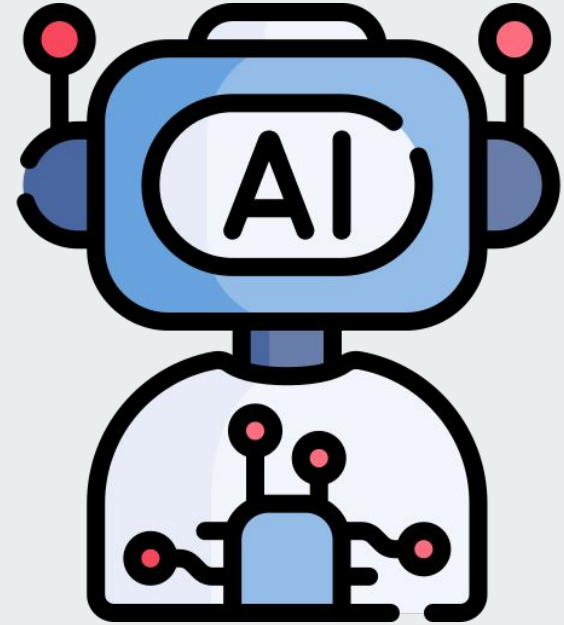




# Journal Club

Hunter Ratliff & Matt Lokant  
07/16/2025



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# Article 1

JAMA | Original Investigation

# Stewardship Prompts to Improve Antibiotic Selection for Pneumonia

## The INSPIRE Randomized Clinical Trial

Shruti K. Gohil, MD, MPH; Edward Septimus, MD; Ken Kleinman, ScD; Neha Varma, MPH; Taliser R. Avery, MS; Lauren Heim, MPH; Risa Rahm, PharmD; William S. Cooper, PharmD; Mandelin Cooper, PharmD; Laura E. McLean, MEd; Naoise G. Nickolay, RPh; Robert A. Weinstein, MD; L. Hayley Burgess, PharmD; Micaela H. Coady, MS; Edward Rosen, BA; Selsebil Sljivo, MPH; Kenneth E. Sands, MD, MPH; Julia Moody, MS; Justin Vigeant, BA; Syma Rashid, MD; Rebecca F. Gilbert, BA; Kim N. Smith, MBA; Brandon Carver, BA; Russell E. Poland, PhD; Jason Hickok, MBA; S. G. Sturdevant, PhD; Michael S. Calderwood, MD, MPH; Anastasiia Weiland, MD; David W. Kubiak, PharmD; Sujan Reddy, MD, MSc; Melinda M. Neuhauser, PharmD, MPH; Arjun Srinivasan, MD; John A. Jernigan, MD, MS; Mary K. Hayden, MD; Abinav Gowda, BS; Katyuska Eibensteiner, BA; Robert Wolf, BS; Jonathan B. Perlin, MD, PhD; Richard Platt, MD, MSc; Susan S. Huang, MD, MPH

# Background & purpose



- HCA developed a **classification algorithm using AI** to **predict a patient's risk of various MRDOs**
  - MRSA, pseudomonas, ESBL
- Prediction based on over 50 variables
  - Demographics,
  - Healthcare exposures
  - Prior antibiotic use
  - Hx of MDROs, comorbidities
  - Hospital-specific MDRO prevalence

Prediction was incorporated AI into their CPOE for pneumonia

## Purpose

Evaluate whether **computerized provider order entry (CPOE) prompts** providing patient- and pathogen-specific MDRO infection risk estimates could **reduce empiric extended-spectrum antibiotics** for non-critically ill patients admitted with pneumonia

# Design

**Cluster-randomized trial** conducted in 59 US community hospitals within the HCA Healthcare system

## Phases of study

- 18-month baseline (4/2017 - 9/2018)
- 6-month phase in (10/2018 - 3/2019)
- 15-mo intervention (4/2019 - 6/2020)



