

Antimicrobial Stewardship

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Disclosures

This presenter has no current or potential conflicts to report.

Objectives

Define antimicrobial stewardship (AMS) and antimicrobial resistance (AMR)

Assess the current climate of antimicrobial resistance

Learn about the various stewardship tactics, their impacts, and how to incorporate them into clinical practice

(Not so) Shocking Facts

Reports from 2010: >73 billion antibiotic doses are prescribed worldwide yearly

In the United States, children receive an average of 2.7 courses by age 2 and 10.9 by age 10

More than 50% of women receive antibiotics during pregnancy or perinatally

The CDC reports that at least 28% of antibiotics prescribed in the outpatient setting are unnecessary

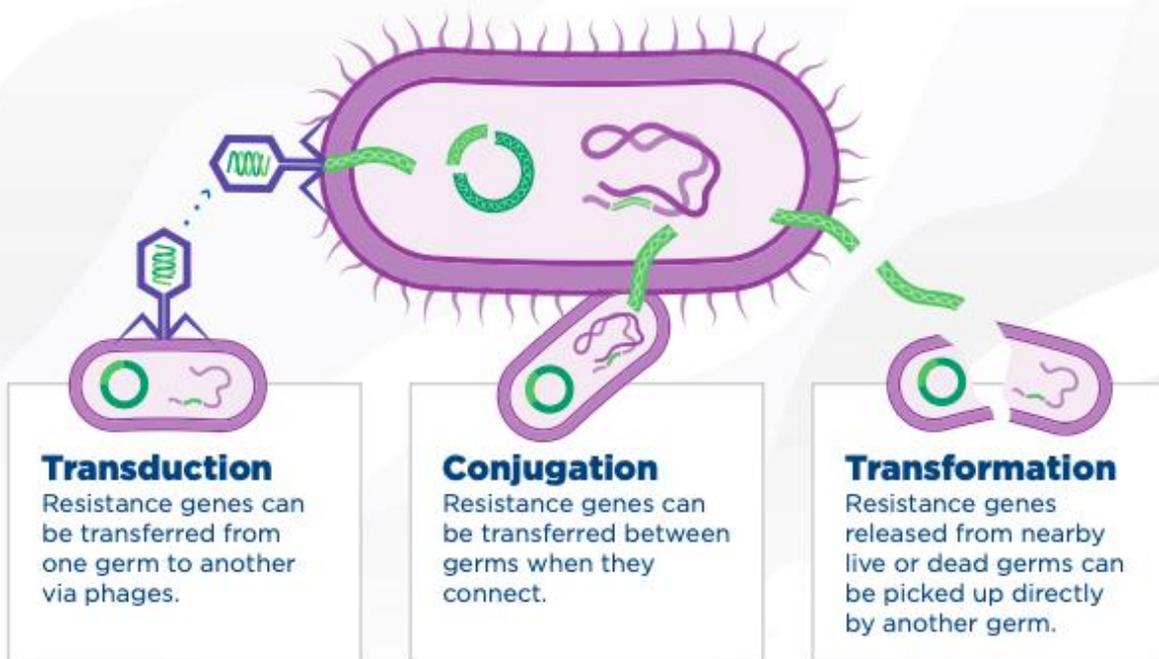
Antimicrobial Resistance (AMR)

AMR is a natural process due to genetic changes in pathogens



- Emergence and spread is **accelerated by human activity, mainly the misuse and overuse of antimicrobials** to treat, prevent or control infections in humans, animals and plants

How Mobile Genetic Elements Work



Antimicrobial Resistance (AMR)

AMR threatens:

- Ability to treat common infections
 - Can prevent chemotherapy administration, C-sections, hip replacements, transplants and other surgeries
- Health of animals and plants
 - Reduces farm productivity → threatened food security

Antimicrobial Resistance (AMR)

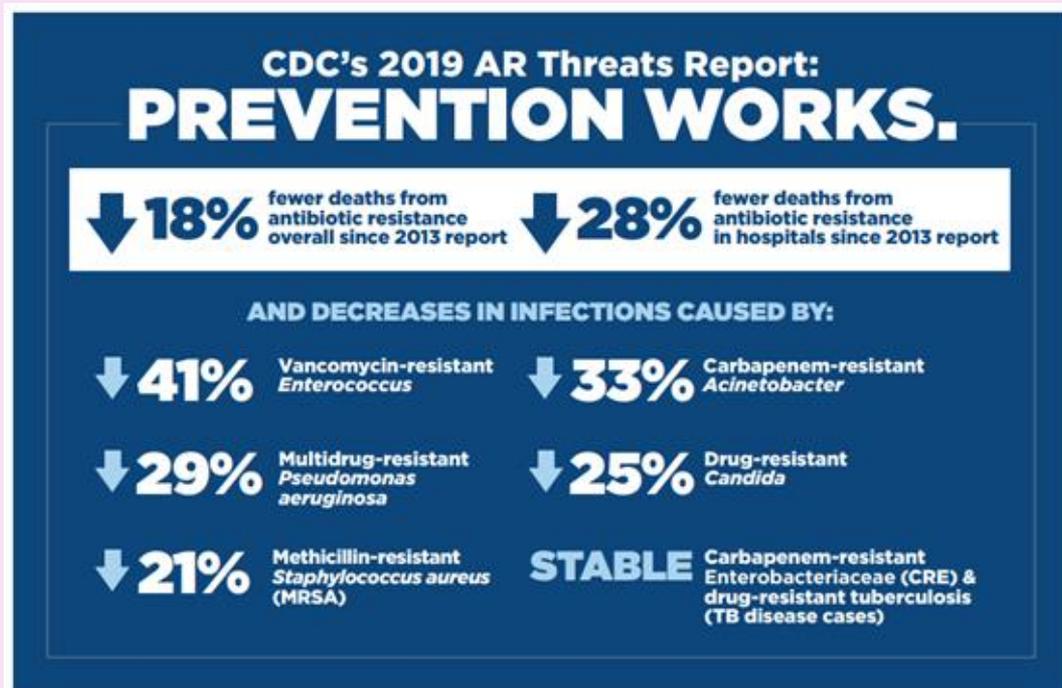
AMR Costs:

