



TECHNOLOGY

SNAPSHOTS

# Nurses and Engineers

Partnering for Patient Safety

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# 21<sup>st</sup> Century Technology Challenges

- Diffusion of complex technology
  - Increased complexity of environment
  - Increased acuity and complexity of patients
  - Technology is *not* just in the ICU / ORs
    - General Care Floors
    - Skilled Nursing
    - Nursing Homes
    - Home Care





## Nurse & Engineer Partnerships



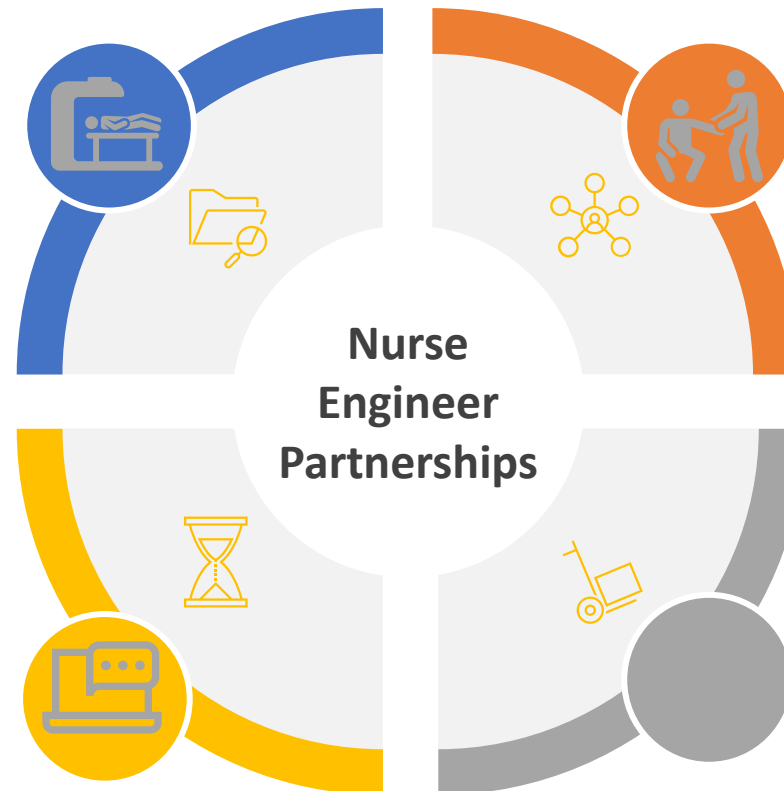
# AAMI Foundation



National Coalition to Promote the Safe Use of Complex Technology

# Nurse and Engineer Partnerships

**Design and Implement  
New Technologies**

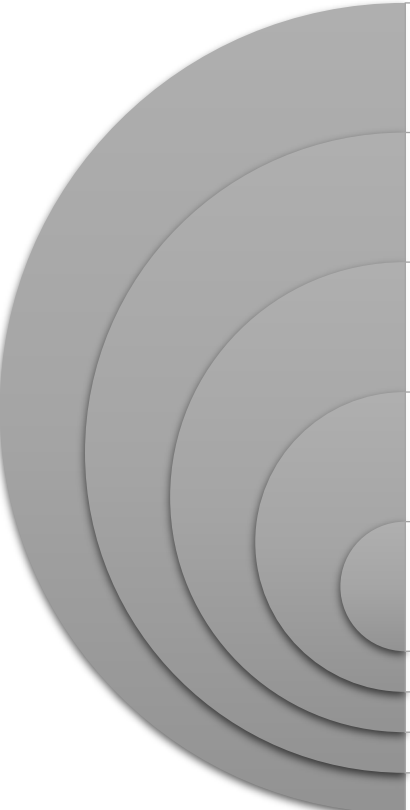


**Establish safe patient care  
environments**

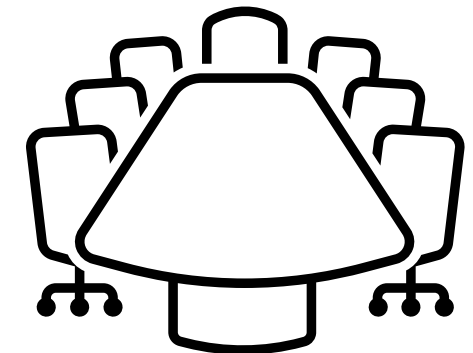
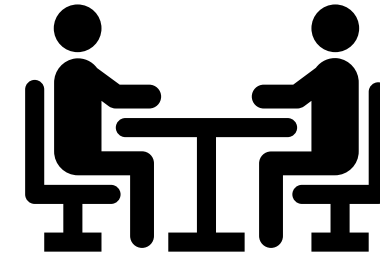
**Ensure data security**

