

Radio Frequency Identification (RFID) in Pharmaceuticals - Supply Chain Security Concerns Provide Impetus for RFID Adoption

Reference Code: **GBIHC013MR**

Publication Date: **February 2010**

RFID is the most promising solution available to prevent counterfeiting

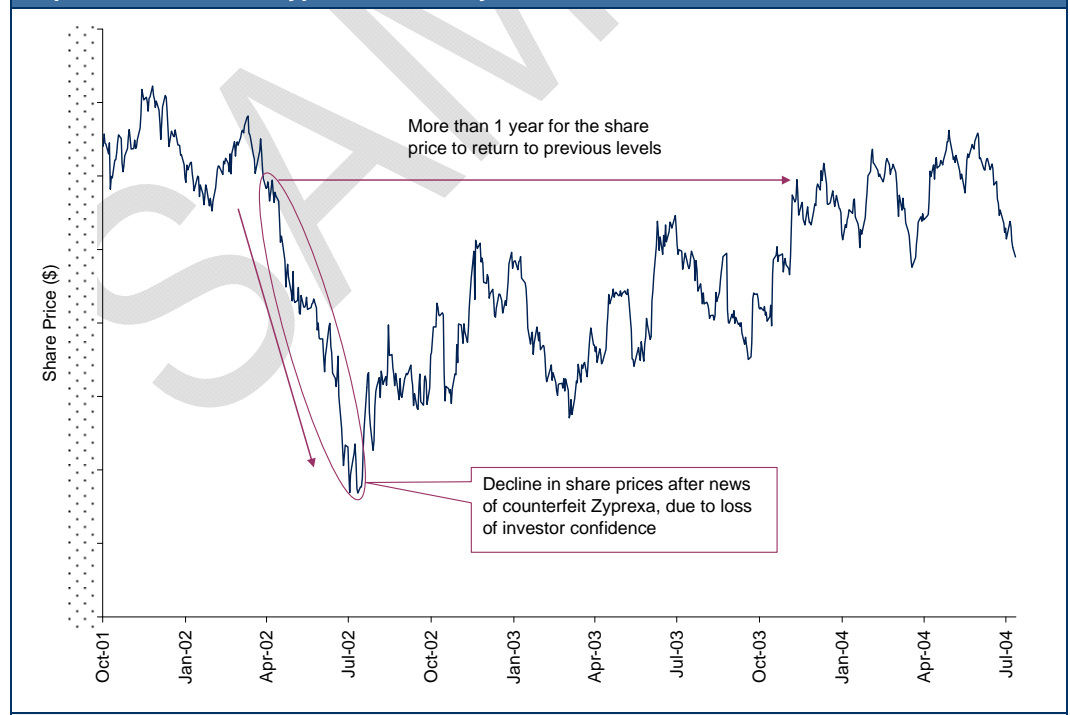
Radio Frequency Identification (RFID) in Pharmaceuticals - Executive Summary

GBI Research's report on the markets for RFID in the pharmaceutical industry provides a comprehensive analysis on the applications of RFID technology in the pharmaceutical supply chain. The market for RFID hardware, software and services is forecast for seven years and the key factors driving or restraining the market are analyzed. Analysis on regulations and mandates provides valuable insights into the key trends that drive the growth of RFID in the pharmaceutical industry.

Pharmaceutical Industry's Pressing Need to Regain Lost Reputation and Revenues Due to Counterfeit Drugs Will Drive the Growth of RFID Market

GBI Research finds that there is a growing need for the pharmaceutical industry to secure their distribution channels from counterfeit drugs. RFID solutions provide the ideal identification method by which pharmaceutical industry can counter fake drug issues. While pharmaceutical companies, distributors and wholesalers are on a continuous look out for these fake drugs, counterfeiters find innovative ways to introduce fake drugs into legitimate supply chains. The use of RFID solutions can avoid the loss of investor confidence and a consequent decline in share prices due to such counterfeiting incidents. Also, increased supply chain security and operational efficiency will help the pharmaceutical industry improve their reputation in the delivery of safe drugs. Hence, increasing concerns over the safety of supply chains and the health of patients have forced companies to think big and adopt RFID solutions. A steady increase in the adoption of RFID hardware, software and services in the pharmaceutical industry is expected to drive the growth of these solutions.

