Diagnostic and Antimicrobial Stewardship

Mara Rauhauser, BSN, RN, PHN, CIC

Senior Public Health Nurse

County of San Diego HAI Program

www.sdhai.org

phs.hai.hhsa@sdcounty.ca.gov

Healthcare Associated Infections Program

Objectives

The learner will be able to...

- Describe the role of the infection preventionist in diagnostic and antimicrobial stewardship.

- Summarize how to apply stewardship principles to prevent multidrug-resistant organisms.

Agenda

- Background of Antimicrobial Resistance (AR)
- How to improve AR in your facility: Pieces of the Puzzle:
  - Diagnostic Stewardship
 - Antimicrobial Stewardship
- Tools and Resources

Agenda

- **Background of Antimicrobial Resistance (AR)**
- How to improve AR in your facility: Pieces of the Puzzle
  - Diagnostic Stewardship
  - Antimicrobial Stewardship
- Tools and Resources

Background on Antimicrobial Resistance

Antimicrobial resistance is affecting our healthcare.

- More than 2.8 million antimicrobial-resistant infections occur each year the U.S.
- More than 35,000 people die annually from AR infections

https://www.cdc.gov/antimicrobial-resistance/data-research/threats/index.html
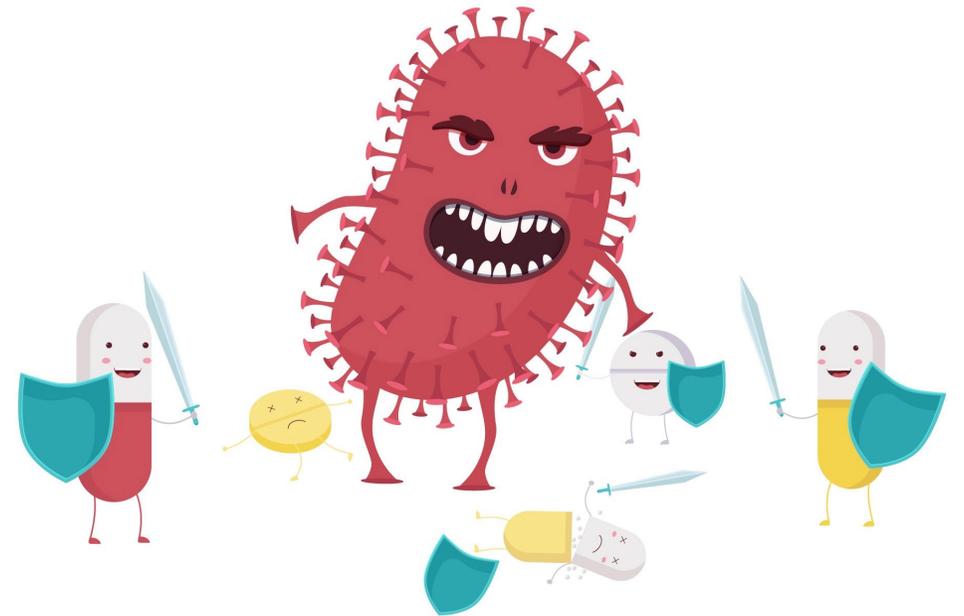
Background…cont.

Many issues have contributed to the increase of antimicrobial resistance:

- Use in healthcare, including misuse and overuse
- Use in livestock industry
- Use in agriculture

https://www.cdc.gov/antimicrobial-resistance/data-research/threats/index.html
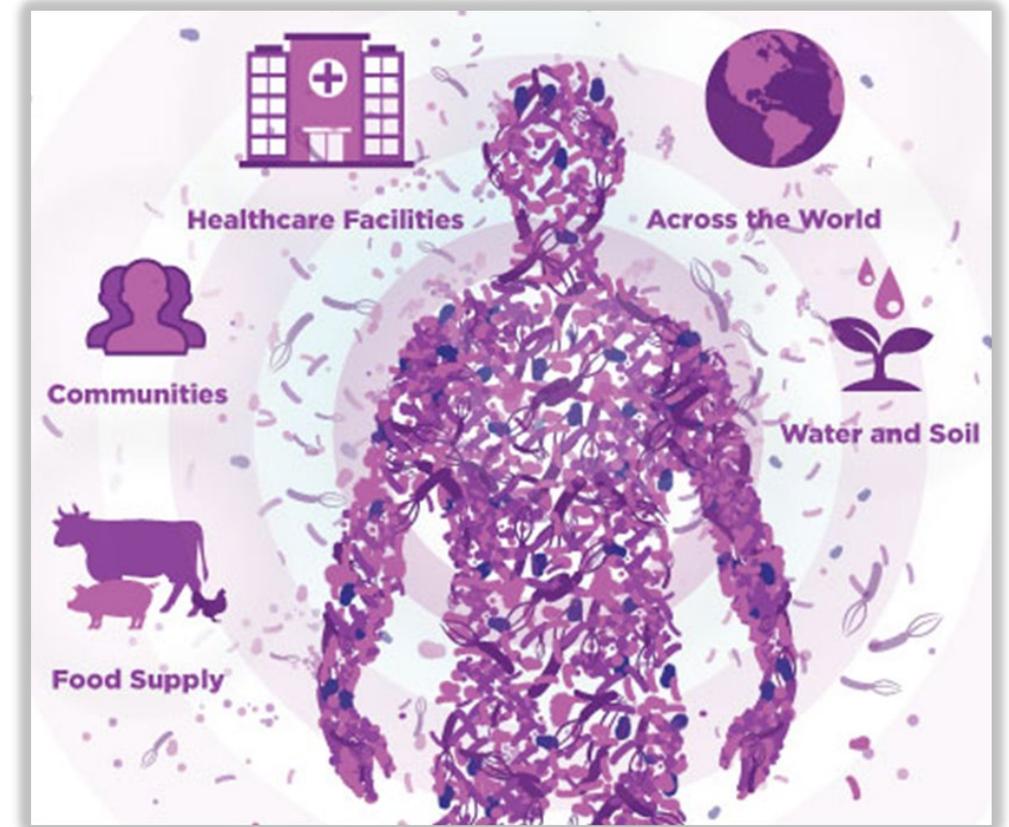
Background…cont.