**Develop effective  
information technologies  
for communication**

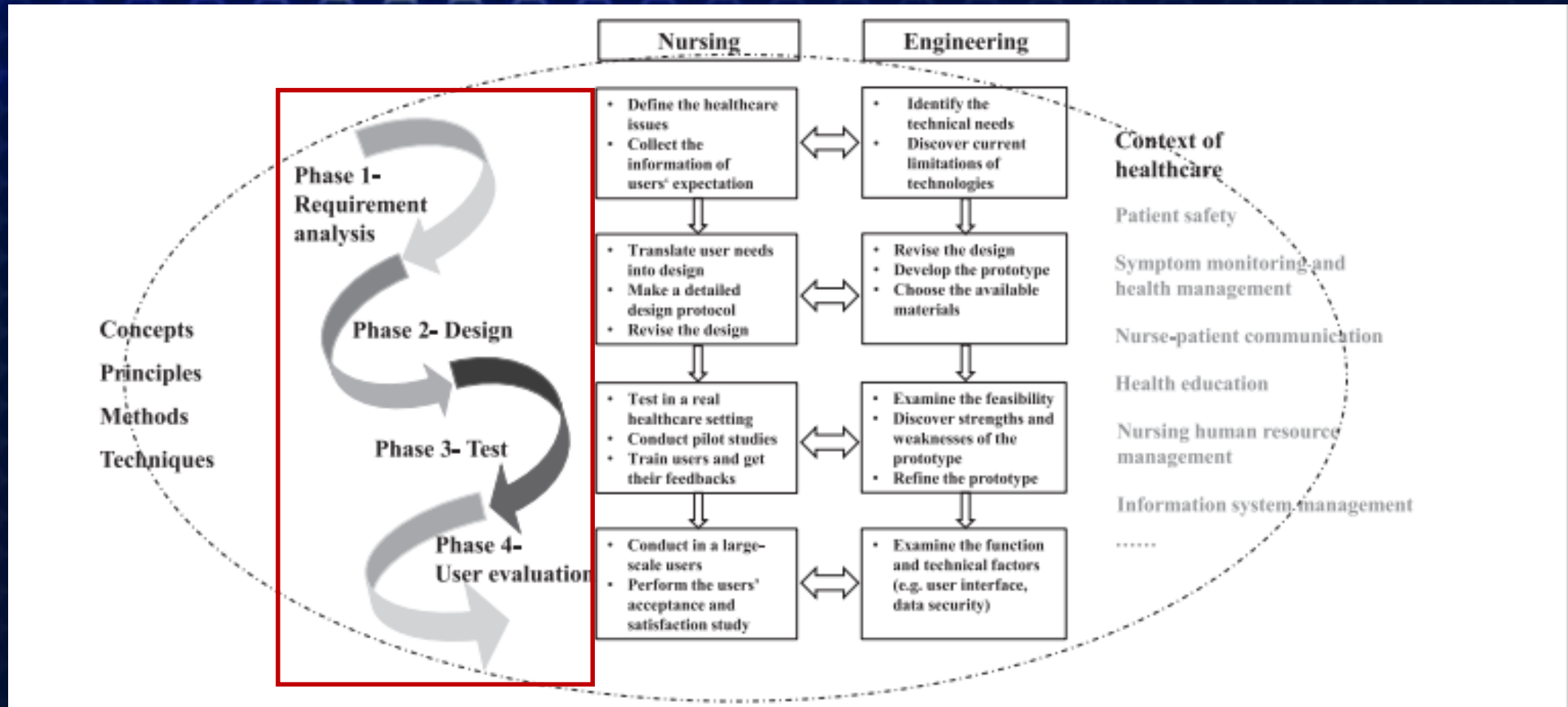
# Interdisciplinary Areas of Collaboration

