Antibiotic Stewardship

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This presentation is produced and presented by Carilion Clinic through the Virginia Long-Term Care Infrastructure Pilot Project (VLIPP)

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Disclaimer

- For educational purposes only
- No endorsement of products, software, or tools

Target Audience

- Infection preventionist
- Administration
- Pharmacy
- Nurses

Objectives

- Describe why antibiotic overuse is harmful to long-term care residents
- Provide an overview of antibiotic stewardship
- Discuss Centers for Medicare and Medicaid Services (CMS) requirements regarding implementation of antibiotic stewardship program
- Describe effective methods to implement antibiotic stewardship programs in long-term care

Introduction

- Antibiotic usage in long-term care facilities is often done inappropriately

- Estimated 66% of nursing home residents are prescribed antibiotics annually
  - 75% of these prescribed antibiotics are inappropriate
  - Estimated 46% of antibiotics for UTIs had the wrong dose
  - Estimated 67% of antibiotics for UTIs had the wrong duration

AHRQ (2017, March) Antibiotic Stewardship. Retrieved from: https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/quality-patient-safety/quality-resources/tools/cauti-ltc/modules/implementation/educational-bundles/urine-culturing/antibiotic-stewardship/abx-stewardship-part2.pptx

Introduction Cont'd

- Inappropriate use of antibiotics increases the likelihood of developing various other infections
- Antibiotic resistance is responsible for an increasing number of infections and higher healthcare costs throughout SNFs in the US
- Reducing these usages would decrease infection rates, mortality rates, and financial costs while increasing the quality of life and care of the residents
- Common infections as a results of antibiotic overuse are
  - *C. difficile*, UTIs, and multidrug-resistant organisms (MDROs)

AHRQ (2017, March) Antibiotic Stewardship. Retrieved from: https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/quality-patient-safety/quality-resources/tools/cauti-ltc/modules/implementation/educational-bundles/urine-culturing/antibiotic-stewardship/abx-stewardship-part2.pptx

Why *C. difficile*?

- Antibiotic therapy is the critical factor that alters the colonic flora, creating an environment for growth and colonization by C. difficile that releases toxins, causing mucosal inflammation and damage.
  - 91% of deaths due to *C. difficile* occurred in people greater than 65 years of age, making it the 18th leading cause of death for this demographic
  - Symptoms are typically severe and include diarrhea, abdominal pain, and colitis

Hota, S. S., Achonu, C., Crowcroft, N. S., Harvey, B. J., Lauwers, A., & Gardam, M. A. (2012). Determining mortality rates attributable to Clostridium difficile infection. *Emerging infectious diseases*, *18*(2), 305–307. https://doi.org/10.3201/eid1802.101611

Why UTIs?

- UTIs are commonly over diagnosed and overtreated in the elderly population, leading to increased antibiotic resistance from prescriptions
- Symptoms in elderly patients include hypotension, tachycardia, incontinence, drowsiness, and delirium
- Mortality rate between 0% - 33%

Beveridge, Louise A et al. “Optimal management of urinary tract infections in older people.” *Clinical interventions in aging* vol. 6 (2011): 173-80. doi:10.2147/CIA.S13423

Dutta, Chandrani et al. “Urinary Tract Infection Induced Delirium in Elderly Patients: A Systematic Review.” *Cureus* vol. 14,12 e32321. 8 Dec. 2022, doi:10.7759/cureus.32321

