

MARKET FOR PET RADIOPHAMACEUTICALS AND PET IMAGING

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.0 PET MARKET OVERVIEW	1
1.1 Changes in PET Reimbursement	3
1.2 New Reimbursement Methodology	4
1.3 The Road Toward Open Coverage for PET	6
1.4 Ongoing Activities of the NOPR PET Registry	7
1.4.1 Changes in Patient Management with PET	8
1.4.2 Impact of PET in Reducing Biopsies	8
1.5 Growth of Primary Applications for PET	9
1.5.1 Therapy Planning and Treatment Monitoring	10
1.5.2 Expanded Applications for PET in Oncology	12
1.5.3 PET Scanning for Prostate Cancer	13
1.5.4 Bone Scanning with Sodium Fluoride	15
1.5.5 Infection Imaging	15
1.6 Imaging Specific Body Parts vs. Whole Body Imaging	16
1.6.1 The Naviscan PEM Breast Imaging System	16
1.6.2 Dedicated Cardiac PET	18
1.7 Prospects for Integrating Diagnostic CT with PET-CT	19
1.7.1 Advantages of Simultaneous Diagnostic CT and PET	20

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.7.2 More Technology and Support Required	21
1.7.3 Artifacts Introduced	21
1.7.4 Overlap of CT Contrast and FDG	22
1.8 Cardiology Applications of PET	23
1.9 Research in PET Tracers	24
1.9.1 Expanded Applications for Rubidium PET Imaging	24
1.9.2 PET Perfusion Agent BMS747158 (Lantheus Medical Imaging)	26
1.9.3 Fluro Pharma's BF PET Myocardial Imaging Agent	27
1.9.4 FDG-PET/CT in Plaque Evaluation	28
1.9.5 PET with C-11 PiB to Assess Beta-Amyloid Brain Deposits	29
1.9.6 GE's New PET Agent for Detecting Amyloid Plaque	31
1.9.7 PET with FLT for Predicting Response to Chemo in Leukemia	32
1.9.8 Aposense Reports Positive Results in Apoptosis	33
1.9.9 Avid Pharmaceuticals Alzheimer's PET Agent	34
1.9.10 Siemens, UCLA Alzheimer's PET Agent	34
1.9.11 Novel Tracer for Prostate Cancer	35
1.10 Growth of FDG Market	36
1.10.1 FDG Pricing	37
1.10.2 FDG Market Prospects	37
1.11 Orders for PET Scanners	38
1.11.1 Domestic PET Scanner Market	39
1.11.2 International PET Scanner Market	41

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
1.11.3 Improvements in Scanner Performance	42
2.0 GROWTH IN PET PROCEDURE VOLUME	42
2.1 Positive Growth Factors	42
2.2 Restraining Influences	43
2.3 Distribution of PET Procedures	44
2.4 Oncology PET Procedures	47
2.5 Overlap Between PET and SPECT Imaging in Oncology	49
2.5.1 Experience with Targeted SPECT Agents for Oncology	49
2.5.2 Comparative Advantages of PET in Oncology	50
2.6 Clinical Requirements And Projections For PET	52
3.0 ANALYSIS OF THE FDG MARKET	52
3.1 Price Per Dose and Delivery Charges	53
3.2 Historic And Forecast Sales of FDG	54
3.2.1 Distribution of FDG Sales	54
3.2.2 Oncology Sales of FDG	56
3.2.3 Rubidium Sales for Cardiology PET	58
3.3 Analysis of FDG Suppliers	60
3.3.1 Economics of Producing and Delivering FDG Doses	60
3.3.2 Market Distribution of Commercial FDG Suppliers	62
3.3.2.1 PETNet Pharmaceuticals	62
3.3.2.2 Other Commercial Distributors Of FDG	64
3.4 Challenges In The Production and Distribution of FDG	66

