New Directions for Personalized Medicine

By Scientia Advisors
Agenda

1. About Scientia Advisors

2. Personalized medicine overview
Science, Knowledge and Skill for your competitive advantage.

Scientia Advisors is an international strategy and management consulting firm with a concentration in life sciences. We have one mission, to ensure that our clients consistently outperform the market and their competitors.
• We understand the dynamic forces shaping today’s Life Sciences markets and can guide your organization to exploit growth opportunities
  ➢ Identify and define specific strategic market opportunities
  ➢ Assess growth options and paths, both organic & inorganic
  ➢ Develop strategies for achieving and sustaining leadership

• Our understanding of the technology and context of individual Life Sciences sectors enables us to provide realistic viewpoints on market opportunities
  ➢ Discovery, Diagnostics, Therapeutics, and Environment Sciences
  ➢ Buyer insights, supplier positions, regulatory issues, etc.

• Successful execution of strategy relies upon operational realities. We bring a working appreciation of key operational areas, enabling you to link strategy with action
  ➢ Sales, marketing, and client interaction
  ➢ Product life-cycle management (development, distribution, evolution)
  ➢ Partnerships, alliances, licensing, intellectual property, etc.
We specialize in work that leverages our market insight and capabilities

**Corporate Strategy**
- Growth strategy
- Core growth and market expansion
- White space growth
- Customer strategy

**Venture Capital/Private Equity**
- Due diligence
- Portfolio prioritization
- Exit strategy

**Mergers & Acquisitions**
- Roll-up strategy
- Acquisition screening
- Target due diligence
- Divestitures
- Joint ventures and alliances

**Emerging Companies**
- Post investment growth strategy
- R&D prioritization
- Market strategy and positioning
- Valuation
Case Study: Development of companion diagnostics to boost therapeutic sales

CLIENT SITUATION

- **Global top-10 pharmaceutical company**
- **Objective:** Evaluate the commercial prospects for molecular diagnostics to be launched simultaneously with a Phase II/III therapeutics in the autoimmune/inflammatory disease and transplant categories
- **Target:** Provide independent third party recommendation on whether to continue development of companion diagnostics

APPROACH

**Market Analysis**
- Segmented therapeutic and diagnostic markets by geography, care cycle and competitive products using secondary sources
- Interviewed Key Opinion Leaders to understand potential uptake of a new diagnostic and therapeutic

**Business Case**
- Created financial DCF model based on secondary and primary research
- Validated with client financial analysis

**Scenario Evaluation**
- Developed multiple scenarios based on differing therapeutic and diagnostic market penetration, pricing and development costs
- Calculated NPVs for each scenario and conducted sensitivity analysis

PROPOSED SOLUTIONS

- Determined that diagnostic tied to transplant therapeutic should be funded further with explicit
  - Features and attributes required by transplant surgeons
  - Diagnostic performance milestones for specificity and accuracy
- Recommended that the diagnostic for immune/inflammatory disease X only be developed further based on efficacy demonstrated in Phase III trials of the companion therapeutic

![Cash Flow Estimate for an Autoimmune/Inflammatory Disease Theranostic](chart)

Source: Scientia Analysis
Industry Thought Leadership
We both speak and publish broadly on the issues of importance to the healthcare industry

Recent Conference Participation:

» **Second Annual Diagnostic Asia**—”The State of Molecular Diagnostics”
  Singapore, March 27, 2007


» **Partners Research Acceleratory Program**—”Future of IT and Healthcare”,
  Boston, February 14, 2007

Recent Articles:

» **“Molecular Imaging”** Genetic Engineering News, Sept. 2007


» **“Diagnostic Tools Change Cancer Treatment”** Genetic Engineering News,
  February 2007

Not an exhaustive list
We work across all sectors of the $1 trillion worldwide health care products market

Macro Market View

- Healthcare is the largest single sector in the WW economy
- The product inputs to healthcare have historically grown faster than total healthcare spending and have been non-cyclical
- Healthcare spending is rapidly growing as a % of GDP (in U.S. will grow from 16% to 18% by 2014)
- Ageing population in developed economies will drive increased spending on healthcare
- Emerging middle class in China and India will open huge new markets
- Constant introduction of new technologies that save, extend and increase quality of life
- The products sector is unlikely to be replaced due to intellectual property, distribution strength and production methods

Global Products* Health Care Market
Scientia Estimates - (2007)

- Medical Devices $253 B
- Discovery Tools & Diagnostics^ $137 B
- Therapeutics $656 B
- Total $1,046 B


