said attracting talent to the state from other locations is difficult, though the region's generally lower cost of living and high quality of life were held up as effective recruiting tools once people visit the state.

Attraction and Expansion of the Industry

Indiana's medical device industry continues to grow through local company expansions and the attraction of new companies to the state. From 2005-2010, the Indiana Economic Development Corporation reports that Indiana obtained an estimated 4,300 medical device and equipment job commitments and approximately $433 million of projected capital investment.[18] Companies announcing major expansions included Beckman Coulter, Biomet, Cook Medical and Zimmer.

Indiana's Medical Device Workforce

As noted above, the medical device sector is the largest single component of the Indiana life sciences industry, with its more than 20,000 employees accounting for over 40 percent of all life sciences jobs.[19]

According to a recent nationwide industry study, each medical technology job generates an additional 1.5 jobs within their state.[20] Additionally, each medical technology payroll dollar generates an additional $0.90 in earnings within the state, and each dollar of medical technology sales generates an additional $0.90 in sales activity.[21] In Indiana, it is estimated that the over 20,000 medical device jobs give rise to an additional 28,800 jobs, for a total employment impact of approximately 50,000 jobs related to the medical device sector.[22]

"The value of the jobs in this sector cannot be overstated," said David Floyd, CEO of OrthoWorx, a Warsaw-based industry and community initiative to advance and support growth and innovation within northern Indiana's uniquely concentrated, globally significant orthopedics device sector. "These positions are coveted elsewhere. The state of Indiana and our country should go to great lengths to preserve and grow them."

THE MEDICAL DEVICE INDUSTRY DIRECTLY EMPLOYS OVER 6,800 WORKERS IN WARSAW, INDIANA

From 2002-2009, 8,807 new jobs were added within Indiana's life sciences industries – a growth rate of over 21 percent – at a time when Indiana lost over 147,000 private sector jobs or six percent of its private sector workforce.[23] Of the 8,807 new life sciences-sector jobs added, 5,612 were in the medical devices and equipment sector.[24]

High-Paying and Increasingly Complex Jobs

Indiana's medical device sector jobs are high-paying. The average annual salary for medical device sector employees is nearly $60,000, which is more than 56 percent greater than the state average for private sector jobs.[25]

Currently, many entry-level positions in medical device companies – especially in manufacturing operations – only require a high school degree. According to the BioCrossroads survey, 53 percent of medical device companies require a high school diploma for production jobs compared to 31 percent of other life sciences companies.[26] But a high school degree alone is rapidly becoming insufficient.

"Generations of workers have grown up in the industry, but that heritage is a diminishing advantage as the jobs have become more technical," said David Floyd of OrthoWorx. "Most manufacturing jobs require advanced math and training beyond high school, which marks a change from hand work to automation and robotics."

"There is an increasing demand for experienced engineers in the biomedical, mechanical, electrical, and manufacturing areas," added Christine Cook, Chief Operating Officer of Catheter Research, Inc. "When we are looking for resources, many of the resumes we receive come from applicants with backgrounds in other industries, and often do not fit our needs."

The need for more highly educated and skilled workers is fostering several collaborations and partnerships between industry and the Indiana higher education sector that will be discussed further in this report.

ROCHE DIAGNOSTICS OPERATES THE ONLY U.S.-BASED MANUFACTURING FACILITY FOR GLUCOSE MONITORING STRIPS IN INDIANAPOLIS

Manufacturing Products Throughout the State

The medical device industry produces a diverse set of products in the state ranging from commodity products like bandages to highly-advanced implantable and precision-engineered devices. Furthermore, the industry is geographically diverse, extending its reach and positive benefits to all corners of Indiana.

- **The Orthopedics Capital of the World (Warsaw):** Home to three of the world's top five manufacturers of orthopedic devices (Zimmer, DePuy and Biomet) and one-third of the world's orthopedics industry, the Warsaw region enjoys 6,800 medical device industry jobs. These companies manufacture a range of orthopedic devices including artificial knees, hips, and spine products. The city of 14,000 is a strong example of a well-established industry cluster with DePuy's history dating to the 1890s and Zimmer to the late 1920s. Only three (and each, far larger) U.S. regions (Orange County, CA; Los Angeles, CA; and Minneapolis, MN) have more medical device jobs.