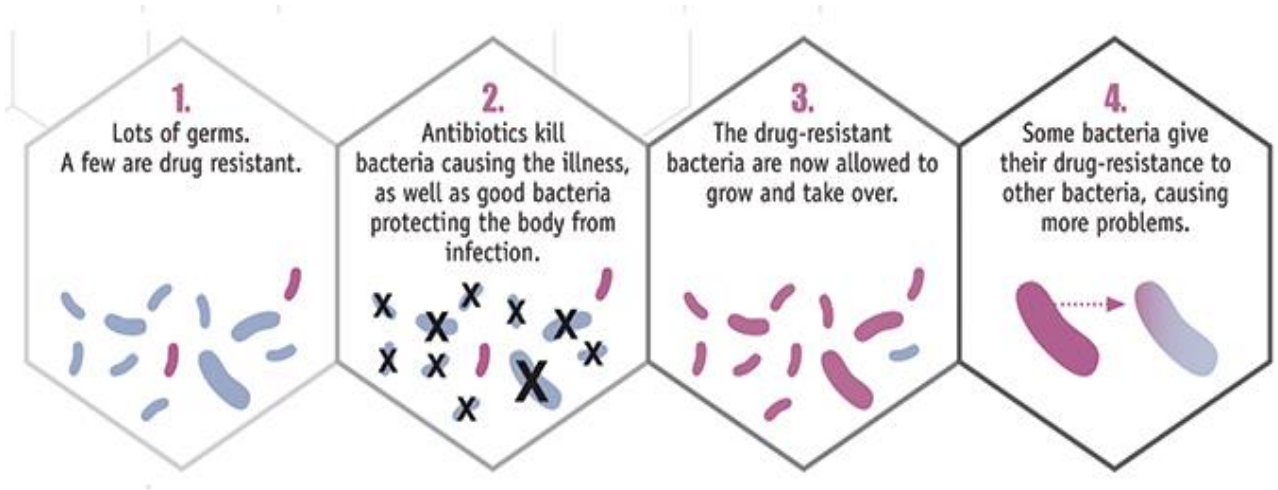
MDROs

Bacteria can develop immunity to some antibiotics through mutations and selection of defense mechanisms. Factors that contribute to this mutation are:

Taking antibiotics when it is not necessary or taking antibiotics that are left over from a prior infection

Not finishing a prescribed course of antibiotics

MDROs are difficult to treat due to limited availability of antimicrobials, resulting in an estimated 23,000 deaths annually



CDC (July 20, 2022) Antibiotic Resistance and NARMS Surveillance. Retrieved from: https://www.cdc.gov/narms/faq.html

CDC (2006) MDRO Prevention and Control. Retrieved from: https://www.cdc.gov/infectioncontrol/guidelines/mdro/prevention-control.html#

