

# What is ACCORDS?

Adult and Child Center for Outcomes Research and Delivery Science

ACCORDS is a 'one-stop shop' for pragmatic research:

- A multi-disciplinary, collaborative research environment to catalyze innovative and impactful research
- Strong methodological cores and programs, led by national experts
- Consultations & team-building for grant proposals
- Mentorship, training & support for junior faculty
- Extensive educational offerings, both locally and nationally



# ACCORDS Upcoming Events – mark your calendars!

|   |  |
|---|--|
| November 5, 2024<br>AHSB Room 2007                    | <b>ACCORDS Guest Lecturer</b><br>Implementation Science and Precision Health: Maximizing the promise of genomics for health and prevention for all<br><i>Presented by Alanna Kulchak Rahm, PhD</i>                   |
| November 11, 2024<br>Ed 2 N Room 1308                 | <b>Emerging Topics in Digital Health &amp; Clinical Informatics</b><br>Social-Emotional, AI-Powered Avatar Simulations: Improving Communication & Building Empathy for all!<br><i>Presented by Clint Carlson, MS</i> |
| December 4, 2024<br>AHSB Room 2002<br>3:30-5:00pm MT  | <b>Transforming and Advancing a Learning Health System: Multiple Perspectives for Mutual Gain</b><br><i>Presented by Edward Stenehjem, MD</i>  |
| December 9, 2024<br>AHSB Room<br>2200/2201            | <b>Emerging Topics in Digital Health &amp; Clinical Informatics</b><br><i>Presented by Annie Collier, PhD</i>  |
| February 2025   | <b>*New Workshop*</b> ACCORDS/CCTSI Pragmatic Research Planning Workshop<br><i>Registration coming soon!</i>   |
| Annual Conference<br>June 4-6, 2025<br>9:00-3:30pm MT | <b>Colorado Pragmatic Research in Health Conference</b><br>Future of Pragmatic Research: Building Multidisciplinary Teams for Innovation and Impact  |



# Emerging Topics in Digital Health & Clinical Informatics

## 2024-2025 Seminar Series



**Presented by:**  
Cathy Bodine, PhD

# *Inclusive Design for Digital Health and Applied Clinical Informatics*





University of Colorado

Boulder | Colorado Springs | Denver | Anschutz Medical Campus

FOUR CAMPUSES UNITED  
ALL FOUR:**ONE**

# INCLUSIVE DESIGN FOR DIGITAL HEALTH AND APPLIED CLINICAL INFORMATICS



Coleman Institute for Cognitive Disabilities

UNIVERSITY OF COLORADO

Boulder | Colorado Springs | Denver | Anschutz Medical Campus



**Cathy Bodine, PhD**

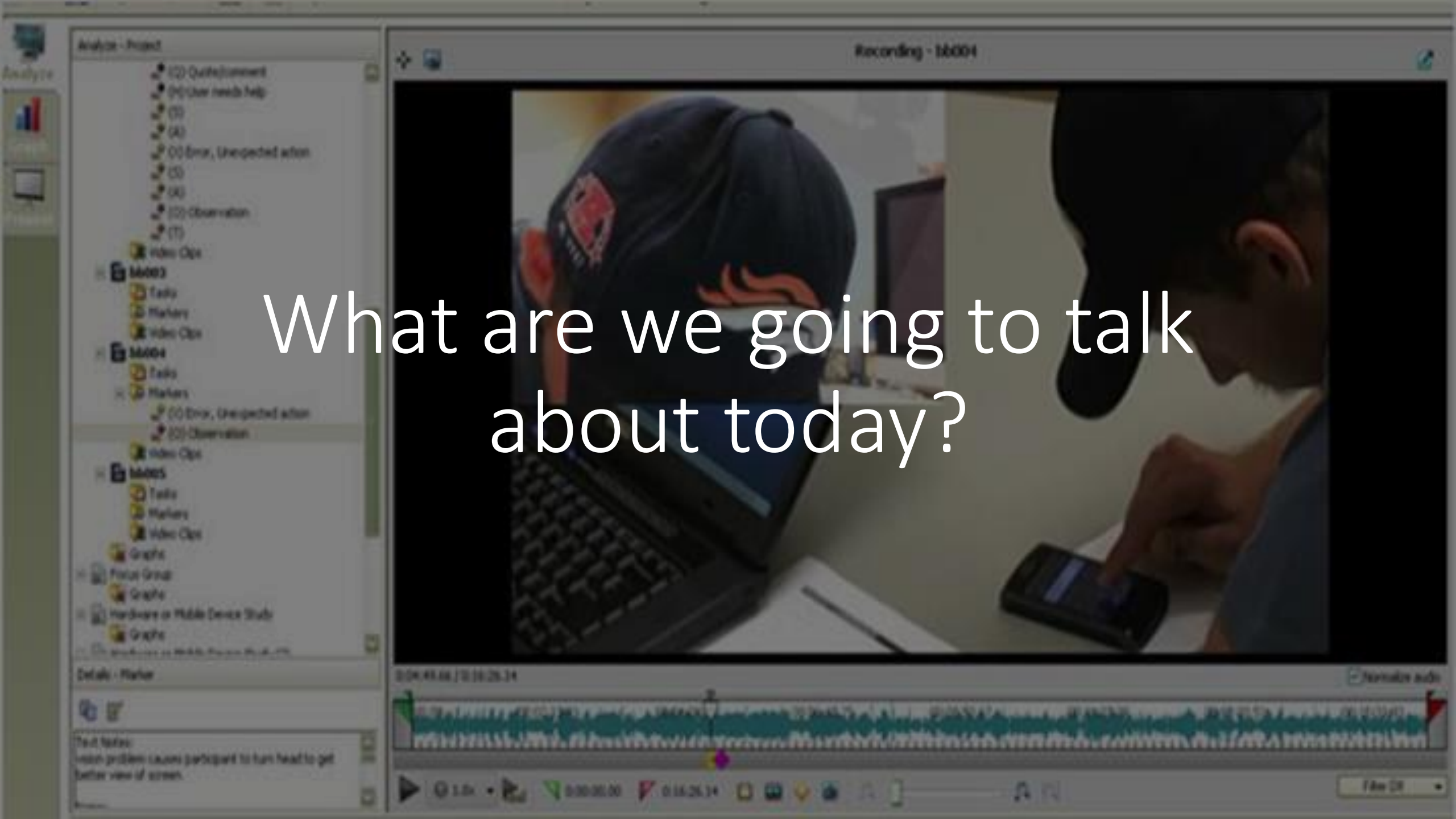
**Professor, Department of  
Bioengineering**

**Director, Center for Inclusive  
Design and Engineering**

**Director, Innovation Ecosystems,  
Colorado Clinical Translational  
Sciences Institute (CCTSI)**

**Executive Director, Coleman  
Institute for Cognitive  
Technologies**

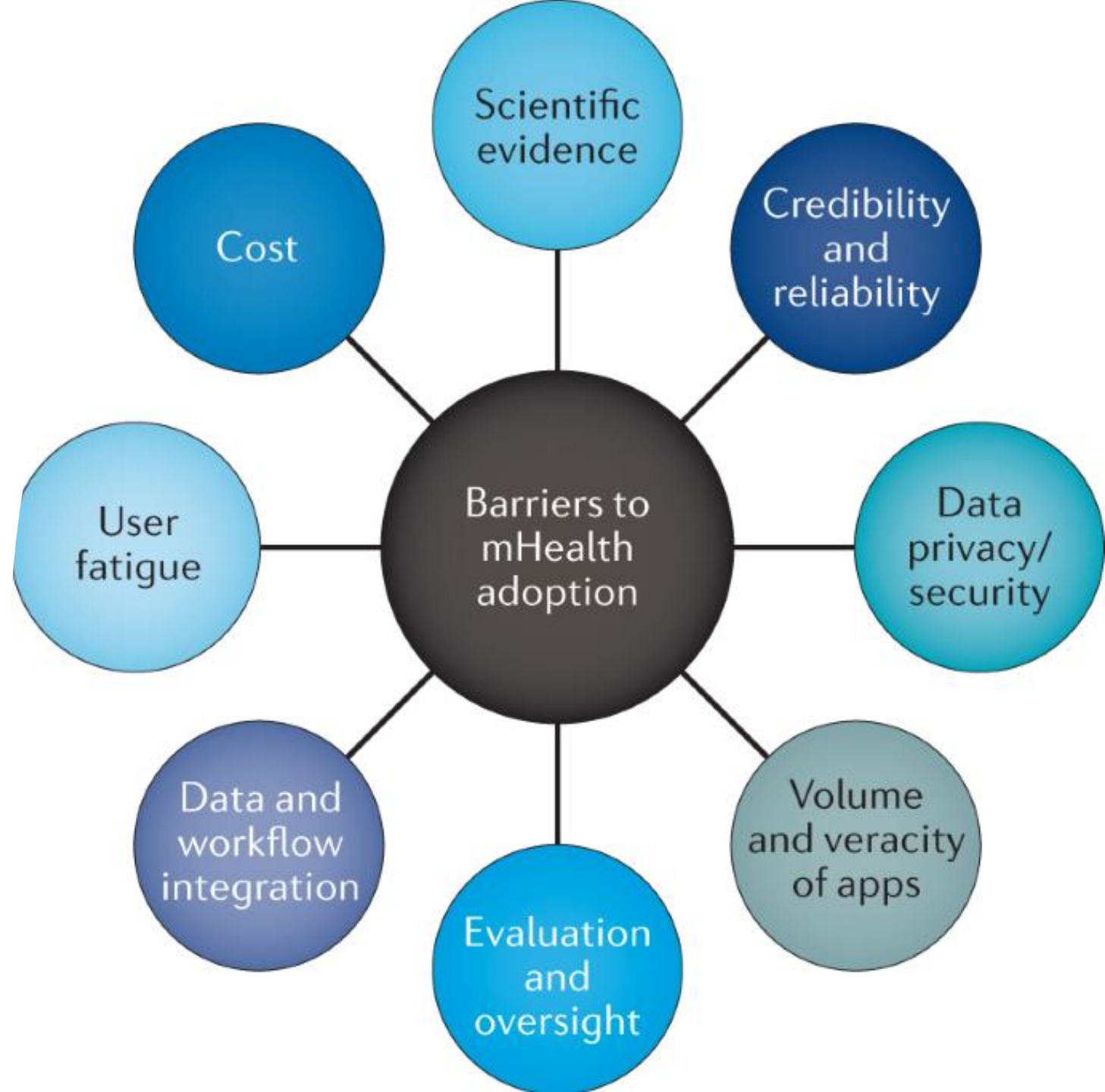
What are we going to talk about today?