Impact of Counterfeit Zyprexa on Eli Lilly's Share Prices, Oct 2001 – Jul 2004



Source: GBI Research

1 Table of Contents

1	Table of Contents	4
1.1	List of Tables	7
1.2	List of Figures	8
2	Introduction	9
2.1	GBI Research Report Guidance	9
3	Radio Frequency Identification (RFID) in Pharmaceuticals – Overview of the Pharmaceutical Supply Chain	11
3.1	Overview of the Pharmaceutical Supply Chain	11
3.2	Pharmaceutical Supply Chain Models	12
3.2.1	<i>Traditional Wholesaler Model</i>	12
3.2.2	<i>Limited Distribution Model</i>	13
3.2.3	<i>Direct Distribution Model</i>	14
4	Radio Frequency Identification (RFID) in Pharmaceuticals – Overview of RFID Technology	17
4.1	RFID Applications in the Supply Chain	17
4.2	RFID Tags	17
4.2.1	<i>Introduction</i>	17
4.3	RFID Readers	20
4.4	RFID Infrastructure	20
5	Radio Frequency Identification (RFID) in Pharmaceuticals – Unmet Needs in the Pharmaceutical Industry	22
5.1	Counterfeit Problems Due to Unauthorized Secondary Wholesalers	22
5.2	Counterfeit Issues in Parallel Trade	22
5.3	Counterfeit Problems Due to Product Shortages	24
5.4	Counterfeit Problems Due to Repackaging	25
5.5	Counterfeit Introduction in Drug Re-Importation	26
5.6	Markets for Counterfeit Drugs	27
5.6.1	<i>Costs to the Pharmaceutical Industry due to Counterfeiting</i>	32
5.6.2	<i>High Costs Due to Drug Callbacks</i>	34
5.6.3	<i>Operational Inefficiency and Costs in Inventory Management</i>	36
5.6.4	<i>Inaccurate Transactions in Chargeback Management</i>	36
5.6.5	<i>Increasing Cost and High Percentage of Errors in Clinical Trials</i>	36
6	Radio Frequency Identification (RFID) in Pharmaceuticals – RFID as a Solution for the Pharmaceutical Industry	37
6.1	Solutions for the Pharmaceutical Industry	37
6.1.1	<i>E-Pedigree Solutions</i>	37
6.1.2	<i>Track and Trace Solutions</i>	39
6.1.3	<i>Product Callback Management</i>	40
6.1.4	<i>Authentication of Drugs in the Supply Chain</i>	40
6.1.5	<i>Inventory Management</i>	40
6.1.6	<i>Sample Distribution Management</i>	40
6.1.7	<i>Clinical Trial Solutions</i>	41
6.2	Costs of RFID Solutions	41
6.3	Considerations for RFID Implementation	42
6.3.1	<i>Parent-Child Relationship for Choice between HF and UHF Frequencies</i>	43
6.3.2	<i>Pilot Phase Execution</i>	43
6.4	Pharmaceutical Industry's Priorities for RFID Implementation	44
6.4.1	<i>Retailer Mandates for RFID implementation Pushes Pharmaceutical Manufacturers to Adopt RFID Technology</i>	45
6.5	Considerations for Total Enterprise Management	45
6.6	Business Process Reengineering for RFID Implementation	46
6.6.1	<i>Reengineering Packaging Processes</i>	46
6.6.2	<i>Reengineering Tag Placements</i>	46
6.6.3	<i>Slap-and-Ship Applications May Suit Smaller Enterprises</i>	47
6.6.4	<i>Reengineering Site Processes</i>	47

