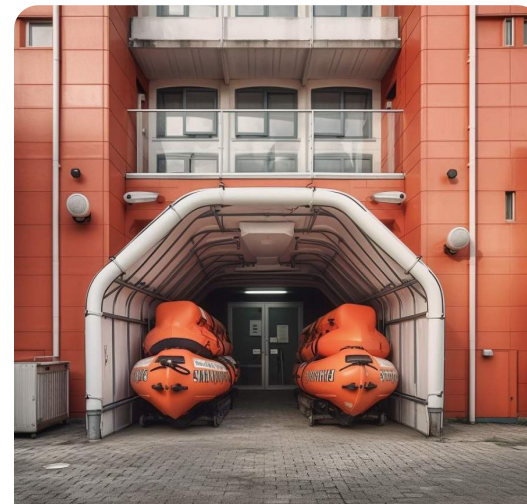


# AMC 2045

Exploring various futures and their implications for academic medical center (AMC) facility planning.



# 01 Speculative Design

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# 02 Future Considerations

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# 03 Design Futures

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# 04 Today's Planning

# 01

# What's speculative design and why does it matter?

## **Medical Planning is Conservative**

Medical facilities, particularly in California, are huge financial investments governed by stringent regulations. This naturally leads toward a conservative approach based on historical data, institutional knowledge, and expertise. However, the timeline for a single building often unfolds over 7 to 10 years and a campus can evolve over multiple decades.

## **The World Changes Rapidly**

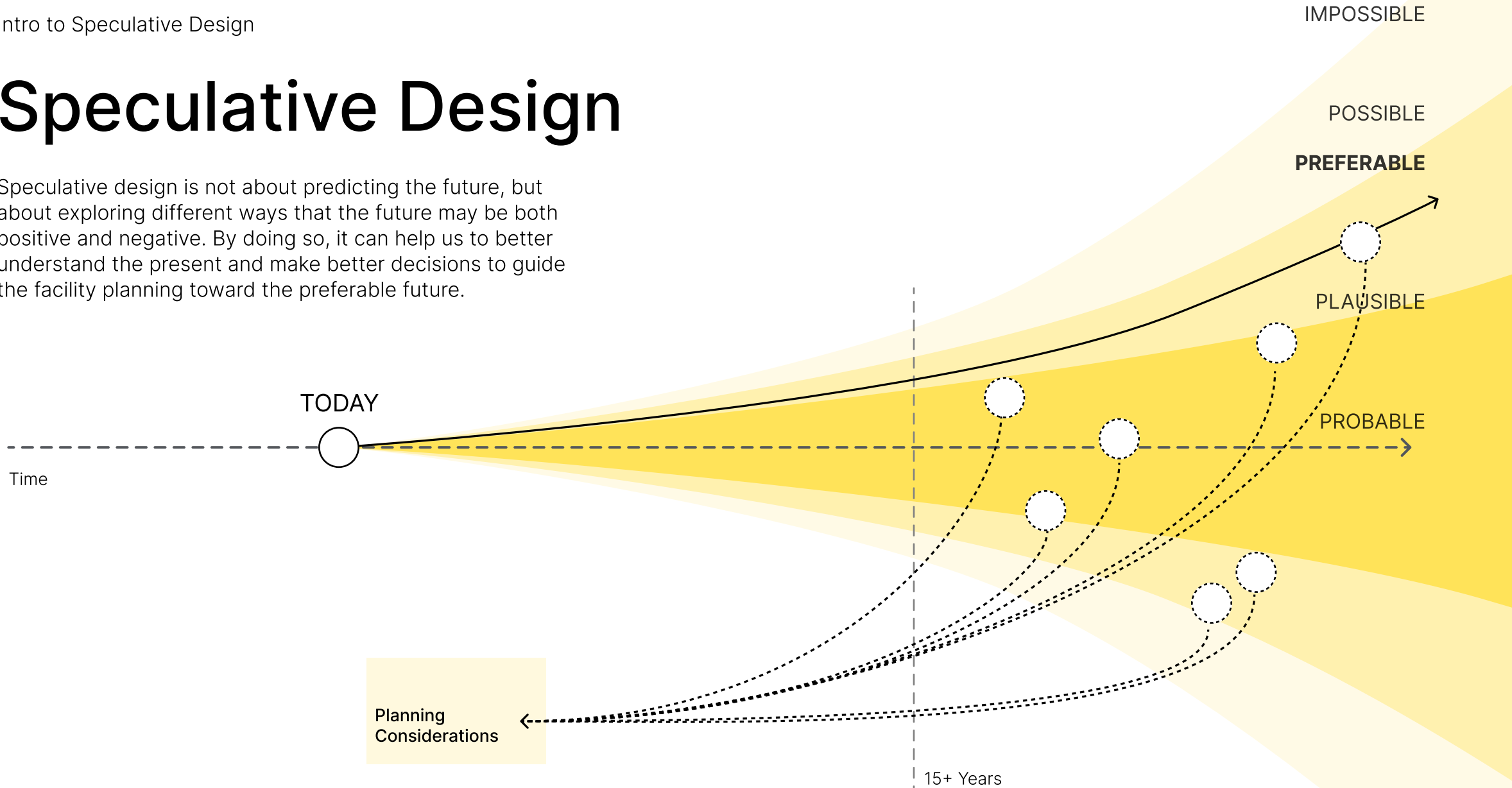
While the healthcare industry is just starting to implement permanent changes resulting from the global pandemic, major transformative changes are already on the horizon from technology innovation to climate change.

## **How Might We Change Today's Planning?**

Using the speculative design process we developed 16 design futures to probe the possibilities.