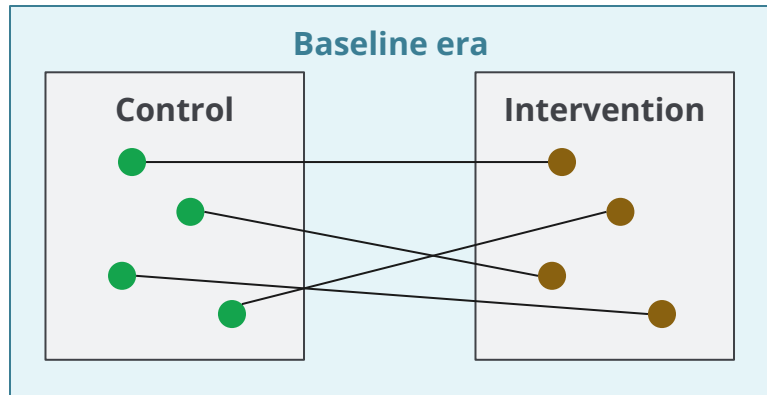
# Design

**Cluster-randomized trial** conducted in 59 US community hospitals within the HCA Healthcare system

**Hospitals paired** based on baseline era data  
→ **randomized hospitals** (1:1)

## Phases of study

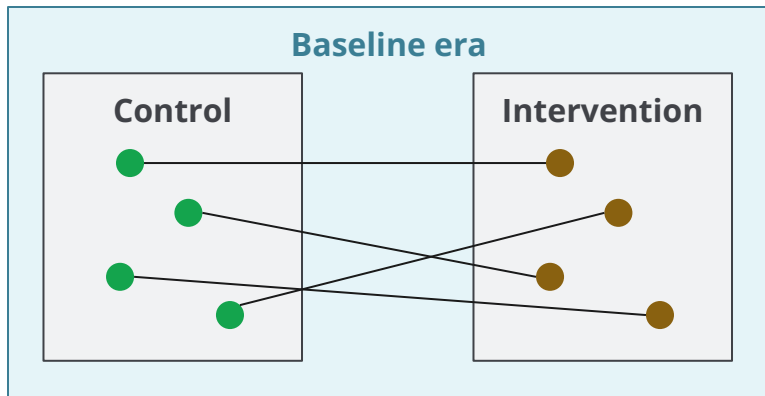
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# Design

**Cluster-randomized trial** conducted in 59 US community hospitals within the HCA Healthcare system

**Hospitals paired** based on baseline era data  
→ **randomized hospitals** (1:1)



## Phases of study

- 18-month baseline (4/2017 - 9/2018)
- 6-month phase in (10/2018 - 3/2019)
- 15-mo intervention (4/2019 - 6/2020)

Inclusion: **Non-critically ill** adults  
**hospitalized with pneumonia** on admission

Exclusion: Incarceration or transferred to ICU  
within 48h of admission

# Study arms

## Stewardship alone group (n = 30 hospitals)

- Received standard educational materials
- Quarterly coaching calls for stewardship
- Prospective deescalation based on micro results (MRSA screen, sputum cultures)





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- Quarterly coaching calls for stewardship
- Prospective deescalation based on micro results (MRSA screen, sputum cultures)



## Stewardship + CPOE group (n = 29 hospitals)

Same as **control group** --plus-- if starting broad spectrum ABX and **patient-pathogen risk <10%**  
→ **CPOE prompted antimicrobial change**

- Prompts were tailored to the specific extended spectrum antimicrobial that was ordered
- Gave them a single click option to change

MRSA risk <10% → click to *"stop vancomycin"*

Pseud <10% → click to *"change Zosyn to ceftriaxone"*



# Design

## POPULATION

49 963 Women  
46 232 Men



Adults hospitalized  
with pneumonia

Mean age: 68 years

## LOCATION

59

Community hospitals  
in the US



## INTERVENTION



59 Hospitals randomized

29

### CPOE bundle

CPOE prompts recommending  
standard-spectrum antibiotics  
coupled with clinician  
education and feedback



30

### Routine stewardship

Educational materials and  
quarterly coaching calls to  
maintain stewardship activities  
per national guidelines

