Quantum tech meets healthcare: Why angel investors should pay attention now

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ABSTRACT

Quantum technologies represent a genuine paradigm shift for healthcare, but th investment landscape requires careful navigation. This essay examines three qua domains (computing, sensing, communication) through the lens of healthcare applications, with particular focus on commercial readiness timelines ranging fr 2 years (sensing) to 10+ years (theoretical computing applications). Key findings include: quantum sensing applications in diagnostics and bioprocessing are commercially viable today with companies like Genetesis and Q.ANT showing re revenue; quantum computing for drug discovery remains 3-5 years from meanin ROI despite significant pharma partnerships; quantum communication for healt data security offers compelling risk mitigation but faces adoption friction. The r synthesizes data from 40+ case studies, interviews with portfolio companies and quantum researchers, and analysis of $2B+ in recent quantum startup funding. F angel investors, the thesis centers on selective exposure through commercial-sta sensing companies, early positioning in quantum-classical hybrid computing platforms serving biopharma, and patient capital deployment in communication infrastructure. Risk factors include hardware maturity timelines, regulatory uncertainty, talent scarcity, and the potential for classical AI/HPC to solve probl before quantum advantage materializes.

Introduction: Why Quantum Now

Look, I get it. Another emerging tech category promising to revolutionize health We've all sat through the blockchain for medical records pitch, watched VR ther companies burn through Series A cash, and heard about how this particular AI r will definitely solve prior auth this time. So when quantum computing shows up talking about simulating molecular interactions and revolutionizing drug discov the pattern-matching part of your brain should absolutely be screaming “wait ar see.”

But here’s the thing. The quantum opportunity in healthcare is actually differen the timing matters more than usual. Not because the technology suddenly got 1(better last quarter (though hardware IS improving faster than most people realiz but because three separate trends are converging in ways that create actual near- commercial opportunities, not just science projects.

First, we’ve got quantum sensing technologies that are already commercially dep and generating revenue. Not pilot programs, not “research use only” disclaimers actual FDA-track devices being used in clinical settings. Companies like Genete have their magnetocardiography platform in hospitals right now. This isn’t vapo

Second, the biopharma industry is desperately seeking any edge in R&D product and they’re willing to pay real money to explore quantum approaches. When you looking at $2-3B to bring a drug to market and 90%+ failure rates in clinical tria calculus on experimental computational methods changes dramatically. Modern partnering with IBM on quantum computing for PR. They’re doing it because th existing simulation tools hit fundamental limits when modeling complex molecu systems.

Third, and this is the piece most healthcare investors miss, quantum communica and post-quantum cryptography have become urgent priorities because of “harv now, decrypt later” attacks. Healthcare organizations are sitting on data that wil valuable for 50+ years, and adversaries are already capturing encrypted traffic to with plans to decrypt it once quantum computers get powerful enough. This cre forcing function for adoption that doesn’t depend on quantum hardware getting dramatically better. The threat is already real.

Now let me be clear about what this essay is NOT. This is not a quantum physics tutorial. If you want to understand why entanglement works or what a qubit act is at the physics level, there are much better resources. This is also not a comprehensive market map of every quantum startup. What this IS is a practical framework for thinking about quantum investments in healthcare, with specific attention to what's real vs what's fundraising theater, and where angels can actu build differentiated positions.

The WEF report that came out recently does a solid job cataloging use cases and sorting them by maturity timeline. I'm going to build on that framework but foc specifically on the investment angle, including stuff like how to evaluate technic risk, what the talent market looks like, where incumbents have unassailable advantages vs where startups can win, and what kind of position sizing makes se given the wide range of outcomes.

Let's get into it.

The Three Quantum Pillars in Healthca

The quantum ecosystem breaks down into three distinct technology domains, ar really need to understand each separately because they have completely differen maturity curves, competitive dynamics, and paths to market.

