Co-Development and Marketing of Pharmacogenetic Tests and Therapeutics: Economic Incentives and Policy Implications

Louis P. Garrison, Jr., Ph.D.,

Professor, Department of Pharmacy

University of Washington

OECD : OCDE

An International Perspective on Pharmacogenetics: The Intersections Between Innovation, Regulation, and Health Delivery

Rome, Italy : 17-19 October, 2005

Acknowledgements

- Financial support and expert scientific contributions from Roche Biomarker Program.
- Collaboration with Dr. Finley Austin of Roche Pharmaceuticals.

Introduction

This research was aimed at understanding—from a theoretical perspective--the economic incentives related to the development of linked diagnostic-therapeutics products.

The analysis relies on a simplified, “stylized” numerical example to illustrate the complexities of the incentives and to identify and understand the important factors that come into play.

Current Business Models

- Prescription Pharmaceuticals
  - » Intellectual property protection
  - » High margins/high risk
  - » Blockbuster financing
  - » Detailing
- Diagnostics
  - » Low margin
  - » Compete on platform
  - » High volume

Current Pricing and Reimbursement Environments

- Pharmaceuticals:
  - » Somewhat value-based in the US.
  - » In EU, more price controls and limited flexibility.

- Diagnostic tests:
  - » Cost-based in both US and EU.

- Role of intellectual property: can only capture value above short-run marginal cost with patent protection and accompanying monopoly power.

Rationale

Personalized Medicine—and a linked PGx Dx-Tx--could create additional economic value in at least four ways:

1. As the non-responders or poor responders are removed from the pool of users, their costs (monetary and negative utility) for adverse events are avoided.
2. Better targeting can lead to a greater volume of adoption by good responders (some of whom would not have used the drug previously).
3. Good responders may have improved compliance—and therefore additional net benefits— especially for long-term chronic therapies.
4. The improvement of predictability of outcome creates additional value for patients as they face less uncertainty.

A Simple Framework and Example: Defining Economic Value

- What is “economic value”?

- “Value”= what fully informed patients would be willing to pay (WTP) for a new Dx or Tx based on:

    1) any cost savings,

    2) life years gained,

    3) improvements in quality of life or morbidity, and

    4) reduction in uncertainty.

Example: New Therapeutic (Tx) with and without Diagnostic Test (Dx)

Tx with no Dx

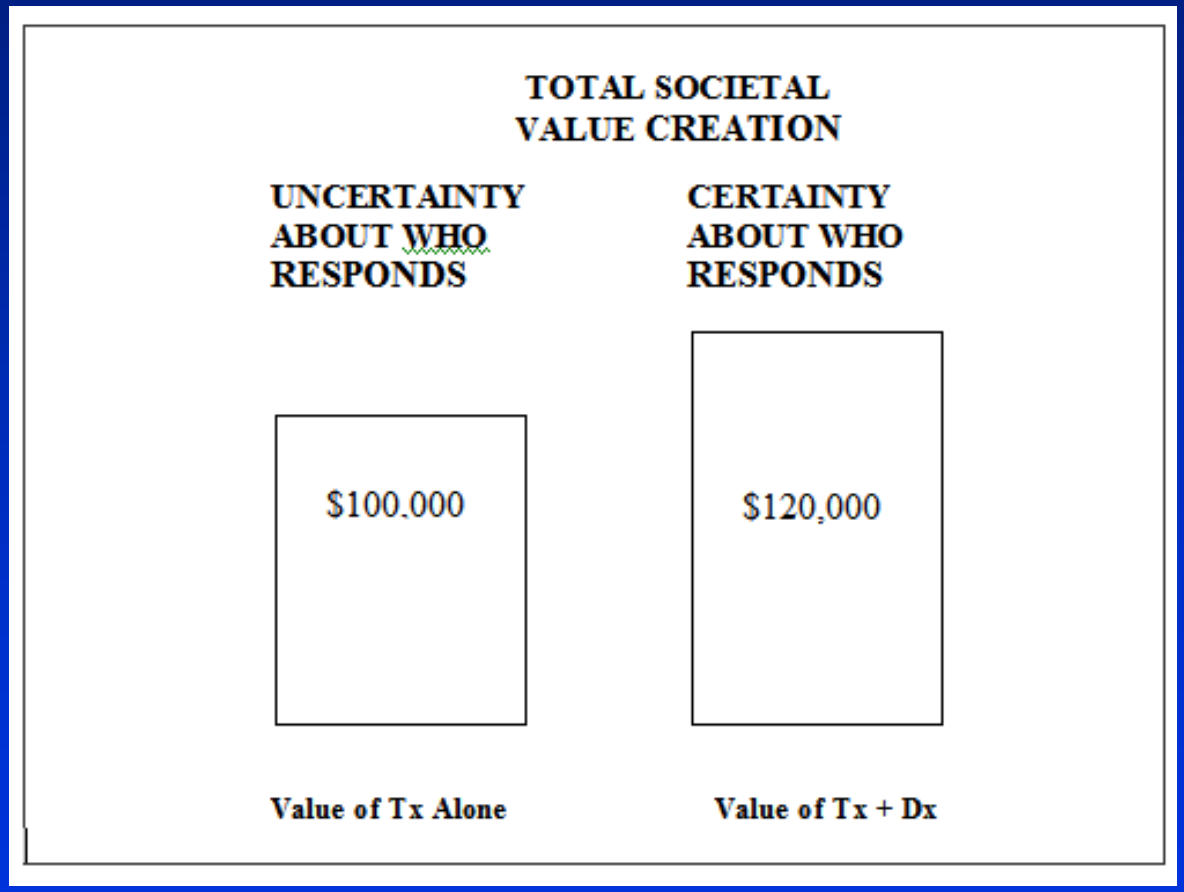
- 100 patients receive Tx
- 20% respond
- Willingness to pay: $1000
- Total value generated:
  - (100 x $1000)
  - =$100,000

Tx with perfect Dx

- 100 patients are tested
- 20 receive Tx
- Willingness to pay: $6000
- Total value generated:
  - (100 x .2 x $1000)
  - =$120,000

Therefore, a Dx test has the potential to generate an additional $20,000.