- **Cook Group (Bloomington, Spencer, and West Lafayette):** From humble origins in the Bloomington apartment of its founder, Cook Group has become a global manufacturer of medical devices and equipment used in countless medical procedures. Examples of Cook products include catheters for surgical and diagnostic procedures, stents, guidewires, and a tissue-based scaffold to heal wounds.

- **Roche Diagnostics (Indianapolis):** Located in the northeast corner of Indianapolis, Roche Diagnostics produces a number of devices and technologies to diagnose and monitor diseases. Products range from laboratory diagnostic tools to devices that patients with diabetes can use to monitor blood glucose levels.

- **Boston Scientific (Spencer):** One of the largest employers in Spencer, about 55 miles southwest of Indianapolis, Boston Scientific has a long history of developing innovative products, particularly those used to treat a range of urology conditions. A town of only 2,200 residents, Spencer is home to more than 1,500 medical device industry jobs.

Collaboration with Clinicians and Universities

The medical device industry has worked closely with individual clinicians to develop and refine products for many years. Through these active relationships, existing products are often enhanced by incorporating new technologies and materials to better serve patients. This work also spurs innovation as new products are envisioned and developed, which is essential for maintaining a robust pipeline of emerging technologies.

Dr. Bruce Molitoris knows the value of industry and academia collaboration. He has helped develop two companies out of Indiana University's work – Inphoton, which provides contract research services, and FAST, which is developing a technology to better measure kidney function. In addition to providing him with time to develop these ventures, Molitoris noted that the University has given him latitude to do his work without undue restrictions or burdens.

THE MEDICAL DEVICE SECTOR IS 56 TIMES MORE CONCENTRATED IN WARSAW, INDIANA, THAN IN THE AVERAGE U.S. CITY

"The University has to provide a very friendly, cooperative, and exciting place if they are going to be successful," he said. To spur additional successes, Molitoris wants to "maximize the interactions between universities and industry" so all parties will benefit.

While many medical device companies rely upon clinicians as a source of new product ideas, companies are also beginning to partner with Indiana universities and colleges for workforce training (Ivy Tech Community College), research capabilities (Indiana's three major research universities), and specific product development projects (Rose-Hulman Institute of Technology).

Such Indiana-based collaborations are not surprising given the considerable investments that have been made to develop the state's life sciences sector at all levels. Between 2004-2008, Indiana University, Purdue University, the University of Notre Dame, and Ball State University combined spent nearly $3 billion on life sciences research. In addition to the larger research universities, interviewees singled out the efforts of Rose-Hulman and Ivy Tech in developing a well-trained workforce.

"Ivy Tech is a great partner, especially where we each have locations. They are extremely responsive in developing specific education and training programs, such as the regulatory program in Bloomington. They are one statewide institution that can respond to our needs," said Dan Peterson of Cook Group. "As technology changes and devices become more advanced, we're doing more with research-based universities like Indiana University, especially with the Medical School. Translational science work is also on the Cook radar screen." David Broecker, Chairman of Zorion Medical, a medical device start-up, also notes that the state's universities are "starting to become a magnet for medical device activities," calling the institutions "a laboratory of ideas."

Access to Capital

Indiana, like many other Midwest states, faces a considerable challenge in securing private venture capital which is vital to small, young life sciences firms through their first months and years, through the "Valley of Death" and the extensive ongoing financial support necessary prior to getting a product to the marketplace. More recently the state has developed novel public-private partnerships to establish privately

SINCE 2004, OVER $57 MILLION OF VENTURE CAPITAL HAS BEEN INVESTED IN INDIANA MEDICAL DEVICE COMPANIES

managed venture capital funds that balance fiduciary responsibility to their investors with a need to address insufficient private investment available for in-state life sciences firms. While the funding needed to commercialize a medical device is relatively less than other life sciences products such as pharmaceuticals, the cost can still exceed $50 million dollars for a single product. Access to risk-based capital is a key component of successfully bringing a medical device to the market.

Venture Capital Funds

The availability of capital for medical device companies in Indiana has steadily increased over the past decade. Institutional funding available to medical device companies includes the following initiatives.