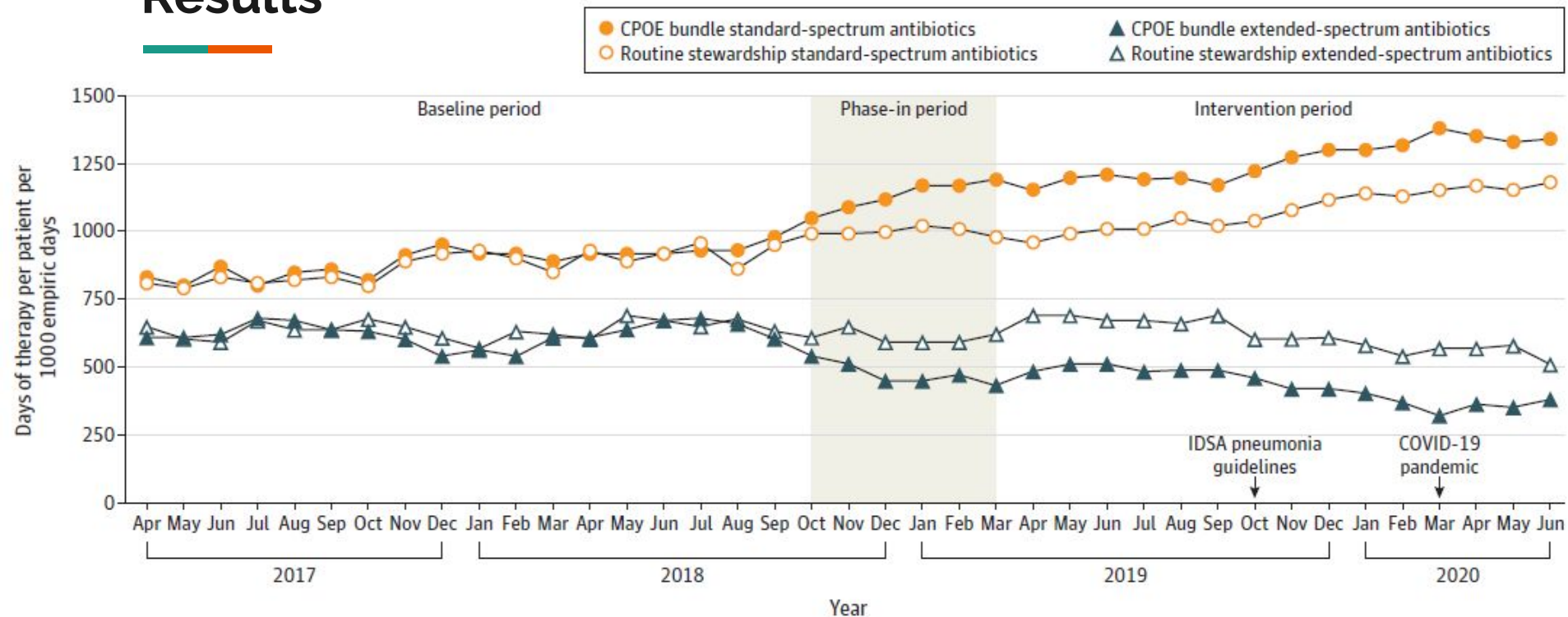
## PRIMARY OUTCOME

Extended-spectrum antibiotic days of therapy

Measured as  
individual antibiotic  
days during first  
72-hours



# Results



# Results

Outcome	<u>CPOE group</u>			<u>Control group</u>			Rate/Hazard Ratio of difference-in-differences
	Before	After	RR/HR	Before	After	RR/HR	
(1) Extended spec days	614	429	<b>0.68*</b>	633	615	0.94	<b>0.72*</b> (0.66-0.78)

Primary outcome: **CPOE bundle group** experienced a **28.4% reduction** in empiric extended spectrum days of therapy (within first 72 hours)

- **12.5% of prompts** resulted in **extended** → **standard-spectrum** antibiotic

# Results

Outcome	<u>CPOE group</u>			<u>Control group</u>			Rate/Hazard Ratio of difference-in-differences
	Before	After	RR/HR	Before	After	RR/HR	
(1) Extended spec days	614	429	<b>0.68*</b>	633	615	0.94	<b>0.72*</b> (0.66-0.78)
Vanco days	235	161	<b>0.68*</b>	241	219	<b>0.89*</b>	<b>0.77*</b> (0.71-0.83)
Anti-pseud days	342	240	<b>0.67*</b>	357	361	0.98	<b>0.68*</b> (0.61-0.75)

Secondary outcomes: **CPOE bundle group** had reduction in anti-MRSA and anti-pseudomonal antibiotics

# Results

Outcome	<u>CPOE group</u>			<u>Control group</u>			Rate/Hazard Ratio of difference-in-differences
	Before	After	RR/HR	Before	After	RR/HR	
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Anti-pseud days	342	240	<b>0.67*</b>	357	361	0.98	<b>0.68*</b> (0.61-0.75)
Length of stay (days)	6.9	7.1	1.00	6.9	6.8	1.04	0.96 (0.91-1.01)
Days to ICU transfer	6.6	7.1	1.06	6.7	6.5	1.02	1.04 (0.89-1.21)
Days to ABX escalation	5.5	6.1	<b>0.81*</b>	5.4	5.3	0.99	<b>0.82*</b> (0.69-0.97)

Safety outcomes: Similar LOS & time to ICU transfer

- **CPOE group** had **delayed time to ABX escalation** (18% longer), but didn't affect other safety outcomes

# Results

Outcome	<u>CPOE group</u>			<u>Control group</u>			Rate/Hazard Ratio of difference-in-differences
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Other notable findings: Algorithm classified **96% of patients as low risk of MDRO**

- Less than 2% of these patients grew MDROs

# Conclusions & Limitations



AI assisted **computerized provider order entry prompts** seems to be an effective (and likely safe) **intervention** to improve antibiotic stewardship in pneumonia treatment

## Limitations

- **COVID**: Intervention period occurred during COVID
- **Hawthorne effect**: Getting prompts may have contributed to stewardship (irrespective of patient risk)
  - But does it matter why providers changed behavior?
- **Is 10% the right cut off?** Is a 5% risk of MRSA the same in a COPD patient vs neutropenic fever?



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# Article 2

## Article 2

Artificial intelligence (AI) use  
for personal protective  
equipment training,  
remediation, and education in  
health care

Veronica Preda [a], Zehurn Ong [a], Chandana  
Wijeweera [b], Terence Carney [c], Robyn  
Clay-Williams [d], Denuka Kankanamge [a],  
Tamara Preda [e], Ioannis Kopsidas [f],  
Michael Keith Wilson [a,c]

- a Faculty of Medicine, Health and Human Sciences, Macquarie University, Sydney, New South Wales, Australia
- b Emergency Medicine and Rural Practice, Bairnsdale Regional Hospital, Bairnsdale, Victoria, Australia
- c Surgical XR, Innovation and Development Department, Sydney, New South Wales, Australia
- d Australian Institute of Health Innovation, Health Resilience & Systems Research, Sydney, New South Wales, Australia
- e Department of Surgery, University of Notre Dame, St Vincent's Clinical School, Sydney, New South Wales, Australia
- f Centre for Clinical Epidemiology and Infection Control, University of Athens, Athens, Greece

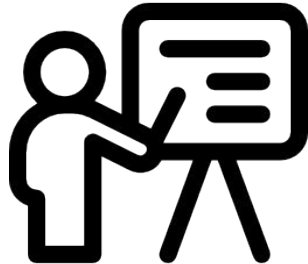
# Background & purpose

- **Donning and doffing PPE correctly** are critical skills for HCWs
  - Failure to do so → **nosocomial infections**
  - Many **may not know** there are **doing it incorrectly**