Up to 75% of antimicrobial therapy in nursing homes may be unnecessary or inappropriate

UP TO **70%** OF NURSING HOME RESIDENTS RECEIVED **one or more** COURSES OF SYSTEMIC ANTIBIOTICS IN A YEAR
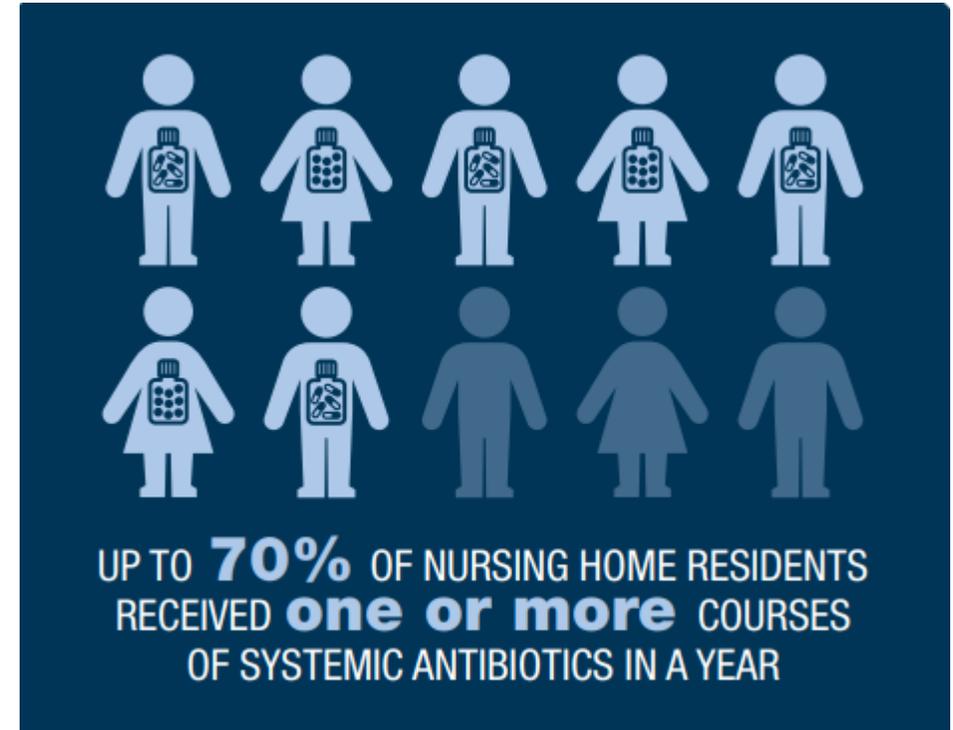
Healthcare Consequences of AR

- Infections become harder to treat
- Residents spend more days in the healthcare setting
- Increased cost of treatment

Critical Actions to Reduce Antimicrobial Resistance

- Prevent the spread
  - Surveillance
  - Infection Prevention and Control Practices
- Improve Diagnostic Stewardship
- Optimize Antimicrobial Stewardship

Agenda

- Background of Antimicrobial Resistance
- **How to improve AR in your facility: Pieces of the Puzzle**
  - **Diagnostic Stewardship**
  - Antimicrobial Stewardship
- Tools and Resources

Diagnostic Stewardship

Diagnostic stewardship: Efforts aimed at optimizing every step of the diagnostic process:

- Supply Storage
- Ordering of Tests
- Specimen Collection
- Specimen Storage and Transportation
- Lab Procedures
- Reporting
- Interpretation

- the *right* test,
- for the *right* patient,
- to prompt the *right* action

Diagnostic Stewardship

Consider using the Infection Control Committee for diagnostic stewardship activity planning. Key members of this effort would be:

- Medical Director
- Consulting Pharmacist
- Infection Preventionist
- Administrator
- Director of Nursing

Diagnostic Stewardship

Supply Storage: Have a process for monitoring
- Expiration dates
- Temperature control of storage spaces
- Prevent contamination
    - Do not store supplies on the ground
    - Do not store dirty equipment with clean supplies
    - Do not store supplies in the splash zone of a sink

Diagnostic Stewardship

Diagnostic Test Ordering:

- Have policies/procedures in place that encourage best practice for when to test and which test to use:

  - Have pop-up reminders

  - Restrict access to tests that are rarely appropriate

  - Follow up with friendly reminders for providers who are lagging behind current best practices

Diagnostic Stewardship

Specimen Collection Process

- Use education and direct observation to ensure current best practice
  - Include Infection Prevention and Control (IPC) practices that minimize chance of cross contamination
  - Include vendors and inhouse staff
  - Provide reeducation when necessary
  - Report findings to IPC committee

Diagnostic Stewardship

Specimen Storage and Transportation
- Within allowed timeframe
- Temperature within recommended range
- Process that prevents cross contamination
  - Example: Vendor Lab Process

Diagnostic Stewardship

Lab Procedures:

- Appropriate Process and Equipment
  - Maintained and quality controls are done as necessary
  - Prevention of cross contamination
  - Timely
  - Up to date MIC parameters

Reporting:

- Include interpretation of results when appropriate
- Restrict access to test results as necessary
- Timely communication

Diagnostic Stewardship

ORGANISM	Acinetobacter baumannii ❗	
Susceptibility	Acinetobacter baumannii ANTIMICROBIAL SUSCEPTIBILITY	
Ampicillin+Sulbactam	16	RESISTANT
Cefepime	>=64	RESISTANT
Ceftazidime	>=64	RESISTANT
Ceftriaxone	>=64	RESISTANT
Ciprofloxacin	>=4	RESISTANT
Colistin	<=0.25	SUSCEPTIBLE
Gentamicin	>=16	RESISTANT
Meropenem	>=16	RESISTANT
Piperacillin+Tazobactam	>=128	RESISTANT
Tigecycline	1	SUSCEPTIBLE
Trimethoprim+Sulfamethoxazole	<=20	SUSCEPTIBLE

Test Result Interpretation:
- Timely communication of result
- Evaluation of any empiric antimicrobial once results are available
- Include generalized best practice notes (Example: more than 2 organisms in a urine culture suggests contamination)

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  - Diagnostic Stewardship
  - **Antimicrobial Stewardship**
- Infection Preventionist Role
- Tools and Resources

Antimicrobial Stewardship

Antimicrobial Stewardship:
Coordinated interventions designed to improve and measure the appropriate use of antimicrobial medications

- Includes antibiotic, antifungal, antiparasitic and antiviral medication

National Public Health Priority

Antimicrobial Stewardship is:

- A national and international priority
- A CMS requirement
- Best practice

Goals

Goals of improved Antimicrobial Stewardship can include:

- Minimize antimicrobial resistance
- Optimize clinical outcomes
- Effective use of resources
- Enhance patient safety
- Avoid patient harm

Antimicrobial Stewardship

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- Medical Director
- Consulting Pharmacist
- Infection Preventionist
- Administrator
- Director of Nursing

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Healthcare Associated Infections Program

Antimicrobial Stewardship

Components of an Antimicrobial Stewardship Program:

- Best practice for prescribing antimicrobials
- Tracking of antibiotic use
- Use of an antibiogram

Antimicrobial Stewardship

Best practice for prescribing antimicrobials:

- Policies that guide prescribing practices for common infection (urinary tract, respiratory, skin and soft tissue)
- Consider use of automated tools or algorithms to guide decision making
- Oversight and feedback for providers and floor staff
  - Consider peer to peer interaction
  - Share data with leadership and providers

Antibiotics
Antivirals
Antifungals
Antiparasitics

Antimicrobial Stewardship

Best practice for prescribing antimicrobials continued:

- Education for providers, floor staff and families
  - Use available tools and handouts
- Oversight by a consultant pharmacist
- Restricted access to certain medications
- Use strategies like a time out to consider if deprescribing or change is warranted
  - Narrower spectrum
  - Change from IV to oral