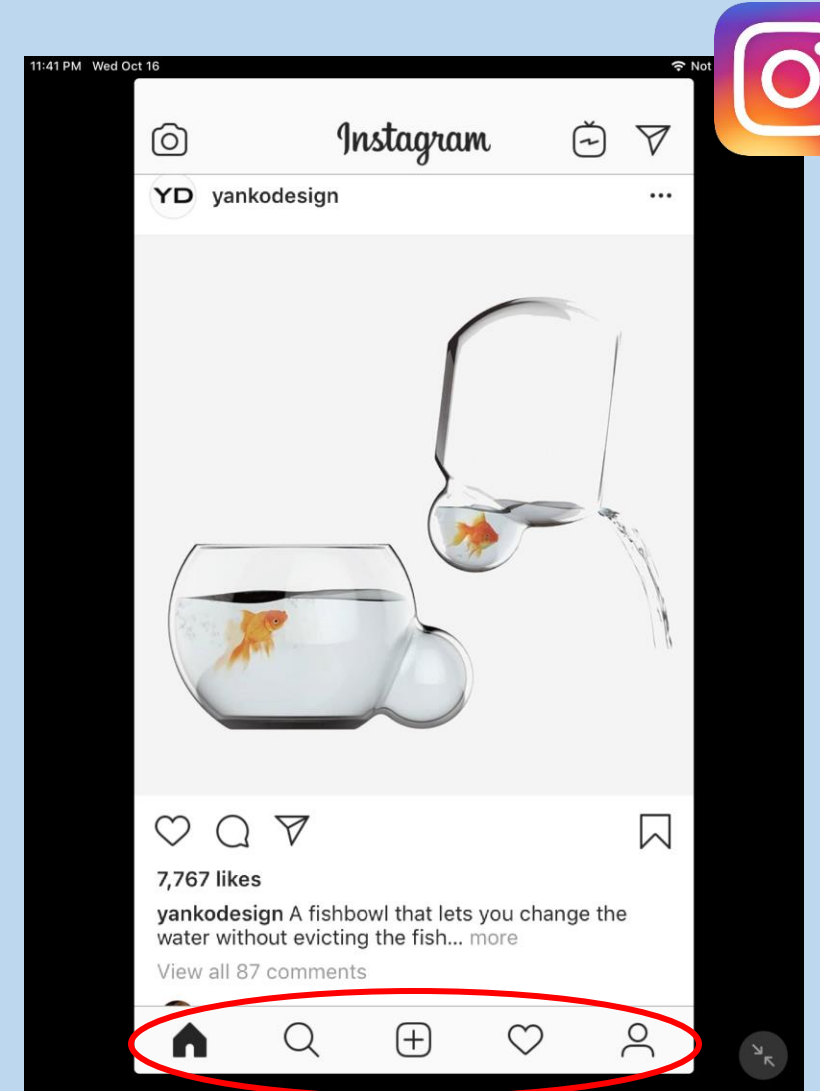
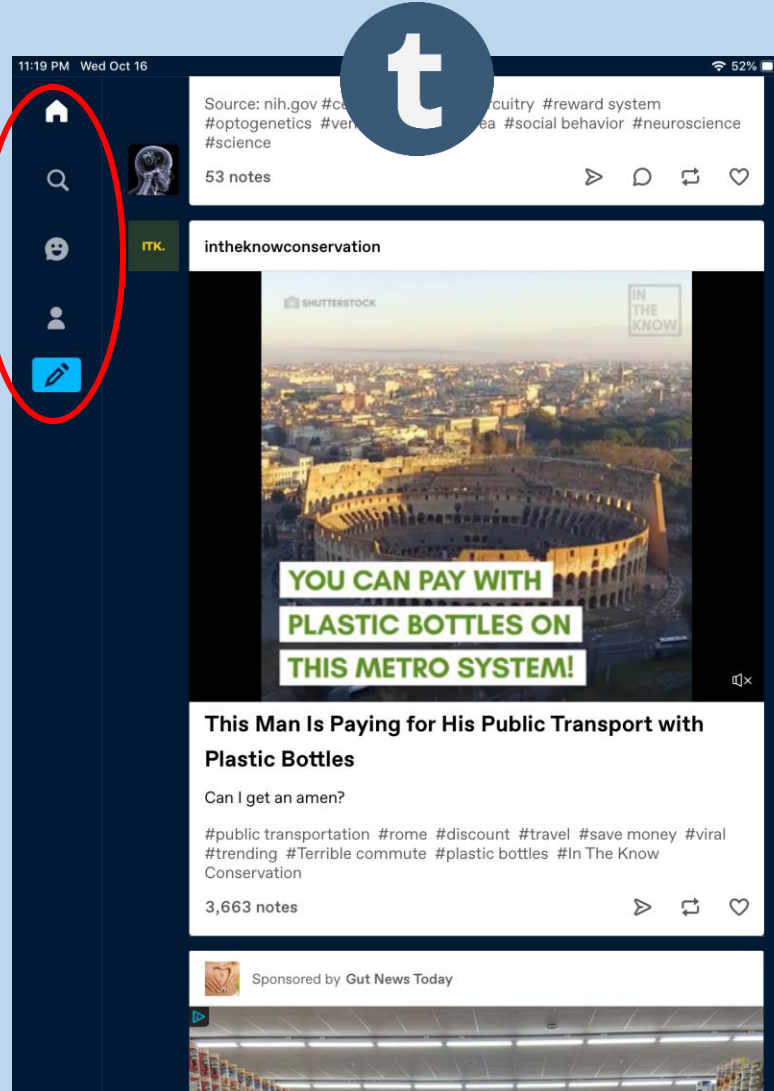
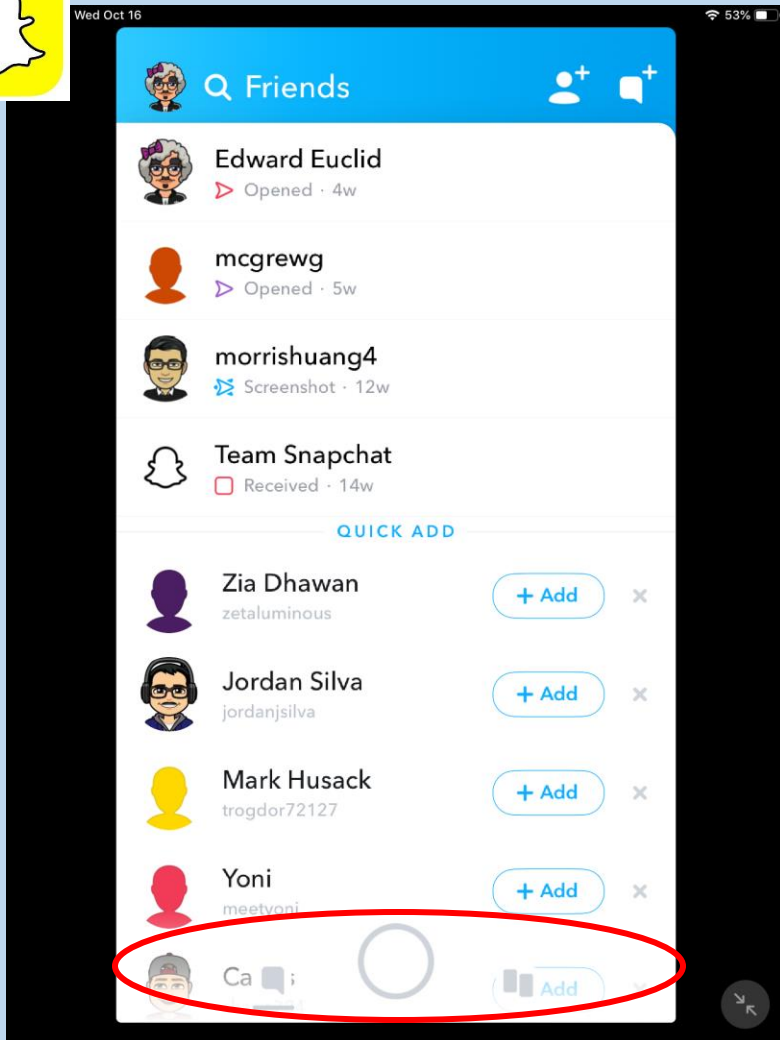
# Agenda