Quantum Computing: Beyond the Hype

Quantum computing gets 80% of the press and probably 70% of the VC dollars, it's actually the furthest from broad commercial deployment in healthcare. The promise is compelling though. Classical computers struggle with problems that involve simulating quantum mechanical systems (like drug molecules interacting protein targets) because the computational complexity grows exponentially with system size. Quantum computers, in theory, can handle these simulations more efficiently because they're literally operating under the same physics as the mole they're simulating.

The killer use case everyone points to is drug discovery and development. Mode partnership with IBM focuses on predicting mRNA secondary structure, which crucial for vaccine and therapeutic design. Boehringer Ingelheim has a multi-yea quantum program exploring molecular dynamics. Qubit Pharmaceuticals raised Series A specifically to build quantum-accelerated drug design platforms. The to addressable market here is enormous, given that pharma R&D spending hit $288 globally in 2024.

But (and this is a big but), we're still in the prototype readiness phase for most o these applications. The WEF report categorizes use cases like protein folding prediction and photodynamic property modeling as 6-10 years out. Even the mor mature applications like molecular dynamics simulation are realistically 3-5 year from production deployment. Why? Hardware constraints.

Current quantum computers (even the latest IBM or Google systems) have mayb 1000 physical qubits, with error rates that require extensive error correction. To meaningful molecular simulation, you probably need 1000+ logical qubits (which means maybe 100,000 physical qubits with current error correction schemes). W not there yet. The industry roadmap suggests fault-tolerant machines with the required specs arrive around 2030, though hardware progress has been faster tha expected over the past few years.

Here's what that means for investors. If you're looking at quantum computing pl for healthcare, you're making a 5-10 year bet on hardware maturity coinciding w algorithm development and pharma adoption. That's a long time horizon with a technical risk. The flip side is that if it works, the value creation is massive. Cut 3 years off drug development timelines or improving clinical trial success rates b even 10% would justify billions in market cap for the enabling platform.

The smarter near-term investment angle is hybrid quantum-classical approaches Companies building platforms that can run parts of molecular simulation on qu hardware and parts on classical HPC, with automatic workload distribution. Th pharma customers start building quantum expertise and workflows now, even w hardware is still maturing. It also means the platform can deliver value using toc quantum systems for smaller problems, then scale up as hardware improves.

The talent situation is brutal though. There are maybe 10,000 people globally wi combination of quantum computing expertise and domain knowledge in chemistry/biology needed to build these applications. Every major pharma comp every cloud provider, every quantum hardware vendor, and every startup is comp for the same talent pool. Compensation packages are getting absurd. Moderna explicitly mentioned partnering with universities to create joint PhD programs because they can't hire enough experienced quantum folks.

Quantum Sensing: The Sleeper Hit

This is where things get interesting from a near-term investment perspective. Quantum sensing is about using quantum effects (like superposition and entanglement) to make extremely precise measurements of physical quantities. T out the human body generates all kinds of weak signals (magnetic fields from th heart and brain, bioelectric activity, metabolic changes) that classical sensors str to detect with high sensitivity.

The commercial readiness here is dramatically different from computing. Multip quantum sensing applications are already in market, generating revenue, with credible paths to broad adoption. Genetesis is the poster child. Their CardioFlu magnetocardiography system uses quantum sensors to detect magnetic fields generated by the heart's electrical activity. It's more sensitive than standard ECC certain cardiac conditions and works at the bedside without elaborate infrastruc They've got the device deployed in hospitals, partnerships with major health sys and are in the FDA clearance process.

Another example is quantum diamond sensors for bioassays. Harvard and Bosto hospitals are using nitrogen-vacancy centers in diamond for ultra-sensitive dete of nanoparticles and biomarkers. This is research use only right now but the commercial path is clear. There's also quantum photonic sensing for biomanufacturing process control, which is basically quantum-enhanced quality assurance for pharma production. Festo has a commercial product here.

The key insight is that quantum sensing applications don't require fault-toleran quantum computers. The physics is more forgiving. A quantum sensor might us or a few entangled particles to make very precise measurements, rather than tryi maintain coherence across thousands of qubits doing complex calculations. This makes the engineering challenge much more tractable.