6.7	RFID Implementation and Maximization of Benefit	47
7	Radio Frequency Identification (RFID) in the Pharmaceuticals – Market Characterization....	50
7.1	Market Forecasts for RFID in Pharmaceuticals.....	50
7.2	Technology Adoption Framework for RFID Solutions	52
7.3	Drivers for the Adoption of RFID Solutions.....	54
7.3.1	<i>Increasing Counterfeit Incidents Accentuate the Urgent Need for RFID Implementation</i>	<i>54</i>
7.3.2	<i>Mandates by Drug Retailers and Pharmacies Increases Adoption of RFID systems by Pharmaceutical Manufacturers</i>	<i>54</i>
7.3.3	<i>Harmonization of UHF Standards and the Elimination of Listen before Talk Protocol in Europe is Likely to Spur Growth</i>	<i>55</i>
7.3.4	<i>Pedigree Requirements in the Pharmaceutical Industry will Accelerate RFID Implementation</i>	<i>55</i>
7.4	Barriers for the Adoption of RFID Solutions	55
7.4.1	<i>High Cost of Implementation Raises Concerns over Return on Investment.....</i>	<i>56</i>
7.4.2	<i>Management of Overload in Data Due to Large Scale RFID Implementation is a Challenge</i>	<i>56</i>
7.4.3	<i>High Costs and Time Consumption of Mass Serialization Deters Adoption</i>	<i>56</i>
7.5	SWOT Analysis.....	57
8	Radio Frequency Identification (RFID) in the Pharmaceuticals – Competitive Landscape	58
8.1	Value Chain in the RFID Industry.....	58
8.1.1	<i>Automated Packaging and Tagging Solution Providers</i>	<i>58</i>
8.1.2	<i>Software Solutions Providers</i>	<i>59</i>
8.1.3	<i>Providers of Pilot Kits</i>	<i>59</i>
8.1.4	<i>One-Stop Solution Providers</i>	<i>59</i>
8.2	Pharmaceutical Industry’s Priorities Shape the Growth of RFID Markets	61
8.3	RFID Systems Compete with Cheaper Barcode Systems.....	62
9	Radio Frequency Identification (RFID) in the Pharmaceuticals – Regulatory Landscape	64
9.1	Regulations in the US Encourage RFID Adoption in the Pharmaceutical Industry.....	64
9.1.1	<i>The Prescription Drug Marketing Act of 1987 (PDMA)</i>	<i>64</i>
9.1.2	<i>California Pedigree Legislation’s Deadline has been Postponed on Multiple Occasions Due to the Challenges Faced in RFID Implementation.....</i>	<i>64</i>
9.2	Regulations in Europe are not yet Favorable for Rapid RFID Adoption	65
9.2.1	<i>Code Structures for Unique Identification Differ across European Countries</i>	<i>65</i>
9.2.2	<i>Harmonization of Regulations for UHF in Europe is Expected to Increase Adoption ..</i>	<i>65</i>
10	Radio Frequency Identification (RFID) in Pharmaceuticals - Case Studies	67
10.1	Case Study: RFID implementation in Direct-to-Pharmacy Distribution Channel	67
10.2	Pfizer.....	68
10.2.1	<i>Challenge</i>	<i>68</i>
10.2.2	<i>Solution.....</i>	<i>68</i>
10.3	GlaxoSmithKline.....	68
10.3.1	<i>Challenge</i>	<i>68</i>
10.3.2	<i>Solution.....</i>	<i>68</i>
10.4	Purdue Pharma	69
10.4.1	<i>Challenge</i>	<i>69</i>
10.4.2	<i>Solution.....</i>	<i>69</i>
11	Radio Frequency Identification (RFID) in the Pharmaceutical Industry – Company Profiles..	70
11.1	Alien Technology.....	70
11.2	Avery Dennison.....	71
11.3	Blue Vector.....	72
11.4	Hewlett-Packard.....	73
11.5	International Business Machines (IBM) Corporation	74
11.6	Intermec, Inc.	75
11.7	Motorola, Inc	76
11.8	Siemens	77

11.9	SupplyScape	78
11.10	SureID	79
11.11	TAGSYS Inc.....	80
11.12	Texas Instruments.....	81
11.13	Toshiba Tec	82
11.14	UPM Raflatac	82
11.15	VeriSign.....	83
11.16	Zebra Technologies Corporation.....	84
12	Appendix.....	86
12.1	Market Definitions	86
12.2	Abbreviations	86
12.3	Research Methodology	87
12.3.1	Coverage.....	88
12.3.2	Secondary Research	88
12.3.3	Primary Research.....	89
12.3.4	Expert Panel Validation	89
12.4	Contact Us	89
12.5	Disclaimer	89

SAMPLE

1.1 List of Tables

Table 1:	RFID in Pharmaceuticals, Share of Parallel Imports in Pharmacy Sales (%), 2007	24
Table 2:	RFID in Pharmaceuticals, Number of Counterfeiting Cases Opened by the US FDA, 1997-2006	28
Table 3:	RFID in Pharmaceuticals, Number of Counterfeit Cases Reported in Europe, 2006-2008	29
Table 4:	RFID in Pharmaceuticals, Number of Counterfeit Medicines Seized in Europe, 2006-2008	30
Table 5:	RFID in Pharmaceuticals, Share of Counterfeit Drugs Seized in Europe by Country of Origin, 2006-2008	31
Table 6:	RFID in Pharmaceuticals, Number of Drug Callbacks in the US, 1997-2007	34
Table 7:	RFID in Pharmaceuticals, Global, Revenues (\$m), 2008-2015	50
Table 8:	RFID in Pharmaceuticals, Alien Technology, 2010	70
Table 9:	RFID in Pharmaceuticals, Avery Dennison, 2010	71
Table 10:	RFID in Pharmaceuticals, Blue Vector, 2010	72
Table 11:	RFID in Pharmaceuticals, Hewlett-Packard, 2010	73
Table 12:	RFID in Pharmaceuticals, International Business Machines (IBM) Corporation, 2010	74
Table 13:	RFID in Pharmaceuticals, Intermec, Inc, 2010	75
Table 14:	RFID in Pharmaceuticals, Motorola, Inc, 2010	76
Table 15:	RFID in Pharmaceuticals, Siemens, 2010	77
Table 16:	RFID in Pharmaceuticals, SupplyScape, 2010	78
Table 17:	RFID in Pharmaceuticals, SureID, 2010	79
Table 18:	RFID in Pharmaceuticals, TAGSYS, Inc, 2010	80
Table 19:	RFID in Pharmaceuticals, Texas Instruments, 2010	81
Table 20:	RFID in Pharmaceuticals, Toshiba TEC, 2010	82
Table 21:	RFID in Pharmaceuticals, UPM Raflatac, 2010	82
Table 22:	RFID in Pharmaceuticals, VeriSign, 2010	83
Table 23:	RFID in Pharmaceuticals, Zebra Technologies Corporation, 2010	84