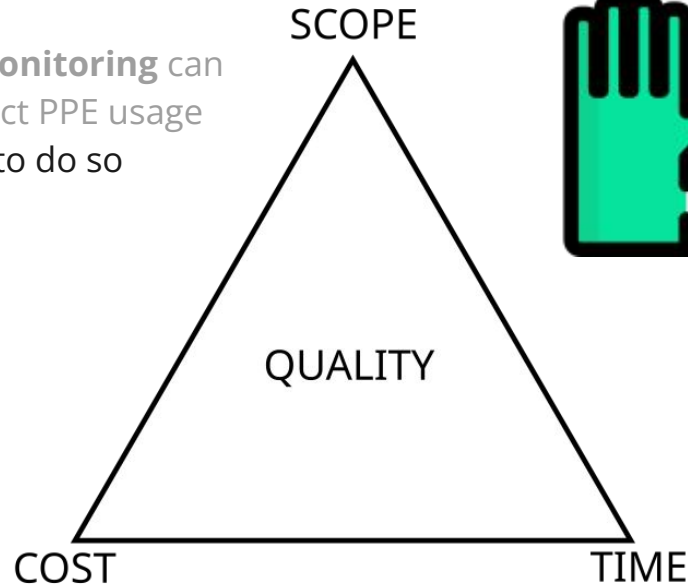
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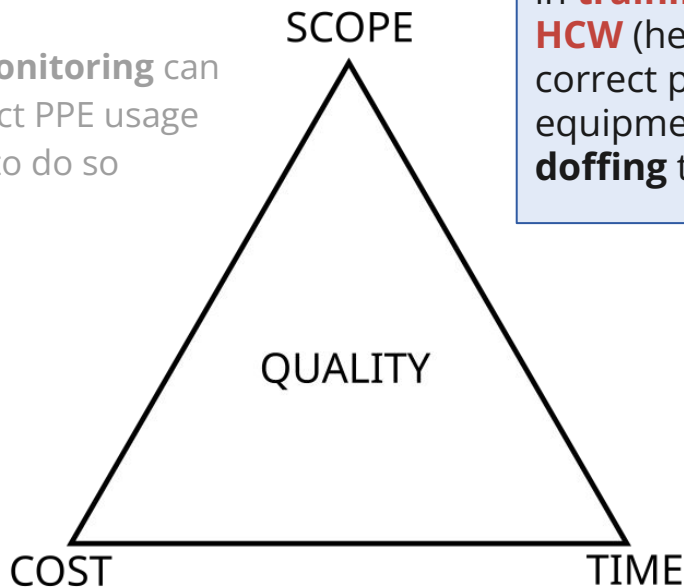
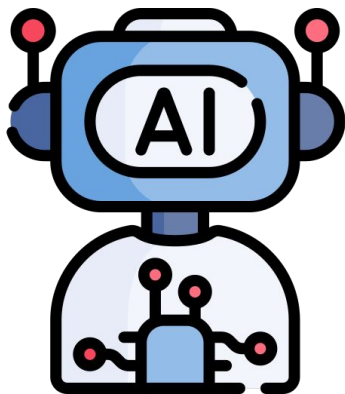
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# Background & purpose

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- **Regular training & monitoring** can improve rates of correct PPE usage
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## Purpose

To **assess the efficacy** of **Surgical XR AI-PPE** (SXR AI-PPE) in **training and remediating HCW** (health care workers) in correct personal protective equipment (**PPE**) **donning and doffing** techniques

# The SXR AI-PPE Platform

Utilizes **AI and computer vision** to analyze and assess user donning and doffing

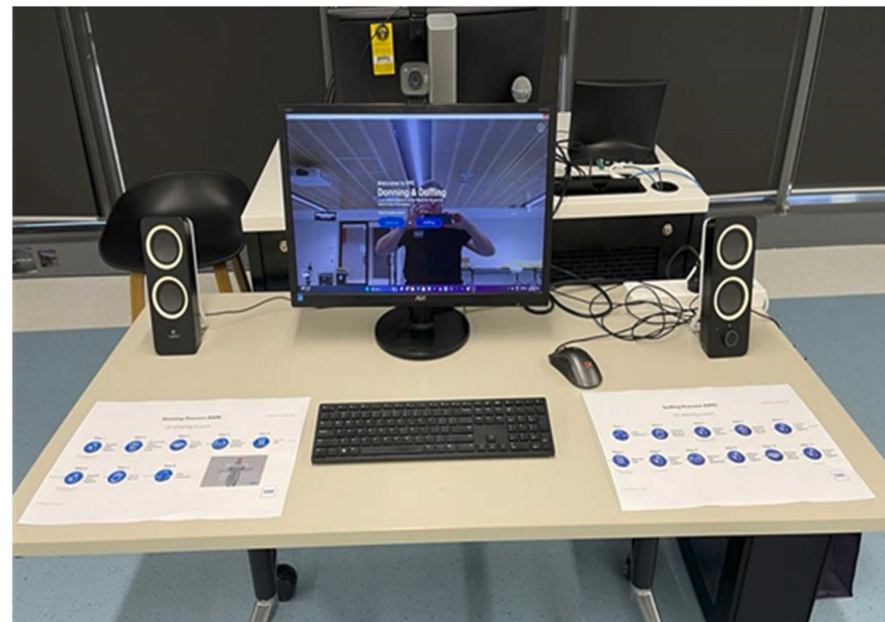


# The SXR AI-PPE Platform

Utilizes **AI and computer vision** to analyze and assess user donning and doffing