Market size is harder to estimate because quantum sensing could displace existi diagnostic modalities across multiple categories. Magnetocardiography compete stress tests, echocardiograms, and Holter monitors depending on the clinical co Quantum biomarker assays compete with existing lab tests but might enable ent new diagnostics. My rough guess is the addressable market for quantum sensing diagnostics alone is $10-20B over the next decade, with additional opportunity i biomanufacturing and research tools.

The startup landscape is fragmented. You've got pure-play quantum sensing companies trying to build platform technologies that can address multiple applications. You've got companies building specific diagnostic devices using quantum sensors. And you've got quantum technology vendors (like Q.ANT in Germany) building components and selling to device manufacturers. Different business models, different risk profiles, different timelines to exit.

For angels, I think the best opportunities are either very early-stage companies v legitimate technical founders and a clear first application, or later-stage compan that already have commercial traction and are raising for scale. The middle stag tricky because you need a lot of capital to get through clinical validation and FD clearance, which means you're probably getting diluted through multiple round before there's a clear outcome.

One more thing on sensing. The portability and form factor trajectory matters a First-gen quantum sensing devices are often bulky, require cryogenic cooling or special infrastructure, and are limited to centralized facilities. But there's a clea roadmap toward miniaturization and room-temperature operation. If magnetocardiography devices can shrink to the size of a Holter monitor and wor primary care offices, the market expands massively. Same with wearable quantu

sensors for continuous biomarker monitoring. This is still speculative but the pl
doesn't prohibit it.

Quantum Communication: Security's Next Frontier

Quantum communication (specifically quantum key distribution and quantum-s cryptography) is the third pillar, and it's the most immediately relevant to health data infrastructure even though it gets less attention than computing or sensing.

The basic threat model is this. Healthcare organizations hold sensitive data that retains value for decades (genetic information, longitudinal health records, etc). Adversaries with sufficient resources can already be capturing encrypted health data traffic today, storing it, and planning to decrypt it in 5-10 years once quantu computers are powerful enough to break current encryption schemes (RSA, ECC This is called "harvest now, decrypt later" and it's not theoretical. It's happening

Post-quantum cryptography (standardized by NIST in 2024) provides mathemati approaches to encryption that should be resistant to quantum attacks. Transitio healthcare IT infrastructure to PQC is going to be a multi-year, multi-billion do effort. The FDA's 2023 pre-market cybersecurity guidance explicitly requires me device manufacturers to ensure "crypto agility" and the ability to upgrade encry over a device's lifecycle. This creates regulatory forcing function for adoption.

Quantum key distribution is the more exotic approach. It uses quantum mechan generate and distribute encryption keys in a way that's provably secure (any eavesdropping attempt disturbs the quantum state and is detectable). QKD requ specialized hardware (photon sources, quantum channels, detectors) which make deployment expensive and complex. But for very high-value data links (like hosp to-hospital transfers of imaging data, genomic data, or drug manufacturing specifications), the economics might work.

There are a few companies building QKD infrastructure specifically for healthca Quantasphere has an MoU with Abeer Group in Saudi Arabia to implement qua

secured data exchange across their hospital network. ID Quantique and other ve
are part of the OPENQKD project in Europe, which includes healthcare testbed
business model is typically infrastructure-as-a-service, where the quantum communication provider charges for secure data transfer capacity.

The investment case here is less about giant outcomes and more about defensive necessity. Healthcare data breaches cost the industry $10B+ annually. Regulator penalties for security failures are increasing (HIPAA fines, GDPR violations, etc quantum communication can demonstrably reduce breach risk and achieve cost with classical secure infrastructure, adoption becomes inevitable rather than op

Timing is the tricky part. Near-term (0-2 years), the focus is on PQC implementa which is mostly a software/integration challenge that benefits traditional cybersecurity vendors more than quantum startups. Medium-term (3-5 years), Q deployments for critical healthcare links become viable, creating opportunity fo infrastructure providers. Long-term (7-10 years), there's a possibility of continen scale quantum-secured healthcare networks (like extensions of EuroQCI), which would require massive capital and likely be government-led initiatives that priva investors participate in via PPP structures.