1.2 List of Figures

Figure 1:	RFID in Pharmaceuticals, Structure of a Traditional Distribution Channel	13
Figure 2:	RFID in Pharmaceuticals, Structure of a Limited Distribution Channel	14
Figure 3:	RFID in Pharmaceuticals, Structure of a Direct-to-Pharmacy Distribution Channel	16
Figure 4:	RFID in Pharmaceuticals, Components of an RFID System	17
Figure 5:	RFID in Pharmaceuticals, Classification of RFID Tags	18
Figure 6:	RFID in Pharmaceuticals, Comparison of Passive and Active Tags	18
Figure 7:	RFID in Pharmaceuticals, Comparison of Radio Wave Frequencies	19
Figure 8:	RFID in Pharmaceuticals, Communication in an RFID Infrastructure.....	21
Figure 9:	RFID in Pharmaceuticals, Counterfeit Intrusion in Parallel Trade	23
Figure 10:	RFID in Pharmaceuticals, Share of Parallel Imports in Pharmacy Sales (%), 2007	23
Figure 11:	RFID in Pharmaceuticals, Counterfeit Intrusion Due to Product Shortage	25
Figure 12:	RFID in Pharmaceuticals, Counterfeit Intrusion Due to Repackaging	26
Figure 13:	RFID in Pharmaceuticals, Number of Counterfeiting Cases Opened by the US FDA, 1997-2006	27
Figure 14:	RFID in Pharmaceuticals, Number of Counterfeit Cases Reported in Europe, 2006-2008	29
Figure 15:	RFID in Pharmaceuticals, Number of Counterfeit Medicines Seized in Europe, 2005-2008	30
Figure 16:	RFID in Pharmaceuticals, Share of Counterfeit Drugs Seized in Europe by Country of Origin, 2006-2008	31
Figure 17:	RFID in Pharmaceuticals, Share of Counterfeits in Pharmaceutical Markets, 2008.....	32
Figure 18:	RFID in Pharmaceuticals, Impact of Counterfeit Zyprexa on Eli Lilly's Share Prices, Oct 2001 – Jul 2004.....	33
Figure 19:	RFID in Pharmaceuticals, Impact of Combivir Counterfeiting on GlaxoSmithKline's Share Prices, May 2001- May 2004	33
Figure 20:	RFID in Pharmaceuticals, Number of Drug Callbacks in the US, 1997-2007.....	34
Figure 21:	RFID in Pharmaceuticals, Impact of Vioxx Withdrawal on Merck's Share Prices, Apr 2003- Oct 2006	35
Figure 22:	RFID in Pharmaceuticals, e-Pedigree in a Pharmaceutical Supply Chain	37
Figure 23:	RFID in Pharmaceuticals, Paper Based Pedigree in a Pharmaceutical Supply Chain	38
Figure 24:	RFID in Pharmaceuticals, Information Flow in Track-and-Trace Applications.....	39
Figure 25:	RFID in Pharmaceuticals, Costs of Implementation in Distribution Channels, 2008	41
Figure 26:	RFID in Pharmaceuticals, Considerations for RFID Implementation, 2010.....	42
Figure 27:	RFID in Pharmaceuticals, Attractiveness Matrix for RFID, 2008.....	44
Figure 28:	RFID in Pharmaceuticals, Considerations for Total Enterprise Management, 2010.....	46
Figure 29:	RFID in Pharmaceuticals, Maximization of Benefits Through RFID Implementation, 2010	47
Figure 31:	RFID in Pharmaceuticals, Benefits Due to RFID in the Pharmaceutical Supply Chain, 2010	48
Figure 30:	RFID in Pharmaceuticals, Supply Chain Maturity Due to RFID Adoption, 2010.....	49
Figure 32:	RFID in Pharmaceuticals, Global, Revenue Forecasts (\$m), 2008- 2015.....	50
Figure 33:	RFID in Pharmaceuticals, Demand for Hardware and Services in the Early Stage of Adoption, 2008	51
Figure 34:	RFID in Pharmaceuticals, Technology Adoption Framework for RFID Technology, 2008	52
Figure 35:	RFID in Pharmaceuticals, Drivers and Barriers for the RFID Market, 2008-2015	54
Figure 36:	RFID in Pharmaceuticals, Impact Analysis for RFID Adoption, 2008.....	55
Figure 37:	RFID in Pharmaceuticals, SWOT Analysis, 2008.....	57
Figure 38:	RFID in Pharmaceuticals, Value Chain in the RFID Industry, 2010	58
Figure 39:	RFID in Pharmaceuticals, RFID Solutions Mapping to Implementation Challenges, 2010	60
Figure 40:	RFID in Pharmaceuticals, Example of One-Stop Solution - California Express Solution, 2010	61
Figure 41:	RFID in Pharmaceuticals, Priority of Solutions for Implementation in the Pharmaceutical Industry, 2008.....	62
Figure 42:	RFID in Pharmaceuticals, Comparison of RFID and 2D Barcode Systems, 2010	63
Figure 43:	RFID in Pharmaceuticals, Information Requirements on Pedigree, 2008	65
Figure 44:	RFID in Pharmaceuticals, Advantage of e-Pedigree in a Direct-to-Pharmacy Distribution, 2010	67
Figure 45:	GBI Research Methodology	88

