Federated Learning

Global Model
Aggregation

Gradients
Updates

🏥 **Hospital A**
Local Training

🏥 **Hospital B**
Local Training

🏥 **Hospital C**
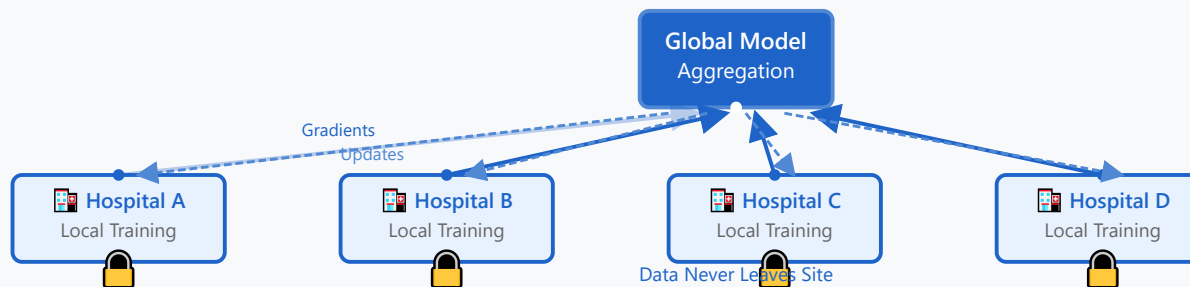Local Training

🏥 **Hospital D**
Local Training

Data Never Leaves Site

Distributed Training

- Local model training
- Gradient aggregation
- Global model updates
- Data never leaves site

Privacy Protection

- HIPAA-compliant by design
- Secure multi-party computation
- Encrypted communications
- Differential privacy integration

Hospital Networks

- Multi-institutional collaboration
- Diverse patient populations

Technical Challenges

- Non-IID data distribution
- Communication overhead

- Improved generalizability

- System heterogeneity
- Convergence guarantees

Success Examples: Google Health (diabetic retinopathy), NVIDIA Clara (medical imaging consortia)