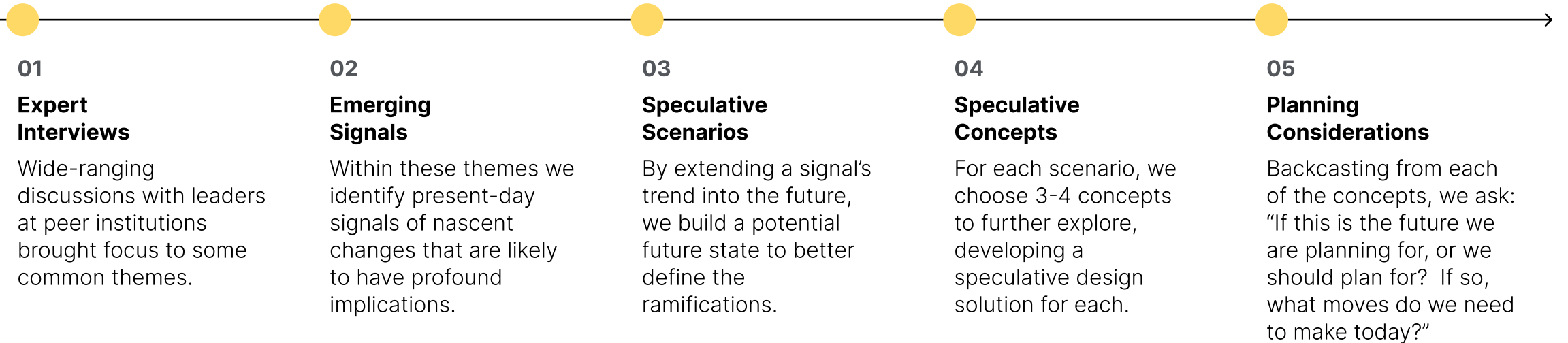
# Speculative Design

Speculative design is not about predicting the future, but about exploring different ways that the future may be both positive and negative. By doing so, it can help us to better understand the present and make better decisions to guide the facility planning toward the preferable future.



# Our Approach

Speculative design is an approach to developing design futures based on present-day signals of emerging change. The intent is to explore social, political, technological, and ethical issues, in order to generate new ideas and design solutions that will help us critique what paths we might take in current day planning.



# 02

# Which future considerations matter?

## **Thinking Beyond the Status Quo**

Future scenarios tend toward utopian and dystopian visions of the future, because the status quo middle of the road is well understood. Inquiry into the dystopian areas surfaces risks that may not have been considered yet, and pulls them into the conversation about mitigation measures. Likewise, on the utopian side, raising issues early helps future-proof facilities by making sure that current planning doesn't block a future opportunity.

# AMC Leaders

We met with leaders from across the healthcare ecosystem and peer institutions to discuss trends, needs, thoughts, concerns, and questions about the future of healthcare delivery in AMCs.



**Director, Strategy**  
Mayo Clinic



**Director, Service Lines**  
Cleveland Clinic



**Chief Medical Officer**  
SimX



**Division Administrator,**  
Northwestern Medicine



**Director, Strategy**  
NY Presbyterian



**Director, Capital Initiatives**  
**Director, Medical Planning**  
Stanford Health Care



**Director, Project Delivery**  
**Director, IT Infrastructure**  
UCSF



**Strategy & Performance**  
Chartis Consulting

## FINANCE

### **Compete and Complement**

AMCs both compete for volume and fill-in specialty gaps in the regional health system. Building a network that reinforces the hub and spoke model limits competition and drives specialty volume to the hub.

### **Changing Philanthropy**

The landscape of philanthropic support to AMC's is changing to a smaller pool of mega donors, who may have an agenda that diverges from the AMC's mission.

### **Unique Service Opportunities**

Given their unique mission and relationship with research, AMCs are the most likely vanguard for early adoption of new treatments. Capitalizing on first-mover advantages could offset declining reimbursements.

## WORKFORCE

### **Staffing Complexities**

The cost of living, unionization, physicians' groups, and the rising dependence on travel nurses has created pressure on recruitment and retention, with no clear picture of how to meet the demand for skilled roles

### **Generational Changes**

Younger generations of staff, both clinical and administrative, have changing expectations for their work environment. They expect safe and flexible workplace environments, both in physical and emotional sense.

### **Staff Amenities**

To recruit, retain and draw in top-quality staff, facilities have embarked upon a strategy of providing high-end amenities for staff such (such as on-site childcare, laundry services, health clubs, etc...)

## FACILITIES

### **Site of Care Change**

As the site of care continues to shift to less acute settings, there is little agreement on how far the trend will go. The future spectrum ranges from "new care modalities will back-fill" to "hospitals will only be ORs and ICUs."

### **Design for Flexibility**

Facilities are investing in flexible spaces that can adapt to different requirements as the need changes over time, despite the added first-costs (e.g. acuity-adaptable patient rooms & units).

### **Climate as a Threat Multiplier**

COVID laid bare the reality that each facility has their own unique needs and responses to a health crisis. The next crisis is likely to be exacerbated by climate change - related factors, like natural disasters and/or new biological threats.

## TECHNOLOGY

### **Technology in Patient Care**

Expectations are consistent that technological change will transform general support services, but will have limited changes to clinical practice. There is general reluctance to delegate patient care to AI or robotics.

### **Cautious Optimism**

Given the rapid pace of change, it is difficult to know which technology to invest in, so ROI time horizons need to be shorter with faster implementation strategies.