- **INext Fund:** Organized through BioCrossroads and managed by the Credit Suisse Customized Fund Investment Group, INext is a $58 million capital pool that invests in venture capital firms strategically focused on life sciences. To date, four leading national life sciences venture capital firms – 5AM Ventures, OrbiMed Advisors, SV Life Sciences, and H.I.G. Bioventures – have received funding commitments from the INext Fund.[27]

- **Indiana Future Fund:** A $73 million fund of funds launched by BioCrossroads in 2003, and also managed by the Credit Suisse Customized Fund Investment Group, it seeks to stimulate Indiana's venture capital sector as a ready source of early investment for Indiana's most promising life sciences companies. Thus far, the Indiana Future Fund program has directly invested over $60 million, and brought in an additional $270 million from national venture capital investors into more than 25 Indiana life sciences start-up firms.[28]

- **Indiana Seed Fund:** A $6 million fund managed by BioCrossroads which has invested in 12 early-stage companies, including six medical device companies.[29]

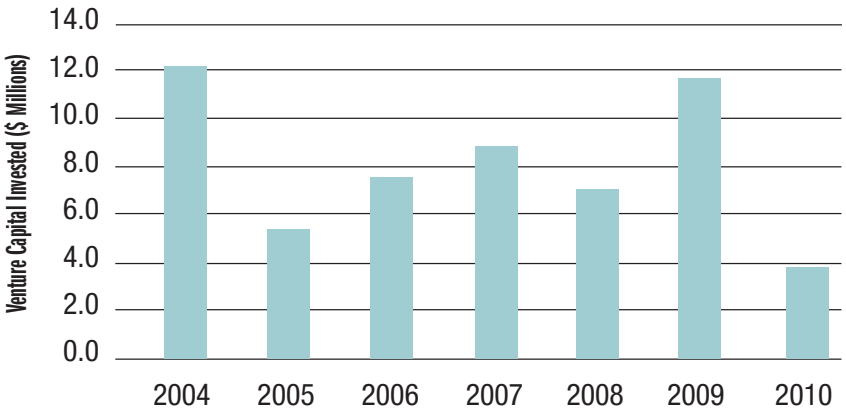
- **Additional Venture and Angel Funds:** Other life sciences-focused venture funds that have established a presence in Indiana since 2002 include Burrill & Co., Pappas Ventures, CHV Partners, HALO Angels, Heron Capital, Spring Mill Ventures, Pearl Street Venture Fund, Main Street Venture Fund, StepStone Advisors, Triathlon Medical Ventures, Indiana University's Innovate Indiana Fund, and Purdue University's Emerging Innovations Fund.[30] Because venture firms increasingly "syndicate" their investments, having multiple funds with operations in Indiana is important to enable firms to start up and grow in the state.

Recent Activity

Indiana's sizeable medical device industry has recently given rise to a number of early-stage companies commercializing orthopedic, cardiovascular and women's health technologies. Since 2004, over $57 million of venture capital has been invested in Indiana medical device companies.[31] Examples include NICO Neuro and Spine (minimally-invasive neurosurgery), SonarMed (emergency breathing intubation), Symbios Medical Products (pain management) and Perfinity Biosciences (mass spectrometry tools). In addition to venture capital investors, several angel networks have funded medical device companies in recent years, and these angels continue to be an important source of early stage capital. Since 2004, medical device start-ups have received more than $22 million from Indiana's 21st Century Fund. This investment has enabled many of these companies to raise additional funding from outside investors.[32]

SINCE 2004, INDIANA'S 21ST CENTURY FUND HAS INVESTED OVER $22 MILLION IN INDIANA MEDICAL DEVICE COMPANIES

Venture Capital Investment in Indiana Medical Device Companies



Source: BioCrossroads Analysis of Thomson Reuters Private Equity data

Suros Surgical Systems (Suros) has been the region's most recent successful venture-funded medical device company. Suros commercialized a minimally invasive interventional breast biopsy technology for biopsy, tissue removal, and biopsy site marking. Funded by angel and venture investors in 2000, Suros was acquired by Hologic, Inc. in 2006 for over $285 million.[33] Former Suros executives went on to found NICO Neuro and Spine, which is based on the same underlying technology as Suros. Suros is an early and important example of a growing number of Indiana management teams that have become serial entrepreneurs.