- Leads to more expensive and intensive care
- Prolonged hospital stays
- Use of newer, novel antimicrobials (often more expensive than standard therapy)
- Harms agriculture productivity



**Bacteria and
fungi do not have
to be resistant to
every antibiotic
or antifungal to
be dangerous**

Compared to 2013...



But...

Urgent global threat



Antimicrobial resistance is an urgent global public health threat, killing at least 1.27 million people worldwide and associated with nearly 5 million deaths in 2019.

Did you know?

In the United States in 2019:



**AND INCREASES
IN INFECTIONS
CAUSED BY:**

↑ **315%**

Erythromycin-resistant
invasive group A strep

↑ **124%**

Drug-resistant
Neisseria gonorrhoeae

↑ **50%**

ESBL-producing
Enterobacteriaceae

The COVID-19 pandemic did not help



Available data show an alarming increase in resistant infections starting during hospitalization, growing at least 15% from 2019 to 2020.

- Carbapenem-resistant *Acinetobacter* (+78%)
- Antifungal-resistant *Candida auris* (+60%)*
- Carbapenem-resistant Enterobacterales (+35%)
- Antifungal-resistant *Candida* (+26%)
- ESBL-producing Enterobacterales (+32%)
- Vancomycin-resistant Enterococcus (+14%)
- Multidrug-resistant *P. aeruginosa* (+32%)
- Methicillin-resistant *Staphylococcus aureus* (+13%)

ANTIMICROBIAL RESISTANCE THREATS in the United States, 2021-2022

CDC used new data¹ to analyze the U.S. burden of the following antimicrobial-resistant pathogens typically found in healthcare settings:



Carbapenem-resistant
Enterobacteriales (CRE)



Carbapenem-resistant
Acinetobacter



Candida auris (*C. auris*)



Methicillin-resistant
Staphylococcus aureus
(MRSA)



Vancomycin-resistant
Enterococcus (VRE)



Extended-spectrum
beta-lactamase (ESBL)-
producing Enterobacteriales



Multidrug-resistant (MDR)
Pseudomonas aeruginosa

AR Threats

	Threat	Change in Rates or Number of Infections***			
		2020 vs. 2019	2021 vs. 2020	2022 vs. 2021	2022 vs. 2019
URGENT*	Hospital-onset CRE	 Increase	 Increase	 Stable	 Increase
	Hospital-onset Carbapenem-resistant <i>Acinetobacter</i>	 Stable	 Stable	 Stable	 Increase**
	Clinical Cases of <i>C. auris</i>	 Increase	 Increase	 Increase	 Increase
SERIOUS*	Hospital-onset MRSA	 Increase	 Stable	 Decrease	 Stable
	Hospital-onset VRE	 Increase	 Increase	 Stable	 Increase
	Hospital-onset ESBL-producing Enterobacterales	 Increase	 Stable	 Stable	 Increase
	Hospital-onset MDR <i>Pseudomonas aeruginosa</i>	 Increase	 Increase	 Stable	 Increase

Key Findings

20%

Bacterial antimicrobial-resistant hospital-onset infections caused by the pathogens listed above increased by a combined 20% during the COVID-19 pandemic compared to the pre-pandemic period, peaking in 2021. In 2022, rates for all but one of these pathogens (MRSA) remained above pre-pandemic levels.

5x

The number of reported clinical cases of *C. auris* increased nearly five-fold from 2019 to 2022. Clinical cases are identified when specimens collected from patients during routine clinical care test positive for *C. auris*.

A large purple circle with a white outline is centered on a light pink background. Inside the circle, the text is written in a black, sans-serif font, arranged in seven lines.

If antibiotics and
antifungals lose their
effectiveness, then
we lose the ability to
treat infections and
control these public
health threats

WHY?