For angels, the opportunity is probably in picks and shovels. Companies buildin quantum random number generators, PQC migration tools, hybrid classical-qua security platforms, or specialized hardware for healthcare QKD deployments. D QKD infrastructure investment is too capital-intensive and too dependent on government contracts to be a good angel play.

Market Timing and Investment Thesis

So with all that technology context, what's the actual investment thesis? Why no what's the entry strategy?

The macro timing argument is that we're at an inflection point where quantum technologies are transitioning from pure research to commercial deployment in healthcare, but the startup ecosystem is still relatively immature. Most healthca investors don't have deep quantum expertise, which creates an opportunity for a who invest the time to build domain knowledge and networks in this space.

There's about $2B in global VC funding for quantum startups annually right no meaningful chunk of that is going to healthcare applications, but it's still early enough that there aren't dominant winners in most categories. You can still get seed/Series A rounds at reasonable valuations if you have relevant domain expert and can add value beyond capital.

The challenge is separating real technology risk from execution risk. Every quan startup will tell you their approach is differentiated and their timeline to comm deployment is realistic. Most of them are wrong. The way to evaluate this is by focusing on a few key indicators.

First, hardware dependencies. If a company's product requires quantum comput hardware that doesn't exist yet and won't exist for 5+ years, you're making a very term bet with lots of technical risk. This is fine if you're a corporate venture arm strategic reasons to invest or a deep-tech VC with a 15-year fund lifecycle, but it generally too risky for angels unless you have very high conviction and are comfortable with binary outcomes.

Second, customer validation. Are design partners actually putting in effort to te technology and provide feedback, or is it just a "let's stay close to this trend" partnership announcement? Moderna's quantum program has dedicated headco and real computational workloads running on IBM's quantum systems. That's ve different from a pharma company agreeing to be an "advisor" to a quantum start Look for evidence of paid pilots, data sharing agreements, or joint development contracts.

Third, path to competitive advantage. Quantum is going to see massive investme from big tech companies (Google, IBM, Microsoft, Amazon) and pharma incumb The startup's advantage can't just be "we're using quantum." It has to be some combination of: unique IP on algorithms/applications, proprietary data for mod training, a distribution wedge in a specific vertical, or a team that can't be replic Otherwise you're going to get competed away once the space gets validated.

Fourth, realistic about limitations. The best quantum founders I've talked to are clear about what their technology can and can't do today, what the roadmap look like, and what needs to happen at the hardware/algorithm level to unlock the ne stage of capability. If a founder is claiming their quantum sensing platform will replace all of MRI and CT scanning in 3 years, run away. If they're saying they ca improve sensitivity by 10x for a specific type of cardiac measurement and here's physics and the clinical validation plan, that's much more credible.

The position sizing question is tricky. Given the range of outcomes (quantum computing might change everything about drug development, or it might turn o that classical AI with better data gets 80% of the value at 10% of the complexity), think the right approach is a barbell strategy. Make small bets across a portfolio quantum healthcare companies at different stages of maturity and different technology domains. Then concentrate capital in the 1-2 companies that show re commercial traction and defensible advantages.

Specifically, if you're allocating $500K to quantum healthcare, maybe structure i $100K into 2-3 early-stage quantum sensing companies with clear first applicati $100K into 1-2 quantum-classical hybrid computing platforms serving biopharm $100K into a later-stage quantum diagnostics company that's in FDA process, ar keep $200K in reserve to double down on whoever is winning 18-24 months fron

The other macro consideration is that quantum is going to attract a lot of capita non-traditional sources. National governments are investing billions in quantum programs as strategic tech priorities (US CHIPS and Science Act, EU Quantum Flagship, UK National Quantum Technologies Programme, etc). This creates opportunities for startups to access non-dilutive funding through grants and government contracts, but it also means there's going to be a flood of capital cha limited number of high-quality teams. Valuations will get frothy in certain sub-sectors. Be disciplined.