Significant Ecosystem

Indiana's established orthopedics industry has created an "ecosystem" of suppliers, consultants and experienced employees that support the development of newly-formed companies. For example, more than 20 suppliers and nearly 6,800 orthopedics industry employees in and around Warsaw create a level of product "knowledge" that allows entrepreneurs to access virtually every skill needed to design, develop and commercialize their orthopedics technologies. Orthopediatrics, a start-up company focused on orthopedic devices for children, was able to conceive, design, develop and manufacture devices with expertise resident in the local supply chain. While very much a global industry, significant value has been derived from the proximity of this robust supply chain which allows product development teams to collaborate face-to-face with their outsourcing partners.

A Work in Progress

Even with these considerable in-state efforts since 2002, capital gaps aren't being sufficiently addressed by the private sector, particularly in the early stages of company development as companies strive to achieve proof of concept. Given the relative size and scope of Indiana's medical device industry, the level of venture and angel funding – while improved over the previous decade – trails other states with comparably-sized device sectors. The industry's stakeholders, including companies, academic institutions, state government and supporting organizations will need to continue to do much more to:

- Provide greater access to seed and grant funding;
- Offer support and technical assistance for entrepreneurs;
- Fund and facilitate university technology transfer activities; and
- Encourage early communication between medical device start-up companies and their future customers in the health care community.

Continuing Institutional Investor Interest?

Venture funding for medical device companies – especially early stage investments – is increasingly hindered by regulatory and business uncertainty. Lack of clarity and delays in the FDA's product approval process, uncertainties surrounding product reimbursement, and an impending federal medical device excise tax have caused venture and angel investors to move away from funding medical device companies. In a recent survey by the National Venture Capital Association, more than 42 percent of venture capital firms expect to decrease investments in medical device companies in the upcoming years, with North America bearing the brunt of the burden.[34] Those venture capital firms that are investing in medical devices are investing in fewer early stage companies. To facilitate clinical development in the future, medical device companies will need to seek partnerships with larger companies at an earlier stage – and most likely under less favorable terms – than in the past two decades.

As the preceding section indicates, the medical device sector in Indiana continues to grow despite the national recession and sluggish recovery, albeit at a slower rate than in the previous decade. Looking forward, the industry is well positioned for expansion due to an aging American and global population with complex chronic diseases such as obesity, diabetes, and high blood pressure. However, a number of significant, external challenges threaten the industry's worldwide leadership.

The medical device industry has a longstanding history of consolidation, with development-stage companies maturing into acquisition targets for larger companies.[35] The current economic, regulatory, and global environment may set the stage for large companies to merge and consolidate as they seek to build scale that can help them mitigate these external challenges. Early evidence of this trend shows that the value of merger and acquisition deals for medical device companies in 2010 nearly tripled over those made in 2009.[36] Significant consolidation within the medical device industry could be especially negative for Indiana given the benefits the state derives from multiple corporate headquarters and large manufacturing operations located here.

The following section of this report examines several of the external challenges the industry is facing.

A Rapidly Changing Health Care Sector & Anti-Innovation Tax Policies

An overwhelming 90 percent of the medical device companies surveyed identified uncertainties surrounding implementation of the Patient Protection and Affordable Care Act ("PPACA," Public Law 111-148) and concerns about increased government regulation as top issues for their businesses over the next five years.[37] In particular, the respondents flagged the federal medical device tax, included in PPACA to help pay for other portions of the law, as a major problem that will harm their companies.

"The device tax is a huge threat," said Dan Peterson of Cook.

PPACA established a new excise tax of 2.3 percent on the sale of medical devices by manufacturers, producers, or importers to offset costs of the health reform law. The tax will apply to sales made after December 31, 2012 and will raise $20 billion over a 10-year period. Products such as eyeglasses, contact lenses, hearing aids, and any device that is generally purchased by the public at retail for individual use are exempt from this provision, but the tax will apply to the vast majority of medical devices manufactured in Indiana.

During Congressional debate on the bill and following its enactment, medical device companies and trade associations have raised concerns that the tax will hinder patient access to safe, affordable, and innovative medical technologies. In addition to slowing

product innovation and patient access to new products, recent studies have shown that the tax will have a negative impact on device sector employment nationwide and in Indiana.