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
4.0 MARKET FOR PET IMAGING EQUIPMENT	67
4.1 Market Overview	77
4.2 Product Focus of PET Manufacturers	78
4.2.1 Siemens Molecular Imaging	79
4.2.2 GE Medical Systems	82
4.2.3 Philips Medical Systems	85
4.2.4 Naviscan, Inc.	86
4.3 U.S. and International Distribution of PET Scanner Orders	87
4.3.1 Domestic Orders for New and Refurbished PET Scanners	88
4.3.2 International Orders for New and Refurbished PET scanners	89
4.3.3 Worldwide Orders for New and Refurbished PET Scanners	90
4.4 Mobile PET Market	91
4.4.1 Distribution of Mobile PET Orders	93
4.4.2 Contractual Relationships Used by Mobile Providers	94
4.4.3 Charges for Reading the Scans	95
4.4.4 Reading the PET-CT Study	96
4.4.5 Providers of Mobile PET Services	97
5.0 US AND WORLDWIDE SALES FORECASTS FOR PET	99
5.1 US Sales Forecasts for PET Scanners	99
5.2 Sales Forecast for Mobile PET Systems	106
5.3 Worldwide Sales Forecast for PET scanners	107
6.0 GROWTH OF US AND WORLDWIDE INSTALLED BASE	108

TABLE OF CONTENTS

<u>Section</u>	<u>Page</u>
6.1 Growth of the Domestic Installed Base	108
6.2 Growth of Installed Base of Mobile Scanners	111
6.3 Estimated PET Procedure Volume Based on Scanner Utilization	111
6.4 Comparison of PET and SPECT Installed Base	113
7.0 END-USER PROFILE	115
7.1 Overview of the User Environment	115
7.2 Organization of Nuclear Medicine Departments	117
7.2.1 Important Functional Differences with PET	118
7.2.2 Interaction of PET with Radiology	119
7.3 Allocation of Hospital Nuclear Medicine Equipment	119
7.4 Comparative Utilization Parameters	120
7.4.1 Distribution of Imaging Procedures	123
7.4.2 Relative Diagnostic Activity	123
7.4.3 Relative Procedure Volume	125
7.4.4 Imaging Activity Index	127
7.5 In-Hospital Hot Lab Versus Commercial Pharmacies	127
7.5.1 Unit-Dose Packaging	130
7.5.2 Pricing Practices	130
7.5.3 Other Services	130
7.5.4 Issues of Board Certification	131

**MARKET FOR PET RADIOPHARMACEUTICALS
AND PET IMAGING**

LIST OF EXHIBITS

<u>Exhibit</u>		<u>Page</u>
1	HISTORIC AND FORECAST PET PROCEDURE VOLUME FOR CARDIOLOGY, NEUROLOGY AND ONCOLOGY BY PROCEDURE TYPE FROM 2006-2016	46
2	HISTORIC AND FORECAST PET PROCEDURE VOLUME IN ONCOLOGY BY TYPE OF DISEASE FROM 2007-2016	48
3	HISTORIC AND FORECAST SALES OF FDG DOSES FOR CARDIOLOGY, NEUROLOGY AND ONCOLOGY BY PROCEDURE TYPE FROM 2006-2016	55
4	HISTORIC AND FORECAST SALES OF FDG DOSES FOR ONCOLOGY APPLICATIONS BY DISEASE TYPE FROM 2007-2016	57
5	HISTORIC AND FORECAST SALES OF RUBIDIUM DOSES FOR CADIOLOGY PET PERFUSION STUDIES FROM 2006-2016	59
6	2008 SALES DISTRIBUTION OF COMMERCIAL FDG SUPPLIERS IN THE U.S., NUMBER OF END-USERS, ANNUAL DOSES SOLD AND SALES VOLUME	63
7	U.S. UNIT ORDERS FOR NEW AND REFURBISHED PET SCANNERS, UNIT ORDERS BY MANUFACTURER AND MARKET SHARE IN 2007-2008	68
8	U.S. SALES ORDER VOLUME FOR NEW AND REFURBISHED PET SCANNERS, SALES VOLUME BY MANUFACTURER AND MARKET SHARE IN 2007-2008	69
9	INTERNATIONAL UNIT ORDERS FOR NEW AND REFURBISHED PET SCANNERS, UNIT ORDERS BY MANUFACTURER AND MARKET SHARE IN 2007-2008	70
10	INTERNATIONAL SALES ORDER VOLUME OF NEW AND REFURBISHED PET SCANNERS, SALES VOLUME BY MANUFACTURER AND MARKET SHARE IN 2007-2008	71
11	WORLDWIDE UNIT ORDERS FOR NEW AND REFURBISHED PET SCANNERS, UNITS ORDERED BY MANUFACTURER AND MARKET SHARE IN 2007-2008	73