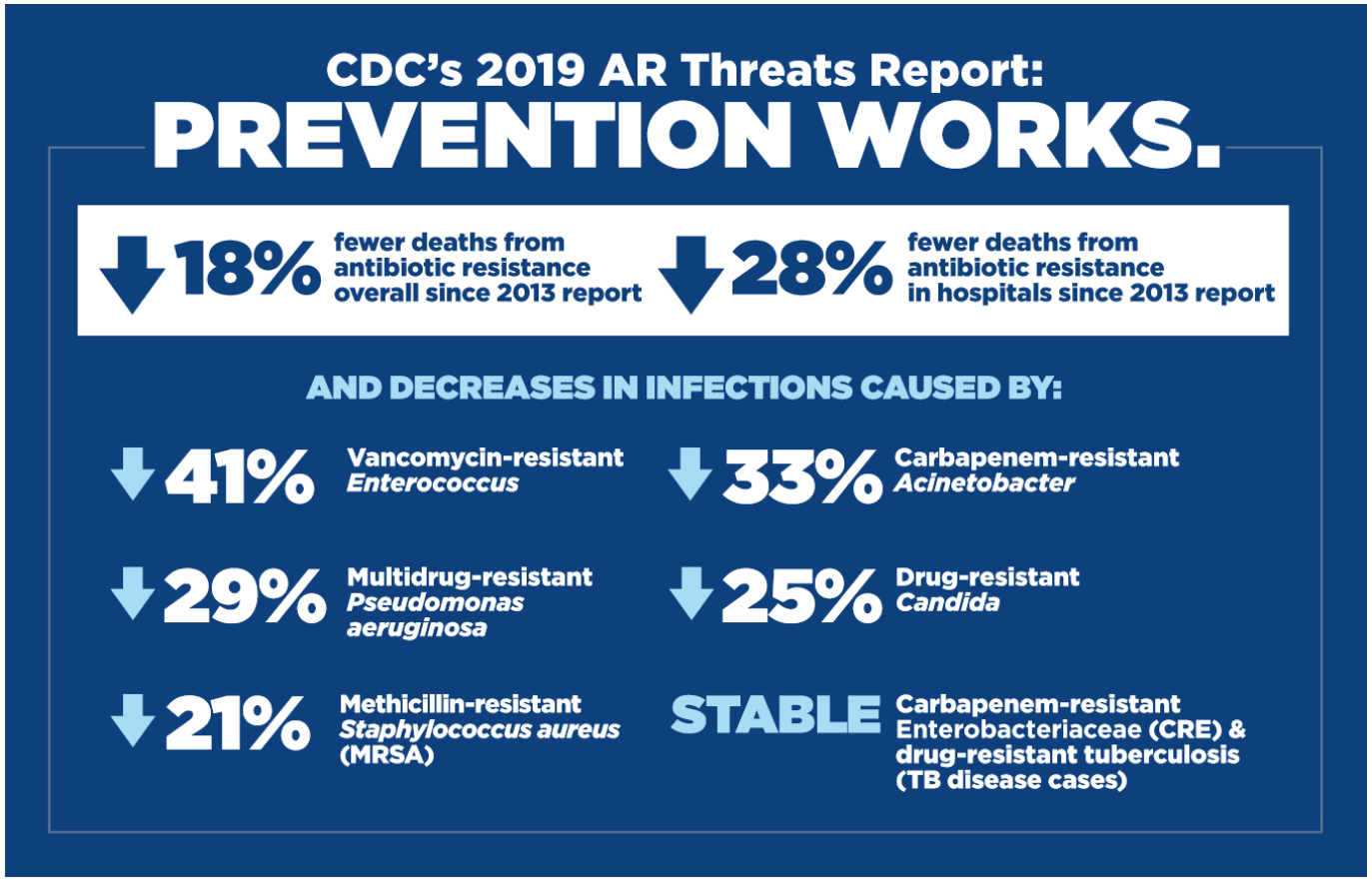
CMS Requires Antibiotic Stewardship For LTC Facilities

"The facility must establish an infection prevention and control program (IPCP) that must include, at a minimum, the following elements:

- An antibiotic stewardship program that includes antibiotic use protocols and a system to monitor antibiotic use." **CMS§483.80(a)(3)**

- Antibiotic stewardship refers to "a set of commitments and actions designed to optimize the treatment of infections while reducing the adverse events associated with antibiotic use"

An Antibiotic Stewardship Program Works!



Source: U.S Centers for Disease Control and Prevention. Antibiotic Resistance Threats in the United States, 2019.

- Antibiotic stewardship policies have been shown to -
  - Reduce antibiotic prescription by 31% for UTIs
  - Can have upwards of 65% reduction in *C. difficile* infections

Antibiotic Stewardship is Achieved By....

- Enhancing infection prevention and control
- Controlling the source of infection
- Prescribing antibiotics when they are truly needed
- Prescribing appropriate antibiotics with adequate dosage
- Using the shortest duration of antibiotics based on the evidence
- Reassessing treatment when culture results are available
- Supporting surveillance of HAIs and AMR and monitoring antibiotics consumption
- Educating staff
- Supporting an Interdisciplinary Approach

Lagunes, L., Encina, B., & Ramirez-Estrada, S. (2016). Current understanding in source control management in septic shock patients: a review. *Annals of translational medicine*, *4*(17), 330. https://doi.org/10.21037/atm.2016.09.02

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CDC Core Elements of Antibiotic Stewardship