According to a recent study, the medical device tax could cost more than 43,000 jobs and reduce pay for sector workers by more than $3.5 billion nationwide.[38] The study also found that the medical device excise tax will roughly double the total tax bill of American medical device companies and raise their average effective corporate income tax rate to one of the highest levels faced by any industry in the world.[39] The study notes that as a result of this tax, U.S. manufacturers will be more likely to close plants in this country and replace them with plants in foreign countries.[40]

The medical device tax will be particularly distressing to states like Indiana where the device industry is a key sector and economic driver. The 2.3 percent excise tax coupled with an associated 10 percent shift in production offshore could lead to the elimination of 2,124 medical device sector jobs in Indiana alone.[41]

"Our Company will not be able to invest as many resources in areas such as new product development, technology, and training as the new device tax will decrease our profitability. We will also be forced to make difficult decisions regarding employee pay and benefits," said Christine Cook of Catheter Research, Inc.

David Floyd of OrthoWorx added that, if left in place, "the medical device tax will likely force decisions to reduce investments in the United States and potentially move manufacturing operations offshore."

Regulatory Uncertainty

A historically high level of regulatory uncertainty is another major concern for Indiana medical device companies. Sixty-one percent of venture investment firms have cited U.S. Food and Drug Administration (FDA) regulatory challenges as having the greatest impact on investment decisions.[42] Sector respondents believe these challenges are primarily rooted in an imbalance in how the agency weighs the benefits and risks of a specific therapy and to increased overall unpredictability at the FDA.

For medical device start-up companies, the path forward is increasingly long, uncertain, and expensive. Compared to a decade ago, medical device companies are less likely to attract the interest of venture capital investors. Longer review times and increased data requirements by the FDA – coupled with less certainty as to how those products will be paid for in the marketplace – have led investors to view the sector with skepticism. The increased risk profile of these new companies has not translated into higher rewards for their early investors. With declining investor interest, company

formation will likely decline.

In a separate university study of medical device companies, 76 percent of companies surveyed chose to bring a specific device to market first outside of the U.S. primarily because of the heavy regulatory burden. Of the respondents, 22 percent blamed the high cost of conducting clinical trials in the U.S. and 14 percent cited quicker and simpler regulatory processes outside of the U.S.[44] Nearly all of the remaining companies that chose to bring a product to market initially outside of the U.S. said they did so because of unpredictable requirements within the 510(k) approval process.[45] In written testimony submitted to a Congressional hearing in October 2011 in Indianapolis, Cook Group Chairman Steve Ferguson noted that "Just a few years ago, 100 percent of our technologies were introduced to market in the U.S. Today, nearly 100 percent are introduced internationally then brought back to the U.S."

ACCORDING TO BATTELLE, INDIANA IS RANKED 3RD IN THE UNITED STATES IN THE CONCENTRATION OF MEDICAL DEVICE INDUSTRY EMPLOYMENT

Dan Peterson of Cook added, "We need the best regulatory system, but that doesn't mean the slowest. It ought to be the world standard for getting safe and effective products to patients. Many major technologies are now introduced outside the U.S., but it used to be the other way around."

510(k) Reform

Approximately one-third of all medical devices entering the market go through the 510(k) clearance process, which is used by the FDA to clear for marketing those devices that are similar to existing products on the market.[46] More than 80 percent of medical devices manufactured in Indiana are cleared through this process, making 510(k) reform a top-tier policy issue for the sector. In recent years, there has been heightened interest in the effectiveness of the 510(k) clearance process as it relates to both the safety and efficacy of medical devices. Many in the device industry have raised concerns that FDA's recent approach to the 510(k) process has created regulatory uncertainty, has been overly burdensome, and has delayed patient access to enhanced products.

In September 2009, the FDA launched a comprehensive assessment of the 510(k) clearance process. Sixteen months later, in January 2011, after reviewing extensive public comment, the agency announced a set of actions it would take to strengthen the process. Beyond these near-term steps, FDA requested an independent evaluation by the Institute of Medicine (IOM) of seven key recommendations before making a final decision on their implementation.

In July 2011, the IOM published its report and somewhat surprisingly recommended that rather than continuing to adapt the well-established 510(k) process, the FDA

should instead develop a new integrated pre- and post-market regulatory framework. FDA has responded that the 510(k) process should not be eliminated, and the agency continues to look at additional proposals for improving device review. Several Members of Congress have responded by introducing related legislation, and the 510(k) clearance process and related issues are expected to be debated heavily as Congress reauthorizes the Medical Device User Fee and Modernization Act in 2012.