5.6 Markets for Counterfeit Drugs

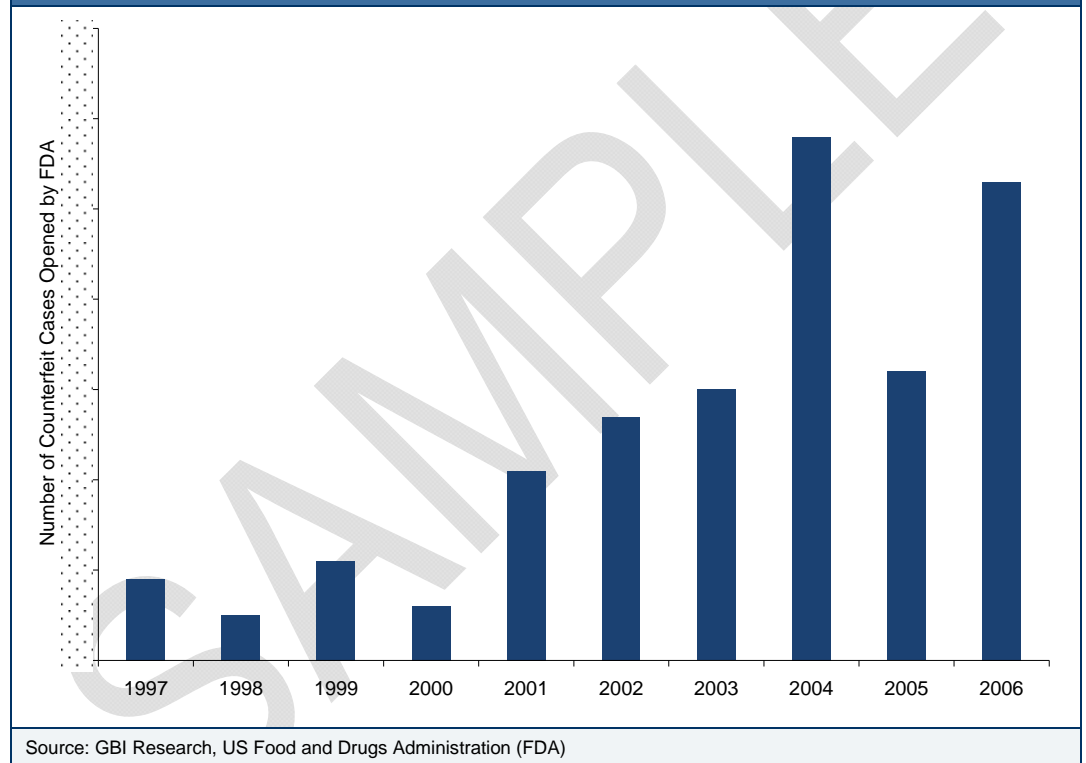
In developing countries counterfeit drugs are estimated to account for approximately XX% of the total pharmaceutical market

Counterfeit drugs are one of the key challenges facing pharmaceutical supply chains and the safety of patients. It is estimated that the global market for counterfeit drugs was \$XX billion in 2006 and is expected to grow to \$XX billion by 2010.

Counterfeit drugs are those drugs which are sold under a product name without authorization and which are sold with the intention of misleading the customer into believing that the drug is original. Counterfeiting is one of the major problems facing healthcare systems across the world. It is more prevalent in developing countries where there is limited control over the flow of drugs through the supply chain.

Counterfeiters find weak links in the supply chain to introduce fake drugs and so counterfeiting market thrives in developed countries where the movement of goods in the supply chain is not strictly regulated. In the developing countries of Africa, Asia and Latin America, counterfeit drugs constitute nearly XX% of the total pharmaceutical market.

