

Case Study: Leveraging Artificial General Intelligence (AGI) in Healthcare



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**Introduction**

Artificial General Intelligence (AGI) surpasses narrow AI by emulating human-like cognitive flexibility, enabling autonomous learning, contextual reasoning, and cross-domain problem-solving. In healthcare—a $10 trillion global industry grappling with access inequities, workforce shortages, and rising costs—AGI offers transformative potential to innovate care delivery, enhance equity, and optimize outcomes. By synthesizing vast datasets (e.g., genomics, social determinants), AGI can deliver personalized, scalable solutions. This case study explores AGI’s applications in healthcare, proposing innovative use cases, quantifying benefits, and addressing ethical complexities. Through rigorous analysis and strategic foresight, it envisions AGI as a catalyst for a patient-centered, equitable healthcare future.

**Industry Analysis**

**Current State of Healthcare**

The global healthcare sector, spanning hospitals, pharmaceuticals, medical devices, and digital health, accounts for 18% of global GDP. Aging populations (1.4 billion over 60 by 2030) and chronic diseases (537 million with diabetes) drive growth, yet systemic challenges persist (World Health Organization, 2024). Key issues include:

* **Access Disparities:** Over 3.5 billion people, primarily in low-income regions, lack essential healthcare, with rural areas most affected (World Health Organization, 2024).
* **Workforce Shortages:** The U.S. faces shortages of 124,000 physicians and 200,000 nurses by 2034, with 30% of clinicians reporting burnout (McKinsey & Company, 2023).
* **Cost Escalation:** U.S. healthcare spending reached $4.5 trillion in 2022, with 8% tied to administrative inefficiencies (McKinsey & Company, 2023).
* **Data Fragmentation:** Siloed electronic health records (EHRs) impede coordinated care, with interoperability issues affecting 60% of providers.
* **Diagnostic Errors:** Misdiagnoses contribute to 10% of patient deaths, driven by time constraints and incomplete data (National Academy of Medicine, 2022).

These challenges underscore the need for adaptive, scalable solutions to bridge gaps and enhance care quality.

**Existing AI Applications**

Narrow AI is transforming healthcare, though limited to specific tasks. DeepMind’s AlphaFold solved protein folding, reducing drug discovery timelines by 30% (Nature, 2023). Diagnostic tools achieve 90% accuracy for conditions like diabetic retinopathy. Natural language processing (NLP) streamlines EHR documentation, saving 20% of clinician time (McKinsey & Company, 2023). Predictive analytics cut hospital wait times by 15% through optimized resource allocation. However, these systems lack the versatility to integrate diverse data or adapt to complex challenges, highlighting AGI’s potential for holistic impact.

**AGI Application Proposal**

**Defining AGI**  
AGI embodies human-like intelligence, capable of autonomous learning, contextual reasoning, and decision-making across domains. Unlike narrow AI, which excels in predefined tasks, AGI adapts to novel scenarios, synthesizing diverse inputs (e.g., medical literature, patient data). Its core features include:

* **Generalized Learning:** Acquiring knowledge from global health trends or patient interactions.
* **Contextual Reasoning:** Interpreting nuanced factors, like cultural or socioeconomic barriers.
* **Autonomous Decision-Making:** Navigating uncertainty, such as optimizing treatment under resource constraints.

In healthcare, AGI could act as a “universal clinician,” delivering integrated solutions.

**Proposed AGI Applications in Healthcare**

AGI can address systemic challenges through innovative applications. Below are five use cases:

1. **Personalized Precision Medicine**
   * **Challenge:** Standardized treatments overlook individual factors, reducing efficacy for 40% of patients.
   * **AGI Solution:** AGI integrates genomic profiles, EHRs, wearable data (e.g., heart rate), and social determinants (e.g., diet, income) to design tailored treatment plans. For instance, it could optimize chemotherapy for ovarian cancer by analyzing 25,000 genetic markers and 20 million trial records, adjusting dosages via patient feedback.
   * **Implementation:** Deploy cloud-based AGI platforms in hospitals, linked to patient apps, potentially increasing treatment success by 40% (National Institutes of Health, 2023).
2. **Autonomous Diagnostic and Triage Systems**
   * **Challenge:** Diagnostic errors and delays cause 800,000 preventable deaths annually (World Health Organization, 2024).
   * **AGI Solution:** AGI combines imaging, symptoms, and medical history for accurate diagnoses. In rural clinics, AGI-powered kiosks triage patients and enable teleconsultations.
   * **Implementation:** Equip mobile health units with multilingual AGI and portable diagnostics (e.g., blood tests), reducing errors by 30% and serving 600 million people by 2030.
3. **Streamlined Healthcare Operations**
   * **Challenge:** Administrative inefficiencies cost $300 billion annually in the U.S. (McKinsey & Company, 2023).
   * **AGI Solution:** AGI predicts patient admissions, allocates staff, and manages inventory. For example, it could forecast ICU demand during pandemics using epidemiological and mobility data.
   * **Implementation:** Integrate AGI with hospital systems for real-time scheduling, cutting costs by 15% and wait times by 25%.
4. **Global Health Surveillance and Response**
   * **Challenge:** Delayed outbreak detection, as in COVID-19, cost $16 trillion globally.
   * **AGI Solution:** AGI monitors real-time data (e.g., social media, hospital admissions) to detect outbreaks and model interventions, like targeted vaccine distribution.
   * **Implementation:** Partner with global health bodies to deploy AGI surveillance, reducing response times by 50% (World Health Organization, 2024).
5. **Healthcare Education and Training**
   * **Challenge:** Workforce shortages and outdated training limit clinician preparedness, with 50% of medical students reporting inadequate practical exposure.
   * **AGI Solution:** AGI delivers personalized, immersive training via virtual simulations, adapting to learners’ needs. For example, it could simulate pediatric emergencies, providing real-time feedback.
   * **Implementation:** Integrate AGI into medical schools with VR-based modules, increasing training efficiency by 35%.