The Four Moments of Antibiotic Decision Making

1. Make the Diagnosis
2. Cultures & Empiric Therapy
3. Duration of Therapy
4. Stop, Narrow, Change to Oral

Long-Term Care
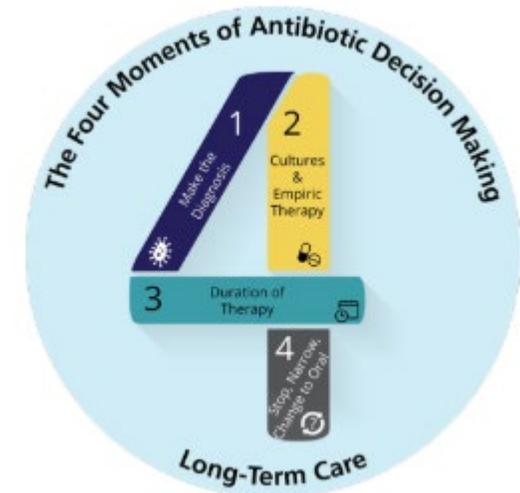
Antimicrobial Stewardship

- **Tracking of antibiotic use:**
  - Use a systematic and consistent approach
  - Share the data
  - Consider tracking data on common infections

Example 6.1 Palomar Health Antibiotic Usage (2 of 5)
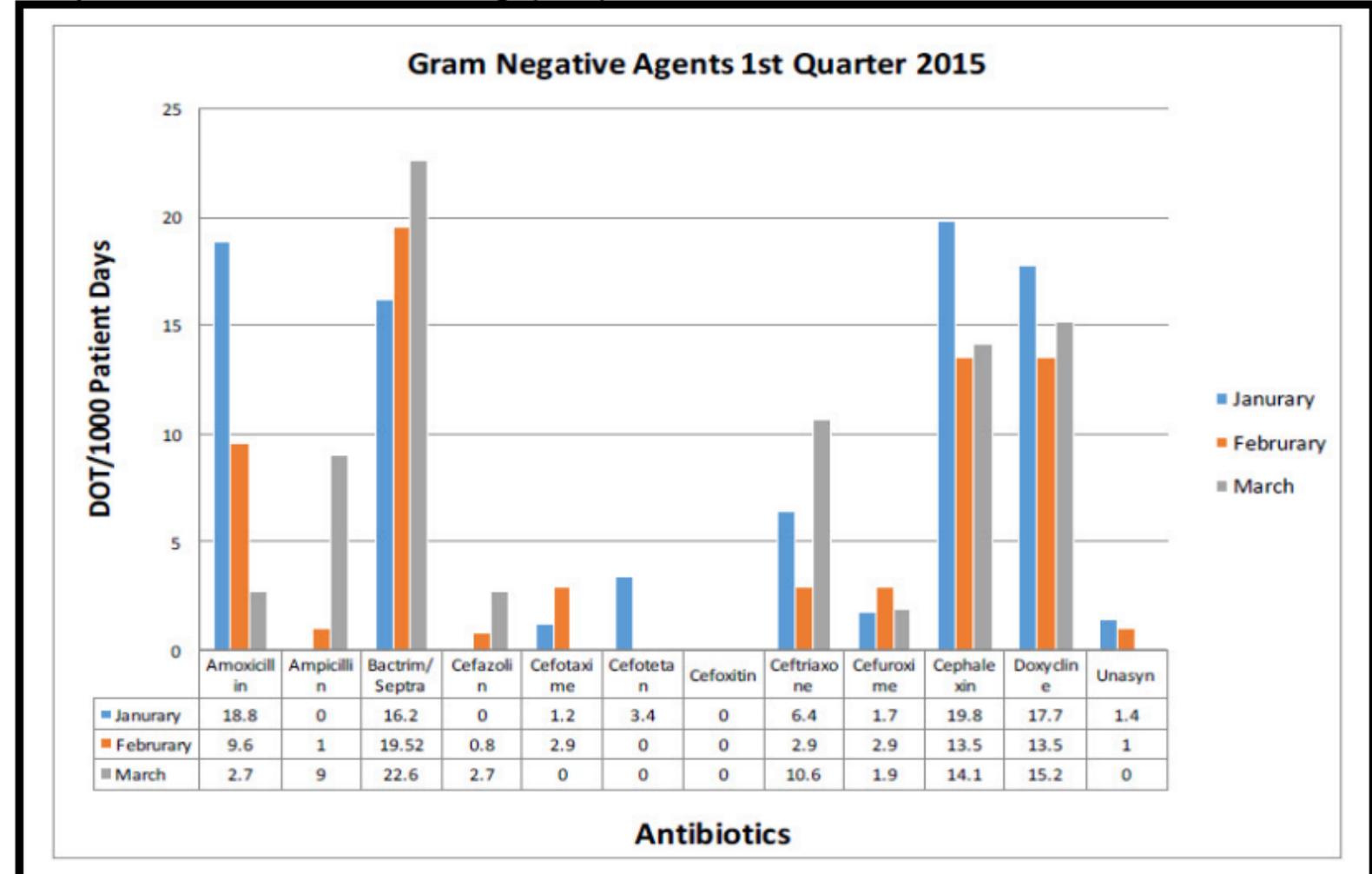
Gram Negative Agents 1st Quarter 2015