Figure 13:RFID in Pharmaceuticals, Number of Counterfeiting Cases Opened by the US FDA, 1997-2006



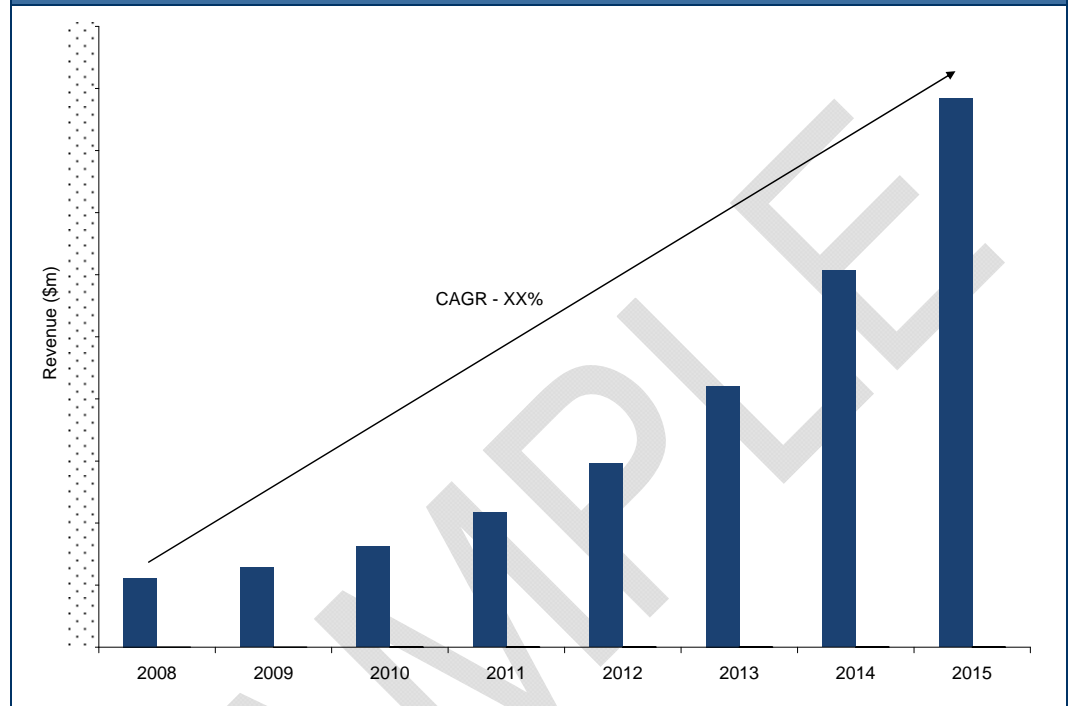
7 Radio Frequency Identification (RFID) in the Pharmaceuticals – Market Characterization

7.1 Market Forecasts for RFID in Pharmaceuticals

The global market for RFID solutions in the pharmaceutical industry will grow rapidly due to the expected increase in awareness and the alleviation of concerns regarding implementation. The global market for RFID solutions in the pharmaceutical industry was valued at \$XXm in 2008. It is expected to grow to \$XXm in 2015 at a compound annual growth rate of XX%.

The global market for RFID solutions was valued at \$XXm in 2008

Figure 32: RFID in Pharmaceuticals, Global, Revenue Forecasts (\$m), 2008- 2015



Source: GBI Research

Table 7: RFID in Pharmaceuticals, Global, Revenues (\$m), 2008-2015

Year	2008	2009	2010	2011	2012	2013	2014	2015	CAGR (%)
Revenue (\$m)	XX	XX	XX	XX	XX	XX	XX	XX	XX
Growth Rate (%)									

Source: GBI Research

A lack of awareness about RFID technology and the lack of a proof-of-concept for returns on investments have hampered the growth of the market for RFID in pharmaceuticals. Although RFID technology has been implemented in industries such as the automotive industry, its implementation rate in the pharmaceutical industry has been slow. The pharmaceutical industry is reluctant to make large investments in RFID implementation as it is unsure about the efficiency of the technology in real-time functions. One of the key concerns raised is the lack of standardization across the supply chain that could lead to the inefficient functioning of RFID systems. Although RFID technology is being deployed in closed-loop systems, where tags can be reused, deployment in open loop systems will require an increase in awareness and proof-of-concept studies. The effectiveness and reliability of RFID systems in open-loop systems need to be demonstrated to encourage industry participants to adopt RFID technology.

9 Radio Frequency Identification (RFID) in the Pharmaceuticals – Regulatory Landscape

9.1 *Regulations in the US Encourage RFID Adoption in the Pharmaceutical Industry*

9.1.1 The Prescription Drug Marketing Act of 1987 (PDMA)

The Prescription Drug Marketing Act of 1987 (PDMA), as modified by the Prescription Drug Amendments of 1992, amended sections 301, 303, 503, and 801 of the Federal Food, Drug, and Cosmetic Act (the Act) to establish the requirements related to the wholesale distribution of prescription drugs. One of the primary purposes of the PDMA was to increase safeguards to prevent the introduction and retail sale of substandard, ineffective, and counterfeit drugs in the US drug supply chain.