* Does not include healthcare delivery costs (e.g. physician services, hospital charges)
^ Includes services such as CRO, Pharma CRM, laboratory testing services and other.
Major Trends in Healthcare
The next several years will see numerous changes due to these trends

- **Aging population**: Growth of chronic disease such as cardio-vascular illness, cancer, as well as severe infections for elderly
- **Decentralized healthcare**: Healthcare delivery moving to clinics, pharmacies and home healthcare
- **Drug resistant “super-bugs”** and hospital acquired infections have become a major healthcare concern and warrant rapid patient diagnostics
- **Increasingly empowered consumer**: Increased awareness and understanding of health
- **Payment for performance**: Payors are pushing for Rx-Dx integration, given the potential to reduce healthcare expenditure
- **Market Convergence**: Therapeutics and diagnostics; Imaging and In vitro diagnostics; diagnostics and patient monitoring
- **Increasing emphasis on “wellness”**, health foods, preventative medicine, early diagnosis, progression monitoring and tailored therapy

Source: Scientia Analysis
Agenda

1. About Scientia Advisors

2. Personalized medicine overview
Best responders to therapy are identified using **Personalized Medicine Tests** and then given the **Targeted therapy** at the right time to maximize efficacy and minimize adverse reaction.
Major trends and drivers of Personalized Medicine

*Key stakeholders see clear benefits to adopting personalized medicine*

**PHARMACEUTICAL COMPANIES**
- Potential for higher pricing due to higher efficacy
- Enables focused trials – smaller groups for shorter periods with better results
- DX facilitates better Rx sales by enabling better market penetration and expansion

**REGULATORS**
- Greater integration of Rx and DX for more efficient and safer clinical trials (e.g. critical path initiative)
- Increased vigilance on drug approvals
- Increased approval of genetic tests that influence safety and efficacy of drugs

**DIAGNOSTIC COMPANIES**
- Research advances in biomarker discovery and systems biology is translating into more DX tests
- Many new companies are emerging that are focused on DX

**PATIENTS AND PRESCRIBERS**
- Increasing influence of patient advocacy groups
- Personalized medicine reduces unnecessary therapies, leading to fewer side effects

**PAYORS**
- Payment for performance
- Payors are pushing for Rx-Dx integration, especially diagnostics that reduce healthcare expenditure e.g. Oncotype DX

Source: Scientia Analysis
The majority of investment and progress in biomarkers has been in discovery and development. We believe there are opportunities among late-stage and marketed drugs.

- **Research**
  - Tailored therapeutics can narrow the target population of patients, tighten up dosing guidance, address the timing of therapy, or provide better information for patients.
  - Biomarkers are established as part of program early in R&D.
  - Faster path to disease targets using genetic data.
  - Knowledge of biological pathway and gene variant helps eliminate poor candidates.
  - Better statistics on few patients as a result of patient segmentation.

- **Development**
  - Understand efficacy and specificity first, then segment patient by class of drugs.

- **Commercial (late-stage & marketed drugs)**
  - Trifling effort from Pharma on qualifying biomarkers for late-stage/commercial drugs.

If we accept that Personalized Healthcare is patient-centric, value-based care — then we can think in terms of a plausible future for 2008 to 2013 characterized by 6 to 12 evidence-based commercially successful linked Rx/Dx products on the market that have demonstrated clinical utility to improve patient care.

- Wayne A. Rosenkrans, President & Chairman, PMC, External Relations Director — Evidence-based Medicine and Personalized Healthcare, AstraZeneca Pharmaceuticals

One of our main drivers is patient’s demand for safe and better targeted therapies.

- Nadine Cohen, Head of Pharmacogenomics and Senior Research Fellow, Johnson & Johnson

Most of Pharma’s biomarker development focus has been on the research & development phases of drug discovery.
Creating new medicines is a lengthy and complex process. Biomarkers can help in discovery and development.
Developing drugs is expensive, time-consuming, and risky. Biomarkers can reduce time and risk.