	Amoxicillin	Ampicillin	Bactrim/Septra	Cefazolin	Cefotaxime	Cefotetan	Cefoxitin	Ceftriaxone	Cefuroxime	Cephalexin	Doxycline	Unasyn
Janurary	18.8	0	16.2	0	1.2	3.4	0	6.4	1.7	19.8	17.7	1.4
February	9.6	1	19.52	0.8	2.9	0	0	2.9	2.9	13.5	13.5	1
March	2.7	9	22.6	2.7	0	0	0	10.6	1.9	14.1	15.2	0

DOT/1000 Patient Days — Antibiotics

Antimicrobial Stewardship

Antibiogram: A table or graph that shows what percentage of each organism is susceptible to each antibiotic listed

https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/SNF_ASP_Toolkit.aspx

Antimicrobial Stewardship

Use an antibiogram:

- Partner with your pharmacy
- Use available tools
- Decide what specific organism or infection type to track

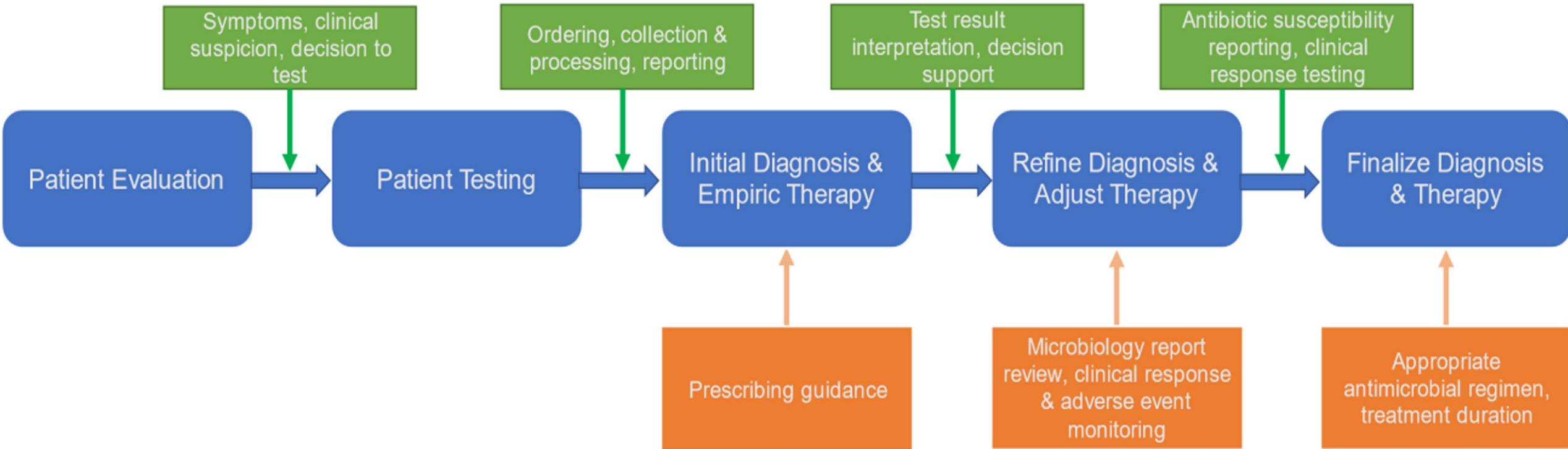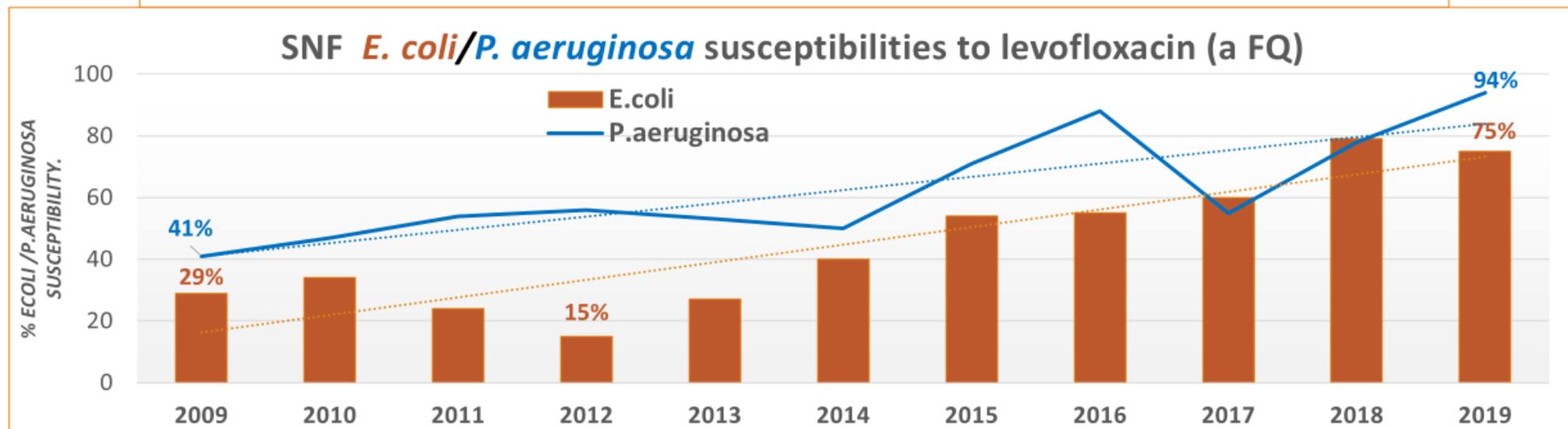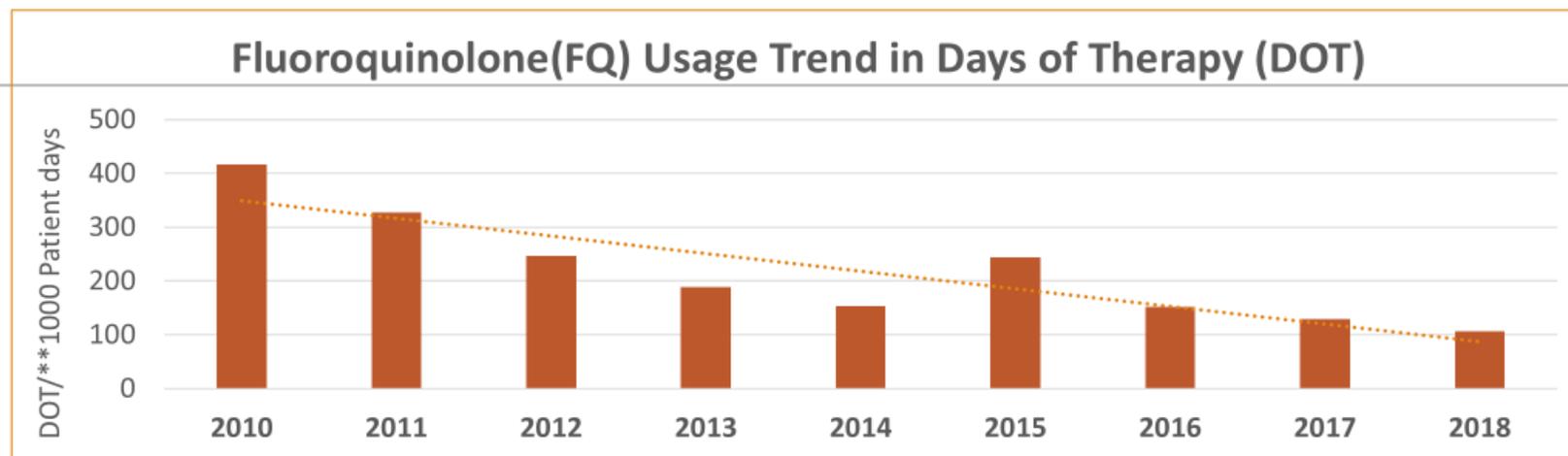| # of isolates	514	411	99	51	22	-	4	67	15	30	30	9	23	7	10	379	51	15	43	18	83	21
Antibiotic	Staphylococcus aureus (All)	Meth-SUSCEPTIBLE Staph aureus (MSSA)	Meth-RESISTANT Staph aureus (MRSA)	Coagulase-negative Staphylococcus	Staph lugdunensis	Group A Streptococcus	Group B Streptococcus	Enterococcus sp	Viridans Streptococcus	Strep pneumoniae (CSF)	Strep pneumoniae (non-CSF)	Citrobacter freundii	Enterobacter cloacae	Klebsiella aerogenes	Serratia marcesans	Escherichia coli	Klebsiella pneumoniae	Klebsiella oxytoca	Proteus mirabilis	Acinetobacter sp	Pseudomonas aeruginosa	Stenotrophomonas maltophilia
penicillin PO	0%	0%	R	0%	0%	S	S			67%		R										
penicillin IV	0%	0%	R	0%	0%	S	S		67%	67%	100%	R										
amoxicillin			R			S	S	97%			100%	R	R	R	R	%	R	R	86%	R	R	R
ampicillin			R			S	S	97%	69%			R	R	R	R	49%	R	R	86%	R	R	R