9.1.2 California Pedigree Legislation's Deadline has been Postponed on Multiple Occasions Due to the Challenges Faced in RFID Implementation

According to the California pedigree legislation, a "Pedigree" means a record, in electronic form, containing the information regarding each transaction resulting in a change of ownership of a given dangerous drug, from the sale by a manufacturer, through to the acquisition and sale by one or more wholesaler, manufacturer or pharmacy, until the final sale to a pharmacy or other person furnishing, administering, or dispensing the dangerous drug.

12 Appendix

12.1 Market Definitions

Pharmaceutical manufacturer – Manufacturer's of traditional chemical drugs and biopharmaceuticals are classified as pharmaceutical manufacturers

Trading partners – Authorized wholesalers, secondary wholesalers, distributors, retail pharmacy chains and pharmacies are classified as trading partners.

Authorized wholesalers – Authorized wholesalers buy drugs directly from the pharmaceutical manufacturers and have an ongoing relationship with the manufacturer

Secondary wholesalers – Secondary wholesalers buy from authorized wholesalers and sell to retail, hospital and individual pharmacies

Radio Frequency Identification – it is an automatic identification technology used to store and remotely retrieve data using devices called RFID tags or transponders

RFID Solutions Market – The scope for RFID solutions market includes the markets for RFID hardware, software and services.

Service providers – RFID service providers include the players who offer services such as installation, integration, maintenance, IT support and training

One-stop solutions – This type of RFID solution includes a single industry participant or a collaboration of industry participants which offers a combination of hardware, software and services for complete implementation and integration

12.2 Abbreviations

ADR	Authorized Distributors
API	Active Pharmaceutical Ingredient
ASN	Advance Shipment Notice
CAGR	Compound Annual Growth Rate
CCPA	Coalition for Community Pharmacy Action
DTP	Direct-to-Pharmacy
EAN	European Article Number
ECJ	European Court of Jurisprudence
EMA	European Medicines Agency
EPC	Electronic Product Code
ETSI	European Telecommunication Standards Institute
EU	European Union
FDA	Food and Drugs Administration
HDMA	Healthcare Distribution Management Association
HF	High Frequency
IS	Information Services
ISO	International Standards Organization
LBT	Listen before Talk
LF	Low frequency
MAH	Market authorization holder
ONS	Object Naming Service
PDMA	Prescription Drug Marketing Act of 1987
PhRMA	Pharmaceutical Research and Manufacturers of America

RAM	Random Access Memory
RFID	Radio Frequency Identification
ROM	Read Only Memory
UHF	Ultra high frequency
ICE	Immigration and Customs Enforcement
EFPIA	European Federation of Pharmaceutical Industry and Association
DS	Discovery Service
GPOs	Group Purchasing Organizations
WHO	World Health Organization
NHS	National Health Service
ROI	Return on investment
UAE	United Arab Emirates
3IS	Internet Infrastructure and Identity Services
FSA	Fluidic Self Assembly
GSC	Global Security Consulting
IAS	Identity and Authentication Services
IC	Integrated Circuits
NABP	National Association of Boards of Pharmacy
ROI	Return-on-Investment
SSL	Secure Socket Layer