Veronica Preda [a], Zehurn Ong [a], Chandana Wijeweera [b], **Terence Carney [c]**, Robyn Clay-Williams [d], Denuka Kankanamge [a], Tamara Preda [e], Ioannis Kopsidas [f], **Michael Keith Wilson [a,c]**

- a Faculty of Medicine, Health and Human Sciences, Macquarie University, Sydney, New South Wales, Australia
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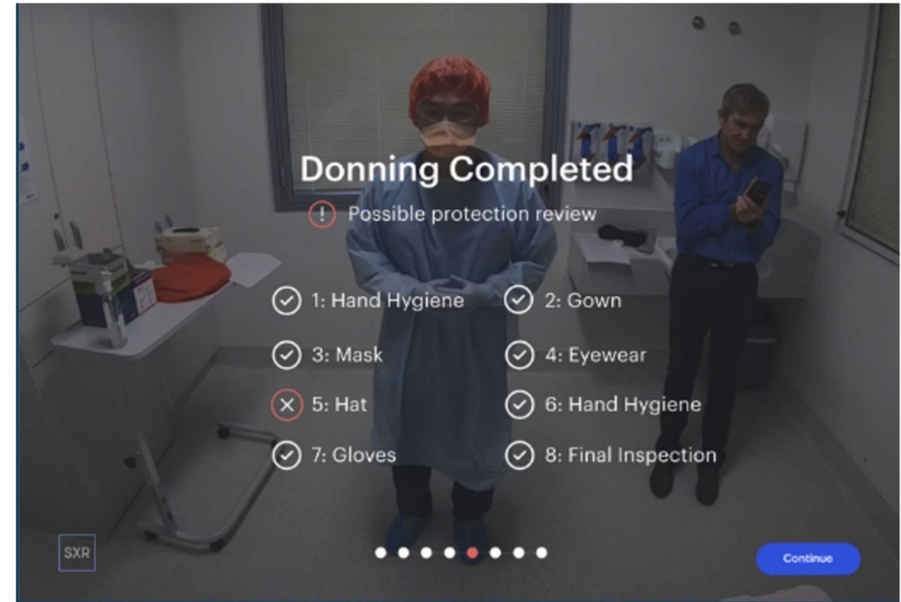




# The SXR AI-PPE Platform

Utilizes **AI and computer vision** to analyze and assess user donning and doffing

**Real-time Feedback:** Provides real-time feedback on the user's performance, helping to identify and remediate user errors promptly for improved technique



# The SXR AI-PPE Platform

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**Guided Mode:** Offers a step-by-step walkthrough of the PPE donning/doffing process, ideal for those unfamiliar with PPE protocols or needing a refresher



# The SXR AI-PPE Platform

**Guided Mode**: Offers a step-by-step walkthrough of the PPE donning/doffing process, ideal for those unfamiliar with PPE protocols or needing a refresher



**Unguided Mode**: designed for more experienced users and providing a quicker, more streamlined assessment



# Study design



“Single-center, mixed-methods, prospective cohort study (?) involving 293 HCWs (?) in Sydney, Australia”

# Study design



This differs some from what is in the text

"Single-center, mixed-methods, prospective cohort study (?) involving 293 HCWs (?) in Sydney, Australia"

Assessed **donning & doffing**

## Components of donning & doffing

- Hand hygiene
- Gown
- Mask
- Eyewear
- Hat
- Gloves

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Assessed **donning & doffing**

- **Accuracy** - Did they do it correctly?
- **Speed** - How long did it take?
- **Longitudinal component** - Did they remember over time?
  - More on this later

## Components of donning & doffing

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  - More on this later

Also did **before-after surveys** to assess confidence in correct PPE use

## Components of donning & doffing

Hand hygiene  
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"Single-center, mixed-methods, prospective cohort study (?) involving **293 HCWs** (???) in Sydney, Australia"

Assessed **donning & doffing**

- **Accuracy**
  - **Speed**
  - **Longitudinal component**
- Only **20 medical students**

Done for the **entire group** (n=293) on guided mode





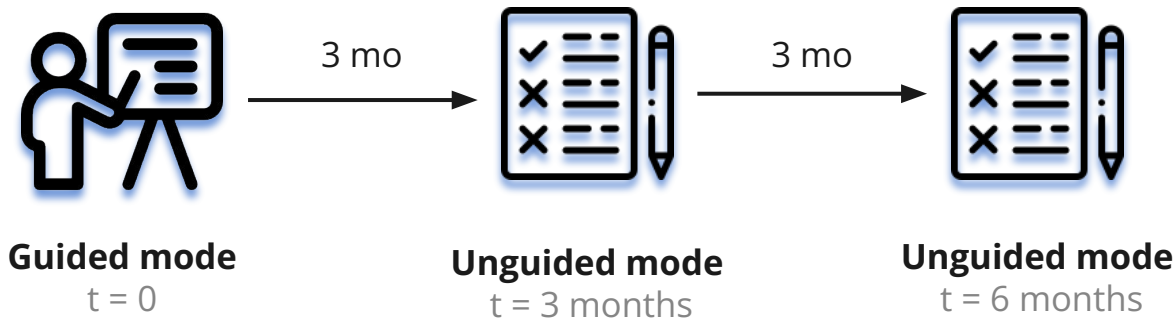
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“Single-center, mixed-methods, **prospective cohort study** (?) involving 293 HCWs (?) in Sydney, Australia”

Paper calls this prospective cohort...