Actions impacting the 510(k) process will have a substantial impact on the Indiana medical device sector. During the 15-year period from 1995-2010, Indiana companies filed the 10th highest number of FDA medical device applications of any state in the nation.[47] Of the 2,226 applications in this timeframe, 1,821 or more than 80 percent were processed through the 510(k) clearance process.[48]

Retaining a Skilled Workforce

Indiana's manufacturing concentration is a major strength for the state's medical device industry. As technologies change and the industry becomes more reliant on highly skilled workers, Indiana's workforce must keep pace to remain competitive domestically and globally. Doing so will require even stronger commitments from higher education institutions across their education and research capabilities.

Currently, a significant number of medical device jobs require only a high school degree to work in the manufacturing operations of these companies. As the products become ever more complex, the employees of these companies will require additional skills and training. In fact, most expect that workers with an Associate's or Bachelor's degree also will need industry-specific training. In the BioCrossroads survey of Indiana medical device companies, approximately 40 percent of the companies noted that their employees will need additional training to stay abreast with changes in the industry.[49]

"For research and development, we will be focused on engineering, chemistry and biochemistry and have more of a need for bioinformatics, especially around FDA requirements. On the commercial side, we'll need people with general business degrees and, on the marketing side, people with e-marketing and social media skills," said Wayne Burris with Roche Diagnostics.

Others said there is a similar need for workers able to help navigate the challenging regulatory environment both domestically and in international markets. The rapidly evolving health care delivery and insurance markets will drive rising demand for professionals who are deeply skilled in these areas.

Increasing Global Competitiveness

While the United States maintains its leading role in device manufacturing, Europe and Japan are not far behind and demand is rising rapidly in Asia and Brazil.[50] Many nations leverage their regulatory environment to enable companies to do business within their borders. For example, Europe approves many devices in roughly half the time it takes the FDA to do so, and China is implementing regulatory reforms in order to build a presence in the medical device industry.[51] With an increasing number of companies looking to non-U.S. markets to launch their products rather than relying on a less predictable U.S. regulatory system, this issue warrants urgent attention.

SPENCER, INDIANA, WITH A POPULATION OF 2,200 IS HOME TO OVER 1,500 MEDICAL DEVICE JOBS

For example, Asia is home to a burgeoning dental device industry that threatens to overtake U.S. competitors. According to one analysis, growth in the Asian and Pacific dental device industry has resulted in a 25 to 30 percent decline in U.S. development of posterior crown implants as domestic manufacturers are forced to lower prices to remain competitive.[52] While western nations continue to dominate manufacturing of high-precision implants, that market is relatively small compared to the crowns and dentures segments.

In addition, the increase in the number of super-specialty hospitals and diagnostic centers in Asia has triggered the demand for high-technology medical devices. This rising demand, together with the relaxed regulatory environments and declining import duties in Asian and Pacific nations, is increasingly the impetus for cross border mergers and acquisitions.[53]

Indiana's medical device industry is a cornerstone of the state's life sciences sector and of the state's economy as a whole. The companies in this sector provide high-paying jobs across the state and leverage the region's manufacturing legacy. Moreover, the industry supports a host of suppliers, distributors, and specialized vendors that, taken together, produce a sizeable and positive ripple effect.

As this report illustrates, the sector has become well diversified, helping insulate it from vulnerabilities or declines in specific sub-sectors. The industry's reach extends across Indiana, the nation, and around the globe through strategic collaborations with clinical, academic, and technical partners.

At the same time, however, this report has enumerated a number of looming and significant challenges that, if unaddressed, will significantly weaken the sector and the state's economy as a whole. Issues range from the need for better training for the next generation of employees to external threats such as the medical device tax, regulatory barriers, and emerging global competitors. Further, these challenges could hasten device sector consolidation that poses a threat to small and medium-sized medical device companies and their thousands of employees across Indiana.

It is important that the medical device industry, along with partners in the public and private arenas, take action to address these challenges in a strong and unified manner. Failure to do so risks one of the state's most important industries for today and the future. Efforts to combat some of the challenges are in progress, and continual monitoring of the ever-changing landscape will enable companies and their partners to stay ahead of the game.

