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Optimizing Health-System Resources to Deliver System Wide Antimicrobial Stewardship

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Disclosure

- The program chair and presenters for this continuing education activity have reported no relevant financial relationships.

Learning Objectives:

- Discuss initial approaches when starting a health-system antimicrobial stewardship program (ASP)
- Give examples of how existing personnel/resources can be used to enhance patient-level stewardship across the health-system
- Describe how a system-level ASP can impact an individual facility with limited antimicrobial stewardship resources

Antimicrobial Expertise Poll

- Do you have Infectious Disease Physician(s) and Pharmacist(s) at your practice site?
  - Both ID Physician and Pharmacist
  - ID physician only
  - ID pharmacist only
  - No ID Physician or Pharmacist

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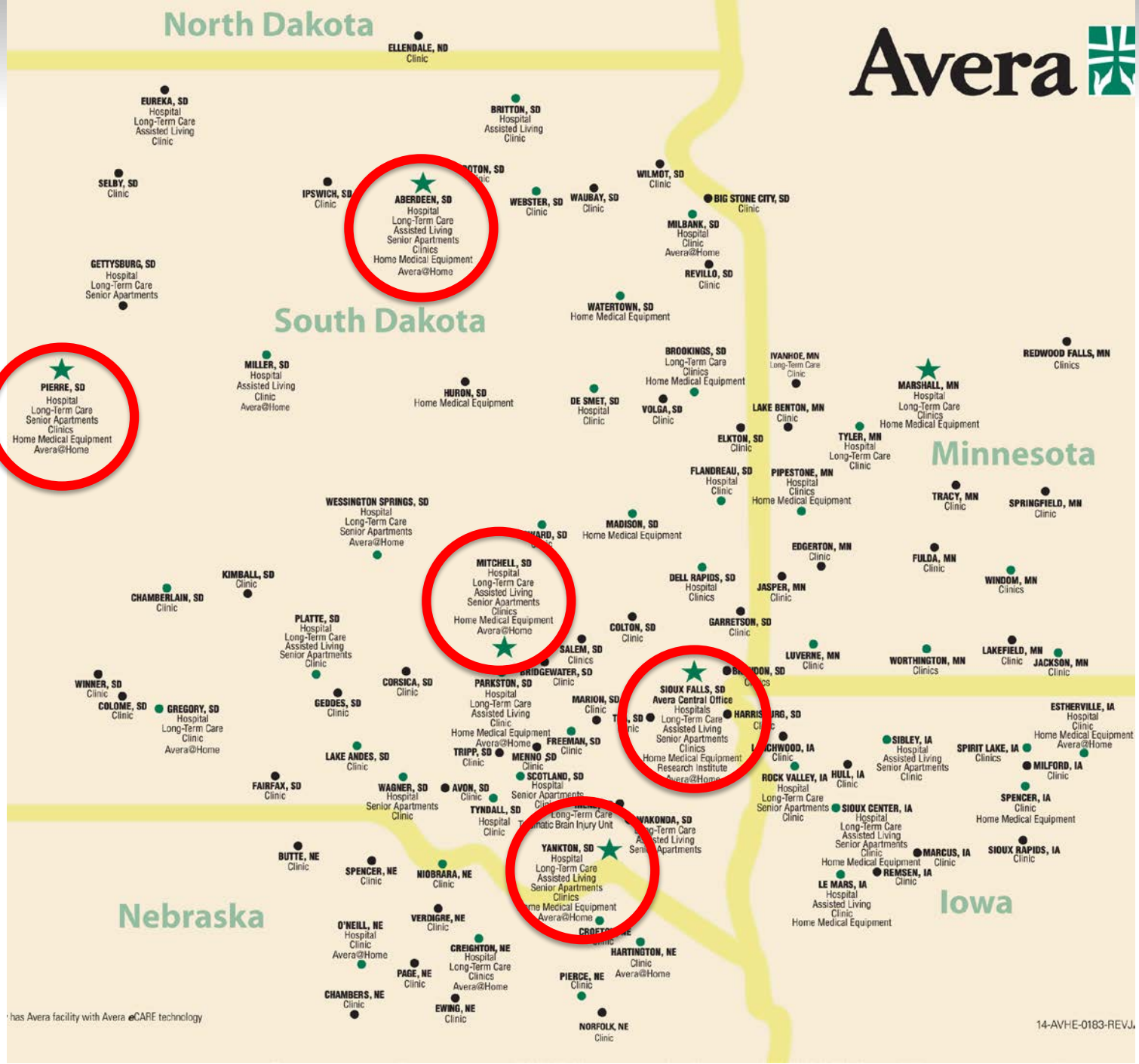