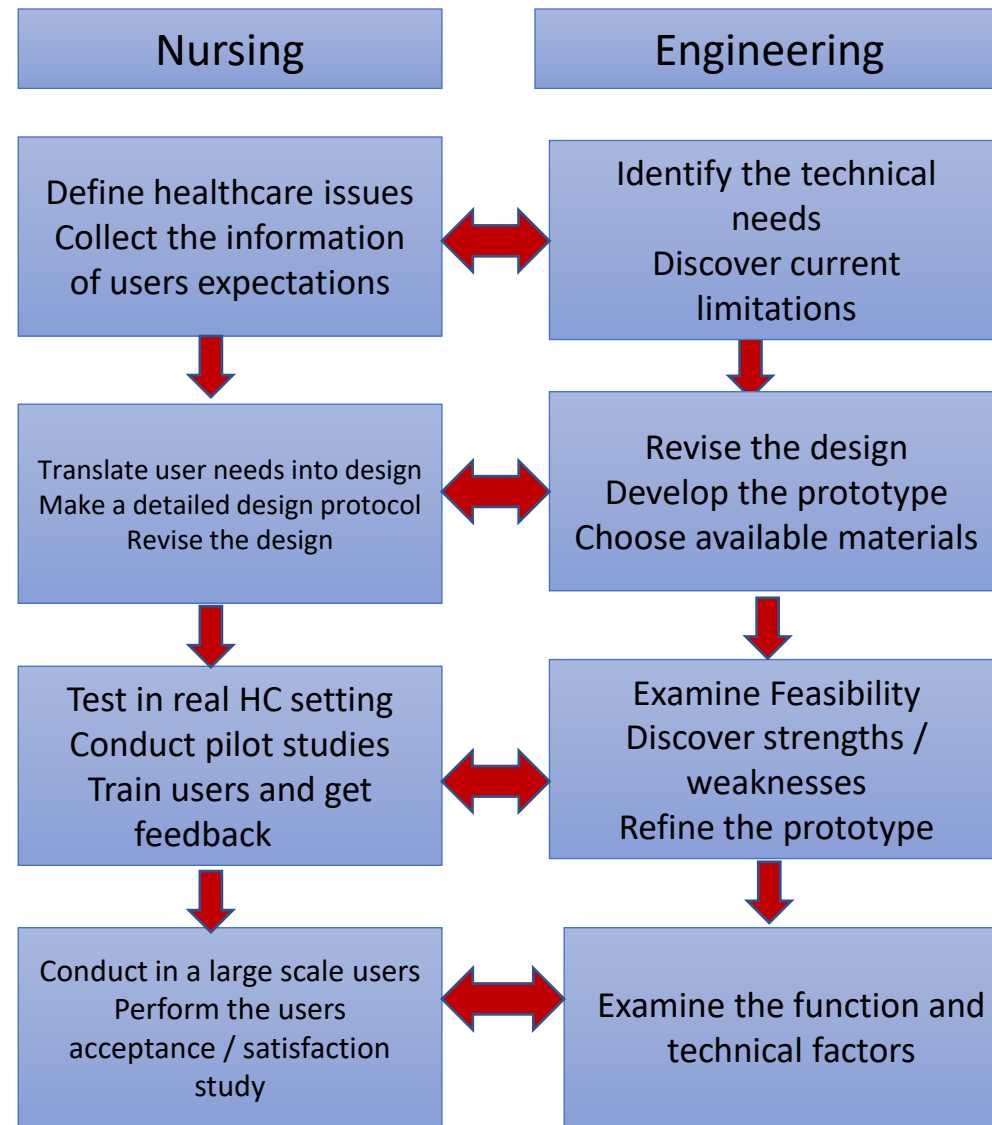


Patient Safety
Symptom Monitoring & Health Mgt
Information System and Nursing HR Mgt
Health Education
Nurse Patient Communication



Zhou, Y., Li, Z., & Li, Y. (2021). Interdisciplinary collaboration between nursing and engineering in health care: a scoping review. *International journal of nursing studies*, 117, 103900.





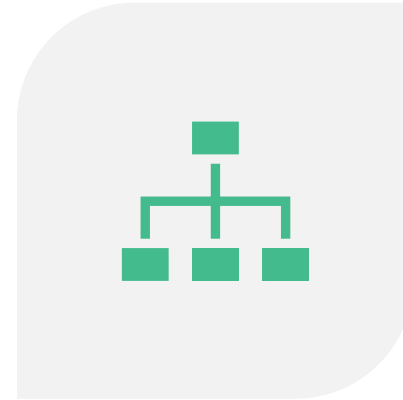
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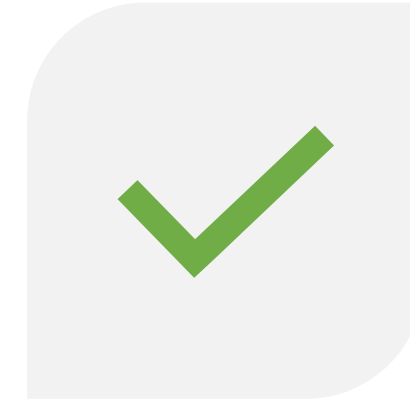
## NURSE IDENTIFIES UNMET CLINICAL NEED