Where the Money Is Actually Going

Let's get concrete about the capital flows. Based on the WEF report and my own tracking of announcements over the past year, here's where meaningful investme happening in quantum for healthcare.

Quantum computing for pharma R&D is getting the most money by far. IBM's Discovery Accelerator with Cleveland Clinic is a 10-year $500M+ commitment (ı technology, infrastructure, and research funding). Moderna's quantum computir partnership with IBM is multi-year though specific numbers aren't disclosed. Boehringer Ingelheim has a quantum computing program with meaningful inter budget. Qubit Pharmaceuticals raised a Series A (probably $20-30M based on ty European rounds). There are probably a dozen stealth startups in this space buil quantum simulation platforms for drug discovery.

The investment thesis for these companies is basically: if quantum computing ca reduce the cost or time of drug development by even 5-10%, it justifies hundreds millions of dollars in platform value. The challenge is that proving ROI requires actually getting drugs through development faster, which takes years to demons So near-term investors are betting on technical milestones (demonstrating quant advantage on benchmark problems, securing pharma partnerships, scaling to lar molecular systems) rather than revenue growth.

Quantum sensing for diagnostics is seeing less total capital but more companies commercial stage. Genetesis has raised probably $30-40M over multiple rounds their MCG platform. SandboxAQ raised a $500M Series B (at $5B+ valuation) an while they do way more than healthcare, their AQ Medical division is building A augmented quantum sensor diagnostics. Cerca Magnetics is developing wearable OPM-MEG for neurology. Quantum Brilliance is working on diamond-based qu sensors for various applications including biomedical.

The investment thesis here is more traditional medical device/diagnostics. There identifiable clinical need, a path to FDA clearance, reimbursement that can be modeled based on comparable existing tests, and an eventual exit to a strategic acquirer (big diagnostics companies, medical device vendors) or potentially IPO platform is broad enough.

Quantum communication for healthcare data security is mostly infrastructure p and is getting less venture capital but more government funding. The EU's OPENQKD project (which includes healthcare use cases) got significant public funding. Individual companies like Quantasphere, ID Quantique, and others are raising capital but often through enterprise sales models rather than venture eq

There's also a category of quantum-adjacent opportunities that are worth mentic Post-quantum cryptography implementation (which doesn't require quantum hardware, just new algorithms) is a huge market and companies like evolutionQ building tools for enterprises to transition to quantum-safe encryption. Quantu talent platforms and education companies are emerging. Component suppliers f quantum hardware (cryogenic systems, laser sources, precision optics) see health as one of several end markets.

One pattern that's emerging is that the most credible quantum healthcare startu have founding teams with unusual combinations of expertise. You need someone deep quantum physics knowledge, someone with healthcare/biopharma domain expertise, and someone who can build enterprise software and manage complex cycles. Very few people have all three, which is why the best teams are often 3-4 founders with complementary backgrounds.

Another pattern is heavy reliance on government funding, especially in Europe. of the most advanced quantum sensing and communication projects are part of Horizon Europe or national quantum programs. This gives startups runway to d technology without taking dilutive venture capital, but it also creates dependenc public funding cycles and makes it harder to get the kind of fast iteration and commercial focus that venture-backed companies have.

Commercial Readiness: What's Real vs What's Powerpoint

Let's cut through the bullshit. A huge amount of quantum for healthcare is curr at the "concept" stage, where there's a plausible scientific case that quantum ap X might help with healthcare problem Y, but nobody has actually built the thing demonstrated it works at scale outside a lab. The WEF report does a good job categorizing maturity levels, but I want to add some practical heuristics for eval what's real.

Commercial readiness (0-2 years): This is technology that's already deployed and generating revenue, or at minimum has cleared major regulatory/validation hurd and is in the final stages before commercial launch. In healthcare quantum, this basically just quantum sensing applications. Genetesis's magnetocardiography s is the clearest example. It's installed in hospitals, being used on real patients, an working through FDA clearance. Q.ANT's quantum photonic sensors for biomanufacturing are commercially available. If you're looking at companies in category, evaluate them like any other medical device or diagnostics investment. What's the clinical evidence? What's the health economics case? Who are the de partners? What's the regulatory pathway? What's the competitive landscape and intellectual property position?