Value Creation Due to Reduction in Uncertainty



Cost-Effectiveness from Societal Perspective

Costs (not charges) for Tx and Dx:

- Short-term marginal cost of Tx = **$5** per patient. (No sunk costs)
- Long-term marginal cost of Dx = **$100.** (Sunk costs plus fair rate of return)

Net Benefit =

[(Aggregate Benefit of Tx+Dx) – (Aggregate Benefit of Tx alone)] –
[(Total cost of Tx+Dx) – (Total cost of Tx alone)]
= [$120,000- $100,000] – [($10,000+ $100) – ($ 500)]
= $20,000 – $9,600
= $10,400

- Net benefit is greater than $0, so this advance would be **cost-effective** (or cost-beneficial) **from a societal perspective**. However, whether this advance would be developed and adopted is likely to depend on how the gains are distributed.

Scenario Analysis: Who Captures the Value?

Vary in terms of:

1. Whether Tx and Dx pricing reimbursement are value-based or cost-based, and how flexible they are over time.
2. Timing--whether Tx is already on the market. *(Ex post vs. Ex ante)*
3. How intellectual property protection—to prevent copycats--is a barrier to entry.
4. Competitiveness of insurance market over short versus long term.

→**Examined five hypothetical scenarios.**

Scenario I: *Ex post* situation; new diagnostic; with no Tx price flexibility; Dx with administered pricing

Key Assumptions:

- T can't raise price
- D set at charge=cost
- Insurers premiums unchanged

VALUE DISTRIBUTION:

• Patient (Direct)	$20K
• Insurer N	$70K
• T Manufacturer	$20K
• D Manufacturer	$10K
TOTAL	$120K

- Tx price $1000 (-$80K revenues, 80% reduction profit, low incentive)
- Dx price $100 (Low profit, normal incentive)
- Premium collected $100,000 (Claims paid out $30,000, high incentive)
- Patient gets better value for money spent

Scenario II: *Ex post* situation with some Tx price flexibility; insurer budget constrained; Dx with administered pricing.

Key Assumptions:

- T can raise price to equal current total spending
- Dx set at charge=cost
- Insurer can't or won't increase premiums

VALUE DISTRIBUTION:

• Patient (Direct)	$20K
• Insurer N	$ 0K
• T Manufacturer	$90K
• D Manufacturer	$10K
TOTAL	$120K

- Manufacturer can set price at $4500 for the 20 responders.
- Insurer spends the cost savings on the responders.

Scenario III: *Ex post* situation with no Tx price flexibility; Dx with some price flexibility and IP protection

Key Assumptions:

- T can't raise price
- D can charge up to maximum value added
- Insurer can't raise premium (constrained to current total spending)

VALUE DISTRIBUTION:

• Patient (Direct)	$20K
• Insurer N	$ 0K
• T Manufacturer	$20K
• D Manufacturer	$80K
TOTAL	$120K

•D manufacturer captures value created (cost savings) by charging $800 per test.

Scenario IV: *Ex ante*, linked situation with Tx price flexibility and Dx cost-based reimbursement

Key Assumptions:

- T can raise price
- Dx charged at cost
- Insurer raises premium in competitive market.

VALUE DISTRIBUTION:

• Patient (Direct)	$ 0K
• Insurer N	$ 0K
• T Manufacturer	$110K
• D Manufacturer	$ 10K
TOTAL	$120K

- T manufacturer captures the value created by targeting.
- Could even try to capture value of reduction in uncertainty.

Scenario V: *Ex ante,* linked situation with Tx and Dx price flexibility and Dx IP protection.

Key Assumptions:

- Tx pricing is flexible and value based.
- Dx pricing is flexible and value-based.
- Assume insurance market is competitive.

VALUE DISTRIBUTION:

• Patient (Direct)	$ 0K
• Insurer N	$ 0K
• T Manufacturer	$ 60K
• D Manufacturer	$ 60K
TOTAL	$120K

• How the value capture is split between Dx and Tx is arbitrary—but competitive market conditions could be key.

Conclusions

- Who will capture the value of a linked diagnostic-therapeutic depends on many factors:
  - » pricing and reimbursement constraints
  - » intellectual property protection
  - » competitive market conditions
  - » timing of entry
  - » insurance market competitiveness
  - » the characteristics of the diagnostic and therapeutic products.
- Along with scientific and clinical considerations, whether, when, and how this value will be created is inextricably related to who captures it.

Public Policy Implications

- Flexible and value-based pricing and reimbursement for diagnostics could provide drug and diagnostic manufacturers a stronger incentive to evaluate the business case for linked diagnostics and therapeutics during drug development.
- Incentive-oriented reforms--linking pricing and reimbursement for drugs and diagnostics to value creation--will encourage personalized medicine.
- Strong, consistent, predictable IP environment remains key to pharmaceuticals. How content vs. platform protection is resolved in diagnostics will affect long-term business prospects.
- Public policy should not focus on PGx technologies alone, but should consider the broader the linked diagnostic-therapeutic paradigm.