Some patients lack the physical ability to push the PCA button to administer medications



## MULTI-DISCIPLINARY TEAM, INCLUDING ENGINEERS

Pain service, clinical engineers, pharmacist, nurse



## DEVELOP AND TEST EFFECTIVE SOLUTIONS

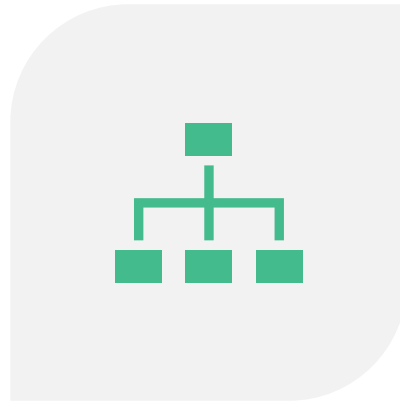


Andrews, R., Greasley, S., Knight, S., Sireau, S., Jordan, A., Bell, A., & White, P. (2020). Collaboration for clinical innovation: a nursing and engineering alliance for better patient care. *Journal of Research in Nursing*, 25(3), 291-304.



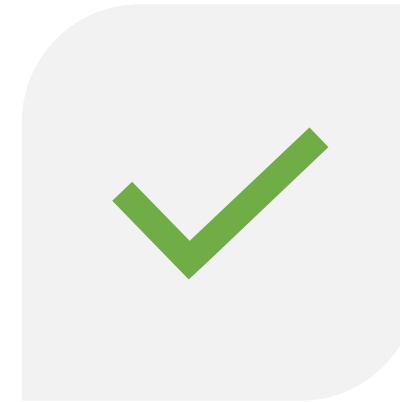
## NURSE IDENTIFIES UNMET CLINICAL NEED

Need for Face shields during the pandemic:  
Rapid production  
Ease of Use



## MULTI-DISCIPLINARY TEAM, INCLUDING ENGINEERS

Engineers  
Clinical Nurses  
Engineering and nursing students



## DEVELOP AND TEST EFFECTIVE SOLUTIONS



Andrews, R., Greasley, S., Knight, S., Sireau, S., Jordan, A., Bell, A., & White, P. (2020). Collaboration for clinical innovation: a nursing and engineering alliance for better patient care. *Journal of Research in Nursing*, 25(3), 291-304.

<https://www.umass.edu/ials/covid19/umass-face-shield>

# Collaboration During COVID

- COVID Crisis
  - Goal of moving equipment, including pumps, ventilators, etc to the hallways.
  - PPE design and distribution
  - Post pandemic role transformation: Nurse-Engineer



Clinical Engineers need to spend more time not only in the clinical corners of the hospitals, but also experiencing what nurses experience



Nurses need to spend time with clinical engineers to understand the how and why of equipment and the intricacies of repair & maintenance

Arquilla, L., & Cram, N. (2005). The relationship between clinical engineers and nurses in the hospital. *Journal of Clinical Engineering*, 30(2), 100-103.

# Nurse-Engineer Teams: Creating the Next Generation of Health Care Innovation Leaders



Medicated Infusions

Can we improve accuracy?



Central Venous pressure

What is the best position for accurate measurements?



Cardiac / Telemetry  
monitoring

What are best practices ?

[Nurse-Engineer Teams: Creating the Next Gen of Innovation | ANA \(nursingworld.org\)](https://www.nursingworld.org)

## Who are your Partners?

### Clinical Partner

- Clinical nurse specialist (CNS)
- Nurse educator
- Clinical Nurse Leader (CNL)

### Operational Partner

- Nurse manager / director
- Manager of Products / Technology
- Director of Operations



## Nurse / Engineer Project Partnerships

Selection	Define the need Evaluation Safety and efficacy Human factors
Risk assessment	FMEA
Business case	Financial analysis
Organizational processes	Decision making
Education and competency	Education Competency
Adoption	Strategies
Evaluation	Did practice change and is it effective

Regulatory issues; FDA approval  
Physical and cognitive ergonomics

What if?

Upfront cost, disposable cost, maintenance costs

Who makes the final decision?

Both nurses and engineers  
Initial and ongoing

Barriers?

Did the new technology deliver the proposed outcomes?

Phillips, J. (2019). Complex medical technology: Strategies for selection, education and competency assessment, and adoption. *AACN advanced critical care*, 30(1), 48-59.

# Engineers: Next Steps



## Publicize your team

- Nurses should know who you are... and what you can do for thme and with them
- Engineers or techs unit based?