### **System Integration**

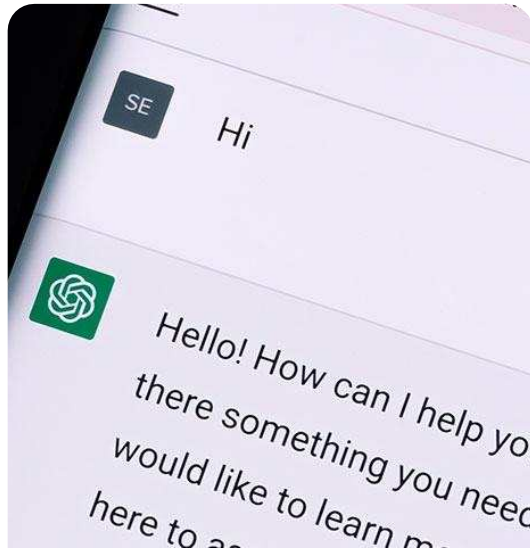
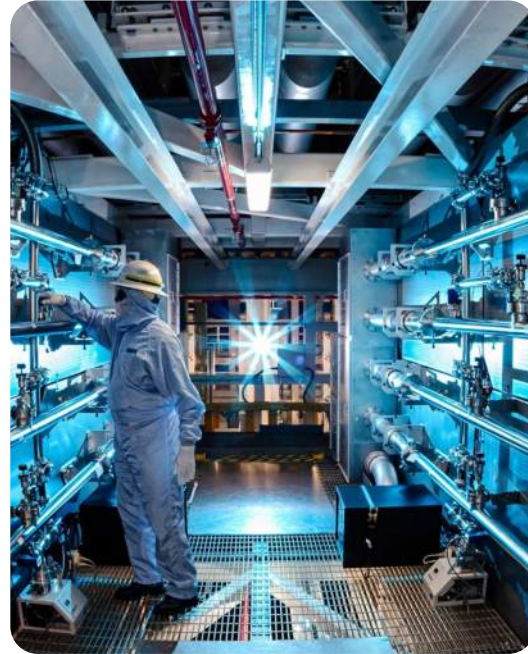
The promise of simultaneously optimizing both patient care and provider time is tantalizing, but interoperability challenges between data systems perpetuate silos and inefficiency.





## Signals

We identified emerging changes in today's technology, culture, and society that we foresee as having significant impact on the future of the academic medical center.



# 5 Key Areas

These 5 topics either directly address one of the themes or cut across multiple themes from our initial research. Multiple similar signals implied a strong emerging trend that warranted further exploration as a future-scenario.

## Advanced Technology

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## Safety

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## Autonomous Vehicles

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## Community Building

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## Shifting Site of Care

# 03

## How might these design futures impact AMCs?

### **Provocative or Absurd?**

Some of these design futures fall squarely in the “probable” range while others may fall in the “possible” or “unlikely” range. The intent is to help the audience step out of their typical routine and think expansively about the future.

# Advanced Technology

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Safety

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Autonomous Vehicles

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Community Building

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Shifting Site of Care

# Advanced Technology

Today, super-computing, natural-language technology and data-driven material management is on the rise.

“Countless AI tools are now focused on maximizing providers’ time.”

Institute Administrator  
Cleveland Clinic



**Cleveland Clinic + IBM**  
Supercomputing

The IBM Quantum System One is the first quantum computer in the world to be uniquely dedicated to healthcare research.



**Chat GPT**  
Conversational AI

ChatGPT is an artificial intelligence (AI) chatbot that uses natural language processing to create humanlike conversational dialogue.



**Conveyco Sortation**  
Material Management

Sortation identifies individual items on a conveyor and diverts them to correct locations using a variety of devices controlled by task-specific software.

In the future, **computational capacity expands profoundly**; research, patient interaction and operational management are optimized through deep digital integration and sophisticated robotics

In the future, changes in academic medical centers may include:

Predictive supply movement

Conversational information access

Sophisticated robotic cleaning systems

# Predictive Supply Movement

Integration between scheduling, electronic medical records, and supply chain management systems enable AI to predict and ship supplies wherever required in the hospital, before it is needed.



## Concept Details

- Hoarding and preemptive ordering is nearly eliminated within the hospital.
- Robotics automate supply picking, delivery and stocking, freeing nursing staff from supply management.
- Management of material supply volumes are optimized with finely-tuned digital oversight.
- Hiring for materials management becomes a greater challenge with increased system sophistication.

## Potential Impacts on Facility Planning

- Space dedicated to on-hand storage is drastically reduced, particularly in supply-heavy departments like the interventional platform.
- Offsite supply chain warehouse controls supply deliveries to the hospital reducing onsite supply warehousing in the hospital.
- A STAT supply delivery system via larger pneumatic tubes backs up the predictive system. Planning for additional pneumatic tube stations required.
- Proliferation of autonomous supply robots requires enlarged corridors and creates challenges for retrofitting older facilities.



# AI Assistive Interactions

Patient service kiosks speak any language fluently and capture patient vitals and presentation, so that an AI can narrow the range of possible diagnoses, speeding physician screening.



## Concept Details

- Kiosks distributed throughout the campus detect patient height, weight, temperature, blood pressure, pulse and other vitals during patient interactions.
- Medical assistants (MA) confirms vitals when the system indicates a low confidence in the detection. MA's role shifts more to customer service.

## Potential Impacts on Facility Planning

- As intake is now distributed, large waiting areas are no longer required. Reception functions are reduced to primarily greeting and safety.
- Consider how these devices may live internally and externally to the hospital. A phone-based app may begin the journey at the patient's home.
- The design of kiosks and their adjacency to one another will require further consideration of patient flow, privacy and comfort.
- Planning for a call center may be needed for humans to take over when the kiosks provide unsatisfactory interactions.

# Machine Learning & Robotic Cleaning

At every room turnover, a fleet of specialized robots enter the room and quickly get to the business of cleaning, sterilizing, analyzing, and optimizing the room for the next patient



## Concept Details

- Automation will speed up infection control and minimize downtime between patients.
- With multiple sensors on each robot, room evaluation can occur with greater fidelity.
- Hospital-acquired infections drop dramatically.
- Provided the quality of hygiene, there is an opportunity to introduce new materials and finishes to care-room, given reliability of infection control.

## Potential Impacts on Facility Planning

- Staffing requirements for cleaning will be reduced, however storage and maintenance, requirements for the robotic fleet will rise significantly, both when the department and across the enterprise.
- In-room clearances increase to provide adequate access to all portions of the room for the robots.
- Finishes last longer due to targeted cleaning protocols.

Advanced Technology

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**Safety**

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Autonomous Vehicles

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Community Building

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Shifting Site of Care

# Safety

Today, reliable energy access, climate change, and mass violence exist and are on the rise as existential threats to the safety of hospitals.