<table>
<thead>
<tr>
<th>Discovery</th>
<th>Pre-clinical</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Registration</th>
<th>Cumulative (candidate to approval)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time (~years)²</td>
<td>-</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>P(success)³</td>
<td>-</td>
<td>0.40</td>
<td>0.70</td>
<td>0.47</td>
<td>0.80²</td>
<td>0.80²</td>
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<tr>
<td>Cost, $M⁴</td>
<td>22</td>
<td>9</td>
<td>20</td>
<td>30</td>
<td>100</td>
<td>40</td>
</tr>
</tbody>
</table>

Notes: IND = Investigational New Drug; NDA = New Drug Application; (1) Phase I cost includes parallel animal studies; (2) simplifying assumptions, time in each phase is variable; (3) probability of entering the next phase; (4) direct costs only, not discounted or risk-adjusted, from 1990s data; current direct costs are likely to be higher; (5) Total pipeline costs per candidate from discovery to approval, probability adjusted and discounted to account for cost of capital is estimated to be over $800 Million (DiMasi et al, 2003).

Sources: Di Massi et al., 2003; FDA, Center for Drug Education and Research; Boston Consulting Group; Scientia Analysis.
Current efficacy limitations of drug treatment is driving the push for personalized medicine

<table>
<thead>
<tr>
<th>Therapeutic area</th>
<th>Rate of efficacy with standard drug treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer (all types)</td>
<td><img src="image" alt="Cancer (all types) rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Alzheimer's disease</td>
<td><img src="image" alt="Alzheimer's disease rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Incontinence</td>
<td><img src="image" alt="Incontinence rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Hepatitis C</td>
<td><img src="image" alt="Hepatitis C rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Osteoporosis</td>
<td><img src="image" alt="Osteoporosis rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Rheumatoid arthritis</td>
<td><img src="image" alt="Rheumatoid arthritis rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Migraine (prophylaxis)</td>
<td><img src="image" alt="Migraine (prophylaxis) rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Migraine (acute)</td>
<td><img src="image" alt="Migraine (acute) rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Diabetes</td>
<td><img src="image" alt="Diabetes rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Cardiac arrhythmias</td>
<td><img src="image" alt="Cardiac arrhythmias rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Schizophrenia</td>
<td><img src="image" alt="Schizophrenia rate of efficacy with standard drug treatment" /></td>
</tr>
<tr>
<td>Depression (SSRIs)</td>
<td><img src="image" alt="Depression (SSRIs) rate of efficacy with standard drug treatment" /></td>
</tr>
</tbody>
</table>

Potential Impact of Personalized Medicine

**Patient**
- Improved selection of optimal therapy
- Reduce ADRs
- May increase patient compliance

**Drug Developer**
- May improve drug discovery target
- Reduce time, cost, and failure rate of clinical trials
- Revive drugs that failed clinical trials or were withdrawn from the market

Plagued by low efficacy & safety, Oncology Rx will be one of the chief adopters of personalized medicine tests.

**Oncology Rx problem: low efficacy & safety**

- **Oncology Rx have low efficacy**
  - Oncology Rx have low safety profile

- **Current Oncology Rx unmet needs**
  - 50% of oncology Rx are not as efficacious for the entire population as prescribed
  - Oncology Rx has the lowest efficacy compared to other Rx
    - Historically, oncology compounds tend to have a significantly lower success rate in clinical development than compounds in other areas, such as cardiovascular disease

- **Solution: Personalized medicine tests**
  - Fewer rates of adverse reactions
  - Better response to Rx, with correct dosages
  - Rx provided only when necessary; leading to reduced healthcare costs
  - Faster approval of drugs, with smaller test population, in shorter period
  - Faster rate of R&D with improved drug discovery targets
  - Revival of drugs that failed in the past

- **Source:** Scientia analysis, Trends in Molecular Medicine, Journal of clinical oncology, CDC
Oncology has been an early adopter of personalized medicine, pointing the way for other diseases.

Multiple factors underlie the penetration of molecular diagnostic into cancer care.

**Medical Need**

Cancer remains a leading killer in the developed world, driving researchers, physicians, patients and payors to seek solutions.

**High Cost**

Cancer treatment is expensive:

- In 1999-2000, cancer accounted for $60.9 billion in direct medical costs and $15.5 billion for indirect morbidity costs\(^1\).

**Research Effort**

Over $200 Bn has been spent on cancer research over the last 40 years\(^2\) resulting in significant advances in understanding of pathway biology.

**Lack of Effective Therapeutics**: Overall, only 25% of cancer treatments are effective\(^4\).

**Nature of Disease**

Cancer is a heterogeneous disease, with over 200 types identified so far\(^3\); each is unique and requires a different therapeutic approach.

**Standard of Care**

Has always included sample biopsy of cancer tissue, a requirement for effective personalized molecular diagnostics.