Inconsistency in adoption of CDC recommended strategies to minimize infection spread

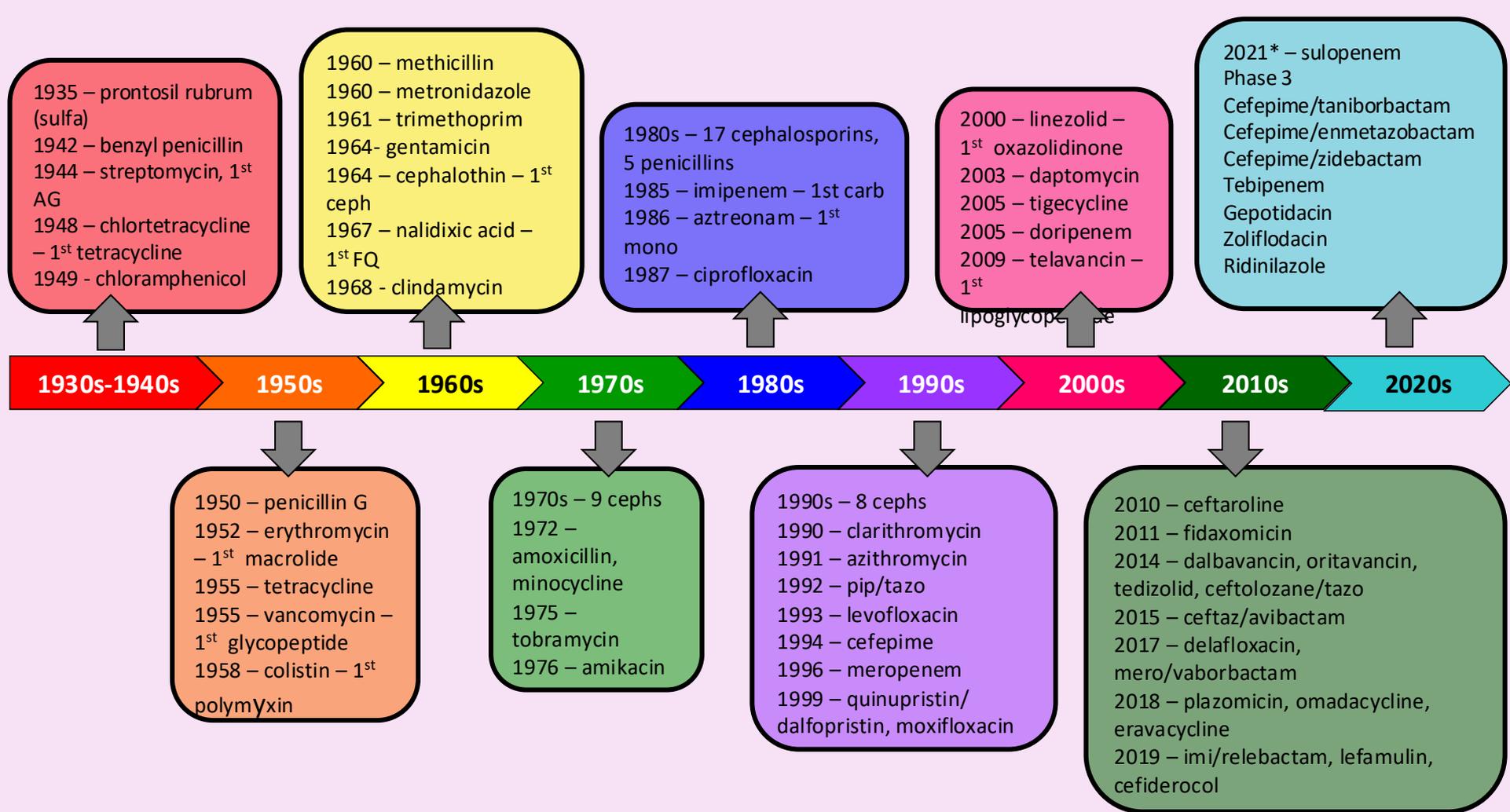
Challenges in preventing spread of germs in non-hospital settings

Emerging threats from outside of the United States

Spread of resistant threats in the food supply, animals

Limited outpatient stewardship efforts

Decrease in new antimicrobials



**To put things into
perspective...**

Antibiotic Approved or Released	Year Released	Resistant Germ Identified	Year Identified
Penicillin	1941	Penicillin-resistant <i>Staphylococcus aureus</i> ^{20, 21}	1942
		Penicillin-resistant <i>Streptococcus pneumoniae</i> ^{9,10}	1967
		Penicillinase-producing <i>Neisseria gonorrhoeae</i> ¹¹	1976
Vancomycin	1958	Plasmid-mediated vancomycin-resistant <i>Enterococcus faecium</i> ^{12,13}	1988
		Vancomycin-resistant <i>Staphylococcus aureus</i> ¹⁴	2002
Amphotericin B	1959	Amphotericin B-resistant <i>Candida auris</i> ¹⁵	2016
Methicillin	1960	Methicillin-resistant <i>Staphylococcus aureus</i> ¹⁶	1960
Extended-spectrum cephalosporins	1980 (Cefotaxime)	Extended-spectrum beta-lactamase-producing <i>Escherichia coli</i> ¹⁷	1983
Ceftazidime-avibactam	2015	Ceftazidime-avibactam-resistant KPC-producing <i>Klebsiella pneumoniae</i> ²⁴	2015
Daptomycin	2003	Daptomycin-resistant methicillin-resistant <i>Staphylococcus aureus</i> ²³	2004