# Study design

"Single-center, mixed-methods, ~~prospective cohort study~~ (?) involving 293 HCWs (?) in Sydney, Australia"

Paper calls this prospective cohort, but **I disagree**

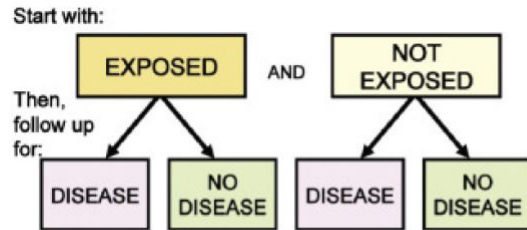


Fig. 8.3

Design of a cohort study beginning with exposed and unexposed groups.

*Gordis Epidemiology* (Chapter 8), probs like the 2019 version

## Prospective cohort studies

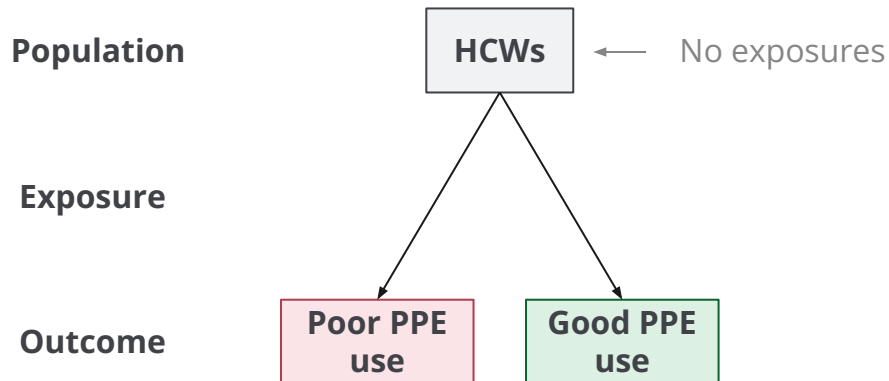
Select individuals ***without the outcome of interest but at risk for it***, and following them over time

The aim is to compare the **incidence of outcomes between groups** based on exposure status

- Exposure: smokers vs non-smokers
- Outcome: lung cancer vs no cancer

# Study design

"Single-center, mixed-methods, ~~prospective cohort study~~ (?) involving 293 HCWs (?) in Sydney, Australia"



## Prospective cohort studies

Select individuals ***without the outcome of interest but at risk for it***, and following them over time

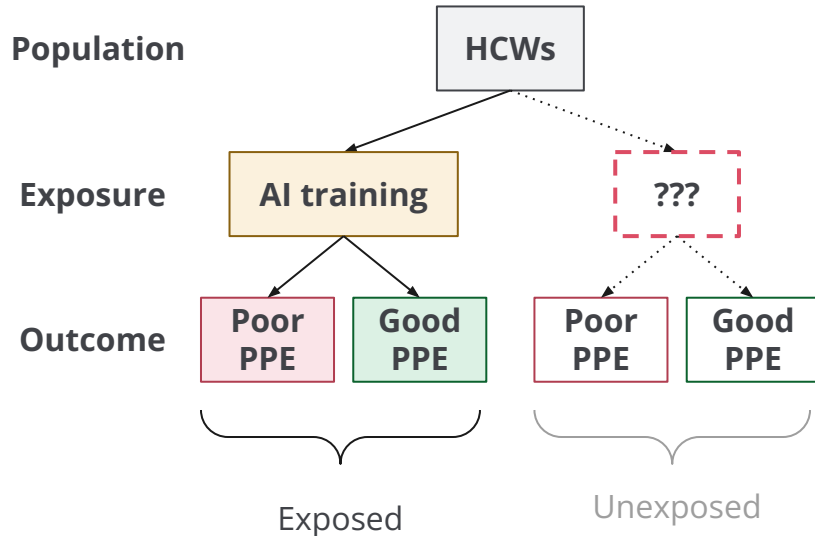
- This part checks out

The aim is to compare the **incidence of outcomes between groups** based on exposure status

- Exposure: ...
- Outcome: Good vs poor PPE use

# Study design

"Single-center, mixed-methods, ~~prospective cohort study~~ (?) involving 293 HCWs (?) in Sydney, Australia"



## Prospective cohort studies

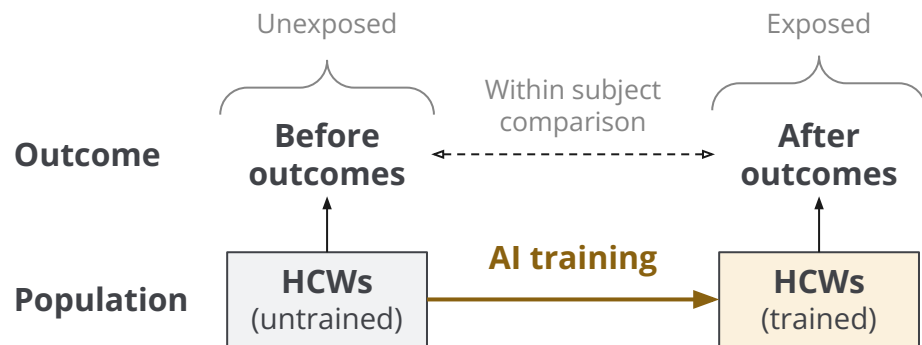
Select individuals *without the outcome of interest but at risk for it*, and following them over time