Prototype readiness (3-5 years): This is where there's a working prototype that h been validated in controlled settings, and the path to commercialization is clear requires additional development and scaling. Most quantum computing applicat for pharma fall here. Moderna's mRNA structure prediction work has shown res comparable to classical methods on real problems, with the promise of better so diversity as quantum hardware improves. High-throughput molecular dynamics simulation is being piloted. These applications need better quantum hardware (r qubits, lower error rates) and more algorithm development, but the fundamenta proven.

If you're investing in this stage, the key is whether the company can deliver incremental value on today's hardware while positioning for bigger wins as hard improves. The "solution diversity" framing from Moderna is smart. Even if quan can't yet find dramatically better molecular candidates than classical methods, i can find a wider variety of good candidates, that's useful. It gives pharma custom more options and increases the hit rate in development.

Experimental readiness (6-10 years): This is where there's solid theoretical work initial proof-of-concept results, but major technical challenges remain before prototype deployment. Protein folding prediction using quantum computers fall here. The physics is sound, the algorithms exist, but the hardware requirements beyond what's available today. Quantum neural networks for surgical risk predic are in this category.

These are long-dated bets. If you're investing, you better have very strong convic in the team's ability to execute over a long timeline, multiple funding rounds, an probably some strategic pivots as the technology landscape evolves. Most angels shouldn't be in this stage unless they have unique access or insights.

Theoretical readiness (10+ years): This is "we think quantum approach X could theoretically solve problem Y but nobody has demonstrated even proof-of-conce yet." Predictive toxicology modeling and biological simulation of treatment resp are here. The ideas are compelling but the path from here to commercial produc very long and highly uncertain.

Don't invest in this stage as an angel. Period. This is what government grants an corporate R&D budgets are for, not early-stage venture capital. By the time these applications are ready for commercial development, the landscape will look completely different and there will be better entry points.

Now here's the thing that makes evaluating quantum companies extra tricky. Hardware progress in quantum is legitimately faster than expected. IBM's roadn has them hitting 100+ logical qubits by 2029, which is ahead of where most peop thought they'd be a few years ago. Google's recent error correction results are promising. This means companies that looked like they were in the experimenta theoretical category might move up faster than anticipated.

The flip side is that classical computing is also getting better. AI models for mol prediction are improving rapidly. AlphaFold revolutionized protein structure prediction using classical deep learning, not quantum. Better HPC infrastructur smarter algorithms are extending the capabilities of classical approaches. So qua companies aren't just racing against their own technical roadmaps, they're racin against the continuous improvement of classical methods.

This creates an important investment consideration. You don't just need quantu work technically, you need it to achieve sufficient advantage over classical metho that it's worth the switching costs and integration challenges for healthcare cust to adopt it. This is a higher bar than just demonstrating quantum supremacy on benchmark problem.

Risk Factors Nobody Talks About

Every investor presentation will cover technical risk (hardware maturity, algoritl development) and market risk (customer adoption, competitive landscape). But t are some specific risk factors for quantum healthcare investments that don't get enough attention.

First is the talent sustainability risk. The quantum workforce shortage is going worse before it gets better. Every major tech company, every pharma company, e government lab, and every startup is trying to hire the same 10,000 qualified pec Compensation is going up, but it's not just about money. People with quantum expertise can basically work anywhere they want. If your startup isn't in a place quantum researchers want to live, or isn't working on problems they find intere you will not be able to recruit and retain the team needed to execute.