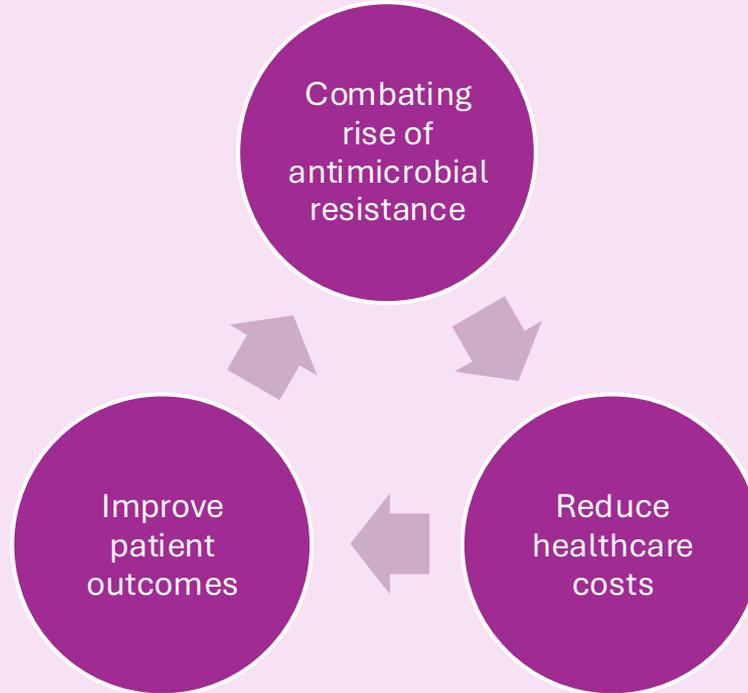


Stewardship and Infection Prevention

What is antimicrobial stewardship?

Effort to coordinate interventions designed to **optimize antimicrobial use** and ensure the **best clinical outcomes** while **minimizing unintended consequences**

Why do we do it?



CDC strategies that work in healthcare:



Preventing device- and procedure-related infections, such as from urinary catheters or central lines



Stopping the spread of resistant germs within and between healthcare facilities



Containing emerging threats through early detection and aggressive response



Tracking and improving appropriate antibiotic use



Infection prevention and control in non-hospital settings, such as long-term care facilities

CDC strategies that work in communities:



Widespread use of vaccines to prevent infections and spread



Routine tuberculosis and gonorrhea screening for at-risk groups and prompt treatment



Using safer sex practices (e.g., condoms)



Safe food handling and preparation



Improving antibiotic use everywhere

Hospital Core Elements

Hospital Leadership Commitment



Dedicate necessary human, financial, and information technology resources.

Accountability



Appoint a leader or co-leaders, such as a physician and pharmacist, responsible for program management and outcomes.

Pharmacy/Stewardship Expertise



Appoint a pharmacist, ideally as the co-leader of the stewardship program, to help lead implementation efforts to improve antibiotic use.

Action



Implement interventions, such as prospective audit and feedback or preauthorization, to improve antibiotic use.

Tracking



Monitor antibiotic prescribing, impact of interventions, and other important outcomes, like *C. difficile* infections and resistance patterns.

Reporting



Regularly report information on antibiotic use and resistance to prescribers, pharmacists, nurses, and hospital leadership.