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Avera Health Antimicrobial Stewardship Program (ASP)

- Scope:
  - Review antimicrobials for formulary / antimicrobial restrictions
  - Review/approval of infectious disease-related order sets and treatment algorithms
  - Adjustment/conversion policies (e.g. renal, IV to PO)
  - Review of antibiogram and antimicrobial utilization data
  - Provide education to providers and other staff
  - Conduct the “ASP Daily Call”

Antimicrobial Formulary

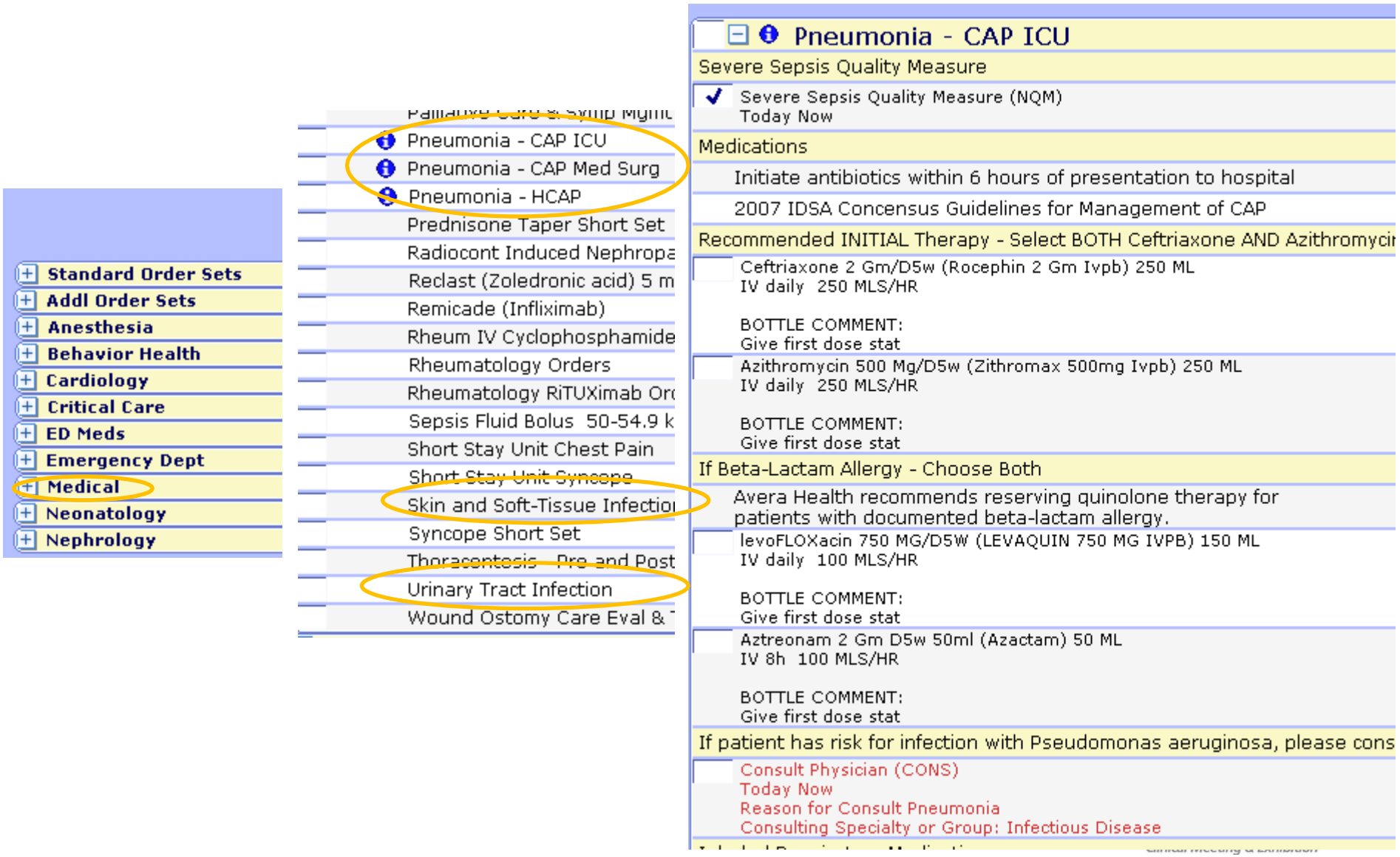
- Beta-lactams
  - PCN, aminopenicillins, Piperacillin-tazobactam
  - Cephalosporins (limited)
  - Meropenem, Ertapenem
- Fluoroquinolones
  - Levofloxacin, ciprofloxacin
- Aminoglycosides
- Antifungals
  - Fluconazole
  - Micafungin
  - Voriconazole, Posaconazole, Isavuconazole*
  - Amphotericin B products*