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1. Identify barriers to digital health adoption by patient populations
2. Understand the importance of inclusive design for patient populations
3. Develop strategies for removing barriers to adoption through inclusive design

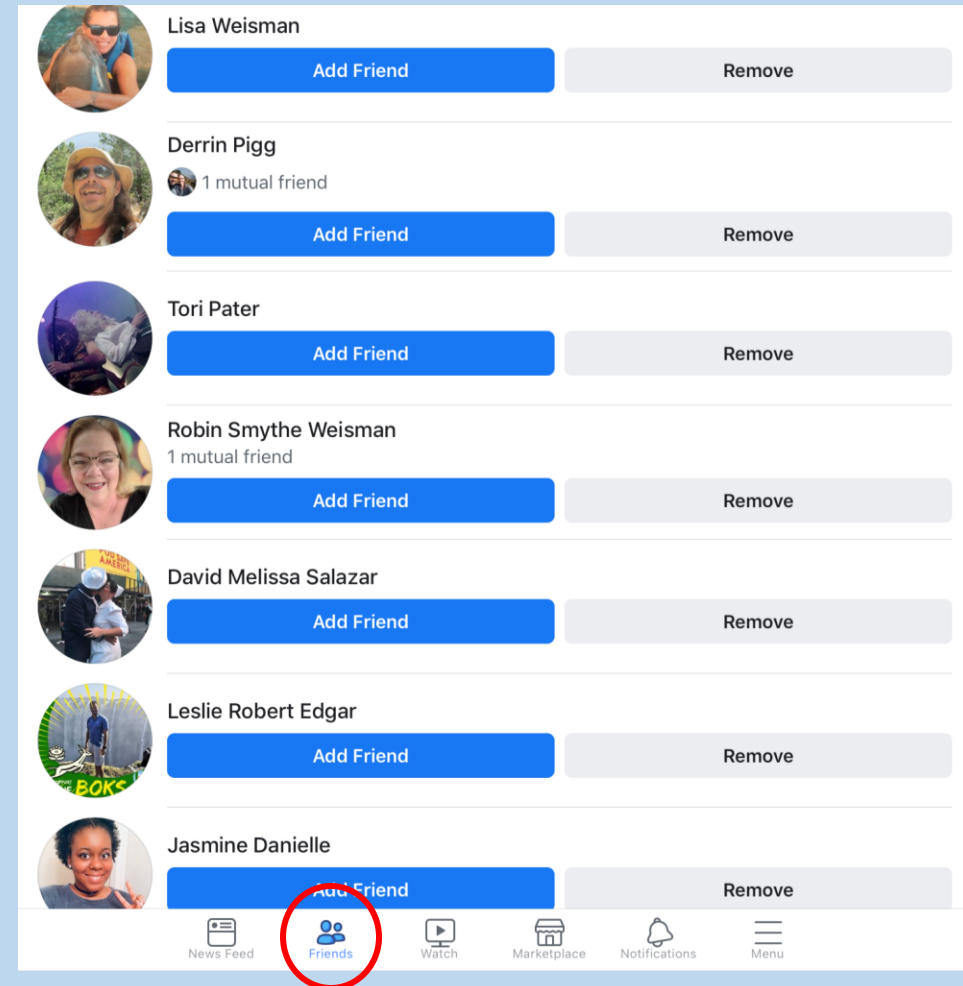
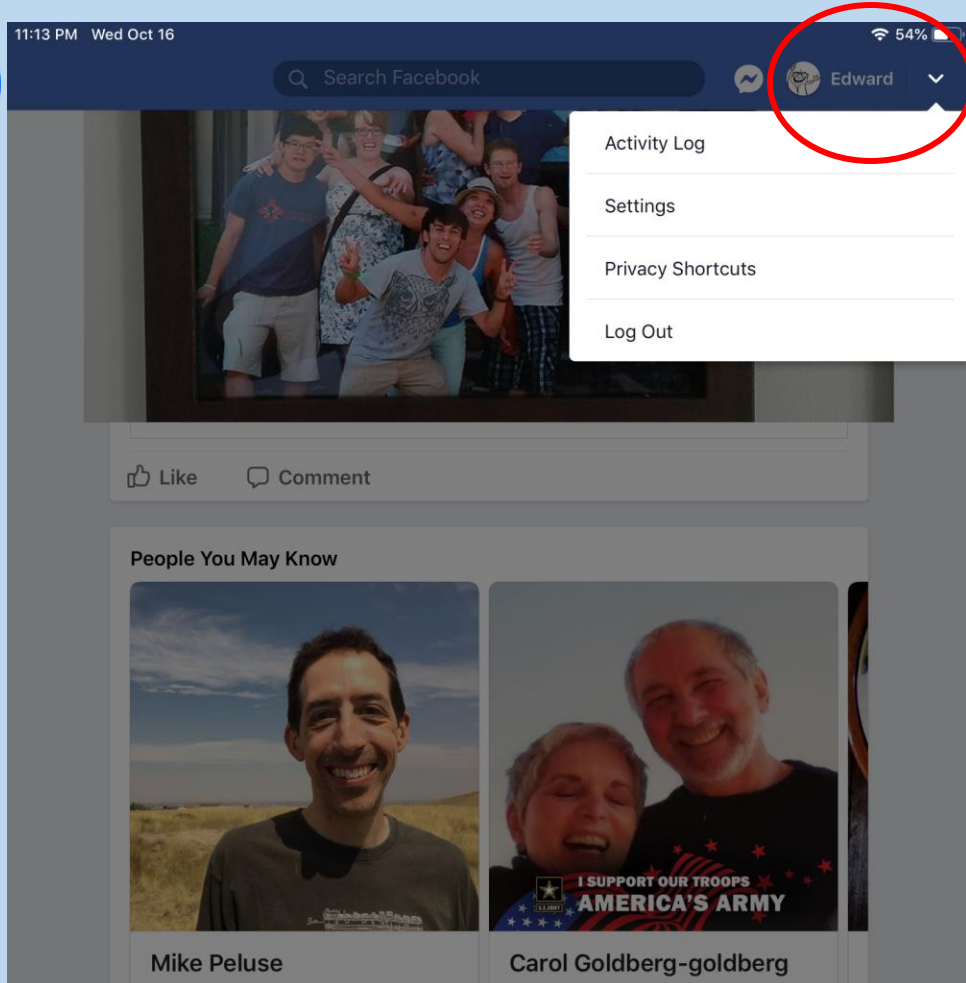