Sources: (1) Chang et al. (2004) J Clin Oncol. 22:3524. (2) Scientia analysis; the NCI alone has spent ~$112Bn over the last 40 years (inflation-adjusted; NCI, http://obf.cancer.gov/financial), the remainder consisting of other government sources, industry and charities; does not include basic science research not specifically targeted to cancer. (3) http://www.cancer.gov/cancertopics/alphabetlist (4) Spear et al. (2001) Trends Mol. Medicine.
The traditional treatment care cycle involves repeated trial-and-error to find the right treatment regimen for each patient.
Personalized medicine not only provides effective patient treatment, but also assists in monitoring and management.

**Personalized Medicine Diagnostic Intervention Points**

- **Screening & Detection**: Test that screens for cases linked to familial cancer cases (e.g. BRCA) and difficult to diagnose cancers (e.g. Agendia CUP Print).
- **Differential Diagnosis & Prognosis**: Test that predicts the aggressiveness of cancer (e.g. Genomic Health's Oncotype Dx).
- **Theranostics**: Test that indicates patient’s response to prescribed therapy (e.g. HER2/Neu test for Herceptin).
- **Surveillance & Monitoring**: On-going monitoring to analyze recurrence of cancer (e.g. Agendia Mammaprint for recurrence of Breast Cancer).
- **Management**

**Traditional Approach**

- **Screening**
- **Diagnosis & Staging**
- **Surgery & axillary lymph node analysis**
- **2nd line treatment**
- **3rd line treatment**

**Source**: Scientia Analysis
The pharma oncology pipeline has begun to respond to ongoing unmet needs and research efforts.

<table>
<thead>
<tr>
<th>WW Incidence (in 1000s)</th>
<th>Phase I</th>
<th>Phase II</th>
<th>Phase III</th>
<th>Submitted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lung</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
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<tr>
<td>Breast</td>
<td>XXX</td>
<td>XXX</td>
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<tr>
<td>Colorectal</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
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<tr>
<td>Prostate</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
<td>XXX</td>
</tr>
</tbody>
</table>

**Source:** Scientia Analysis; SG Cowen & Co Report; Company Websites; ClinicalTrials.gov

* Receptor Tyrosine Kinase (RTK) Inhibitor*
* Non-RTK Inhibitors*
* Chemotherapy Agent
* Unspecified MOA**

* Includes Her-2/Neu, VEGF, EGFR, SRC/Abl, etc.
* Includes HDAC, DRS-targeted pro-apoptotic receptor etc.
** Unspecified method of action
Growth in oncology therapeutics will be highly influenced by targeted approaches

Targeted oncology Rx has a higher CAGR as compared to traditional oncology Rx

Key Takeaways

- Targeted oncology Rx have a higher growth potential than traditional oncology Rx
- Thousands of cancer patients are already benefiting from several targeted Rx such as Avastin and Gleevec, personalized medicine tests will enhance the safety and efficacy of these targeted Rx
- Targeted oncology Rx are most likely to be influenced by personalized medicine tests
  - Example: BCR/ABL test enhances the efficacy of Gleevec
  - Example: UGT1A1 test improves the safety of Irinotecan
- High growth potential of targeted Rx will in turn drive the growth of personalized medicine tests
- In addition to oncology, infectious disease Rx such as HIV Rx have also readily adopted personalized medicine tests (e.g. HIV viral load, resistance tests)

Source: Scientia analysis, 2007 Cowen report on therapeutics
MDx personalized medicine tests include early detection tests that enable early and accurate detection of disease, prognosis tests that provide disease recurrence free survival information, and theranostics tests that enable increased treatment efficacy and reduced adverse events.
Prognosis

A reduction in unnecessary therapies; thus reducing healthcare costs

- Predicts aggressiveness of cancer, which was not possible by traditional pathology methods, thus addresses an unmet need in oncology today
- Identifies patients with high risk of recurrence who may benefit from adjuvant chemotherapy (improved recurrence-free and overall survival)
- Applies only to early stage patients with inherently good chances of survival (who may be cured with local/regional therapy alone)
- Will reduce unnecessary chemotherapies, leading to fewer adverse side effects
- Are not theranostic tests, but influence key therapy decisions

Source: Scientia Analysis
There are two types of theranostic tests. *Both are essential for improved outcomes.*

**Theranostic Tests**

- **Adverse Drug Reaction Tests**
  - Identify people likely to have adverse drug reactions to particular drugs
  - Adverse Drug Reactions are the 6th leading cause of death
  - Includes drug metabolism tests, used to determine right dose
  - One-time tests that cost between $300 and $800
  - Examples: CYP450, UGT1A1

- **Drug Responder Category Tests**
  - Distinguish between responders and non-responders to a specific drug or set of drugs
  - Includes Targeted Therapy tests, focused on identifying suitable patient subsets for targeted therapies
  - Most well-known category of personalized medicine tests

When combined, these tests provide a comprehensive profile that can be used for treatment decisions.