- The efforts to measure and improve how antibiotics are prescribed by clinicians and used by patients
- The CDC designates these six areas as necessary in order to have a successful antibiotic stewardship program in LTC

LEADERSHIP COMMITMENT

ACCOUNTABILITY

DRUG EXPERTISE

ACTION

TRACKING AND REPORTING

EDUCATION

CDC (2021, August 20) Core Elements of Antibiotic Stewardship in Nursing Homes. Retrieved from: https://www.cdc.gov/antibiotic-use/core-elements/nursing-homes.html

Leadership Commitment

- Corporate leaders, owners, and administrators must support and encourage improved antibiotic use by:
  - Providing educational opportunities to staff, residents, and family members
  - Include antibiotic stewardship duties in job posting descriptions
  - Communicate expectations about antibiotic use, monitoring, and enforcement policies
  - Create a culture of care and education that is able to work on itself to improve the health of its residents

CDC (2021, August 20) Core Elements of Antibiotic Stewardship in Nursing Homes. Retrieved from: https://www.cdc.gov/antibiotic-use/core-elements/nursing-homes.html

Accountability

- Individuals are made aware of their responsibilities and are held to those standards

  - Medical directors have the authority to set standards for all antibiotic prescribing practices within the nursing home
    - They should also be periodically reviewing prescription data in the form of antibiograms

  - Encourage the DON to practice effective assessments, monitoring, and communication of antibiotic practices between prescribers, their self, and frontline staff

Drug Expertise

- Work with experts on antibiotic stewardship to improve your own practices
  - Consult with pharmacists and microbiologists who can provide information on best practices and areas to improve
  - Work with your hospitals during care transitions to ensure appropriate administration of antibiotics
  - Communicate with local specialists at the health department to ensure regulations are being met

CDC (2021, August 20) Core Elements of Antibiotic Stewardship in Nursing Homes. Retrieved from: https://www.cdc.gov/antibiotic-use/core-elements/nursing-homes.html

Action

- Encourage enacting policies and procedures that are relevant to the needs of your facility
  - Standardize care practices facility-wide so that staff can care for the needs of any resident
  - Include pharmacy as partners in order to disseminate accurate information
  - Identify specific issues your facility is experiencing and ways to counteract them

CDC (2021, August 20) Core Elements of Antibiotic Stewardship in Nursing Homes. Retrieved from: https://www.cdc.gov/antibiotic-use/core-elements/nursing-homes.html

Tracking and Reporting

- Consult data on antibiotic prescribing practices (such as antibiograms) to determine adherence to policies and ways to improve antibiotic stewardship
- Conduct audits on antibiotic prescriptions to record how, why, how many, and how often they are being prescribed
- Prescription tracking can lead to decreases in adverse effects and financial costs over time

CDC (2021, August 20) Core Elements of Antibiotic Stewardship in Nursing Homes. Retrieved from: https://www.cdc.gov/antibiotic-use/core-elements/nursing-homes.html

Antibiograms

- A summary of antimicrobial susceptibilities for isolates for a particular facility
- Antibiograms can be used by prescribers to assess susceptibility and choose an appropriate antibiotic treatment