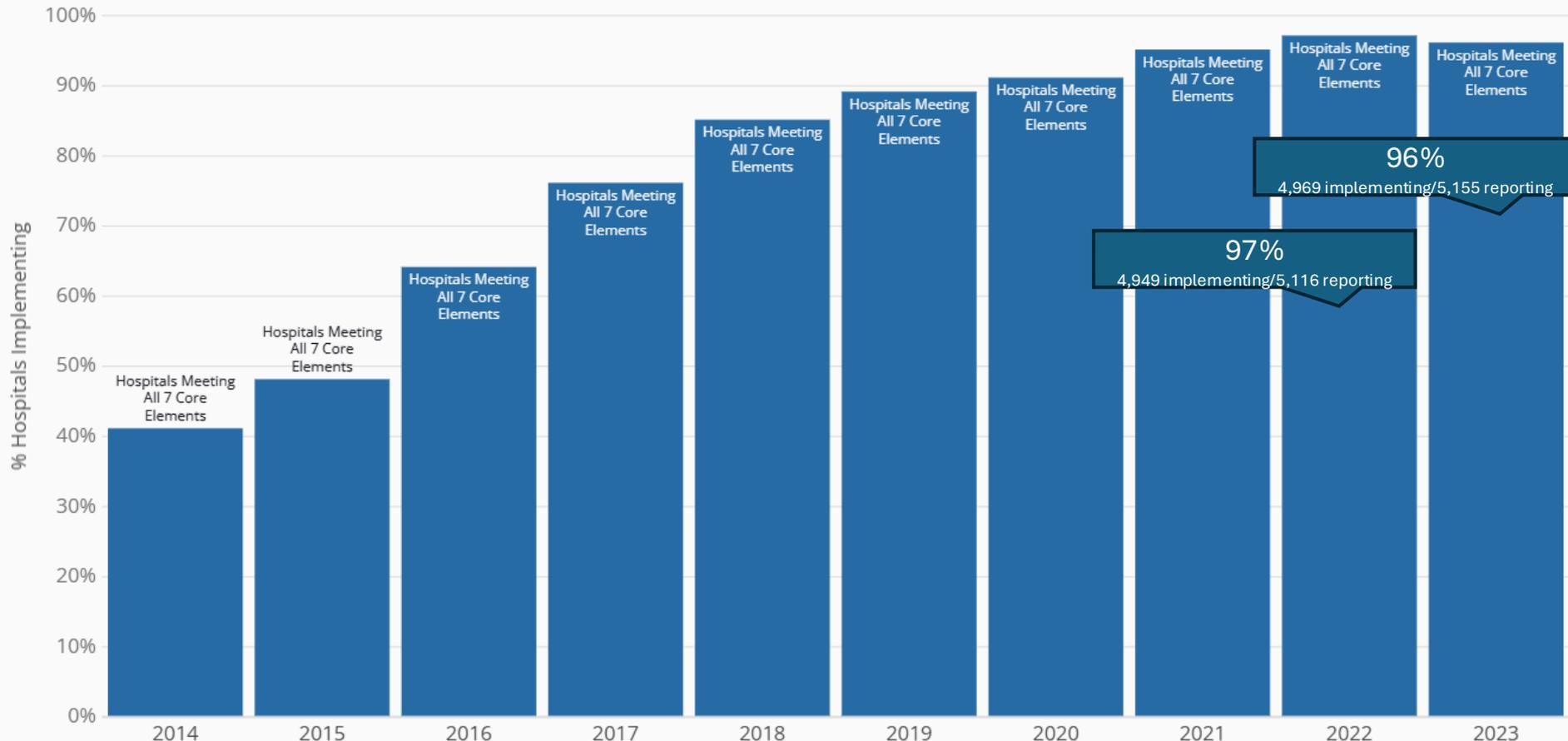
Education



Educate prescribers, pharmacists, nurses, and patients about adverse reactions from antibiotics, antibiotic resistance, and optimal prescribing.

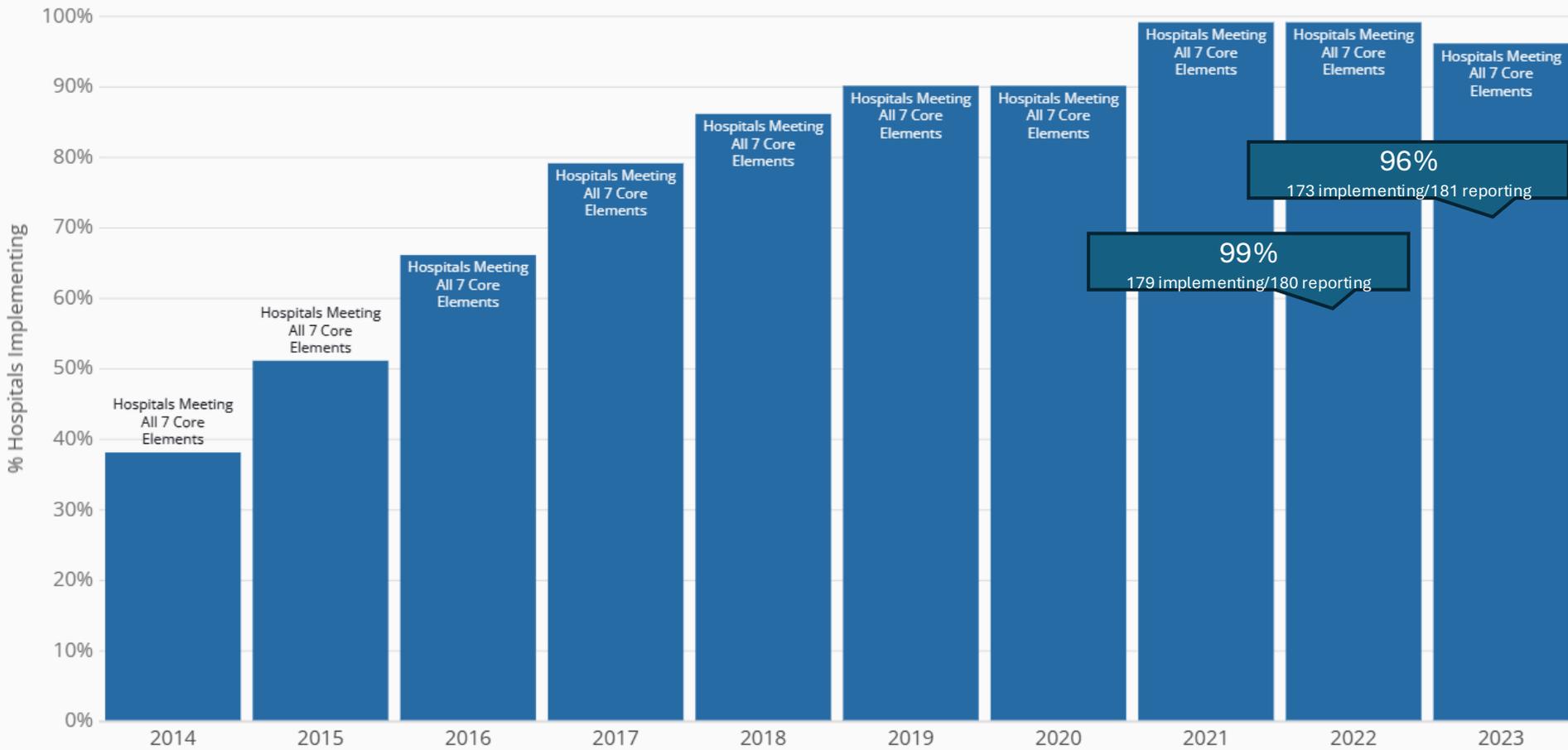
Implementation of CDC Core Elements - Nationwide