oxacillin	80%	100%	R	47%	91%	S																
amox-clav	80%	S	R			S	S	97%			100%	R	R	R	R	%	96%	100%	100%	R	R	R
amp-sulb	80%	S	R			S	S	97%				R	R	R	R	56%	82%	93%	91%	100%	R	R
pip-tazo	80%	S	R					97%				100%	100%	100%	90%	98%	100%	100%	100%		98%	R
aztreonam												89%	83%	100%	80%	92%	94%	100%	98%	R	89%	R
cefazolin	80%	S	R			S	S	R				R	R	R	R	74% 86%*	86% 91%*	33%*	75% 97%*			R
ceftriaxone	80%	S	R			S	S	R	85%	96%	96%	78%	R	R	70%	91%	94%	100%	100%	94%	R	R
ceftazidime			R					R				78%	R	R	80%	92%	96%	100%	100%	94%	98%	R
cefepime	80%	S	R			S	S	R	78%			100%	100%	100%	100%	91%	94%	100%	100%	100%	98%	
ceftaroline	99%	100%	98%																			
ertapenem	80%	S	R			S	S					100%	91%	100%	100%	99%	100%	100%	100%	R	R	R
meropenem	80%	S	R			S	S		67%	97%		100%	100%	100%	100%	99%	100%	100%	100%	100%	95%	R
gentamicin	95%	96%	92%	80%	95%			88%				100%	100%	100%	100%	92%	96%	100%	98%	100%	R	R
tobramycin												100%	100%	100%	90%	90%	96%	100%	98%	100%	99%	R
amikacin												100%	100%	100%	100%	99%	100%	100%	100%	100%	99%	R
nitrofurantoin		100%*		100%*	100%			98%*				100%*	25%*	50%*	R	99%*	64%*	100%*	R			
trimeth-sulfa	99%	100%	98%	68%	100%			R			70%	100%	91%	100%	100%	68%	86%	80%	91%	94%	R	95%
azithromycin											70%										R	R
ciprofloxacin	85%	93%	53%	80%	100%							100%	91%	100%	90%	89%	96%	100%	98%	100%	93%	
tetracycline/ doxycycline	93%	95%	82%		95%							76%							R	R		
daptomycin	99%	99%	99%	100%	100%			99%														
clindamycin	82%	84%	73%		91%		75%	R	92%													
vancomycin	100%	100%	100%	100%	100%	S	100%	100%	100%	100%	100%											
linezolid	99%	100%	100%	100%	100%			97%	100%													