	Organism	Number of isolates*	Aminoglycosides			Carbapenems		Cephalosporins						Penicillins							Quinolones		Miscellaneous								
			Amikacin	Gentamicin	Tobramycin	Ertapenem	Meropenem	Cefazolin	Cefepime	Cefoxitin	Ceftazidime	Ceftriaxone	Cefuroxime	Amox/Clav	Ampicillin	Ampicillin/	Aztreonam	Oxacillin	Penicillin	Pip/Tazo	Ciprofloxacin	Levofloxacin	Clindamycin	Daptomycin	Erythromycin	Linezolid	Nitrofurantoin**	Rifampin***	Tetracycline	Trimethoprim/ Sulfamethoxazole	Vancomycin
			Percent Susceptible																											
Gram-Negative	*Acinetobacter baumannii*	42	76	67	71		71		55		71	37				67					42	57								60	
	Enterobacter cloacae	60	100	98	98	100	100	0	97	0	92	87	0		0	0	92			97	93	95							86	92	
	Escherichia coli	346	100	91	91	100	100	86	100	93	99	100	89		49	52	100			97	60	60					96		71	68	
	Escherichia coli ***ESBL***	78	97	82	63	96	100	0	0	82	0	0	0		0	29	0			93	16	16					85		46	31	
	Haemophilus influenzae	32										100	100		84													100		63	
	Klebsiella oxytoca	35	100	97	100	100	100	46	100	97	100	97	86		3	71	97			97	100	100					100		97	97	
	Klebsiella pneumoniae	151	100	97	98	100	100	96	100	92	100	100	91		0	84	100			97	96	97					52		85	89	
	Morganella morganii	32	100	73	90	100	100	0	100	74	80	100	0		0	3	91			100	72	83							43	73	
	Proteus mirabilis	87	99	91	89	100	100	76	100	90	98	100	93		71	75	99			100	57	74					0		0	76	
	Pseudomonas aeruginosa	220	95	80	91		82		79		79						69			90	73	72									
	Serratia marcescens	36	100	97	77	100	100	0	100	0	56	85	0		0	0	71			74	94	100							12	94	
	Stenotrophomonas maltophilia	34									32											69								100	
Gram-Positive	*Enterococcus faecalis*	212													100				100		69	73					100		21		100
	Staphylococcus aureus ***MSSA***	243		98								100		100	0	98		100	0		77	78	80		53			97	94	99	100
	Staphylococcus aureus ***MRSA***	528		98								0		0	0	0		0	0		20	21	64	100	11	100		99	94	96	100
	Staphylococcus epidermidis	129		68								23		23	0	23		23	0		34	35	46		18			94	87	37	100
	Staphylococcus hominis	36		83								31		33		31		31	0				38		18			100	58	53	100
	Streptococcus agalactiae group b	72																	100			95									100

*=Maximum number of isolates tested; **=indicated for UTI only; ***=should not be used as monotherapy

Baum, Christina. (Nov. 18, 2019) NACCHO. Developing Regional Antibiograms to Monitor Resistance Patterns. Retrieved from: https://www.naccho.org/blog/articles/developing-regional-antibiograms-to-monitor-resistance-patterns

Line Listing

- Line listing allows for consistent tracking and reporting of antibiotic resistance efforts
- Templates can be refined to fit specific facility and/or reporting needs to ensure all appropriate information is included
- Specific areas to include should be person, time, place, prescription information, infection information, underlying conditions, etc.

Line List Template

Reporting County or State: _____ Date of Initial Report: _____

CaseID*	Case Initials	Age	Sex	Onset date	Current Status	Location	Case Category	Epi Links	Underlying Conditions

*Page 4 contains a description of the column headings

CDC (2008) Line List Template. Retrieved from: https://www.cdc.gov/urdo/downloads/linelisttemplate.pdf

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Education

- Ensure that education is being delivered in an effective and beneficial manner
  - Should be provided to prescribers, nursing staff, residents, and families
  - Education should highlight the importance of antibiotic stewardships and the ways in which to promote it within the long-term care setting

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The Role of the Nurse in Antibiotic Stewardship

- Evaluate prescribed antibiotics for appropriate duration i.e. stop dates
- Understand the importance of an antibiogram and advocate for appropriate antibiotic use
- Understand and educate residents and families about antibiotic resistance and appropriate antibiotic use
- Enhance communication to improve transitions of care on admission and discharge
- Ensure accurate and timely administrations and avoid missed doses