### The overall MDx personalized medicine landscape

**Numerous players emerging with novel biomarkers**

**Source:** Scientia analysis

<table>
<thead>
<tr>
<th>WW Incidence (in 1000s)</th>
<th>WW</th>
<th>Regulatory Phase</th>
<th>Pipeline/RUO</th>
<th>Close to Launch</th>
<th>ASR/Commerically available</th>
<th>CE Marked</th>
<th>FDA approved</th>
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<td>1,352 Lung</td>
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<td></td>
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<tr>
<td>1,151 Breast</td>
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<tr>
<td>1,023 Colorectal</td>
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<td>679 Prostate</td>
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<td>357 Bladder</td>
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</table>

**Detection/Staging**

**Prognosis**

**Theranostics**

**Regulatory Phase**

**Source:** Scientia analysis

WW Incidence (in 1000s) | WW | Regulatory Phase | Pipeline/RUO | Close to Launch | ASR/Commerically available | CE Marked | FDA approved |
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<td>Other</td>
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</tbody>
</table>
The most well known personalized medicine tests have focused on identifying suitable patient subsets for targeted therapies

### Targeted Therapy Tests

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Test Developer</th>
<th>Drug Name</th>
<th>Drug Developer</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>HercepTest</td>
<td>DakoCytomation</td>
<td>Herceptin</td>
<td>Genentech</td>
<td>FDA approved test to identify breast cancer patients who over-express HER-2. Over-expression of HER-2 = candidate for Herceptin.</td>
</tr>
<tr>
<td>EGFR Pharma Dx kit</td>
<td>DakoCytomation</td>
<td>Erbitux/ Tarceva</td>
<td>ImClone/ OSIP+ Genentech</td>
<td>Detection of colorectal cancer patients whom may benefit from treatment with Erbitux/ Detection of non-small cell lung cancer patients whom may benefit from treatment with Tarceva</td>
</tr>
<tr>
<td>Ventana Dx c-Kit</td>
<td>Ventana Medical Systems</td>
<td>Gleevec</td>
<td>Novartis</td>
<td>Detect the presence of the c-Kit protein in GIST. c-Kit = asset in selecting patients who may benefit from treatment with Gleevec.</td>
</tr>
<tr>
<td>EGFR</td>
<td>Genzyme Genetics</td>
<td>Tarceva/ Iressa</td>
<td>OSIP+Genentech/ AstraZeneca</td>
<td>For non-small cell lung cancer</td>
</tr>
<tr>
<td>BCR/ABL</td>
<td>Genzyme Genetics</td>
<td>Gleevec</td>
<td>Novartis</td>
<td>The test detects all secondary BCR-ABL mutations and therefore predicts resistance to Gleevec for CML</td>
</tr>
<tr>
<td>Trofile™</td>
<td>Monogram</td>
<td>Maraviroc/ Selezentry™</td>
<td>Pfizer</td>
<td>For HIV. Identifies patients infected with the R5 virus, which should guide therapeutic use of maraviroc, a CCR5 coreceptor antagonist.</td>
</tr>
</tbody>
</table>

Source: Scientia analysis

Most well-known targeted therapy tests are in oncology.
The next most mentioned tests have identified patients with significant adverse reactions to particular therapeutics.

### Adverse Event Tests

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Test Developer</th>
<th>Drug Name</th>
<th>Drug Developer</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>AmpliChip CYP450</td>
<td>Roche/Affymetrix</td>
<td>Various</td>
<td>Various</td>
<td>Microarray scan for CYP2D6 and CYP2C19 gene polymorphisms that affect metabolism of common drug classes, including antidepressants and schizophrenia drugs.</td>
</tr>
<tr>
<td>Invader UGT1A1</td>
<td>Third Wave</td>
<td>Irinotecan</td>
<td>Pfizer</td>
<td>FDA approved molecular assay used to identify patients who may be at increased risk of adverse reaction to the chemotherapy Irinotecan. Based on polymorphisms in UGT1A1 metabolism.</td>
</tr>
<tr>
<td>CYP2C9/VKORC1 genetic test</td>
<td>PGLX Laboratories/Tm Biosciences; Nanosphere</td>
<td>Coumadin</td>
<td>Bristol-Myers Squibb</td>
<td>Identify patients with Warfarin sensitivity, based on polymorphisms in metabolism of Warfarin. Used to adjust dosage and avoid severe bleeding.</td>
</tr>
<tr>
<td>TIM Test</td>
<td>PharmaNetics</td>
<td>Angimax</td>
<td>The Medicines Company</td>
<td>To monitor patients being treated for angina, myocardial infarction, stroke, and pulmonary and arterial emboli. The tests assess blood-clot formation and dissolution.</td>
</tr>
</tbody>
</table>

Current tests apply to both specific drugs and multiple classes of drugs, predominantly related to polymorphisms in common or important drug metabolism pathways.

