Smart Tech, Smarter Policy: The Economics of AI Excellence

Navigating Costs, Competency, and Value in AI

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Disclosures

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AI / ML
Recent **Enthusiasm**

Unbounded expectations

Naive Assumptions:

- *generatum ex nihilo* (Latin "generated out of nothing")
- Effortless portability to bedside interventions
- Clear and demonstrable ROI
- Replacement vs. augmentation of important human thinking and acting

Earnestness is enthusiasm tempered by reason.

~ Blaise Pascal

Policy Implications

Essential Policy Considerations

- Cost structures create access barriers
- AI adoption is accelerating a technology ‘arms race’ and digital divide
- Gaps in reimbursement and health economics policies relating to AI
- Specialized workforce and training needs
- Continuous learning and adaptation requires invalidates conventional safety/efficacy frameworks

- systems materially change during-shortly after the evaluation period, potentially invalidating the original safety/efficacy evidence
- differs from traditional medical devices which remain static after validation testing [i.e., build cumulative evidence over time based on a stable product version]

Paradoxes

+

Challenges

Challenges: AI Cost Pyramid

Will likely mirror current enterprise AI pricing structures

- AI systems often employ per-use pricing models that can escalate rapidly in high-throughput clinical settings
- Financial concerns center on compounding effect of per-use costs in high-volume applications

Key Paradoxes

- ↑ AI capability requires larger, more complex models
- ↑ sophisticated tasks require more compute, not less
- ↑ data quality requirements, raising costs
- ↑ autonomous function adds safety + oversight costs

AI: Hidden Cost Multiplication Effect

Base Platform Costs
- Initial system purchase, a annual licensing, maintenance

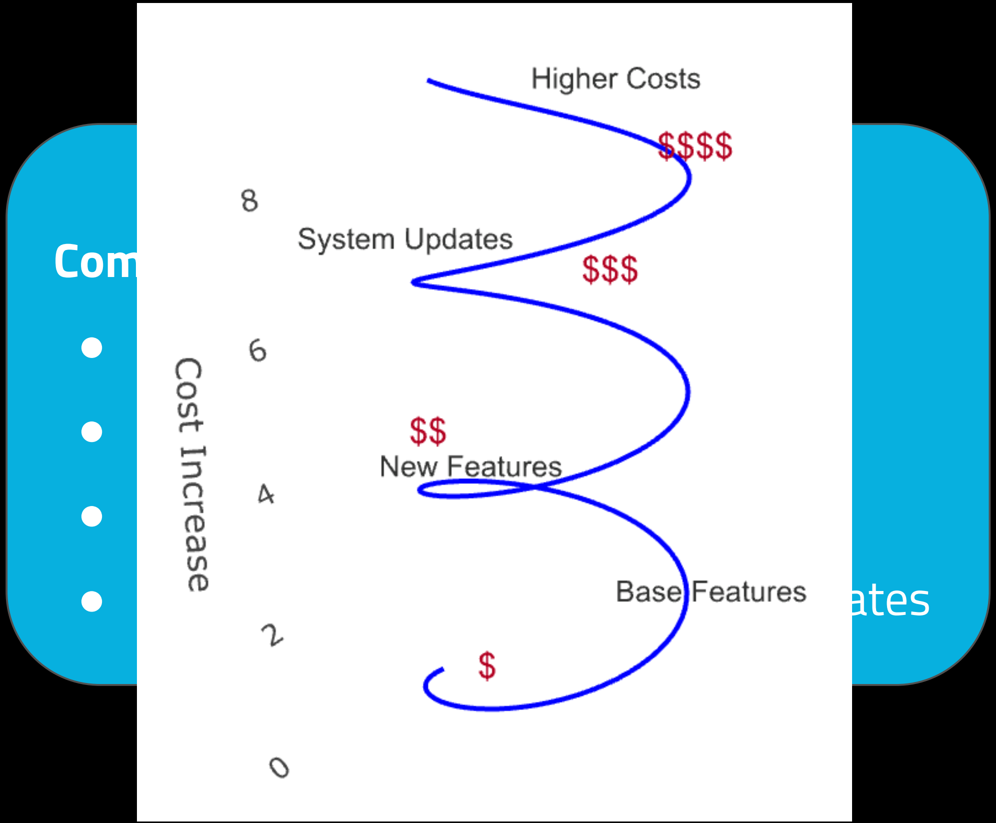
Per-Case Fee Stack
Each procedure incurs layered fees