# Usability Issues: Icons' functions within apps are not always transparent

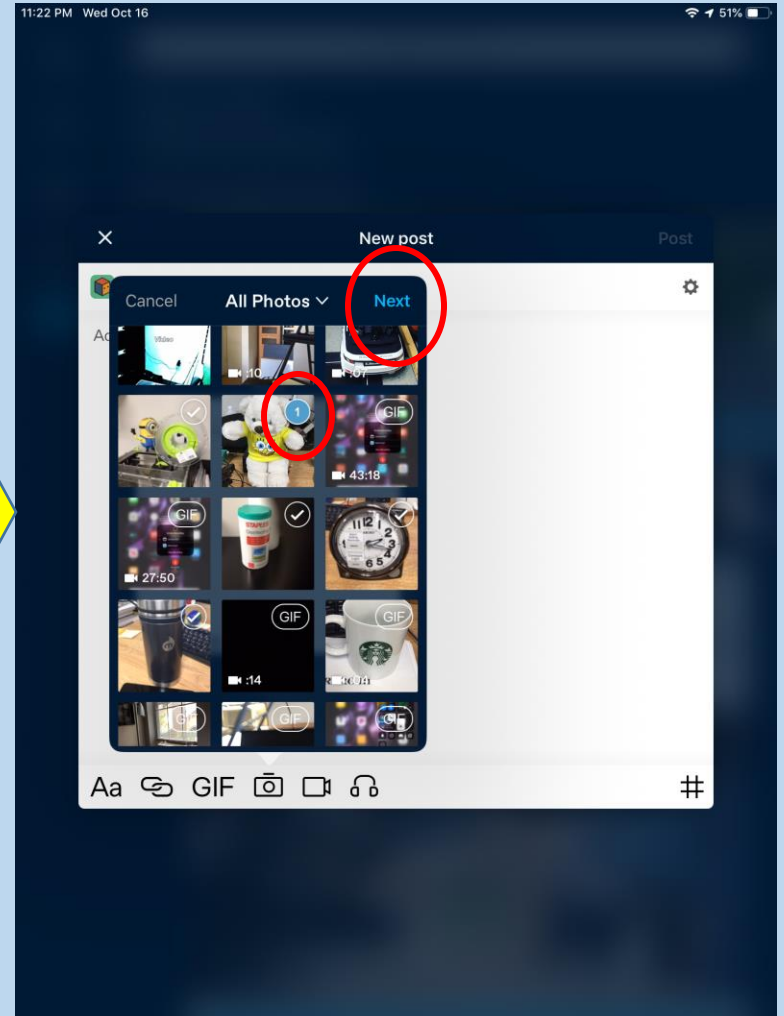
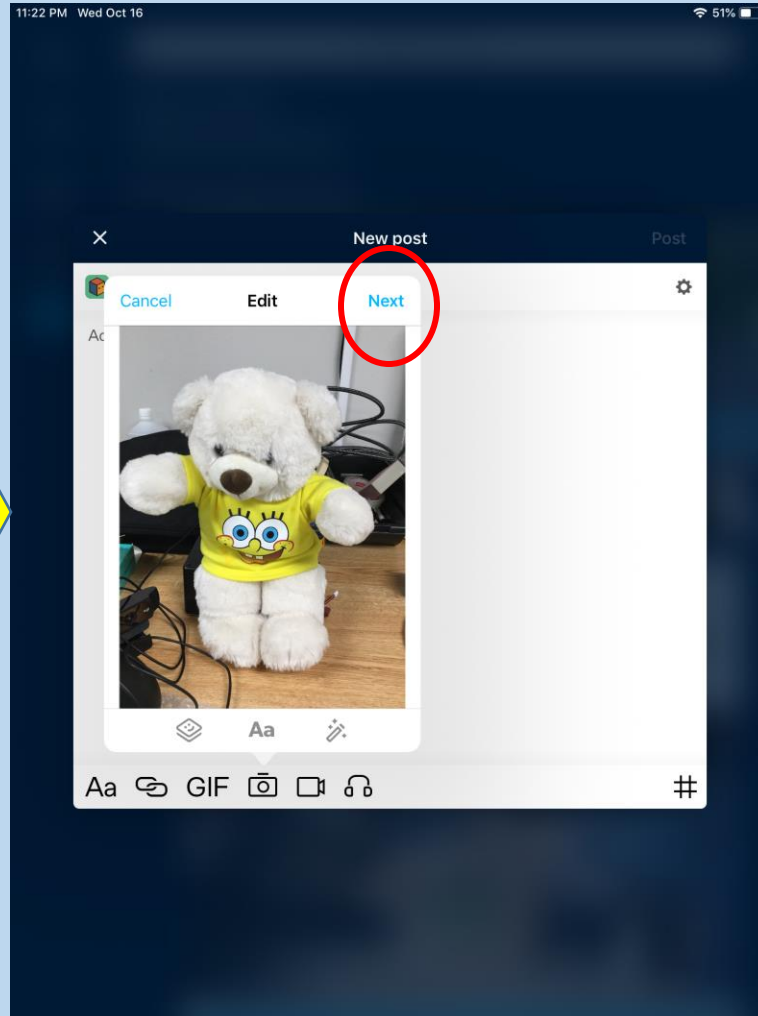
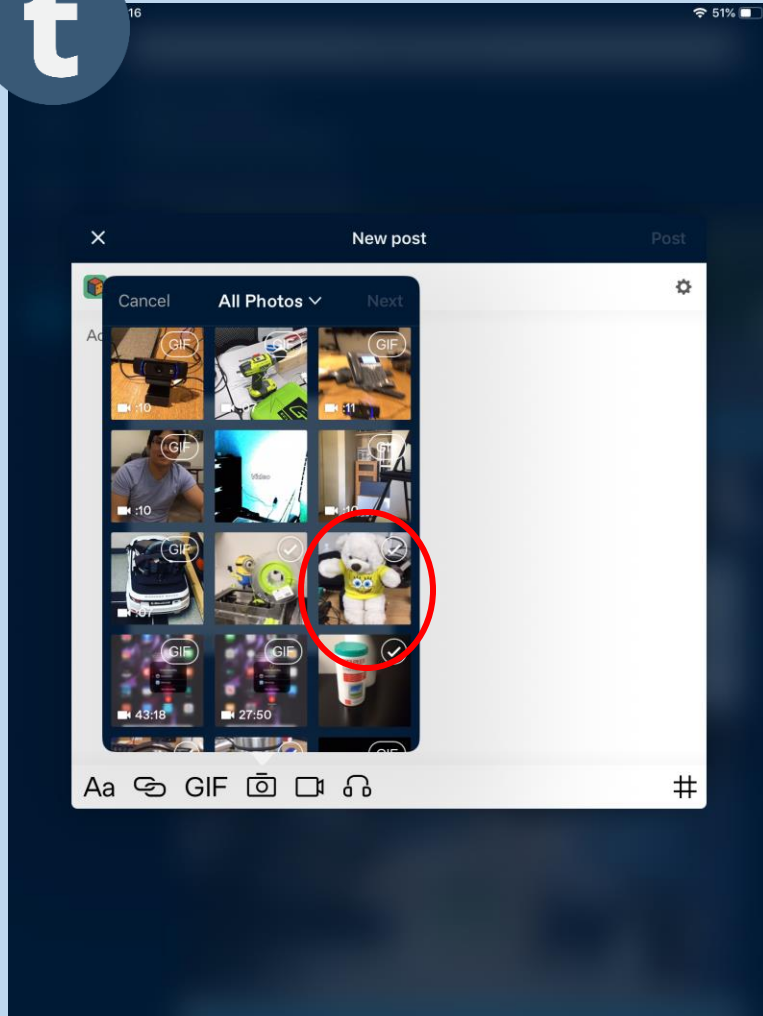




# Usability Issues: Features within apps do not always function as advertised



# Usability Issues: Flow of operations to complete tasks not always logical

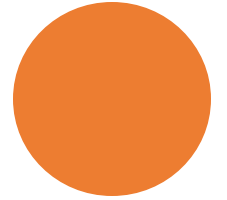


# Accessibility vs User-Centered vs Inclusive Design

## **Accessibility**

Accessibility is the practice of designing products, services, and environments so that people with disabilities can use them.

Technical standards apply!



# Accessibility vs User-Centered vs Inclusive Design

## User-centered Design (UCD)

UCD is a design process that focuses on the user's needs and goals throughout the design process.

UCD is an iterative process that involves gathering data from users, analyzing their feedback, and making decisions based on their needs.

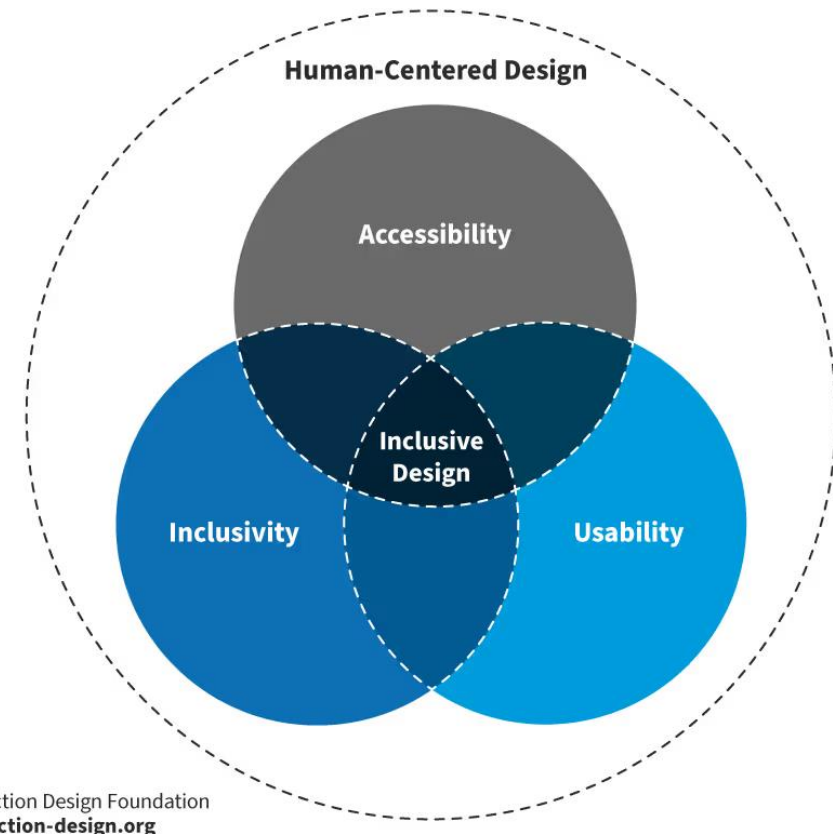
The goal of UCD is to create products that are easy to use and meet the expectations of the end user.



# Inclusive design describes methodologies to create products that understand and enable people of all backgrounds and abilities to use them.

Inclusive design may address accessibility, age, culture, economic situation, education, gender, geographic location, language, and race.

The focus is on fulfilling as many user needs as possible, not just as many users as possible.



Why is  
inclusive  
design  
important?

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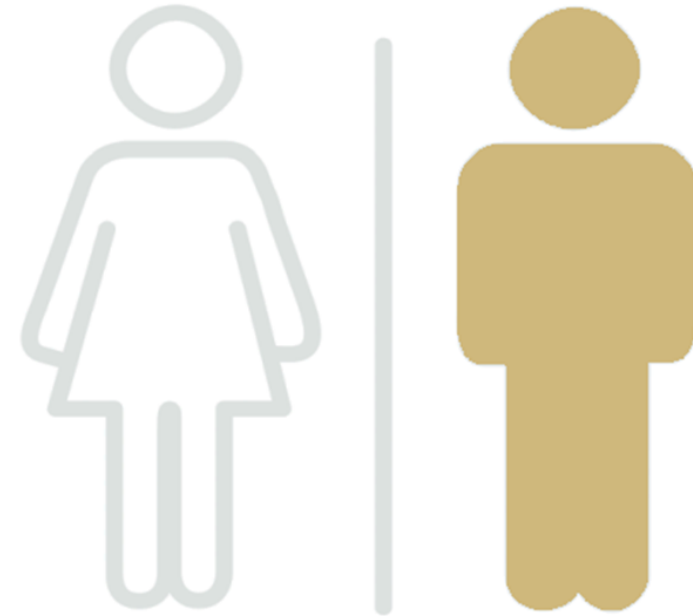


# Some numbers to think about....

More than 2.5 billion people today would benefit from one or more assistive products.