“We are a safety valve for other hospitals in California”

Director of Capital Initiatives  
Stanford Health



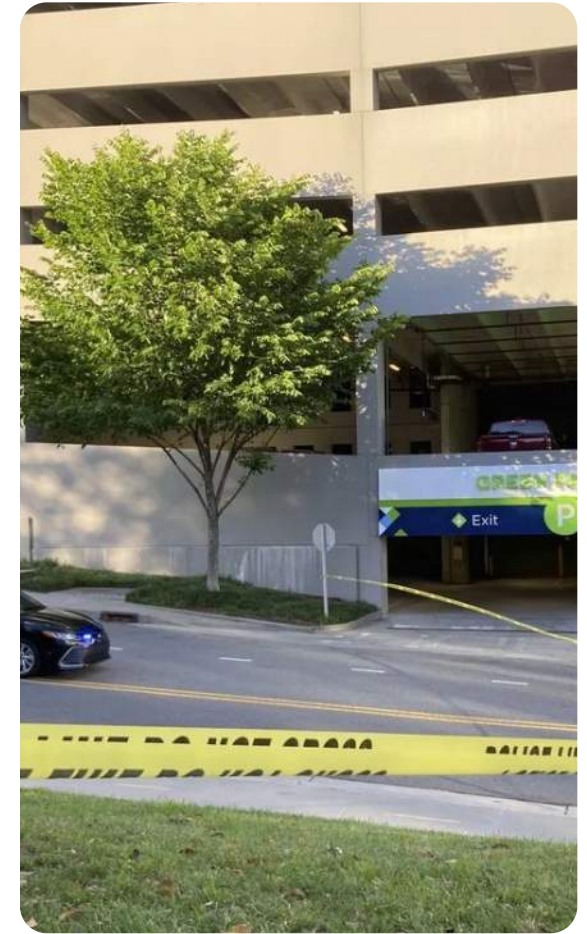
**PG&E Power Disruption**  
Energy

The Camp Fire was the deadliest and most destructive wildfire in California's history, and the most expensive natural disaster in the world in 2018 in terms of insured losses.



**Ark Flood Scenario**  
Climate Change

The ArkStorm 1.0 scenario describes an extreme storm that devastates much of California, causing up to \$725 billion in losses (mostly due to flooding), and affecting a quarter of California's homes.



**Northside Hospital Shooting**  
Violence

A man opened fire inside an Atlanta medical facility in May 2023, killing one person and injuring four others.

Hospitals continue to face **new and profound safety challenges**. Extreme weather events associated with climate change, unreliable energy grids, and incidents of mass violence challenge hospitals to remain resilient and continue providing care

In the future, changes in academic medical centers may include:

Flood Resilience

Energy Independence

Emergency Response

# Flood Resilience

Sea level rise in the Sacramento River delta, combined with an atmospheric river event to breach major levees, resulting in flooding of Sacramento and turning UCDH into an island



## Concept Details

- Clinical functions are now housed in buildings that are impervious to flooding.
- Disaster plans for emergency hospital expansion include tents in the parking structures and boats for shuttling between the parking structures and main hospital buildings.
- Utilities and supplies are now provided to support floating infrastructure.

## Potential Impacts on Facility Planning

- Basements designed to be water tight and building infrastructure moved to higher floors in the building.
- Power, Water, Sewage and Medical Gases will need to be provided during floods
- Access for emergency vehicles and supply deliveries shifts to boat-based platforms.
- Storage for boats and floating platforms required.
- Bridge connections between buildings required at levels above flood threats.

# Energy Independence

Reliable access to safe, clean and nearly limitless electrical power becomes the norm with Central Utility Plants shifting from unreliable grid power and generators to small modular nuclear reactors



## Concept Details

- The hospital now can provide itself with large amounts of electrical power, regardless of time of day or weather conditions
- Access to reliable power now aligns with hospital sustainability goals
- The hospital can return power to the regional grid during times of lower use

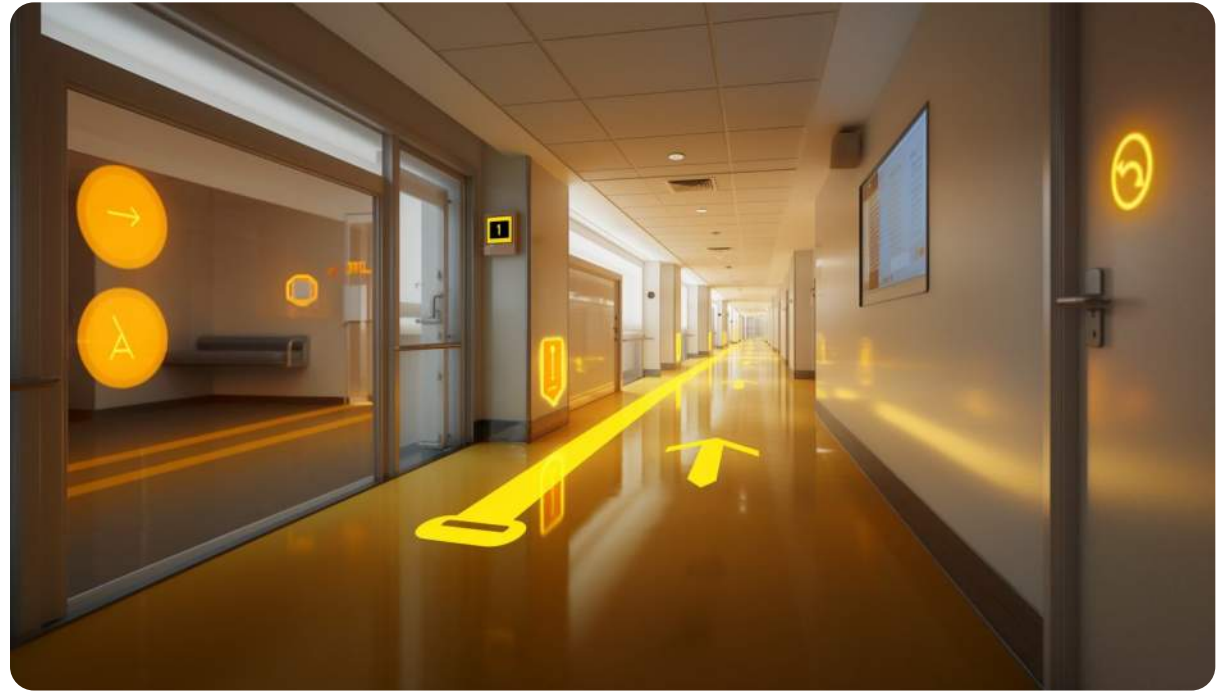
## Potential Impacts on Facility Planning