- MRSA+/- VRE active
  - Vancomycin
  - Trimethoprim-sulfam.
  - Clindamycin
  - Daptomycin*
  - Linezolid*
  - Tigecycline*
  - Ceftaroline*
  - Telavancin*

- Others*
  - Fidaxomicin
  - Fosfomycin
  - Colistin

*ID restricted at MCK

Infection-Related Order Sets: Avera System



Antimicrobial Renal Dosing Policy: Avera System

Avera Health System Antimicrobial Dosing Guideline for Patients with Impaired Renal Function
Avera ID Subcommittee **Update March 2016**
Weight Key: TBW = Total Body Weight, IBW = Ideal Body Weight

NOTE: THIS IS A RENAL DOSING GUIDELINE ONLY. THIS GUIDELINE IS NOT INTENDED TO GUIDE AGENT SELECTION. ANY LISTING OF POSSIBLE INDICATIONS IS NOT ALL INCLUSIVE, AND CLINICAL JUDGMENT IS NECESSARY WHEN SELECTING THE BASE DOSE FOR THE SUSPECTED INFECTION. DISCUSSION WITH THE ANTIMICROBIAL STEWARDSHIP TEAM / ID CONSULT MAY BE WARRANTED TO ENSURE SELECTION OF THE APPROPRIATE BASE DOSE AND SUBSEQUENT RENAL ADJUSTMENTS.

Drug	Route	Typical Base Doses	CrCl (mL/min)	HD
Acyclovir	IV	**Use lesser of TBW vs IBW** 5 – 10 mg/kg q8h	25-50: 100% of dose q12h 10-24: 100% of dose q24h < 10: 50% of dose q24h	Dose for CrCl <10, dose after HD on dialysis days
Ampicillin	IV	2 gm q4h (Suggested for CNS infections, Endocarditis, Osteomyelitis)	If base dose 2 gm q4h : 30-50 : 2 gm q6h 10 – 29 : 2 gm q8h < 10 : 2 gm q12h	Dose for CrCl < 10, give one of the doses after HD on dialysis days
		2gm q6h	If base dose 2 gm q6h : 30-50 : 2 gm q6h 10 – 29 : 2 gm q8h < 10 : 2 gm q12h	Dose for CrCl < 10, give one of the doses after HD on dialysis days
		1gm q6h	If base dose 1 gm q6h : 30-50 : 1 gm q6h 10 – 29 : 1 gm q8h < 10 : 1 gm q12h	Dose for CrCl < 10, give one of the doses after HD on dialysis days
Ampicillin-Sulbactam	IV	3 gm q6h	If base dose 3 gm q6h : 30-50 : 3 gm q8h 10 – 29 : 3 gm q12h < 10 : 3 gm q24h	Dose for CrCl < 10, dose after HD on dialysis days
		1.5 gm q6h	If base dose 1.5 gm q6h : 30-50 : 1.5 gm q8h 10 – 29 : 1.5 gm q12h < 10 : 1.5 gm q24h	