This number is likely to rise above 3.5 billion by 2050

Cognition, Vision, Hearing, Mobility

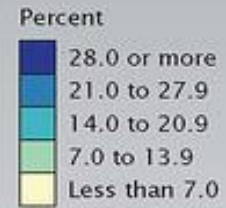
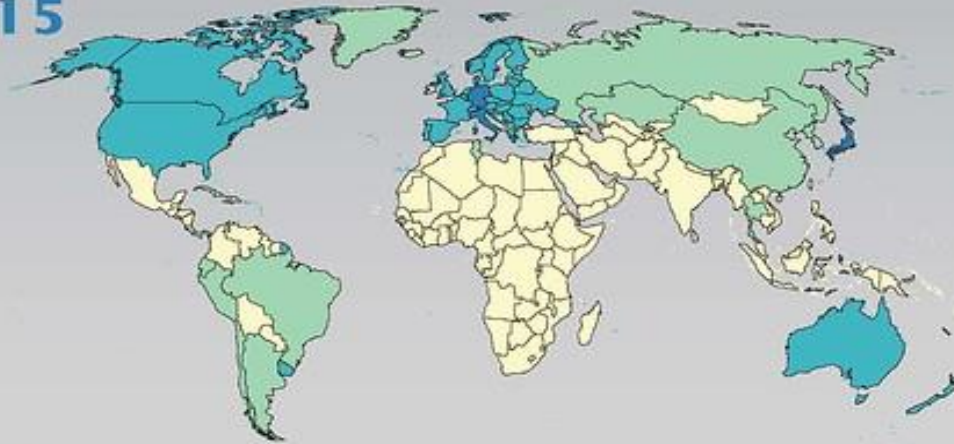


1-in-2

# An Aging World

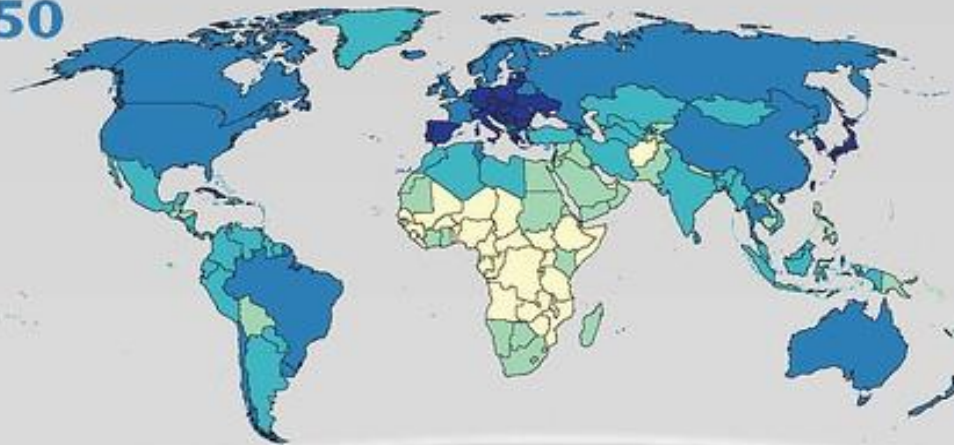
Percentage of the Population Age 65+ in 2015 and 2050

2015



World percent  
2015: 8.5  
2050: 16.7

2050

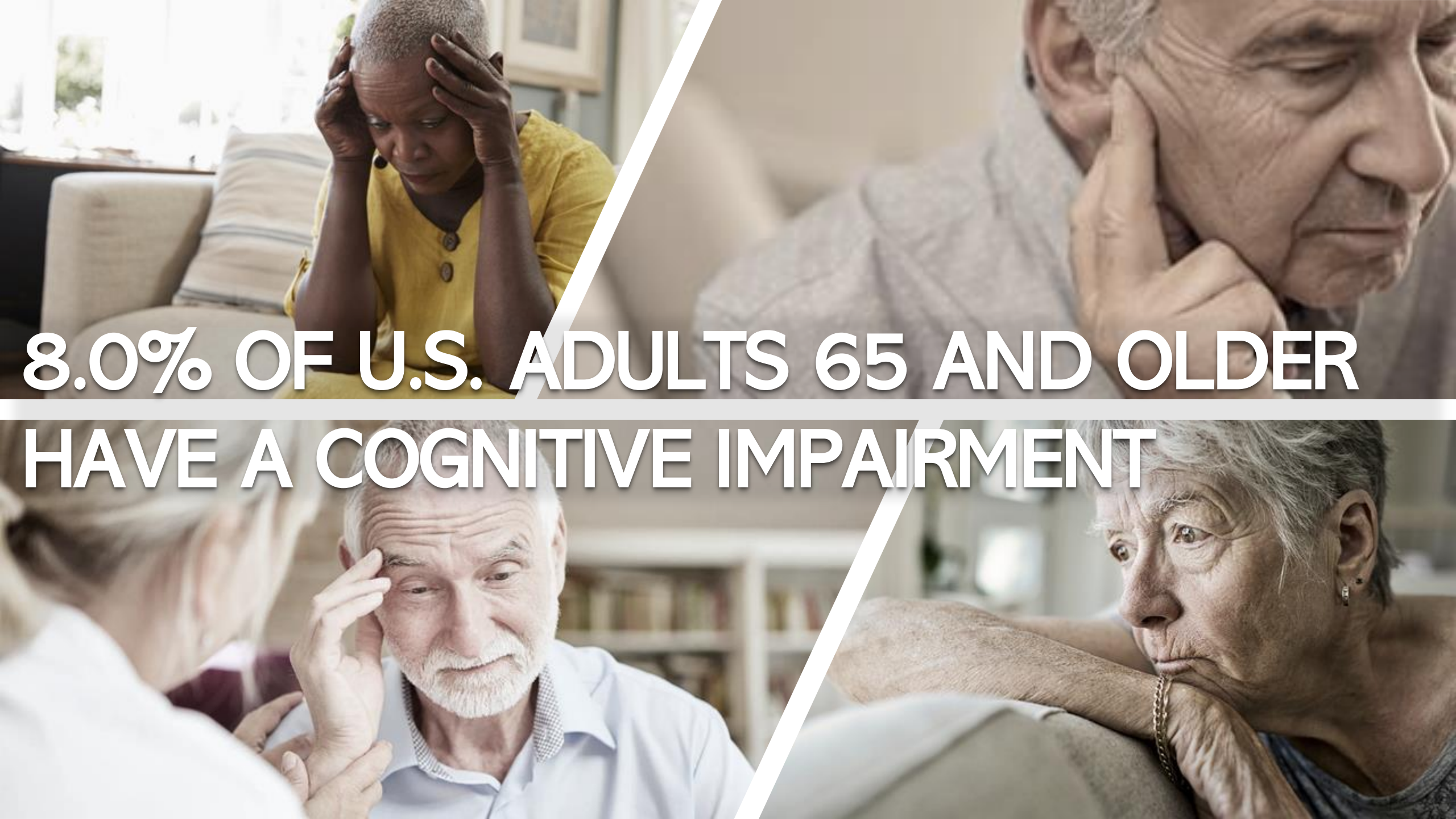


United States<sup>™</sup>  
**Census**  
Bureau

U.S. Department of Commerce  
Economics and Statistics Administration  
U.S. CENSUS BUREAU  
[census.gov](http://census.gov)

Source: U.S. Census Bureau, 2013, 2014a, 2014b; International Data Base, U.S. population estimates, and U.S. population projections.





**8.0% OF U.S. ADULTS 65 AND OLDER  
HAVE A COGNITIVE IMPAIRMENT**



**5.2 MILLION WORLDWIDE**  
**LIVE WITH DEMENTIA AT A COST ~\$24K PER PERSON**

**153 MILLION**  
**BY 2050**



Let's take a look at the patients we serve.

# Children birth to three

Over **three million children** (4.3% of the under-18 population) in the United States have a disability.