- The CUP may need additional security measures
- Generator yards and fuel tank yards can be eliminated, and that space repurposed for clinical or other support functions.
- Concerned residential neighbors demand additional shielding measures like direct bury of the system.
- New diagnostic, computing and infrastructural opportunities arise as access to cheap, clean power becomes more readily available



# Emergency Response

Responding to increasing instances of mass violence, the hospital is now outfitted with a suite of sensors that, at the first sign of crises, automatically activate communicative lighting, recorded audio, and lock doors to isolate the threat



## Concept Details

- AI video processing systems continuously screen for weapons.
- Rooms sense multiple inputs on patient, staff, and space well-being, flagging potential violence for security personnel.
- Faster response times to critical moments in patient and campus safety.
- There is no longer an expectation of privacy within the Hospital.

## How might this impact current planning efforts?

- Accommodation for a suite of sensors will need to be integrated into new and existing structures, along with an enhanced security command center.
- All portions of the hospital designed with progressive lockdown, panic buttons, and multiple egress options.
- Reception areas designed to delay attackers and provide escape routes for staff.

Advanced Technology

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Safety

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**Autonomous Vehicles**

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Community Building

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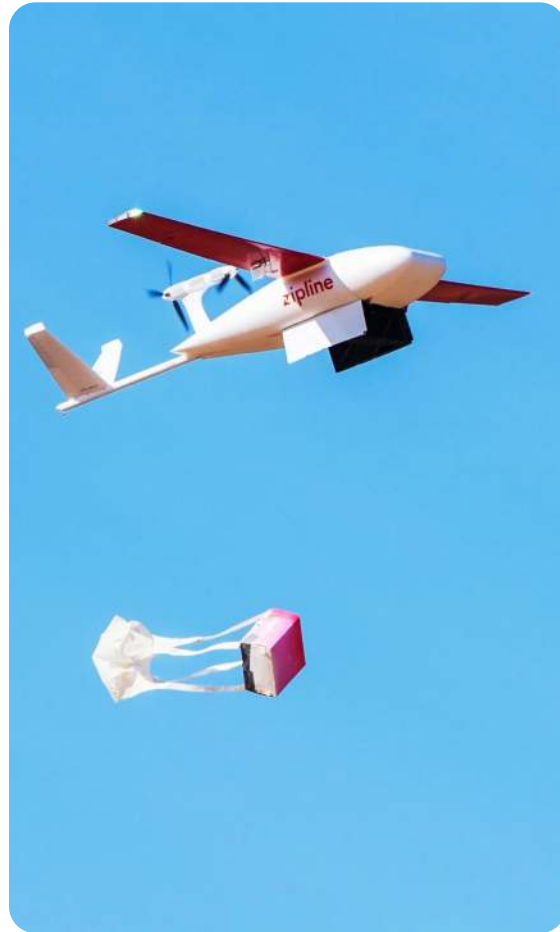
Shifting Site of Care

# Autonomous Vehicles

Today, be it in the sky, on the road, or in our facilities, assistive autonomous vehicles provide reliable transportation of people, equipment, and supplies.

“Having (providers) in a car is not the best use of time.”

Institute Administrator  
Cleveland Clinic



**Zipline + Cleveland Clinic**  
Drones

Unmanned aerial vehicles that autonomously navigate preset routes, transporting critical resources to remote or challenging locations.



**Zoox**  
Cars

Zoox autonomous cars are designed from the ground up for self-driving capabilities, prioritizing the passenger experience of autonomous mobility.



**TUG**  
Robots

TUG is an autonomous mobile robot made specifically for hospitals, delivering linens, medications and meals.

**Autonomous vehicles are everywhere**, using advanced sensors and AI to operate without human control. Reduced human labor becomes practical both inside the hospital and between care settings like hospital at home

In the future, changes in academic medical centers may include:

Medical Drone Delivery

Autonomous Ambulances

Autonomous Patient Beds

# Medical Drone Delivery

Across the hospital campus, entire materials management systems will be redesigned to deliver critical supplies reliably through the air, on-demand.



## Concept Details

- Equipment and supplies are stored in a central warehouse and distributed only when needed.
- Individual drones are dispatched to deliver supplies across the city and campus.
- Areas previously used for storage within buildings are repurposed for alternate uses as needed.
- Noise complaints from local neighbors about the noise when there is a high level of drone deliveries.

## Potential Impacts on Facility Planning

- Drone ports added to the tops of all major buildings. Flight paths will need to be coordinated with the rooftop heliports and assessed for an increase in noise pollution.
- Supply chain department moves out of the basement to the top floor of each building.
- Dedicated material transport elevators required in addition to public, patient and staff elevators.

# Autonomous Ambulances

Electrified, self-driving ambulances safely and reliably bring critical care beyond the hospital.



## Concept Details

- Ambulance staff are more specialized, providing higher-level care to the incident location.
- In low-acuity incidents, patients are treated and delivered home for follow-up care.
- In high-acuity incidents, patients are stabilized and treatment begins while en route to the hospital.

## Potential Impacts on Facility Planning

- Without a driver, ambulances can now be sized and outfitted like a small ED treatment bay. Instead of an external dock, ambulances plug-in to the building, temporarily expanding the capacity of the ED and eliminating patient transport.
- Provisions for high-voltage charging infrastructure will be required at appropriate locations on the hospital campus
- Spaces for EMT's and other mobile care providers will need to be provided (perhaps off campus)

# Autonomous Patient Beds

Patient beds glide through the hospital independent of staff oversight - filling and emptying rooms to support the efficient delivery of care.