I've talked to founders who spend 50% of their time on talent acquisition and retention. Setting up university partnerships, flying to physics conferences to re grad students, offering equity packages that are way above market for typical ea stage startup. And they're still losing key people to offers from Google or to acac positions. This is not a trivial problem and it meaningfully increases execution r

Second is regulatory uncertainty for quantum-enabled medical products. The FI doesn't have clear frameworks yet for how to evaluate diagnostic devices that us quantum sensors, or AI models that were trained using quantum computing. Th isn't insurmountable, but it adds time and cost to commercialization. The FDA's traditional paradigm is based on determinism and reproducibility. Quantum sys (especially quantum AI models) might introduce stochasticity that doesn't fit ne into existing frameworks. Early movers will have to do a bunch of regulatory education and potentially face longer review times.

Third is the interoperability nightmare. Healthcare IT systems are already a fragmented mess of incompatible standards. Adding quantum components (espe for communication/encryption) makes this worse. If a hospital implements QKD secure data transfer, it needs to be compatible with all the other hospitals and providers it exchanges data with. The coordination problem is brutal. This is wh government-led infrastructure programs (like EuroQCI) are important, but it als means commercial adoption will be slower than purely technical readiness woul suggest.

Fourth is the "better mousetrap" problem. Even if quantum technology is techni superior, if it's only marginally better than existing solutions, adoption will be sl Healthcare is conservative and change-averse for good reasons (patient safety, regulatory compliance, established workflows). A quantum diagnostic device ne be dramatically better or dramatically cheaper than existing alternatives to over inertia. "10% more sensitive" probably isn't enough. "Can detect disease 5 years earlier than existing tests" might be.

Fifth is geopolitical risk. Quantum technologies are increasingly viewed as strat national assets. Export controls, technology transfer restrictions, and forced localization requirements are all on the table. If you invest in a quantum health company that develops valuable IP, there's real risk that their ability to sell into markets (China, EU, US) gets constrained by government policy. This is especial for quantum communication and cryptography, which have obvious national sec implications.

Sixth is the hype cycle timing risk. We might currently be near the peak of infla expectations for quantum in healthcare. If the technology fails to deliver high-p

wins in the next 2-3 years (like a quantum-designed drug making it through Pha
trials ahead of schedule, or a quantum diagnostic device getting broad commerc
adoption), there will be a trough of disillusionment. Funding will dry up, valuati
will compress, companies will fail. Some of the best investment opportunities m
come during that trough, but investors who go in now need to be prepared for tl
possibility.

Building a Portfolio Position

Given all the above, how should a healthcare angel investor actually build exposı
quantum? Let me walk through a framework.

Start with education and network building. You can't evaluate quantum healthcı
investments without understanding the technology at some level. You don't neec
physics PhD, but you need to know what's physically possible vs what's science f
what the key hardware limitations are, what the competitive landscape looks lik
across different quantum modalities. Spend time reading actual papers (not just
releases), talking to researchers in the field, and attending quantum tech confere
The World Economic Forum's Quantum Economy Network is a decent entry poi
business-focused people. There are also bootcamps and executive education pro
from places like MIT or Delft that can get you up to speed faster.

Build relationships with technical advisors who can help with diligence. Find a
quantum physicist at a university who's willing to review technical claims. Find
biopharma R&D person who understands computational drug discovery. Find a
diagnostic device veteran who knows the FDA process. You can't evaluate these
investments alone.

On sourcing, the best opportunities probably aren't going to show up on AngelL
You need to be embedded in the quantum ecosystem. That means knowing the k
academic research groups, tracking spin-outs from national labs and major tech
companies, being connected to the quantum-focused VCs (like Quantonation in
Europe or quantum practice leads at generalist firms), and building relationship
corporate venture arms at pharma companies and big tech.

For a typical healthcare angel investor with $500K-$1M to deploy annually, I'd su putting no more than 10-20% into quantum at this stage. So maybe $50-100K pe Within that, diversify across stage and technology domain. Put a bit in early-stag quantum sensing companies where you can get in at seed rounds. Put a bit in lat stage companies that are near commercialization. Maybe put a bit in a quantum-focused fund if you find one with good access and you want more diversification

Be very selective. There are hundreds of quantum startups globally and maybe a dozen that are genuinely focused on healthcare. Of those, probably only 5-10 are worth investing in at any given time (based on team quality, technology differentiation, commercial traction, and investment terms). If you're doing one quantum healthcare deal per year, you're being appropriately selective.