HOSPITALS IMPLEMENTING ALL 7 CORE ELEMENTS IN ALL STATES OVER TIME



Implementation of CDC Core Elements - Ohio

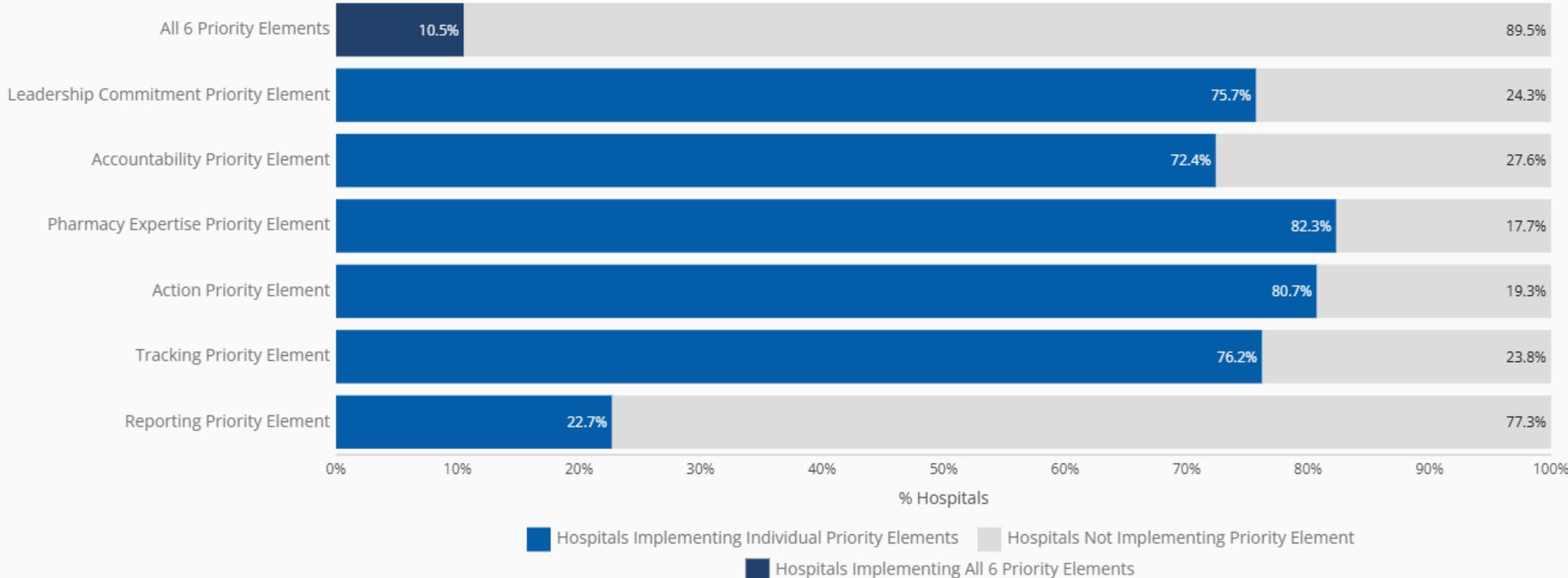
HOSPITALS IMPLEMENTING ALL 7 CORE ELEMENTS IN OHIO OVER TIME



Hospital Core Elements	Priorities for Hospital Core Element Implementation
Hospital Leadership Commitment	
 <p>Dedicate necessary human, financial, and information technology resources.</p>	<p>Antibiotic stewardship physician and/or pharmacist leader(s) have antibiotic stewardship responsibilities in their contract, job description, or performance review.</p>
Accountability	
 <p>Appoint a leader or co-leaders, such as a physician and pharmacist, responsible for program management and outcomes.</p>	<p>Antibiotic stewardship program is co-led by a physician and pharmacist.*</p>
Pharmacy/Stewardship Expertise	
 <p>Appoint a pharmacist, ideally as the co-leader of the stewardship program, to help lead implementation efforts to improve antibiotic use.</p>	<p>Antibiotic stewardship physician and/or pharmacist leader(s) have completed infectious diseases specialty training, a certificate program, or other training on antibiotic stewardship.</p>
Action	
 <p>Implement interventions, such as prospective audit and feedback or preauthorization, to improve antibiotic use.</p>	<p>Antibiotic stewardship program has facility-specific treatment recommendations for common clinical condition(s) and performs prospective audit/feedback or preauthorization.</p>
Tracking	
 <p>Monitor antibiotic prescribing, impact of interventions, and other important outcomes, like <i>C. difficile</i> infections and resistance patterns.</p>	<p>Hospital submits antibiotic use data to the NHSN Antimicrobial Use Option.</p>
Reporting	
 <p>Regularly report information on antibiotic use and resistance to prescribers, pharmacists, nurses, and hospital leadership.</p>	<p>Antibiotic use reports are provided at least annually to target feedback to prescribers. In addition, the antibiotic stewardship program monitors adherence to facility-specific treatment recommendations for at least one common clinical condition.</p>
Education	
 <p>Educate prescribers, pharmacists, nurses, and patients about adverse reactions from antibiotics, antibiotic resistance, and optimal prescribing.</p>	<p>No implementation priority identified.</p>