1. Core Processing + Compute
   - Algorithm usage, analytics, reporting

2. Feature Utilization
   - Advanced imaging integration, real-time decision support, specialized protocols

3. Data Management
   - Storage, quality metrics, outcome tracking, traceability

Mandatory Update Cycle
- Quarterly algorithm updates, annual system upgrades, new feature integration, security



AI Cost Multiplication - System Effects

- Cost-prohibitive for healthcare systems operating on thin margins
- Geographical disparities + economic stratification

  - Two-tiered care system emerges

  - Loss of local expertise as cases shift to centers

  - Health outcomes diverge based on geography

  - Knowledge gap develops between AI and non-AI trained

Specialized Training for AI-Enabled Work

Illustrative Scenario:

Human-AI Collaboration in the Operating Room

- Embedded intelligence (symbolic logic) in surgical robotics
- Semi-autonomous surgery based on deep knowledge of anatomy, structure-function constraints, sequencing, procedural objectives, etc.
- Often integrated with, receiving input from other AI systems (imaging)

Specialized Training for AI-Enabled Work

- AI systems have distinct patterns of excellence and blind spots
- Providers must learn to effectively "co-pilot" with the AI system, understanding not just when to follow its guidance but also when and how to appropriately override it
  - Complicated → with AI's continuous learning capability - as the system evolves, users must adapt their interaction patterns accordingly
  - Dynamic → both the AI and the users are simultaneously learning and adapting, requiring ongoing training and periodic recalibration
  - Needs → new kind of surgical expertise combining traditional surgical judgment + sophisticated AI interaction skills

Strategies to Overcome Challenges

Demand for Innovative Ideas and Models

- Value-based payment model for AI technology
- Dynamic outcomes-linked technology payment models

 - Departure from more ‘conventional’ VB models

  - Entail increased financial risk-bearing by AI technology generators

- Must account for:

  - Rapid evolution of the technology

  - Paradox of cost increasing as technology matures

  - Specialized workforce for more complex AI use cases

Ex 1: AI Value Evolution Model (AVEM)

- Value-based payment model for AI technology vendor / payer partnerships
  Key Components of reimbursement:

Evolution Coefficient (EC)

Clinical Outcomes track against predicted AI performance

Cost Efficiency measures resource utilization

Access Score reflects equitable distribution

Time factor rewards early efficiency gains

Dynamic Adjustment

A 'learning score' for new AI medical technology that answers the question:

'Is this technology getting better and more cost-effective over time as promised?'

Ex 1: AI Value Evolution Model (AVEM)

1

Initial deployment might start with EC = 0.8

reflects early-stage deployment

2

After 3 months, EC = 1.3 (↑)
if it shows:

- Improved accuracy (92%)
- Good adaptation to population (85%)
- Strong edge case handling (88%)
- Effective workflow integration (90%)

3

After 8 months, EC =1.5-1.7 (↑)
if it shows:

- Sustained high performance
- Expanded population coverage (96%)
- Demonstrated learning/adaptation
- Equitable distribution of benefits