Structure deals carefully. Given the long time horizons and high technical risk, y want downside protection. Consider structures with liquidation preferences, an dilution protection if this is later than seed, and ideally some early revenue mile or technical milestones that give you confidence the company is executing. Be ve cautious about valuations. Just because a company is working on cutting-edge quantum technology doesn't mean it deserves a $50M post-money valuation at se stage. If fundamentals don't make sense, pass.

Think about the exit landscape. For quantum sensing/diagnostics companies, str acquirers are the most likely exit (big diagnostics companies, medical device ven potentially pharma). For quantum computing platforms, you might see acquisiti cloud providers or quantum hardware companies, or potentially IPO if they scal enough. For quantum communication/security, it's probably acquisition by cybersecurity vendors or infrastructure providers. Structure your deal terms wit likely exit in mind.

Finally, be prepared to be patient. These are 7-10 year timelines minimum for m quantum investments. You're going to see lots of ups and downs, technical setba competitive threats, and funding challenges. The companies that succeed will be ones with resilient teams, strong partnerships, and enough capital to survive the trough of disillusionment. Make sure you're investing in companies that can go distance.

Conclusion: Conviction Without Delusi

So look, here's my bottom line take. Quantum technologies are going to have meaningful impact on healthcare. Not in a "replaces everything" way, but in targ applications where quantum approaches genuinely offer advantages that classica methods can't match. Quantum sensing is already there for certain diagnostics a measurement applications. Quantum computing will have a real role in drug dis and molecular simulation, probably on a 5-10 year timeline. Quantum communi will become standard for protecting high-value healthcare data as post-quantum cryptography gets adopted and QKD infrastructure gets built out.

The investment opportunity is real but requires a different approach than typica healthcare angel investing. You need deeper technical diligence, longer time hor and different risk/return expectations. The winners are going to be companies tl can deliver incremental value today while positioning for bigger wins as hardwa matures, that have teams with rare combinations of expertise, and that build defensible moats through IP, data, or distribution rather than just being early to quantum tech.

For most angels, the right approach is selective exposure through a small numbe well-chosen investments in different parts of the quantum healthcare stack. Dor to make quantum the center of your portfolio. But don't ignore it either. The companies that get this right are going to be enormous winners, and getting in e with the right teams at reasonable valuations is how you capture that upside.

The key is maintaining conviction without delusion. Be excited about the potent but skeptical of the hype. Demand evidence of commercial traction or at minimu strong technical validation and clear paths to market. Invest in teams that are hc about limitations and realistic about timelines. Structure deals that protect your downside given the long time horizons and high technical risk.

And stay close to the portfolio. Quantum is moving fast enough that your understanding from initial diligence will be outdated within months. Make sure you're adding value as an investor (through intros to potential customers, help w subsequent fundraising, connections to talent, advice on commercial strategy) ar staying on top of how the competitive and technology landscape is evolving.

The next few years are going to separate the real quantum healthcare companies the vaporware. The ones with actual customers, real revenue, validated technolo and strong teams are going to attract more capital and build real businesses. The that are all pitch deck and no substance are going to struggle as investor patienc out. Your job as an investor is to figure out which is which, and to build positior the former while avoiding the latter.

If you do that well, quantum healthcare can be a meaningful part of a differentia angel portfolio that captures the next wave of healthcare innovation. But it requ work, discipline, and a willingness to go deep on complex technology in ways th most healthcare investors aren't willing to do. That's exactly why the opportunit exists.

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Steven evans Dec 15

Since the use case of quantum computing for protein folding/docking is still a nun
years out...and may go out farther...it is being pushed instead as being able to ex
deeply and broadly and rapidly in the small molecule drug space. As I like to say..
screen 10^30 small molecules, and you will just get 10^31 side effects! There ar
currently excellent tools to perform protein/peptide drug discovery, you just need
them effectively. And, anyway, biology trumps everything...any modeled medicati
have to actually work without (much) harm!

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