## Concept Details

- Independently mobile, beds can deploy to any part of the hospital as needed.
- Storage and sterilization of beds occurs in a centralized space within the facility.
- Rooms are automatically reconfigured with different bed types to support the arriving patient.
- Reduced staffing for patient transport.
- Increased maintenance requirements.

## Potential Impacts on Facility Planning

- Hallways and elevators need to be expanded to provide adequate bypass space in case of emergencies and mechanical breakdowns.
- Bed management departments and bed storage facilities are reduced as the bed fleet is optimized.
- Bed maintenance and repair facilities increase in size and capabilities, but can be located offsite



Advanced Technology

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Safety

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Autonomous Vehicles

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**Community Building**

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Shifting Site of Care

# Community Building

Major institutions have focused on bringing everything to campus, building in flexibility to their campus, and providing spaces for population health.

“It’s a fallacy to think that hospitals should be smaller”

Strategy & Performance  
Chartis Consulting



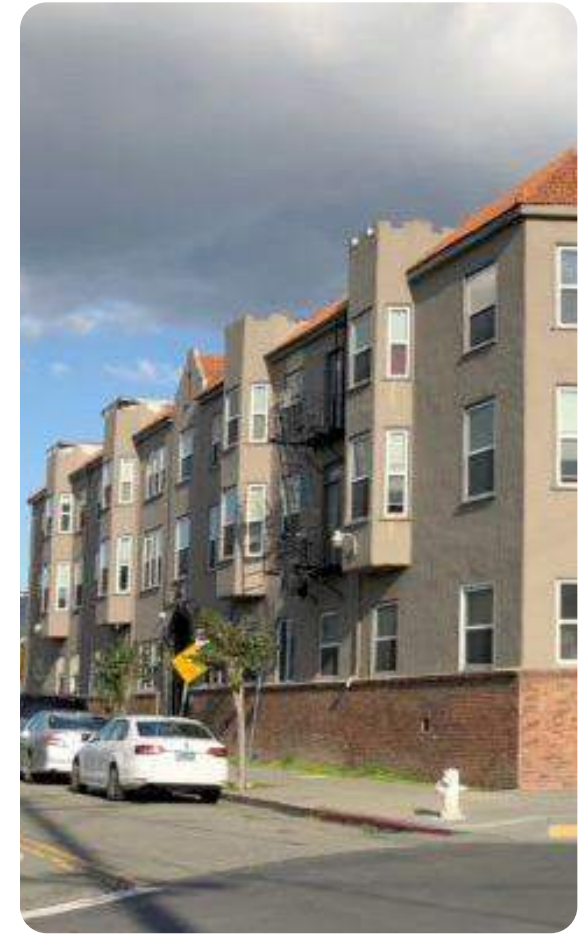
**Santana Row**  
Mixed Use Urbanism

Created as the next iteration of the shopping mall, Santana Row is a master planned commercial and residential ‘neighborhood’ in San Jose, CA.



**Icona Labs**  
Flexible Facilities

Originally built and leased as tech-office space, The Icona was transformed into 390,00sf of class A lab-capable space, adjacent to UCSF Mission Bay Campus.



**Kaiser - Housing for Health**  
Housing Security

Kaiser has committed \$5.2 million to help purchase an East Oakland apartment complex, the first local investment from its \$200 million Thriving Communities Fund.

The industry aggressively pursues shifting site of care to lower-acuity settings, leaving hospitals with primarily ORs and ICUs. **AMCs are backfilled with new uses to maximize real estate holdings.** Meanwhile, the urban cost of living continues to skyrocket.

In the future, changes in academic medical centers may include:

Housing as Healthcare

AMC City

AMC + Hilton

Modular 3P

# Housing as Healthcare

High cost of living drives lower paid support staff, who are nonetheless critical to efficient hospital operations, out of cities. Spare land and retired clinical buildings are converted to staff housing.



## Concept Details

- Housing is offered as a new benefit to attract and retain talented staff.
- The hospital maintains direct control over the cost of housing.
- Housing provides an opportunity to support broader population health.
- Connections to the regional community are strengthened through housing ownership.

## Potential Impacts on Facility Planning

- Campus zoning adjusted to create a residential area with local services in a location that is near to, but separated from, the hospital activity zone.
- A residential zone creates an opportunity for smaller scale (less intimidating) public health clinics and population health interventions.
- Housing could be created in partnership with the main university campus in Davis, with provisions for regular direct bus service between campuses and other distributed sites.

# AMC City

The hospital gradually and continually fills out every parcel across the campus with homes, workplaces, shops, and community resources until it is fully incorporated into the city, no longer a standalone campus



## Concept Details

- This model reconceives the hospital campus as a vibrant urban location.
- With the diversity of uses, opportunities to diversify income sources increases.
- Providing a dynamic campus with housing, schools, open space, and recreation improves the ability of the hospital to recruit and retain staff, serve patients, and function as a major player in the local community.

## Potential Impacts on Facility Planning

- Capital planning will need to conceive of their role as more of an urban planner.
- The needs of the medical system and the urban spaces will require careful balancing.
- Access, circulation will require further consideration.
- Provisions for commercial, residential, academic, and open spaces will require a fundamental reconsideration of the hospital campus.

# Hilton x AMC Collaboration

AMCs pursue a strategy of precision and personalized medicine, shifting hospital elective services to primarily preventative care. Hospitals now create highly customized hospitality experiences to draw in patients.



## Concept Details

- Elevated experience positions the hospital as a destination for care.
- This will support a high quality of work and workplace experience for staff.
- Elevated care differentiates hospital from regional and national peers and drives up HCAHPS Patients' Perspectives of Care Survey scores, leading to higher reimbursements.

## Potential Impacts on Facility Planning

- Lower utilization targets are planned, resulting in construction of more resources but essentially eliminating all waiting spaces within the hospital. Every space in the hospital drives revenue.
- Large monolithic podiums give way to more slender podiums with internal courtyards for increased access to light and views.
- Staff demand an equivalent level of amenities, so staff lounges and collaboration hubs develop airport lounge-like facilities, driving staff satisfaction and improving recruitment and retention.