Implementation of CDC Priority Elements - Ohio

HOSPITAL PRIORITY ELEMENT REPORTING IN OHIO



Updated Joint Commission requirements for accreditation

- **New accreditation requirements** → Implemented January 2023
 - 12 **new and revised** requirements to decrease unnecessary antimicrobial utilization in the hospital setting
 - Including critical access hospitals
 - Updated to better align with federal/CDC recommendations

TJC New and Revised Requirements for Antibiotic Stewardship

- AMS is an organizational priority
- Allocation of financial resources
- Dedicated AMS leadership (physician or pharmacist)
- Creation of multidisciplinary AMS committee
- Evidence-based guideline implementation
- Implementing utilization optimization strategies
- Documenting antimicrobial use
- Reporting antimicrobial use and resistance
- Dedicating IT resources

Stewardship Tactics

Prospective Audit and Feedback (PAF)

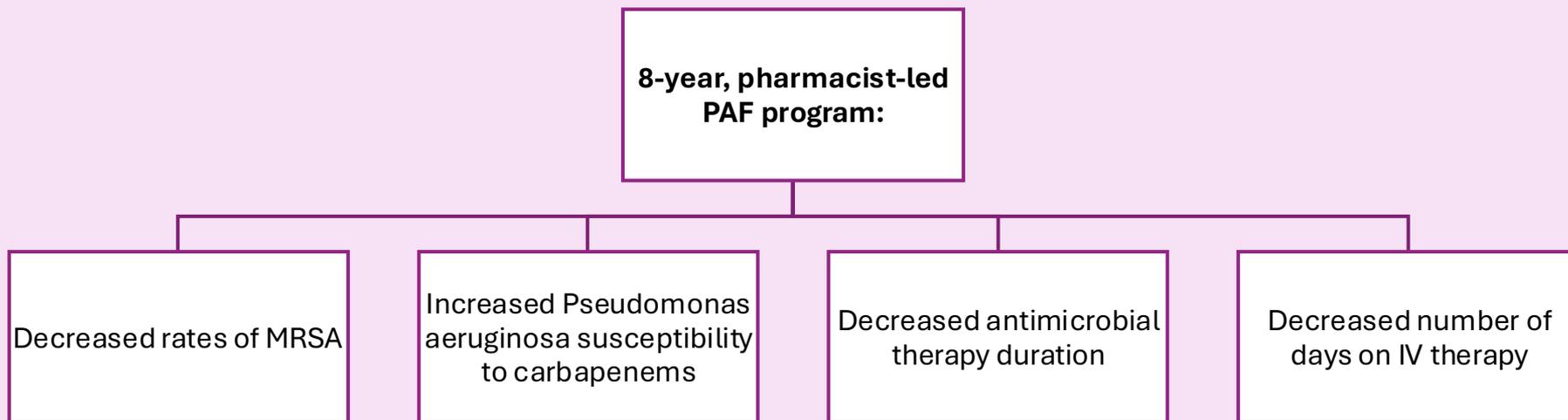
Preauthorization protocols

Institutional Guidelines, Protocols, Ordersets

Prospect Audit and Feedback (PAF)

- Process most commonly involves an ID physician or a clinical pharmacist with ID training reviewing active antimicrobial prescriptions to identify opportunities to enhance the safety and/or effectiveness of therapy
- Widely recognized as one of the most effective antibiotic stewardship practices
- Viewed as a core component of many hospital ASPs

Outcomes of Successful PAF



Preauthorization

Institutional process requiring approval from an antimicrobial stewardship team before prescribing certain antimicrobials



Implementation requires integration into EHR and clinical staff education



Benefits

Reduction in inappropriate usage of novel or broad-spectrum antibiotics

Cost savings

Institutional commitment to antimicrobial stewardship

Institutional Guidelines, Protocols, Ordersets

- Enhance the effectiveness of both PAF and preauthorization
- Can optimize antibiotic selection and duration for common disease states based on available data
- Can include guidance on empiric diagnostic approaches
- Based on national guidelines, optimized based on local antibiograms

Who makes up the AMS team?