Source: Scientia analysis
The emerging tests for personalized medicine are those that seek to identify patients who will respond to classes of drugs. Although most emerging tests are in oncology, there are also new tests for drugs used in cardiovascular and autoimmune diseases.

### Emerging Personalized Medicine Tests

<table>
<thead>
<tr>
<th>Test Name</th>
<th>Test Developer</th>
<th>Drug Name</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>TPMT test</td>
<td>PGxHealth</td>
<td>Various thiopurine</td>
<td>Identifies individuals at risk of developing severe side effects from thiopurine treatment, such as lowering of blood cell counts.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>drugs</td>
<td></td>
</tr>
<tr>
<td>ChemoFX</td>
<td>Precision Therapeutics</td>
<td>Chemotherapy</td>
<td>Cell-based test. Predicts likelihood of tumor response to different chemotherapy treatments.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Responsiveness</td>
<td></td>
</tr>
<tr>
<td>MammaPrint (breast cancer</td>
<td>Agendia</td>
<td>Chemotherapy</td>
<td>Classifies breast cancer patients as 'low' or 'high' risk of developing distant metastasis in a 10-year period, based on a 70-gene profile.</td>
</tr>
<tr>
<td>recurrence)</td>
<td></td>
<td>Responsiveness</td>
<td>Offers additional information to oncologists and patients concerning the future treatment plan.</td>
</tr>
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<tr>
<td>CupPrint (primary tumor</td>
<td>Agendia</td>
<td>Chemotherapy</td>
<td>For Cancer of Unknown Primary (~5% of all the types of cancer). Diagnosis and treatment are difficult, and may result in high rates of toxic deaths by chemotherapy. Identifies the primary tumor reliably.</td>
</tr>
<tr>
<td>identification)</td>
<td></td>
<td>Responsiveness</td>
<td></td>
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</tr>
<tr>
<td>Oncotype Dx</td>
<td>Genomic Health</td>
<td>Chemotherapy</td>
<td>Diagnostic assay for likelihood of breast cancer recurrence. In addition to predicting distant disease recurrence, it also assesses the benefit from certain types of chemotherapy</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Responsiveness</td>
<td></td>
</tr>
<tr>
<td>Prostate Px</td>
<td>Aureon Laboratories</td>
<td>Chemotherapy</td>
<td>Predicts prostate cancer recurrence using in situ RNA and protein imaging.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Responsiveness</td>
<td></td>
</tr>
<tr>
<td>ApoE Genotyping</td>
<td>Qiagen</td>
<td>Statins</td>
<td>ApoE genotyping is used to check for and help diagnose a genetic component to a lipid abnormality.</td>
</tr>
</tbody>
</table>

Source: Scientia analysis

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We believe personalized medicine can have a positive impact on therapeutics in three possible ways

- Enable diagnosis of other related conditions and enable Rx market expansion

Examples

- Diabetes drugs and better diagnostic tests and definition of metabolic syndrome
- Statins and improved cholesterol & lipid testing

- Enable better disease segmentation and facilitate better market penetration of Rx

Examples

- Herceptin and Her2 tests
- Gleevec and Bcr/Abl tests

- Enable migration into earlier Rx treatment paradigm

Examples

- Herceptin and Her2 tests

Source: Scientia analysis
How we identify opportunities
We examine how diagnostics may affect the sales of therapeutics

What the test does

- Enable diagnosis of other related conditions and enable Rx market expansion
- Enable better disease segmentation and facilitate better market penetration of Rx
- Enable migration into earlier Rx treatment paradigm

How it may affect therapeutics

- Expand total market (new indications)
- Expand market for specific Rx
- Increase market share
- Increase penetration
- Increase compliance
- Increased price support
- Better reimbursement
- Increase penetration
- Increase treatment rate per diagnosis

Improved patient outcomes drives therapeutic revenues

Source: Scientia analysis
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