Annual Antibiogram: Avera McKennan

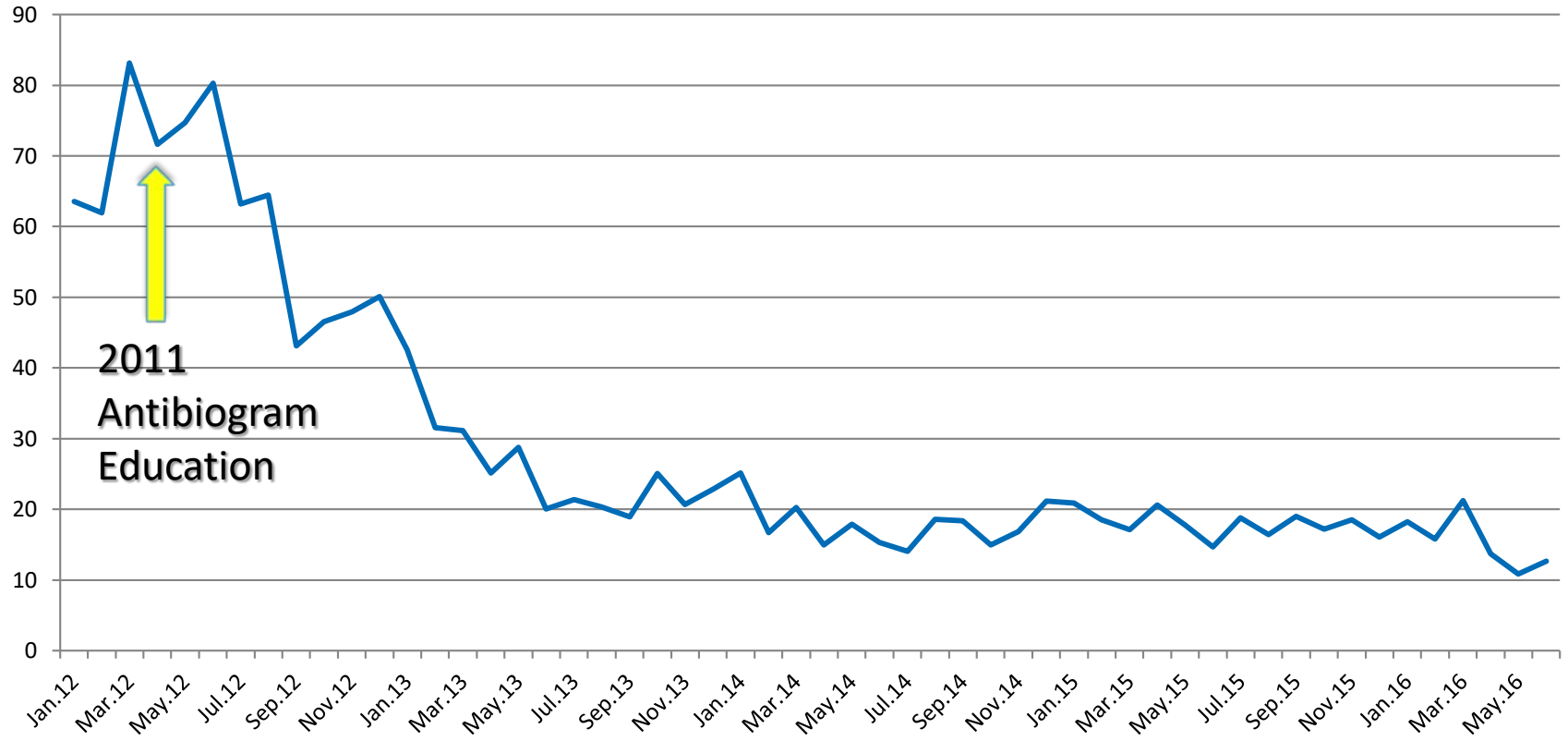
						AVERA MCKENNAN ANTIBIOGRAM 2015										
				GRAM POSITIVE										CFT	CFT	
Organism	Total	TMP/S	GENT SYN	SYN	CLINDA	ERYTH	CIPRO	LEVO	FD	OXA	LIN	PEN-G	VANCO	nonmening	mening	TE
Staph aureus	767	96%		100%	80%	71%			99%	100%	100%	18%	100%			94%
MRSA	386	100%		100%	55%	12%			100%	0%	100%	0%	100%			96%
Staph epidermidis	382	56%		100%	62%	31%			100%	37%	100%	7%	100%			
Staph hominis	74	74%		100%	63%	36%			96%	60%	100%	27%	100%			
Enterococcus faecalis	573		76%	0%		12%	83%	84%	99%		100%	99%	99%			25%
Enterococcus faecium	39		97%	95%		13%	36%	38%	30%		100%	44%	100%			51%
Enterococcus faecium VRE	125		90%	99%		0%	0%	0%	6%		100%	2%	0%			3%
Streptococcus pnemoniae	105	79%			81%	46%		97%			100%		100%	97%	91%	71%
Streptococcus agalactiae	74				47%	36%		97%			100%	100%	100%	100%		15%
				GRAM NEGATIVE												
Organism	Total	AMP	AMP/SUL	CEFAZO	CEFTRI	GENT	CPE	CIPRO	LEVO	PIP/TAZO	TOBRA	TMP/S	MEM	CEFTAZ		
Citrobacter freundii	89				92%	99%	100%	97%	97%	93%	100%		100%	93%		
Enterobacter aerogenes	73				90%	99%	100%	100%	100%	90%	99%	100%	100%	92%		
Enterobacter cloacae complex	186				80%	98%	99%	98%	98%	82%	98%	95%	99%	82%		
Escherichia coli	2794	63%	69%	92%	99%	94%	100%	88%	88%	97%	95%	81%	100%	99%		
Escherichia coli ESBL	116	0%	10%	0%	3%	61%	3%	15%	15%	84%	53%	38%	100%	3%		
Haemophilus influenzae	91	77%			100%							73%				
Klebsiella pneumoniae	568	0%	89%	97%	97%	99%	98%	97%	98%	96%	97%	93%	99%	98%		
Klebsiella oxytoca	128	0%	63%	51%	97%	100%	100%	99%	99%	96%	100%	98%	100%	100%		
Morganella morganii	38	0%	0%	0%	92%	84%	92%	82%	82%	100%	97%	70%	100%	87%		
Proteus mirabilis	177	81%	89%	68%	94%	90%	95%	77%	81%	100%	90%	87%	100%	95%		
Pseudomonas aeruginosa	333		1%	0%	2%	95%	85%	82%	79%	98%	100%	29%	87%	91%		
Serratia marcescens	67			0%	90%	99%	100%	87%	87%		91%		100%	100%		
	# in green	<5% increase in susceptibility				# in green & highlighted yellow			≥5% increase in susceptibility							
	# in red	<5% decrease in susceptibility				# in red & highlighted yellow			≥5% decrease in susceptibility							
	AMP = Ampicillin AMP/SUL = Ampicillin/Sulbactam CEFAZO = Cefazolin CFT= Cefotaxime CEFTRI = Ceftriaxone CIPRO = Ciprofloxacin															
	CLINDA = Clindamycin CPE = Cefepime ERYTH = Erythromycin FD= Nitrofurantoin GENT SYN = Gentamicin synergy LEVO = Levofloxacin															
	LIN = Linezolid MEM= Meropenem OXA = Oxacillin(equals Methicillin) PEN-G = Penicillin-G PIP/TAZO = Piperacillin/Tazobactam															
	SYN = Synercid TE= Tetracycline TOBRA = Tobramycin TMP/S Trimethoprim/Sulfa VANCO= Vancomycin															