# Modular P3

AMCs reinforce the hub and spoke model by pushing routine care out to/into the spokes and redesigning the hub as a public private partnership(P3) merging acute & specialty care, translational research, and biotech incubators with modular departments that can be rented and flexed between functions.



## Concept Details

- Buildings will be designed with modular departments that can be fitted out for clinical space or lab, depending on the needs of the tenant.
- Spaces for scientists and clinicians to collaborate on research are located within the hospital.
- Income generation from innovation hub.
- Develop early stage health companies

## Potential Impacts on Facility Planning

- Buildings will be designed on universal structural grids of 32'x32' which works equally well for healthcare functions and as laboratory functions.
- Hospital support departments (such as SPD and Clinical Lab) expand services to support research labs.
- Access, use and connectivity will need to change depending on current use
- Tenant requirements will differ based on business case and may require ongoing modification to the building.
- These spaces provide additional clinical capacity when required.



Advanced Technology

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Safety

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Autonomous Vehicles

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Community Building

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**Shifting Site of Care**

# Shifting Site of Care

Care is moving beyond the traditional walls of the health campus, representing one of the most dynamic changes in the healthcare industry. Current examples include acute care in the home, retail-care and a distributed workforce.

“Younger people are willing to work someplace else to avoid commuting.”

Division Administrator  
Northwestern Medicine



**Inbound Health**  
**Remote Care**

Inbound Health provides a full stack of capabilities that enable their care partners to launch and scale hospital and skilled nursing-at-home service lines.



**Parsley Health**  
**High End Care**

Parsley Health is a leading holistic medical practice, designed to help women overcome chronic conditions.



**Remote Work**  
**Distributed Workforce**

A flexible work arrangement in which an employee is not expected to perform work at a fixed worksite on a regular and recurring basis.

Trends toward increased in-home care and increased remote work converge to create a **widely distributed remote care network** that requires new supporting approaches.

In the future, changes in academic medical centers may include:

Remote Care Studios

Mobile Patient Rooms

Mobile Care Network

# Remote Care Studios

As patients and staff are increasingly excluded from urban areas due to rising cost of living, two new remote care studio types arise. Exam room pods staffed by medical or physician assistants support remote/rural patients. And studio pods provide a workplace for delivering telehealth, close to staff homes.



## Concept Details

- Creates options for people to work anywhere, but still have access to the tools they require to provide care.
- Creates opportunity for high quality care closer to where patients and staff live.
- Allows for distributed care as technology gets better for remote monitoring.

## Potential Impacts on Facility Planning

- The pods are self-contained exam room or broadcast studios that can be deployed in vacant retail spaces, or even in the lobby of a larger building.
- Deploying resources is no longer tied to the hospital's real estate strategy, but instead to the locations of patients and staff.
- Since they are modular, the pods can rapidly redeploy to match changes in demographics, including incremental growth.
- On campus specialists need a call center with micro-studios to deliver telehealth consults and direct the work of the MA/PAs.

# Mobile Patient Room

When a hospital at home patient needs an increased level of care, a mobile patient room is dispatched to the patient's house. If the patient continues to decline, it returns to dock at the hospital, eliminating the need for patient transfer.



## Concept Details

- The mobile patient room comes fitted out with more advanced equipment and patient monitoring than is possible with acute care at home.
- The vehicle is designed to fit inside a typical residential garage to preserve patient privacy where desired.
- Alternatively, in lieu of a mobile patient room, it could be a mobile imaging suite or mobile lab to provide a targeted increase in at-home service capabilities.

## Potential Impacts on Facility Planning

- Distributed spaces to store, repair, and clean mobile rooms will be required
- A new patient unit type would need to be designed to receive docked mobile patient rooms.
- Increased at home capabilities therefore reduce demand on typical Med/Surg acute care units, which could then be converted to acuity-adaptable or ICU units.

# Mobile Care Network

With a widely distributed workforce delivering care from autonomous vehicles, a network of support spaces are needed for supply distribution, collaboration, lounge, and restrooms



## Concept Details

- Several typologies may develop across different scales:
  - Tiny: renting access to existing restroom & lounge facilities in other businesses.
  - Small: retail infill settings with more collaboration support.
  - Medium: full service centers that include vehicle and equipment repair.

## Potential Impacts on Facility Planning

- Hospital continues to shift focus, with only the most complex instances of care remaining within the hospital.
- On campus parking and traffic demand decline, freeing additional real estate for hospital service expansion.
- Storage and distribution of equipment and medication for mobile care staff will require new spaces and systems of materials management.

# 04

# So what can we take away for today's planning?

## **Defining the Preferable**

Developing insights around which paths we definitely do not want to go down helps narrow down the field of options and provide focus to the preferred paths. Each design is developed just enough to give a sense of what it might be like, and what the ramifications might be for facility planning.

## **Today's Considerations**

Now that we've created different versions of the future of AMC facilities, we need to consider how this impacts us today. Do we want to accelerate towards one of the designs? Or do we want to avoid a certain future? Does our vision include a combination of the directions explored herein? Do we want to explore certain scenarios further?



## Key Takeaways for Today's Planning

Based on the potential planning impacts discussed in the design futures, several large-scale themes emerge:

50% of these design futures relate to increased mobility. **Everything is getting more mobile:** information, supplies, workforce, and even patients.

AMC's are likely to see **major increases in robotic and autonomous fleets**, which shifts the workforce from labor to skilled support jobs.

**The future of the hospital itself is uncertain.** Designing adaptable facilities with 50 year lifespans can either create or inhibit both value and function for decades to come.

### SUPPLY CHAIN & EVS

- Advancements in supply chain management may lead to a loading dock with dramatically increased deliveries from small vehicles. Consider traditional dock bays and smaller box truck docks and/or parking.
- With a shift to offsite general support services, dock and supply chain elevators should be planned with rooftop stop access for construction of future delivery drone landing pads.
- Robotic transportation within the hospital is likely to increase significantly. Offstage circulation spines and basement level circulation should be designed at 12'-16' width, to allow for robotic bypassing without impeding pedestrian flow.
- Provide expanded EVS closets in each department for cleaning/storing robotic systems.