The aim is to compare the **incidence of outcomes** between groups based on **exposure status**

- Exposure: **PPE training** vs **???**
- Outcome: Good vs poor PPE use

# Study design

"Single-center, mixed-methods, ~~prospective cohort study~~ (?) involving 293 HCWs (?) in Sydney, Australia"



## Pre-post study

Follows a **single group over time** and measures outcomes before and after an intervention

Measures **within-subject change** (no separate control group)

# Study design



"Single-center, mixed-methods, ~~prospective cohort study~~ (?) involving 293 HCWs (?) in Sydney, Australia"

Just because an **investigation is *prospective*** doesn't make it a **prospective cohort**

## Prospective cohort studies

Select individuals *without the outcome of interest but at risk for it*, and following them over time

The aim is to compare the **incidence of outcomes** between groups based on **exposure status**

## Pre-post study

Follows a single group over time and measures outcomes before and after an intervention

Measures within-person change (no separate control group)

# Results

Entire group  
(n=293) on  
guided mode



<i>Table 1</i>	No	Percent
Medical student	221	75%
Nursing	7	2%
Administrative staff	15	5%
Junior medical officer	13	4%
Surgeon	3	1%
Path/lab science	31	11%
Physician	3	1%



# Results

Entire group  
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<i>Table 1</i>	No	Percent	<i>Percent failed</i>	Donning	Doffing
Medical student	221	75%	Hand hygiene	29%	4%
Nursing	7	2%	Gown	50%	0%
Administrative staff	15	5%	Mask	23%	1%
Junior medical officer	13	4%	Eyewear	43%	0%
Surgeon	3	1%	Hat	10%	21%
Path/lab science	31	11%	Gloves	14%	0%
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# Results

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PPE time (seconds)	Before	After	Difference
Donning	208	193	15 sec (7.2%)
Doffing	195	173	22 sec (11.3%)

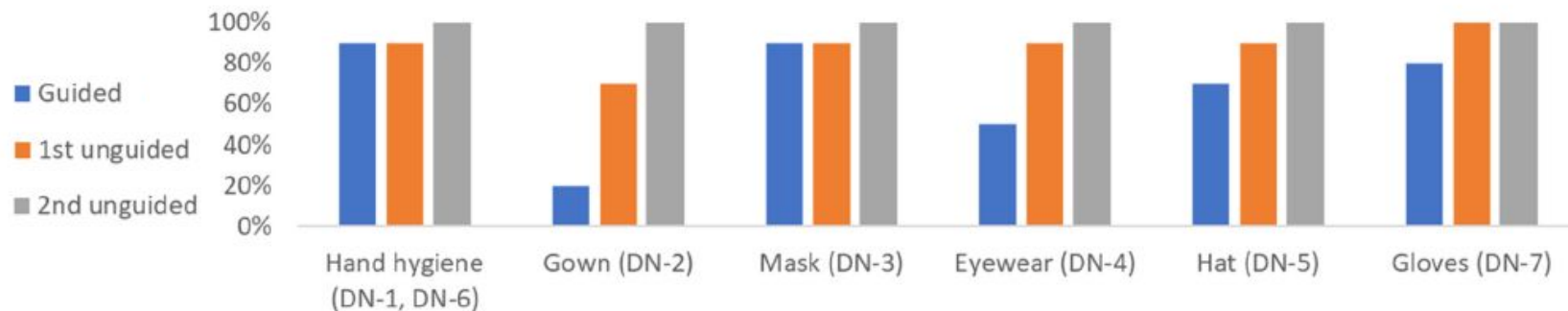
# Results

## Longitudinal component

20 medical students

Percent failing (n=20)	Hand hygiene		Gown		Mask		Eyewear		Hat		Gloves	
	DoNN	DoFF	DoNN	DoFF	DoNN	DoFF	DoNN	DoFF	DoNN	DoFF	DoNN	DoFF
Baseline	5	10	40	0	5	15	25	0	5	20	10	0
3 months	5	5	15	0	5	5	5	0	5	5	0	0
6 months	0	0	0	0	0	0	0	0	0	0	0	0