ASP Effects on Antimicrobial Resistance

Decreased Fluoroquinolone use → Increased *E.coli/P. aeruginosa* susceptibility

Fluoroquinolone(FQ) Usage Trend in Days of Therapy (DOT)

SNF *E. coli/P. aeruginosa* susceptibilities to levofloxacin (a FQ)

*Fluoroquinolone = ciprofloxacin, levofloxacin

**DOT = days of therapy

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  - Antimicrobial Stewardship
- **Infection Preventionist Role**
- Tools and Resources

IP Role in Stewardship

Educator

Team Member

Collaborator

Infection Preventionist

Communicator

Liaison

Data Collector

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CDC Core Elements for Stewardship in Nursing Homes

Leadership commitment
Demonstrate support and commitment to safe and appropriate antibiotic use in your facility

Accountability
Identify physician, nursing and pharmacy leads responsible for promoting and overseeing antibiotic stewardship activities in your facility

Drug expertise
Establish access to consultant pharmacists or other individuals with experience or training in antibiotic stewardship for your facility

Action
Implement **at least one** policy or practice to improve antibiotic use

Tracking
Monitor **at least one process** measure of antibiotic use and **at least one outcome** from antibiotic use in your facility

Reporting
Provide regular feedback on antibiotic use and resistance to prescribing clinicians, nursing staff and other relevant staff

Education
Provide resources to clinicians, nursing staff, residents and families about antibiotic resistance and opportunities for improving antibiotic use

COUNTY OF SAN DIEGO HEALTH AND HUMAN SERVICES AGENCY

LIVE WELL SAN DIEGO

Healthcare Associated Infections Program

https://www.cdc.gov/antibiotic-use/hcp/core-elements/nursing-homes-antibiotic-stewardship.html

AHRQ Long-Term Care Toolkit

- Four Moments
- Developing a Stewardship Program
- Tracking and Measuring
- Appropriate Collection of Specimens
- Many additional tools

CDPH Antimicrobial Stewardship Page

- Antimicrobial Awareness Resources
  - Includes Handouts
  - Links to other sites including CMS requirements for ASP
- CDC's Be Antibiotics Aware Toolkit

https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/AntimicrobialStewardshipLandingPage.aspx

San Diego County HAI Program

Antimicrobial Stewardship/Diagnostic Stewardship

Antimicrobial stewardship programs work to improve antibiotic prescribing and use, which is critical to effectively treat infections, protect patients from harm from unnecessary antimicrobial use, and combat antimicrobial resistance. Antimicrobial stewardship programs focus on improving/optimizing management/treatment (e.g., antimicrobial medications), however diagnostic stewardship works "upstream" to guide appropriate use of diagnostic testing and preventing false positives and overdiagnosis (AHRQ). Both antimicrobial stewardship and diagnostic stewardship work hand-in-hand to combat antibiotic resistance.