LIST OF EXHIBITS

<u>Exhibit</u>		<u>Page</u>
12	WORLDWIDE ORDER VOLUME OF NEW AND REFURBISHED PET SCANNERS, SALES VOLUME BY MANUFACTURER AND MARKET SHARE IN 2007-2008	74
13	U.S. ORDERS FOR MOBILE PET SCANNERS, UNITS ORDERED BY MANUFACTURER AND MARKET SHARE FROM 2005-2008	75
14	U.S. ORDER VOLUME OF MOBILE PET SCANNERS, SALES VOLUME BY MANUFACTURERS AND MARKET SHARE FROM 2005-2008	76
15	DISTRIBUTION OF MOBILE PET UNITS AMONG MOBILE PET PROVIDERS, UNITS ORDERED BY EACH MOBILE PET COMPANY FROM 2000-2008	98
16	U.S. HISTORIC AND FORECASTS UNIT ORDERS FOR NEW AND REFURBISHED PET SCANNERS FROM 2006-2016	100
17	U.S. HISTORIC AND FORECAST ORDER VOLUME FOR NEW AND REFURBISHED PET SCANNERS FROM 2006-2016	101
18	U.S. HISTORIC AND FORECAST ORDERS FOR MOBILE PET SCANNERS, UNITS ORDERED AND SALES VOLUME FROM 2006-2016	102
19	HISTORIC AND FORECAST WORLDWIDE UNIT ORDERS FOR NEW AND REFURBISHED PET SCANNERS FROM 2006-2016	103
20	HISTORIC AND FORECAST WORLDWIDE ORDER VOLUME FOR NEW AND REFURBISHED PET SCANNERS FROM 2006-2016	104
21	GROWTH OF U.S. AND WORLDWIDE INSTALLED BASE OF PET SCANNERS FROM 2006-2016	109
22	GROWTH OF MOBILE PET INSTALLED BASE IN THE U.S. FROM 2006-2016	110
23	ESTIMATED PET PROCEDURE VOLUME IN THE U.S. BASED ON SCANNER UTILIZATION IN 2008	112
24	2008 NUCLEAR CAMERA SHIPMENTS, INSTALLED BASE, REPLACEMENT RATES AND ANNUAL NUCLEAR PROCEDURE VOLUME IN HOSPITALS AND IMAGING CLINICS	114
25	COMPARATIVE ALLOCATION OF DIAGNOSTIC FACILITIES BY HOSPITAL BED SIZE IN 2008	121

LIST OF EXHIBITS

<u>Exhibit</u>		<u>Page</u>
26	COMPARATIVE UTILIZATION PARAMETERS FOR DIFFERENT IMAGING MODALITIES IN 2008	122
27	DISTRIBUTION OF HOSPITAL DIAGNOSTIC IMAGING PROCEDURES IN THE U.S. BY HOSPITAL BED SIZE IN 2008	124
28	RELATIVE PROCEDURE VOLUME AMONG DIFFERENT IMAGING MODALITIES, PERCENTAGE RELATIONSHIP BY HOSPITAL BED SIZE IN 2008	126
29	RELATIVE ACTIVITY INDEX AMONG DIFFERENT IMAGING MODALITIES, PROCEDURES PER BED PER YEAR BY HOSPITAL BED SIZE IN 2008	128