## A: Donning Pass Rates

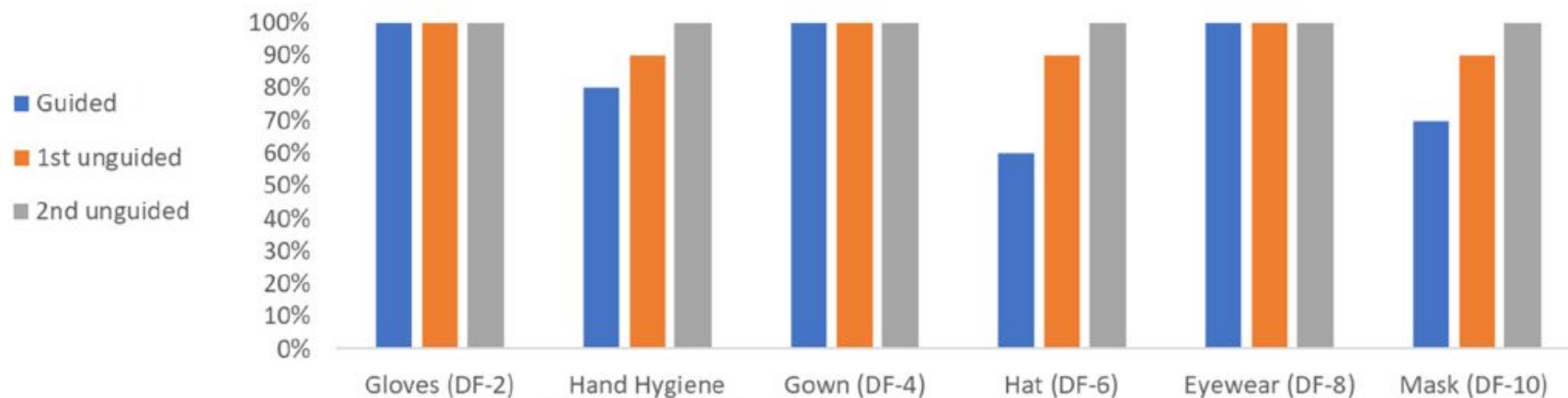


# Results

**Longitudinal component**  
20 medical students

Percent failing (n=20)	Hand hygiene		Gown		Mask		Eyewear		Hat		Gloves	
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Baseline	5	10	40	0	5	15	25	0	5	20	10	0
3 months	5	5	15	0	5	5	5	0	5	5	0	0
6 months	0	0	0	0	0	0	0	0	0	0	0	0

## B: Doffing Pass Rates

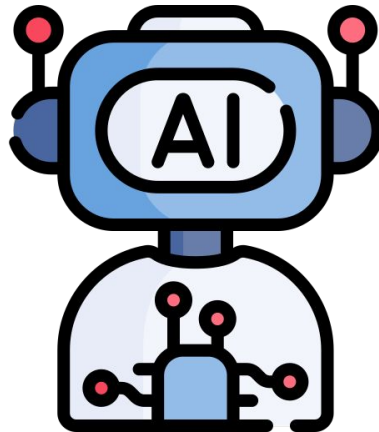


# Conclusions & Limitations

- Really is a pretty cool concept with a fair amount of potential
  - It's just the paper itself doesn't really demonstrate that potential

## Limitations

- Conflict of interest
- No comparison group
- Majority medical students



Good points made by the authors (even if it's a sales pitch)

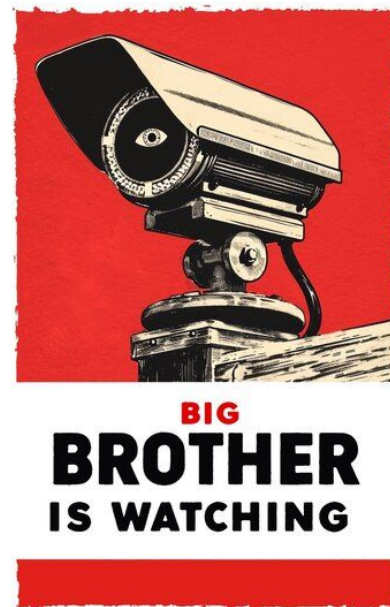
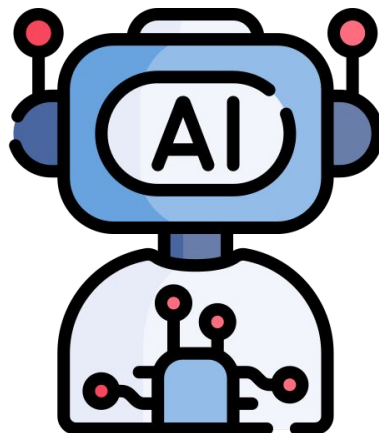
- **Simulation based learning** is effective
- **Scaleable** (only tech is a screen and camera)
- Avoids some potential **issues with the hierarchy** of medicine

# Conclusions & Limitations

- Really is a pretty cool concept with a fair amount of potential
  - It's just the paper itself doesn't really demonstrate that potential
- Seems like it may be suited for **surveillance** & auditing

Each participant started by logging in to their **individual...account via contactless facial recognition**

Trials were **recorded in a variety of settings** with both natural and artificial light as well as differing backgrounds **to mimic variable clinical settings such as wards and outpatient clinics**



See [BlueMirror.ai](https://www.bluemirror.ai)

**Emphasis** (#2f5aa2)  
Primary (#3B71CA)  
BG subtle (#e2eaf7)

**Emphasis** (#b03d50)  
Danger (#DC4C64)  
BG subtle (#fae4e8)

**Emphasis** (#C1443C)  
Pink (#FF6F61)  
BG subtle (#FFE9E6)

**Emphasis** (#3b7e94)  
Info (#54B4D3)  
BG subtle (#e5f4f8)

**Emphasis** (#0c622e)  
Success (#14A44D)  
BG subtle (#dcf1e4)

**Emphasis** (#1F7A6C)  
Mint/Aqua (#48C9B0)  
BG subtle (#f1f2f3)

**Emphasis** (#404247)  
Secondary (#9FA6B2)  
BG subtle (#f1f2f3)

**Emphasis** (#896110)  
Warning (#E4A11B)  
BG subtle (#fbf1dd)

**Emphasis** (#6C3483)  
Purple (#8E44AD)  
BG subtle (#F0E6F5)

**Emphasis** (#2C3E50)  
Slate grey (#5D6D7E)  
BG subtle (#E8ECF1)