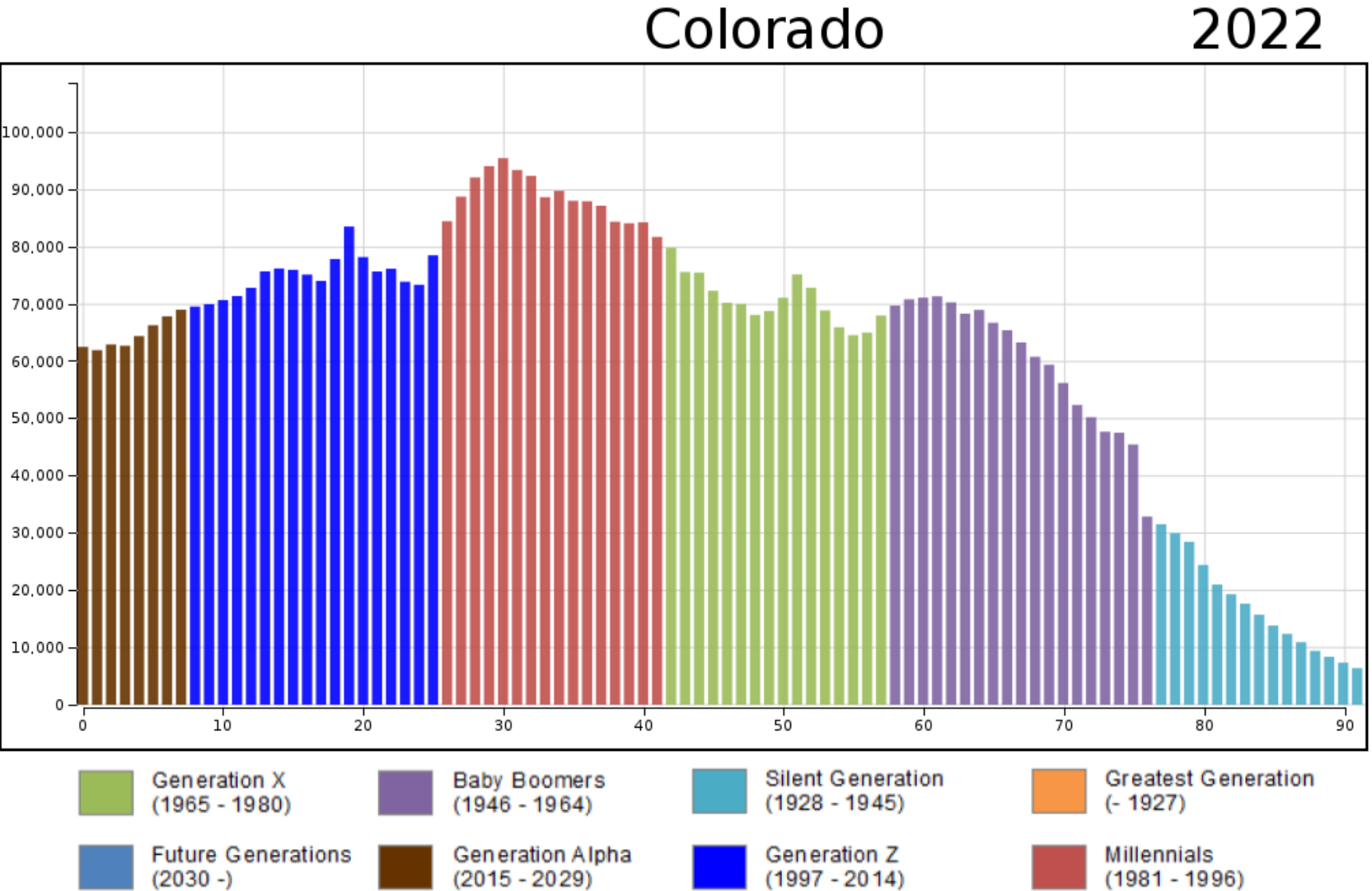
# School age Children

In 2022–2023, **15% of public-school students received special education and/or related services** under the Individuals with Disabilities Education Act (IDEA).

The most common disability category for students receiving special education services is **specific learning disabilities**, which account for 32% of cases.



# Colorado: Growth in the 65+ population accounted for over 100% of the state's overall growth (2001 - 2022)



# 13.8% of Colorado's population is 65 or older.

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Expected to increase to 20% by 2050.

The fastest-growing age groups are those between 70 and 74, 75-79, 80 to 84, and over 85.



# 1 in 4 Coloradans lives with a disability

**Mobility:** Serious difficulty walking or climbing stairs

**Cognition:** Serious difficulty concentrating, remembering, or making decisions

**Independent living:** Serious difficulty doing errands alone, such as visiting a doctor's office

**Hearing:** Deaf or serious difficulty hearing

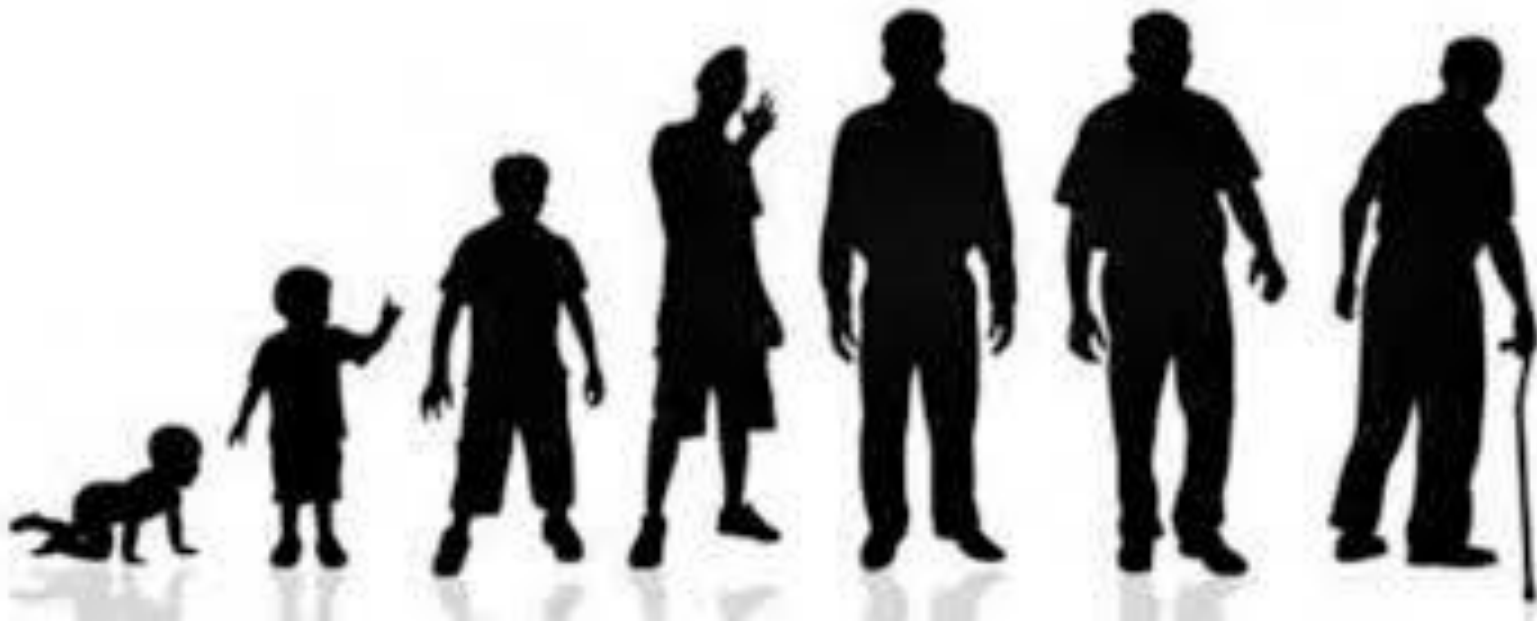
**Vision:** Blind or serious difficulty seeing, even when wearing glasses

**Self-care:** Difficulty dressing or bathing



# What happens as we age?

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# Health Matters!






Digital  
Health is  
exploding!

## Definition:

The use of digital technologies such as electronic health records, telemedicine, mobile health apps, wearables and artificial intelligence to improve healthcare delivery, patient care and empower individuals to take control of their health.

<https://media.market.us/digital-health-statistics/health-outcomes>.



Some numbers to think about...

**The global Digital Health Market is expected to be worth around USD 1,190.4 Billion by 2032.**

**(USD 264.1 Billion, 2023)**

<https://media.market.us/digital-health-statistics/health-outcomes>.



# Adoption and Usage of IoMT Technologies

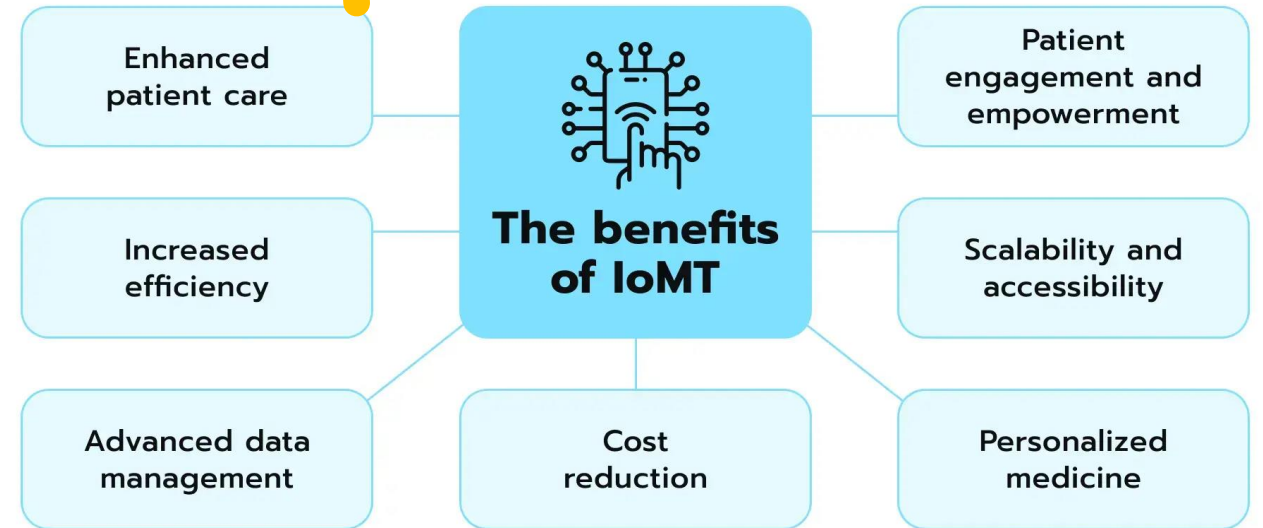
IoMT-enabled remote patient monitoring can reduce hospital readmission **by 50%**.

IoMT solutions have the potential to save the healthcare industry **USD 300 billion annually** in remote patient monitoring of chronic management.