## Listen First

- Do not fix and leave without showing the nurses what the issue was and a brief explanation of how you fixed it

## Speak the same language

- Speak the language, be respectful of nurses who are not “tech savvy”

## Make rounds

- Safety is in relationships. Nurses might say “ oh, while you are here...;’ “I was wondering about’,,,,

## Attend clinical meetings

- Nursing Practice
- Medication Safety

## Involve nursing staff in purchasing decisions

- End users, they are the ones using the equipment

Hayhurst, C. (2015). Hello, Partner: How Working with Nurses Makes for Better Healthcare Technology. *Biomedical Instrumentation & Technology*, 49(1), 14-22.





# Education and Innovation Centers



University of Massachusetts / Amherst  
Elaine Marieb Center for Nursing and Engineering Innovation



Johns Hopkins  
Fellowship Opportunity in Nursing and Engineering



University of Connecticut  
Nursing and Engineering Innovation Center: NursEng Innovation Fellowship



Florida Atlantic  
Nursing and engineering combined degree programs



Duquesne University  
Dual Degree in Engineering and Nursing

[FAU | New Degree Programs Combine Nursing with AI and Biomedical Engineering](#)  
[New Interdisciplinary Fellowship Opportunity in Engineering and Nursing - Johns Hopkins](#)  
[Whiting School of Engineering \(jhu.edu\)](#)  
[Home | Nursing and Engineering Innovation Center \(uconn.edu\)](#)



## Nurse & Engineer Partnerships



### Take Aways:

- Find out **who your partners** are
- How can you develop relationships with the front-line nurses? It will be mutually beneficial.
- Is there anything that you can think of right now that you want to discuss with your nurse partners?
- Find out what clinical meetings would be beneficial – Nursing practice? Medication safety?
- What can you ask of the nurses? Don't be afraid – something as simple as defining what is wrong instead of just writing "broken."
- Ensure that the right stakeholders are present when discussing the purchase of new equipment

# Resources

ANA: [Nurse-Engineer Teams: Creating the Next Gen of Innovation | ANA \(nursingworld.org\)](#)

Andrews, R., Greasley, S., Knight, S., Sireau, S., Jordan, A., Bell, A., & White, P. (2020). Collaboration for clinical innovation: a nursing and engineering alliance for better patient care. *Journal of Research in Nursing*, 25(3), 291-304.

Arquilla, L., & Cram, N. (2005). The relationship between clinical engineers and nurses in the hospital. *Journal of Clinical Engineering*, 30(2), 100-103.

Davis, C. R., & Glasgow, M. E. S. (2017). Nurse-scientists and nurse-engineers. *Am Nurse Today*, 12(11), 50-1.

Davis, C. R., & Glasgow, M. E. S. (2020, November). An examination of nurse-authored patents: Implications for nursing practice. In *Nursing Forum* (Vol. 55, No. 4, pp. 772-781).

Duquesne University: [Biomedical Engineering and Nursing Dual Degree - Duquesne University](#)

Florida Atlantic: [College of Nursing Joint BS/MS Degree Program | Florida Atlantic University \(fau.edu\)](#)

Giuliano, K. (ND). Nurse-Engineer Teams: Creating the Next Generation of Health Care Innovation Leaders

Glasgow, M. E. S., Colbert, A., Viator, J., & Cavanagh, S. (2018). The nurse-engineer: A new role to improve nurse technology interface and patient care device innovations. *Journal of Nursing Scholarship*, 50(6), 601-611.

Johns Hopkins: [New interdisciplinary fellowship opportunity in engineering and nursing - Johns Hopkins Malone Center for Engineering in Healthcare \(jhu.edu\)](#)

Hayhurst, C. (2015). Hello, Partner: How Working with Nurses Makes for Better Healthcare Technology. *Biomedical Instrumentation & Technology*, 49(1), 14-22.

Oerther, D. B., & Glasgow, M. E. (2022). The nurse+ engineer as the prototype V-shaped professional. *Nursing Outlook*, 70(2), 280-291.

Phillips, J. (2019). Complex medical technology: Strategies for selection, education and competency assessment, and adoption. *AACN advanced critical care*, 30(1), 48-59.

University of Connecticut: [Home | Nursing and Engineering Innovation Center \(uconn.edu\)](#)

[University of Massachusetts at Amherst: Homepage : Elaine Marieb Center for Nursing & Engineering Innovation : UMass Amherst](#)

Zhou, Y., Li, Z., & Li, Y. (2021). Interdisciplinary collaboration between nursing and engineering in health care: a scoping review. *International journal of nursing studies*, 117, 103900.



Thank you!