### CAMPUS PLANNING

- Long-range planning should consider land banks for future autonomous or mobile workforce vehicle service depots, accounting for both on-road vehicles and robotic fleets.
- Plan for long-range, on-campus, high-density residential facilities along campus edges, abutting residential-neighboring communities.
- Plan for long-range, urban-style, high-density/high-rise functions along campus edges with commercial-neighboring uses.
- As the hospital workforce becomes more distributed, consider a real estate strategy that targets an even geographic distribution, while still maintaining a sense of place and connection to the physical branding of the hub(s).

### BUILDING PLANNING

- Plan for proliferation of mobile or remote check-in and AI assisted technology throughout the hospital, and a corresponding reduction in waiting room size. Plan for minimum-sized departmental waiting with general lobby waiting as overflow.
- As volumes shift offsite, the rate of change will determine if the hospital growth slows or reverses. Any new building should be planned with universal structural grids (32'x32'), adequate floor-to-floor heights (15'+), and access to daylight and views in order to provide maximum flexibility, as these features are impossible to change later.
- New parking structures to be designed with flat parking decks and adequate clearance for emergency vehicles, for greater flexibility in disaster planning.

### OPERATIONAL

- Create a facility-wide safety strategy that may include physical changes such as way-finding and the installation of discrete metal detectors.
- Collaborate early on with hospitality and experience-focused organizations to create spaces that are attractive to the newest generations in our future workforce (10-15 years out).
- Explore the possibility of providing subsidies or free housing to fellows or other types of employees.
- Interview younger generations to better understand how they might imagine a hospital of the future, better prepared for changes needed in flow and experience.

## Potential Next Steps

In addition to the proposed design guidelines, there are a few recommended directions you could take with the initial scenarios and concepts, to better inform today's strategy and planning efforts. We've outlined a few options/suggestions below.

### **RUN A STRATEGY WORKSHOP**

There are several ways to run speculative workshops. A typical structure usually includes a scheduled workshop with key thinkers, operators, and decision makers to review and discuss the following:

- Review scenarios and concepts
- Build additional concepts
- Discuss their impact on strategic decisions (if applicable)
- Determine a set of specific changes based on these discussions

### **DIVE DEEP INTO A SPECIFIC AREA**

Where specific portions of this overview resonate, it is valuable to deep dive on a specific scenario or topic. Projects like these work well when collaborating closely with teams to develop shorter-term strategies. Additional deep dive considerations could include:

- Additional trends
- Interviews with SMEs
- Designing more near-term concepts

### **COMPLETE RELATED RESEARCH**

This report focuses on the healthcare aspects of the academic medical center campus and its facilities. You could build on this work by further researching related areas and topics:

- Future of academic research
- Future of medical teaching
- Future of food service delivery
- Future of the ICU
- Etc.

## Sources

### Future of Academic Medical Centers

- [www.pwc.com/us/en/industries/health-industries/health-research-institute/americas-future-academic-medical-centers.html](https://www.pwc.com/us/en/industries/health-industries/health-research-institute/americas-future-academic-medical-centers.html)

### Speculative Design

- <https://medium.com/bcg-digital-ventures/deep-design-envisioning-the-future-with-speculative-design-dfd59233a4a7>

### Concept Imagery Development

- [www.midjourney.com/home](https://www.midjourney.com/home)

### Signal: Advanced Technology

- [newsroom.clevelandclinic.org/2023/03/20/cleveland-clinic-and-ibm-unveil-first-quantum-computer-dedicated-to-healthcare-research/](https://newsroom.clevelandclinic.org/2023/03/20/cleveland-clinic-and-ibm-unveil-first-quantum-computer-dedicated-to-healthcare-research/)
- [www.pcmag.com/how-to/what-is-chatgpt-a-basic-explainer](https://www.pcmag.com/how-to/what-is-chatgpt-a-basic-explainer)
- [www.conveyco.com/technology/sortation-systems/#:~:text=Automated%20Sortation%20Systems,type%20and%20the%20required%20rate.](https://www.conveyco.com/technology/sortation-systems/#:~:text=Automated%20Sortation%20Systems,type%20and%20the%20required%20rate.)

### Signal: Safety

- [www.mymotherlode.com/news/local/3252758/nearly-2000-pge-customers-without-power-in-tuolumne-county.html](https://www.mymotherlode.com/news/local/3252758/nearly-2000-pge-customers-without-power-in-tuolumne-county.html)
- [calmatters.org/commentary/2023/01/california-preparation-water-megastorm-flood/](https://calmatters.org/commentary/2023/01/california-preparation-water-megastorm-flood/)
- [www.northside.com/about/news-center/articles/2023/05/08/northside-continues-to-respond-with-help-for-victims-families-as-midtown-building-reopens](https://www.northside.com/about/news-center/articles/2023/05/08/northside-continues-to-respond-with-help-for-victims-families-as-midtown-building-reopens)

### Signal: Autonomous Vehicles

- [www.flyzipline.com](https://www.flyzipline.com)
- [www.zoox.com](https://www.zoox.com)
- [aethon.com/products/](https://aethon.com/products/)

### Signal: Community Building

- [www.santanarow.com/](https://www.santanarow.com/)
- [iconalabs.com/](https://iconalabs.com/)
- [ebaldc.org/kaiser-permanente-to-help-buy-oakland-apartment-building-preserving-low-income-housing/](https://ebaldc.org/kaiser-permanente-to-help-buy-oakland-apartment-building-preserving-low-income-housing/)

### Signal: Shifting of Care

- [www.inboundhealth.com/](https://www.inboundhealth.com/)
- [www.ifm.org/partnerships/parsley-health/](https://www.ifm.org/partnerships/parsley-health/)
- [www.opm.gov/frequently-asked-questions/telework-faq/remote-work/what-is-the-definition-of-remote-work/](https://www.opm.gov/frequently-asked-questions/telework-faq/remote-work/what-is-the-definition-of-remote-work/)