References

- AHRQ (2017, March) Antibiotic Stewardship. Retrieved from: https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/quality-patient-safety/quality-resources/tools/cauti-ltc/modules/implementation/educational-bundles/urine-culturing/antibiotic-stewardship/abx-stewardship-part2.pptx
- Baum, Christina. (Nov. 18, 2019) NACCHO. Developing Regional Antibiograms to Monitor Resistance Patterns. Retrieved from: https://www.naccho.org/blog/articles/developing-regional-antibiograms-to-monitor-resistance-patterns
- Biology Online (2022) Infection. Retrieved from: https://www.biologyonline.com/dictionary/infection
- Beveridge, Louise A et al. “Optimal management of urinary tract infections in older people.” *Clinical interventions in aging* vol. 6 (2011): 173-80. doi:10.2147/CIA.S13423
- CDC (2006) MDRO Prevention and Control. Retrieved from: https://www.cdc.gov/infectioncontrol/guidelines/mdro/prevention-control.html#
- CDC (2008) Line List Template. Retrieved from: https://www.cdc.gov/urdo/downloads/linelisttemplate.pdf
- CDC (2019) Antibiotic Resistance Threats In The United States. Retrieved from: https://www.cdc.gov/drugresistance/pdf/threats-report/2019-ar-threats-report-508.pdf
- CDC (2021, August 20) Core Elements of Antibiotic Stewardship in Nursing Homes. Retrieved from: https://www.cdc.gov/antibiotic-use/core-elements/nursing-homes.html
- CDC (2021, October 7) Improving Antibiotic Use. Retrieved from: https://www.cdc.gov/antibiotic-use/stewardship-report/index.html

References

- CDC (2022, July 20) Antibiotic Resistance and NARMS Surveillance. Retrieved from: https://www.cdc.gov/narms/faq.html
- CDC (2022, August 4) Pathogen Reduction & Decolonization to Prevent Infections. Retrieved from: https://www.cdc.gov/drugresistance/microbial-ecology/decolonization.html
- Dutta, Chandrani et al. "Urinary Tract Infection Induced Delirium in Elderly Patients: A Systematic Review." *Cureus* vol. 14,12 e32321. 8 Dec. 2022, doi:10.7759/cureus.32321
- Hota, S. S., Achonu, C., Crowcroft, N. S., Harvey, B. J., Lauwers, A., & Gardam, M. A. (2012). Determining mortality rates attributable to Clostridium difficile infection. *Emerging infectious diseases*, *18*(2), 305–307. https://doi.org/10.3201/eid1802.101611
- Lagunes, L., Encina, B., & Ramirez-Estrada, S. (2016). Current understanding in source control management in septic shock patients: a review. *Annals of translational medicine*, *4*(17), 330. https://doi.org/10.21037/atm.2016.09.02
- Pulia, M., Kern, M., Schwei, R. J., Shah, M. N., Sampene, E., Crinch, C. J. (2018, June 14) Comparing Appropriateness of Antibiotics for Nursing Home Residents by Setting of Prescription Initiation: A Cross-Sectional Analysis. Retrieved from: https://aricjournal.biomedcentral.com/articles/10.1186/s13756-018-0364-7
- Rao G. G. (1998). Risk factors for the spread of antibiotic-resistant bacteria. *Drugs*, *55*(3), 323–330. https://doi.org/10.2165/00003495-199855030-00001
- Stone, P. W., Herzig, C. T. A., Agarwai, M., Pogorzelska-Maziarz, M., Dick, A. W. (2018, May 28). Nursing Home Infection Control Program Characteristics, CMS Citations, and Implementation of Antibiotic Stewardship Policies: A National Study. DOI: https://doi.org/10.1177%2F0046958018778636
- Tandan, M., Thapa, P., Maharjan, P., Bhandan, B. (2022, June) Impact of Antimicrobial Stewardship Program on Antimicrobial-Resistance and Prescribing in Nursing Homes: A Systematic Review and Meta-Analysis. DOI: https://doi.org/10.1016/j.jgar.2022.02.002