Indiana's deep medical device entrepreneurial roots and its robust industry have helped the region, its business, and its citizens to weather a deep economic downturn and sluggish recovery better than many other areas. The continued success of this sector will advance a healthier economy – and healthier citizens – for Indiana's future as a center of medical technology innovation, production and growth.

Indiana's 25 Largest Medical Device Companies (Employment)

Company	City
Advantis Medical	Greenwood
American Renolit	La Porte
AO Safety	Plymouth
Beckman Coulter	Indianapolis
Biomet	Warsaw
Boston Scientific	Spencer
C&A Tool Engineering	Churubusco
Cook Group	Bloomington
DePuy	Warsaw
EHOB	Indianapolis
Fort Wayne Metals	Fort Wayne
Helmer	Noblesville
Heraeus Kulzer	South Bend
Hologic	Indianapolis
King Systems	Noblesville
Medtronic	Warsaw
Micropulse	Columbia City
Paragon Medical	Pierceton
Point Medical	Crown Point
Quadrant	Fort Wayne
Roche Diagnostics	Indianapolis
Smiths Medical	Gary
Symmetry Medical	Warsaw
TP Orthodontics	Westville
Zimmer	Warsaw

BIBLIOGRAPHY

[1]Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002-2010*, June 2011.

[2] Lewin Group, *State Economic Impact of the Medical Technology Industry*, June 2010.

[3] Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002-2010*, June 2011.

[4] Analysis by BioCrossroads of 2010 data from Wiser Trade database.

[5] Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002-2010*, June 2011.

[6] Battelle/BIO, *State Bioscience Initiatives 2010*, May 2010.

[7] Kalorama Information, *Global Market for Medical Devices*, April 2011.

[8] Battelle/BIO, *State Bioscience Initiatives 2010*, May 2010.

[9] Ibid.

[10] Lewin Group, *State Economic Impact of the Medical Technology Industry*, June 2010.

[11] Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002-2010*, June 2011.

[12] Battelle/BIO, *State Bioscience Initiatives 2010*, May 2010.

[13] Ibid.

[14] Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002-2010*, June 2011.

[15] Ibid.

[16] BioCrossroads Survey Data: Question 4.

[17] BioCrossroads Survey Data: Question 5.

[18] Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002-2010*, June 2011.

[19] Ibid.

[20] Lewin Group, *State Economic Impact of the Medical Technology Industry*, June 2010.

[21] Ibid.

[22] Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002-2010*, June 2011.

[23] Ibid.

[24] Ibid.

[25] Ibid.

[26] BioCrossroads Survey Data: Question 13.

[27] Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002-2010*, June 2011.

[28] Ibid.

[29] Ibid.

[30] Ibid.

[31] BioCrossroads Analysis, Thomson Reuters Private Equity data. Data, 2004 – 2010.

[32] BioCrossroads Analysis, Indiana's 21st Century Fund, 2005–2010.

[33] Walter H. Plosila, Ph.D., *Indiana's Life Sciences Industry: 2002–2010*, June 2011.

[34] National Venture Capital Association (NVCA), *MedIC Vital Signs Report*, October 2011.

[35] SCRIP Business Insights, *Mergers and Acquisitions in the Medical Device Industry*, August 2011.

[36] Ibid.

[37] BioCrossroads Survey Data: Question 18.

[38] Diana Furchtgott-Roth and Harold Furchtgott-Roth, *Employment Effects of the New Excise Tax on the Medical Device Industry*, September 2011.

[39] Ibid.

[40] Ibid.

[41] Ibid.

[42] National Venture Capital Association (NVCA), *MedIC Vital Signs Report*, October 2011.

[43] Northwestern University Institute for Health Technology Studies, *A Comprehensive Analysis of the FDA 510(k) Process: Industry Practice and the Implications for Reform*, 2011.

[44] Ibid.

[45] Ibid.

[46] Institute of Medicine, *Medical Devices and the Public's Health: The FDA 510(k) Clearance Process at 35 Years, Report*, July 2011.

[47] Indiana Business Research Center Analysis; FDA.gov website.

[48] Ibid.

[49] BioCrossroads Survey Data: Question 14.

[50] Milken Institute, *The Global Biomedical Industry: Preserving U.S. Leadership*, September 2011.

[51] Ibid.

[52] Ibid.

[53] SCRIP Business Insights, *Mergers and Acquisitions in the Medical Device Industry*, August 2011.

Indiana Medical Device & Equipment Companies

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