Infectious Diseases trained physicians,
advanced practice providers, pharmacists

Microbiologists and technicians

Infectious Control specialists

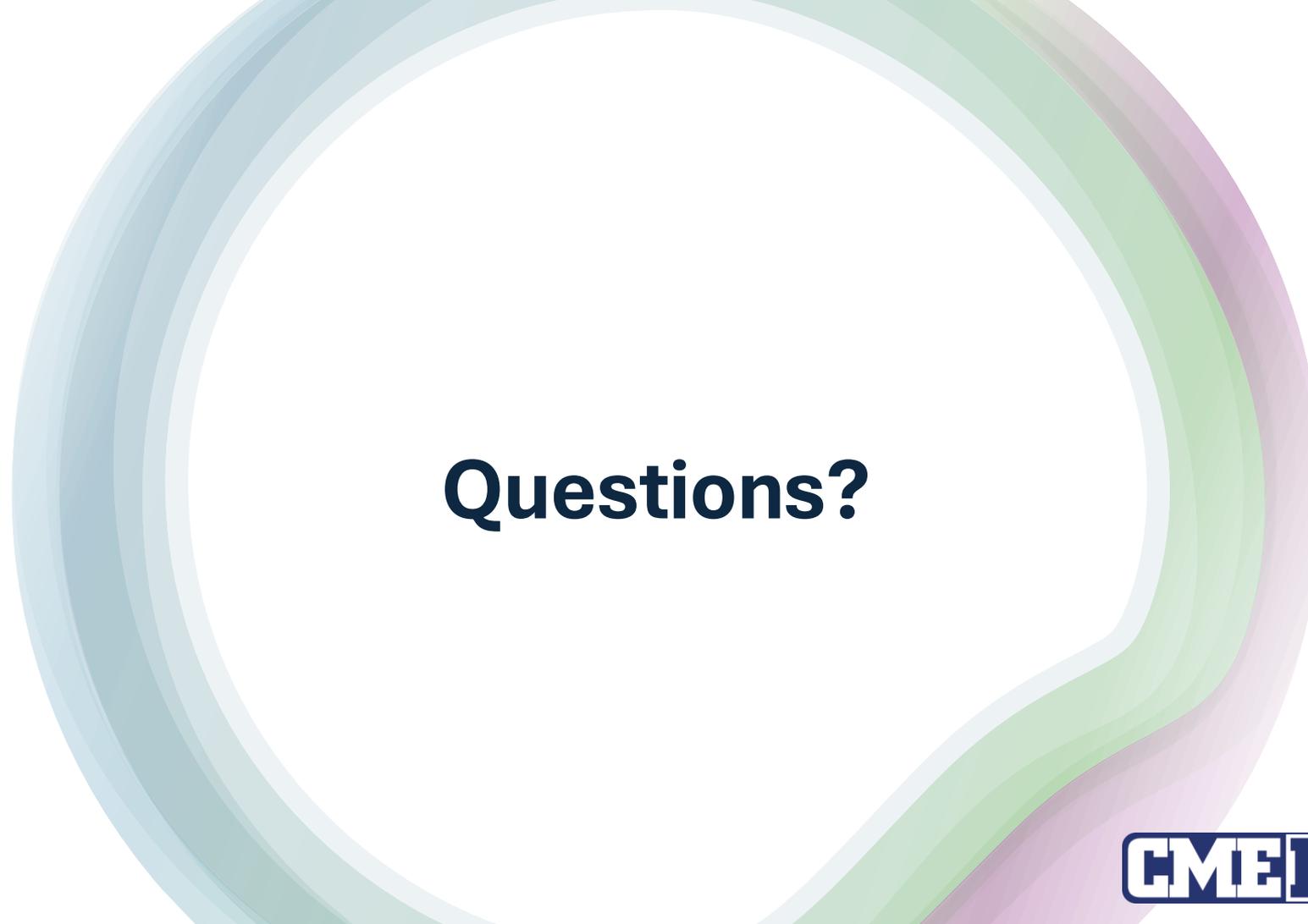
Bedside/front-line nurses

IT specialists

We're all stewards!

A purple circle is centered on a light purple background. Inside the circle, the text "The more you use them the more you lose them!" is written in a bold, black, sans-serif font, arranged in four lines.

**The more you
use them the
more you
lose them!**



Questions?

CMEPRO