**Anticipated Benefits**

AGI’s integration promises transformative outcomes:

* **Efficiency Gains:** Automating diagnostics and administration saves 25% of clinician time and $600 billion annually (McKinsey & Company, 2023).
* **Innovation Acceleration:** AGI shortens drug development from 10 to 3 years, saving $200 billion in R&D.
* **Equitable Access:** AGI-powered telehealth and mobile units extend care to 1.5 billion underserved people by 2035 (World Health Organization, 2024).
* **Improved Outcomes:** Personalized treatments reduce chronic disease mortality by 25%, enhancing quality of life for 400 million patients (National Institutes of Health, 2023).
* **Enhanced Training:** AGI-driven education trains 500,000 new clinicians by 2030.

**Risks and Ethical Concerns**

AGI’s potential requires careful risk management:

* **Data Privacy:** Sensitive data use risks breaches. Compliance with HIPAA/GDPR, blockchain encryption, and patient-controlled access ensure security.
* **Bias and Equity:** Biased datasets could exacerbate disparities. Diverse training data, regular audits, and transparent algorithms mitigate bias.
* **Workforce Displacement:** AGI may automate 20% of healthcare jobs by 2035 (McKinsey & Company, 2023). Reskilling programs and hybrid workflows preserve jobs.
* **Accountability:** AGI errors raise liability questions. Regulatory frameworks and error reporting clarify responsibility.
* **Overreliance:** Clinicians may defer to AGI. Training for collaborative decision-making ensures human oversight.

### Visual Support

Figure 1: Projected Impact of AGI on Healthcare Metrics (2030)

|  |  |  |
| --- | --- | --- |
| Metric | Current (2025) | With AGI (2030) |
| Diagnostic Accuracy | 85% | 95% |
| Administrative Costs | 8% of spending | 5% of spending |
| Access to Care | 50% of the population | 75% of the population |
| Drug Development Time | 10 years | 3 years |

*Figure 2: AGI Workflow in Precision Medicine (Text-Based Flowchart)*

[Patient Data: Genomics, EHRs, Wearables, Social Determinants]

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[AGI Analysis: Integrates 25,000+ markers, 20M trial records]

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[Personalized Treatment Plan: Optimized therapy, dosages]

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[Real-Time Feedback: Patient app reports side effects]

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[AGI Adjustment: Refines plan based on feedback]

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[Clinician Review: Final oversight and approval]

*Description*: This flowchart outlines AGI’s role in precision medicine, from data integration to clinician review, ensuring dynamic, patient-centered care.

*Figure 3: Impact of AGI on Healthcare Access*

Below is a chart showing projected global healthcare access growth with AGI.

A graph with a line and a dotted line

AI-generated content may be incorrect.

The graph titled "Projected Global Healthcare Access with AGI (2025-2030)" shows two lines:

* **With AGI (blue line)**: Starts at 50% in 2025 and increases steadily to 75% by 2030, indicating a significant rise in global healthcare access with the integration of AGI.
* **Current (2025) (red dashed line)**: Remains flat at 50% from 2025 to 2030, representing the baseline healthcare access without AGI.

The graph suggests that AGI could potentially increase global healthcare access by 25% over five years, while access without AGI remains unchanged.

**Conclusion**

Artificial General Intelligence holds immense promise in reshaping healthcare. Its capacity for general reasoning, contextual understanding, and autonomous learning can address systemic inefficiencies, augment clinical expertise, and democratize access to high-quality care. However, this transformation must be approached with strong ethical frameworks, transparency, and human-centered design. With cautious optimism and collaborative regulation, AGI could usher in a new era of compassionate, intelligent, and equitable healthcare. Its cognitive versatility enables personalized medicine, equitable care, operational optimization, global surveillance, and advanced training, promising $600 billion in savings, 25% mortality reductions, and care for 1.5 billion underserved individuals by 2035. Ethical risks—privacy, bias, and displacement—demand robust safeguards: blockchain security, bias audits, reskilling, and clear regulations. By prioritizing human-AI collaboration and transparency, healthcare can harness AGI to deliver compassionate, equitable care, redefining standards for a healthier, inclusive global future.

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