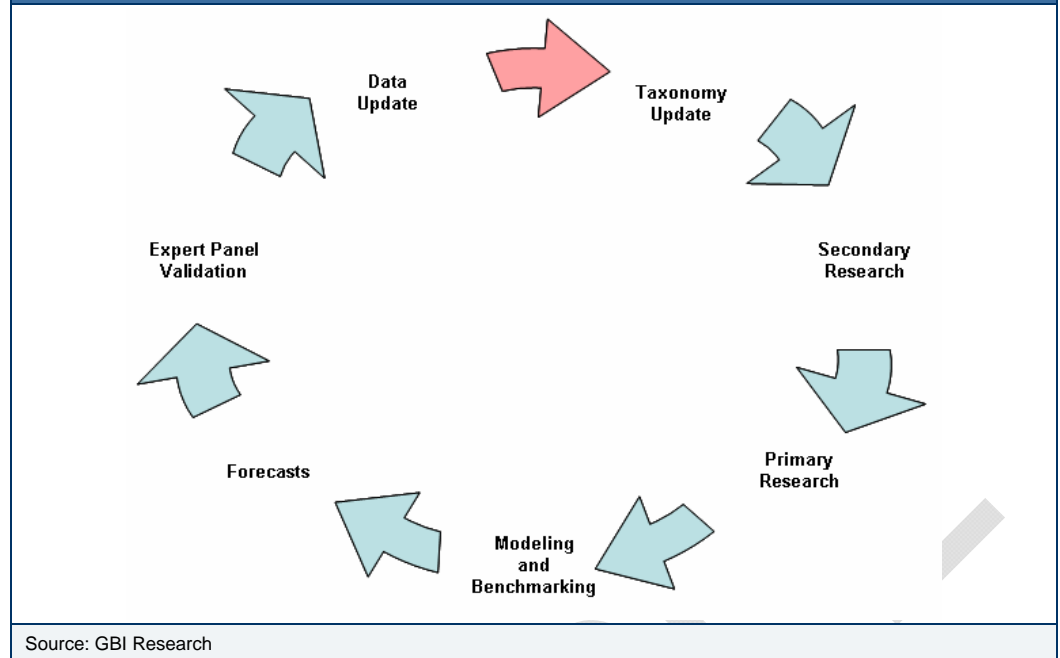
12.3 Research Methodology

GBI Research's dedicated Research and Analysis Teams consists of experienced professionals with a pedigree in marketing, market research, consulting background in the medical devices industry and advanced statistical expertise.

GBI Research adheres to the Codes of Practice of the Market Research Society (www.mrs.org.uk) and the Society of Competitive Intelligence Professionals (www.scip.org).

All GBI Research databases are continuously updated and revised. The following research methodology is followed for all databases and reports.

Figure 45: GBI Research Methodology



Source: GBI Research

12.3.1 Coverage

The objective of updating GBI Research's coverage is to ensure that it represents the most up to date vision of the industry possible.

Changes to the industry taxonomy are built on the basis of extensive research of company, association and competitor sources.

Company coverage is based on three key factors: revenues, products and media attention/innovation/ market potential.

- The estimated revenues of all major companies, including private and governmental, are gathered and used to prioritize coverage; and
- Companies which are making the news, or which are of particular interest due to their innovative approach are prioritized.

GBI Research aims to cover all major news events and deals in the pharmaceutical industry, updated on a daily basis.

The coverage is further streamlined and strengthened with additional inputs from GBI Research's Expert Panel (see below).

12.3.2 Secondary Research

The research process begins with exhaustive secondary research on internal and external sources being carried out to source qualitative and quantitative information relating to each market.

The secondary research sources that are typically referred to include, but are not limited to:

- Company websites, annual reports, financial reports, broker reports, investor presentations and SEC Filings;
- Industry trade journals, scientific journals and other technical literature;
- Internal and external proprietary databases;
- Relevant patent and regulatory databases;
- National government documents, statistical databases and market reports;
- Procedure registries; and

- News articles, press releases and web-casts specific to the companies operating in the market.

12.3.3 Primary Research

GBI Research conducts hundreds of primary interviews a year with industry participants and commentators in order to validate its data and analysis. A typical research interview fulfills the following functions:

- It provides first-hand information on the market size, market trends, growth trends, competitive landscape, future outlook etc;
- Helps in validating and strengthening the secondary research findings; and
- Further develops the Analysis Team's expertise and market understanding.

Primary research involves e-mail correspondence, telephone interviews as well as face-to-face interviews for each market, category, segment and sub-segment across geographies.

The participants who typically take part in such a process include, but are not limited to:

- Industry participants: CEOs, VPs, marketing/product managers, market intelligence managers and national sales managers;
- Hospital stores, laboratories, pharmacies, distributors and paramedics;
- Outside experts: investment bankers, valuation experts, research analysts specializing in specific medical equipment markets; and
- Key opinion leaders: physicians and surgeons specializing in different therapeutic areas corresponding to different kinds of medical equipment.

12.3.4 Expert Panel Validation

GBI Research uses a panel of experts to cross verify its databases and forecasts.

GBI Research expert panel comprises marketing managers, product specialists, international sales managers from medical device companies; academics from research universities, KOLs from hospitals, consultants from venture capital funds and distributors/suppliers of medical equipment and supplies etc.

Historic data and forecasts are relayed to GBI Research's Expert Panel for feedback and adjusted in accordance with their feedback.

12.4 Contact Us

If you have any queries about this report or would like further information, please contact at the below given telephone numbers or email address.

- North America: +1 646 395 5460
- Europe: +44 207 753 4299 (OR) +44 161 227 0669
- Asia Pacific: +91 40 6616 6700
- Email: info@gbiresearch.com

12.5 Disclaimer

All Rights Reserved.

No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior permission of the publisher, GBI Research.

The facts of this report are believed to be correct at the time of publication but cannot be guaranteed. Please note that the findings, conclusions and recommendations that GBI Research delivers will be based on information gathered in good faith from both primary and secondary sources, whose accuracy we are not always in a position to guarantee. As such GBI Research can accept no liability whatever for actions taken based on any information that may subsequently prove to be incorrect.