**30% of American** adults use wearable technology for healthcare as of 2020.

About **85% of healthcare** providers use **IoMT** devices to support **patient engagement and monitoring**.

(Deloitte, Frost & Sullivan, Healthcare IT News, market.us)



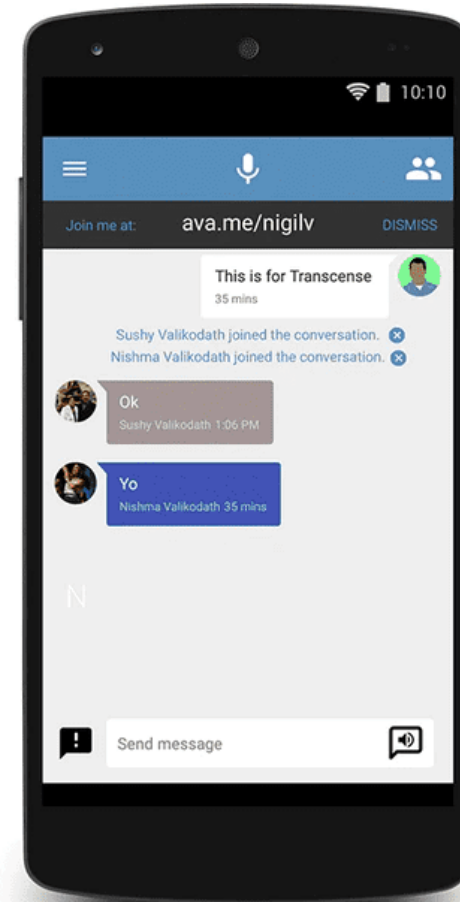
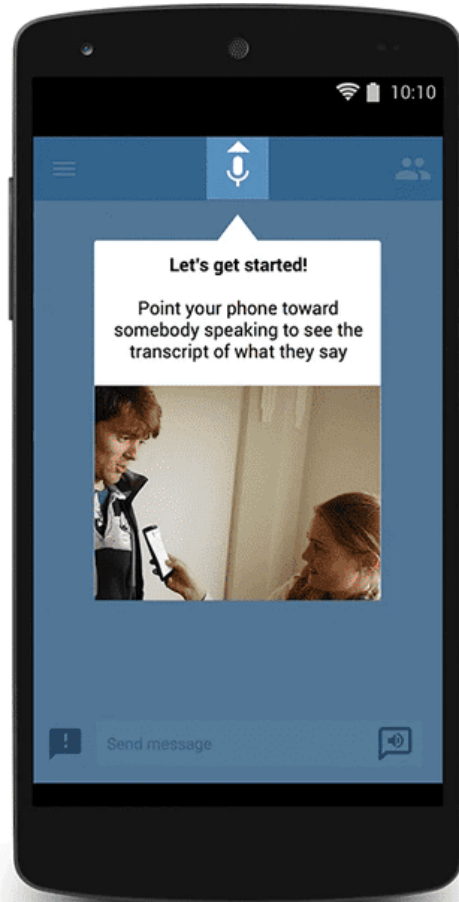
# 1 in 5 Patients Find Health Apps Hard to Use (we think it's higher!)

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Over **10,000,000** health tech apps are available worldwide, and are mostly used by adults **50-80 years** (February, 2022).



# How can we make products that work for our patient populations?

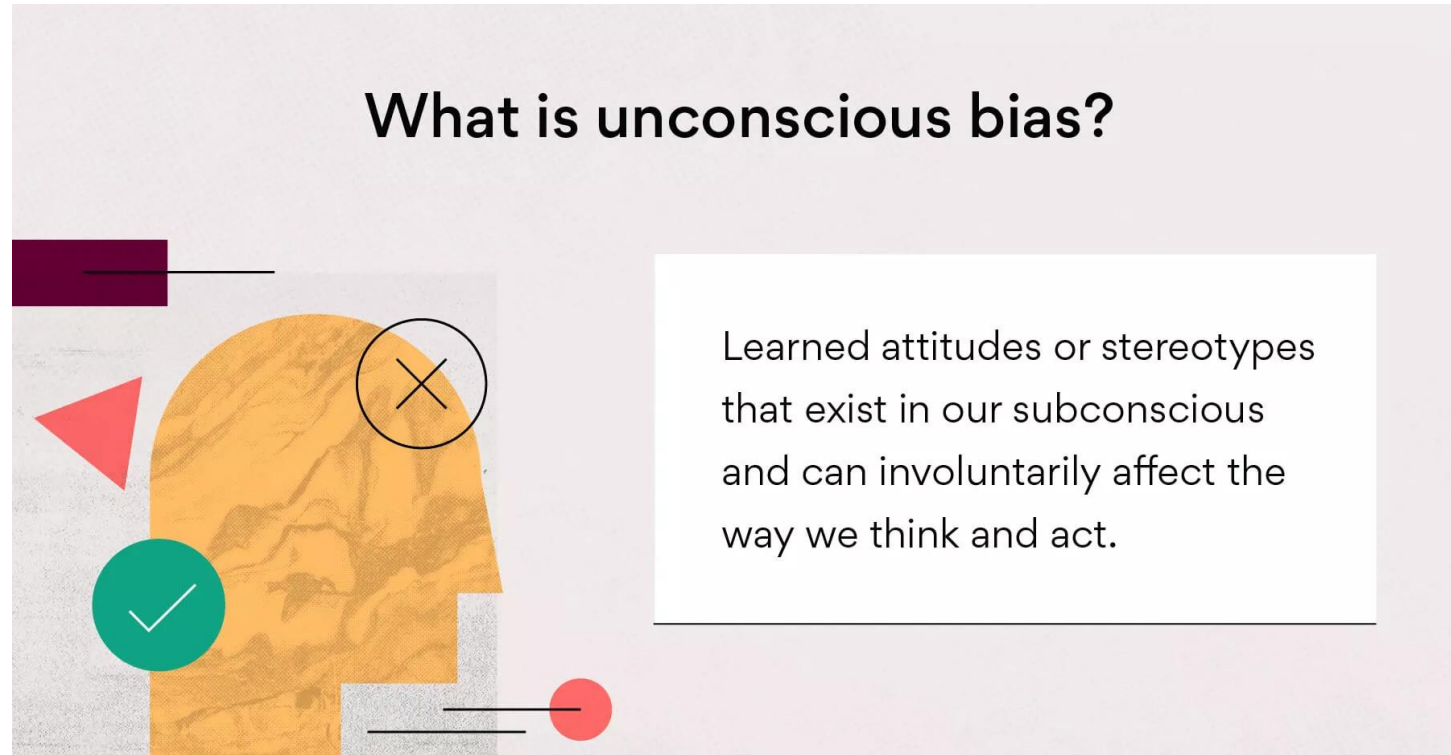


# 8 Principles of Inclusive Design

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## 1. Discover Your Own Biases.

Make sure that everyone has a voice and that different perspectives are involved in your design process.





# 8 Principles of Inclusive Design

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## 2. Uncover user needs and pain points

Conduct customer discovery to obtain a deep understanding of your users' needs, pain points, and behaviors and the problem you're trying to solve for them.

**Iteratively test to see if you are getting it right.**



# Rethinking mobility aids for older adults:

## Traditional Walkers



# Why rethink Mobility Devices

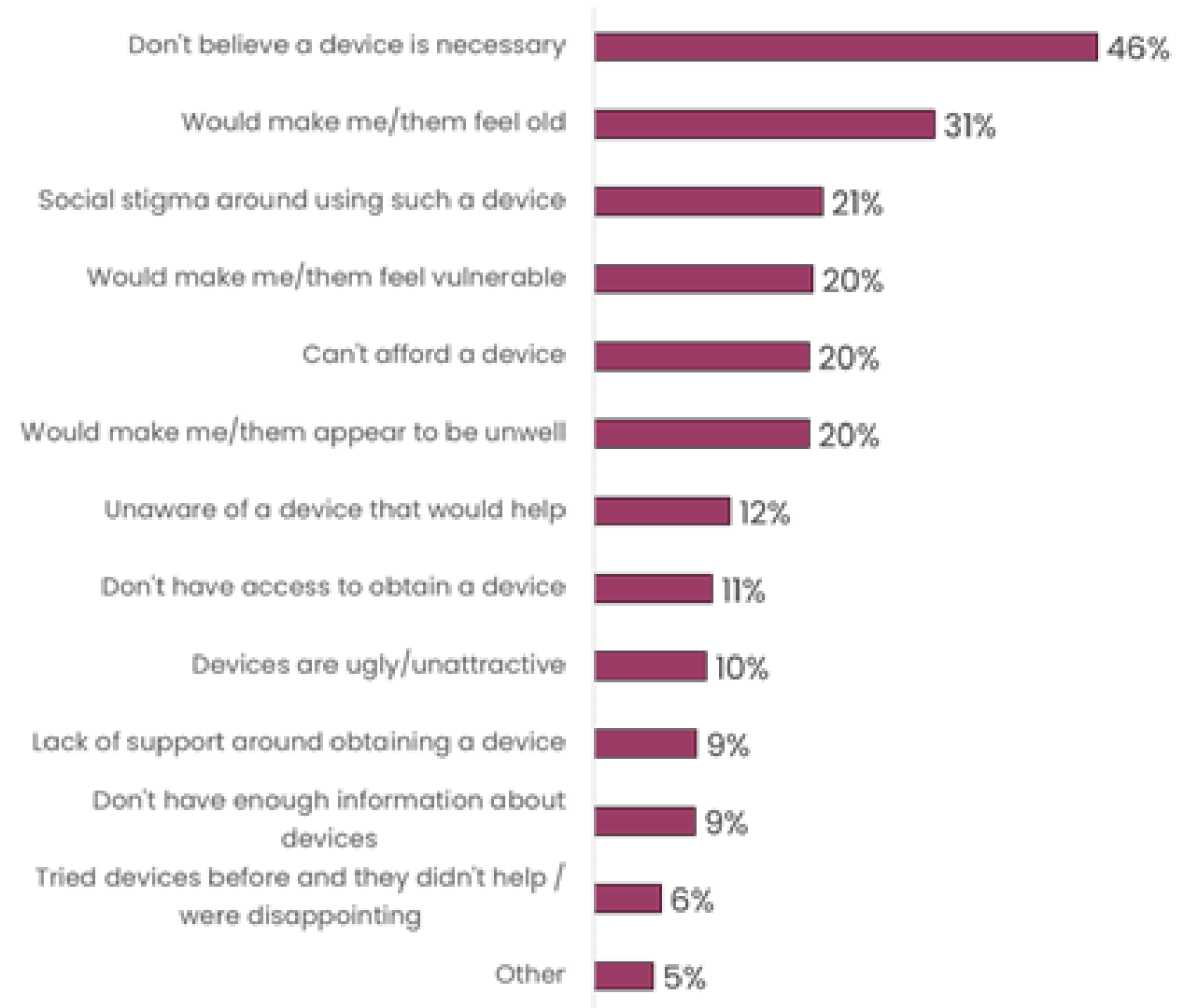
An estimated 2.7 million fall-related ED visits  
1.1 million inpatient visits occurred annually.