The County of San Diego is collaborating with local and state partners to support antimicrobial stewardship and diagnostic stewardship efforts. For more information, please contact phs.hai.hhsa@sdcounty.ca.gov.

Educational Materials

Below are posters and handouts that can be used to support healthcare facilities/providers on antimicrobial stewardship and diagnostic stewardship efforts.

- Addressing Asymptomatic Bacteriuria (ASB)
    - What is Asymptomatic Bacteriuria
    - Asymptomatic Bacteriuria vs. Urinary Tract Infections
    - Suspected UTI Algorithm
    - Myths about UTI Diagnoses
    - Loeb Criteria for UTI in SNFs
    - Identifying Delirium
    - Treating and Preventing Delirium
    - Causes of Delirium in the Elderly
    - Talking to Residents/Families about ASB

https://www.sandiegocounty.gov/content/sdc/hhsa/programs/phs/hai-program/ar.html

Fighting Antimicrobial Resistance Takes All of Us

Additional Resources

Toolkit To Improve Antibiotic Use in Long-Term Care | Agency for Healthcare Research and Quality:

- https://www.ahrq.gov/antibiotic-use/long-term-care/index.html

- https://www.ahrq.gov/sites/default/files/wysiwyg/antibiotic-use/long-term-care/poster-bacterial-cultures.pdf

Develop and Improve Your Stewardship Program | Agency for Healthcare Research and Quality:

- https://www.ahrq.gov/antibiotic-use/long-term-care/improve/index.html

SNF_ASP_Toolkit: https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/SNF_ASP_Toolkit.aspx

Principles of diagnostic stewardship: A practical guide from the Society for Healthcare Epidemiology of America Diagnostic Stewardship Task Force | Infection Control & Hospital Epidemiology | Cambridge Core

- https://www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/principles-of-diagnostic-stewardship-a-practical-guide-from-the-society-for-healthcare-epidemiology-of-america-diagnostic-stewardship-task-force/324C90B8F54885D28CC9218433901E0A

CDPH SNF ASP Toolkit: https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/SNF_ASP_Toolkit.aspx

- https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.ahrq.gov%2Fsites%2Fdefault%2Ffiles%2Fwysiwyg%2Fantibiotic-use%2Flong-term-care%2Fmonthly-data-form.xlsx&wdOrigin=BROWSELINK

CDC ASP for LTC: https://www.cdc.gov/antibiotic-use/hcp/core-elements/nursing-homes-antibiotic-stewardship.html

Resources

- https://pmc.ncbi.nlm.nih.gov/articles/PMC11007360/

- https://www.cdc.gov/antibiotic-use/media/pdfs/core-elements-antibiotic-stewardship-508.pdf?CDC_AAref_Val=https://www.cdc.gov/antibiotic-use/core-elements/pdfs/core-elements-antibiotic-stewardship-H.pdf

- https://www.cambridge.org/core/journals/infection-control-and-hospital-epidemiology/article/principles-of-diagnostic-stewardship-a-practical-guide-from-the-society-for-healthcare-epidemiology-of-america-diagnostic-stewardship-task-force/324C90B8F54885D28CC9218433901E0A

- https://www.ahrq.gov/nhguide/toolkits/implement-monitor-sustain-program/toolkit1-start-program.html

- https://www.cdc.gov/antibiotic-use/hcp/educational-resources/stewardship/index.html

- COSD HAI Resources are at the bottom of the page: https://www.sandiegocounty.gov/content/sdc/hhsa/programs/phs/hai-program/ar.html

- AHRQ Antibiotic Stewardship Program Implementation Toolkit: https://www.ahrq.gov/antibiotic-use/long-term-care/improve/index.html

- CDPH Antimicrobial Stewardship Page: https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/AntimicrobialStewardshipLandingPage.aspx

- https://reach.cdc.gov/sites/default/files/job-aids-resources/Diagnostic%20Stewardship%20Toolkit.pdf

- https://doi.org/10.1017/ice.2025.10252

- https://www.cdph.ca.gov/Programs/CHCQ/HAI/Pages/AntimicrobialStewardshipLandingPage.aspx

- CDC Train Antibiotic Stewardship Courses: https://www.train.org/cdctrain/training_plan/3697

Questions?

For more information, contact the HAI Program at
phs.hai.hhsa@sdcounty.ca.gov

Thank you!

🌐 www.sdhai.org

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