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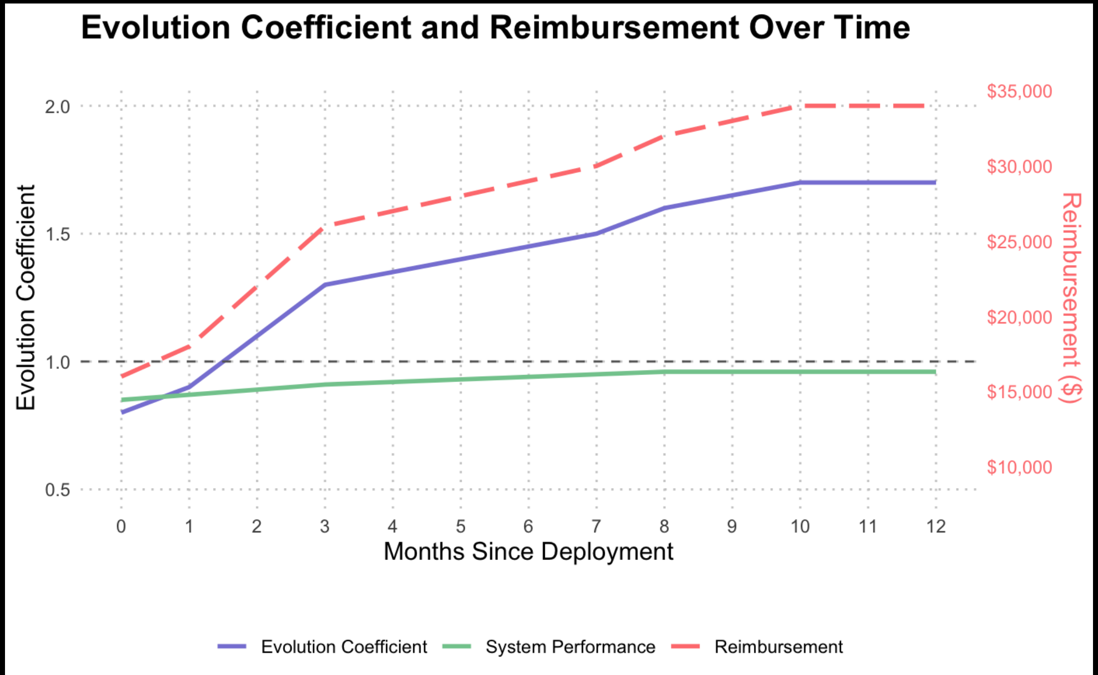

Ex 2: Virtuous Use-Network Learning Model

Base Payment Structure:

Standard Rate: Traditional board-certified surgeon

Tier 1: Basic AI-surgical certification (+15%)

Tier 2: Fellowship-trained (+15%)

Tier 3: Fellowship + 2 years AI system experience (+15%)

Quality Multipliers:

Outcomes meeting AI-predicted targets: 1.1x

Complex case management: 1.2x

Successful edge case handling: 1.3x

Teaching/training others: 1.15x

Risk Mgmt Integration:

Lower malpractice premiums for certification level

Shared liability models between providers + AI vendors

Risk pool adjustments based on certification level

Continuous algorithm updates

Complete case reporting to regulatory authorities

Cybersecurity controls

Ex 3: Training Investment Partnerships

Financial Framework:

CMS: 25%
AI Industry Partners: 50%
Hospital: 25%

Hospital receives credits against future per-case fees

Value Exchange:

Industry Partner

- Committed user base
- Real-world performance data
- Algorithm improvement
- Edge case documentation

Providers

- Ongoing skill development
- Performance optimization
- Latest AI capabilities

CMS

- Offsets DGME + IME payments

Critical Oversight Areas:

Data & Ethics Controls

Financial Firewalls

- Segregated funding streams
- Transparent cost allocation
- Anti-kickback compliance

Clinical Independence controls

- Autonomous clin. decision-making
- Independent assessment protocols
- Unbiased certification standards
- Protected override authority
- Conflict disclosure requirements

What Tomorrow Holds

Crossroads of AI Innovation and Policy

We can either design the future or inherit its challenges

[Effective + innovative] policy will determine whether AI amplifies or resolves healthcare disparities

Final Thoughts

"This isn't the end of something, it's the beginning of many new things."

-Dame Janet Thornton

Senior scientist and Director Emeritus
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European Molecular Biology Laboratory (EMBL)

Backup Slides

AI for *in silico* System Optimization

Millions of simulations

Stress-test different organizational configurations

Suggest structural changes to build redundancy and flexibility

akin to use of genetic algorithms to evolve robust biological systems