The annual average cost was \$1,105 per ED visit and  
\$18,047 per inpatient visit totaling \$22.9 billion  
annually.

# Rethinking mobility aids for older adults:

Smiley Online Community

n=3,306



# Enter the *Sexy Walker* Project!

THOUGHT  
FORWARD  
DESIGN

*pininfarina*



**Early Schematic Renderings.**

# 8 Principles of Inclusive Design

## 3. Be transparent and descriptive

Present a clear, straightforward interface, follow onboarding best practices to help users learn how to use your product, and assess and avoid dark patterns in your design.



# 8 Principles of Inclusive Design

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## 4. Apply a Holistic Approach

### 6 Rules of the holistic design approach

1. Consider all the **stakeholders**
2. Research the **environment**
3. Use **participative practices**
4. Be **sustainable**
5. Make an **ecosystem**
6. **Go beyond** digital

# 8 Principles of Inclusive Design

## 5. Anticipate your product's impact

Understand the intentions, goals, and shortcomings that your product may have.





# 8 Principles of Inclusive Design

## 6. Hire for diversity

Building an inclusive product also means building an inclusive team.

Ensure your team is diverse and is seeking diverse perspectives and opinions about their work.



# 8 Principles of Inclusive Design

## 7. Get out of your bubble

If we constantly review work with designers or the same people in our squad, we can unknowingly start to cater our design solution to what they like because we know they'll get it approved.



# 8 Principles of Inclusive Design

## 8. Be intentional

It may not be possible to immediately focus on all user needs, but any decision should be intentional and planned.

It is often best to focus on solutions that meet most needs, even though not all of them.

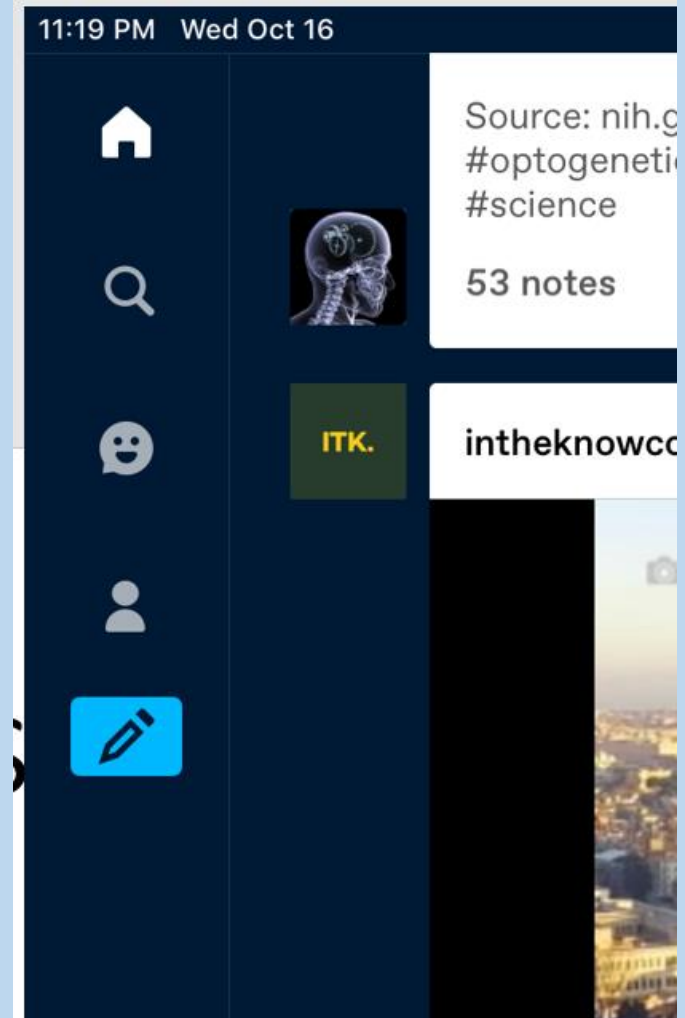


# Ways to address these key usability issues

## [Issue]

Visual cues and guidance are often unclear or unrecognizable

- The meanings behind icons are not always apparent  
Annotate with text and other direct cues
- Clustering and placement of clickable elements can obfuscate their intent  
Employ appropriate spacing and clear visual boundaries

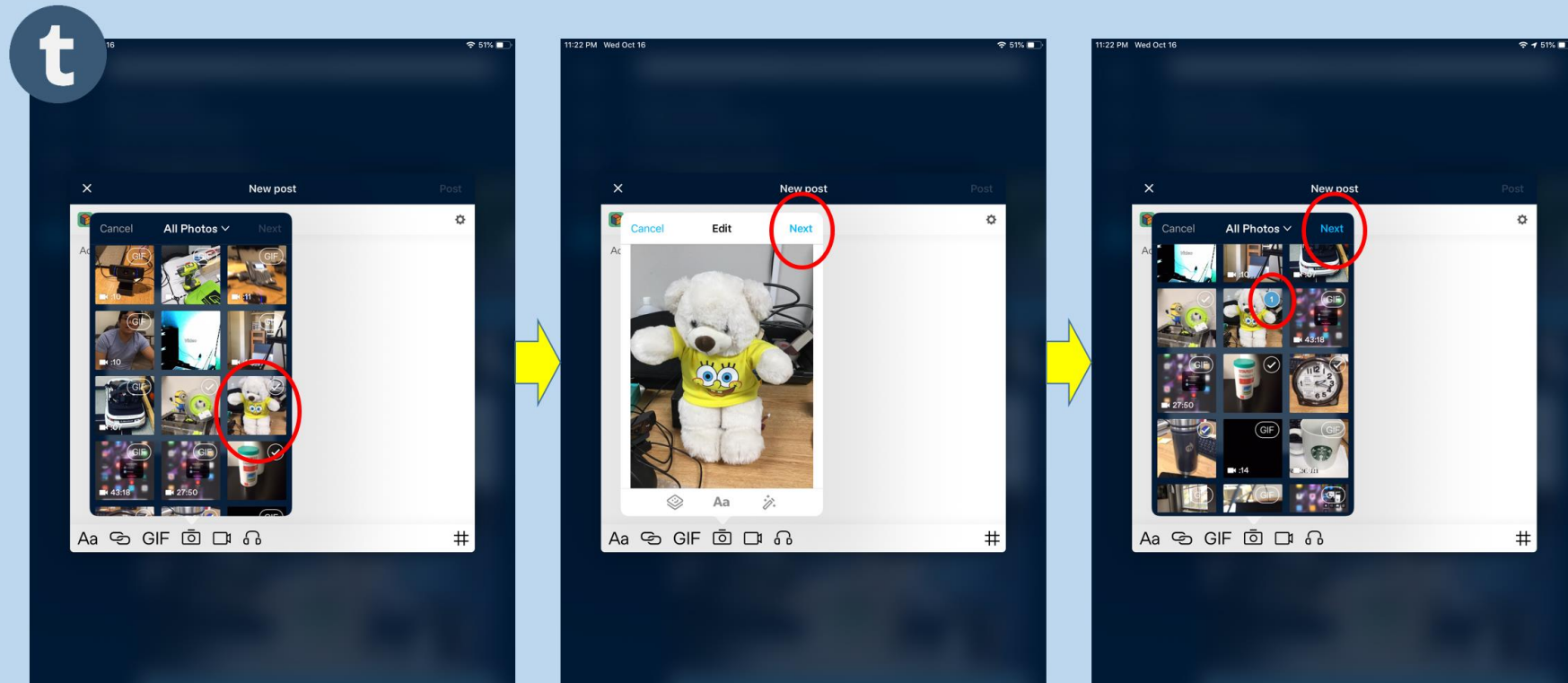


# Ways to address these key usability issues

## [Issue]

Flow of operations to complete tasks is not always intuitive or logical

Reduce number of steps to achieve critical actions



# Thank you!

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