Fluoroquinolone Susceptibility Trends

	2006	*2007*	*2008*	*2009*	*2010*	*2011*
E. coli						
Levofloxacin	87	79	80	80	77	75
Ciprofloxacin	-	-	-	-	-	75

	2006	*2007*	*2008*	*2009*	*2010*	*2011*
P. aeruginosa						
Levofloxacin	75	72	75	57	70	64
Ciprofloxacin	-	-	-	-	-	70

Levofloxacin Days of Therapy/1000 Patient Days
Avera McKennan Inpatient Use



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	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
E. coli										
Levofloxacin	87	79	80	80	77	75	82	84	85	85
Ciprofloxacin	-	-	-	-	-	75	82	84	85	85

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
P. aeruginosa										
Levofloxacin	75	72	75	57	70	64	64	79	80	79
Ciprofloxacin	-	-	-	-	-	70	70	82	82	82

Which of the following should commonly be implemented in the early stages as a good foundation for a health-system ASP?

A. Develop a system antimicrobial formulary
B. Develop antimicrobial-related order sets and treatment pathways based on antibiogram review
C. Implement renal dosing and IV to PO conversion policies
D. Identify a common problem
E. All of the above

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Technology Poll

- Do you already use or have access to screen-sharing conference call technology at your facility?
  - Yes
  - No
  - Don’t know

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ASP Daily Call: Avera System

- Conference call utilizing screen sharing
- Conducted Monday – Friday, 11 AM
- ID physicians and pharmacists review patient cases for potential stewardship interventions
  - Cultures/labs/diagnostics/chart notes reviewed
  - Broad spectrum antimicrobial use is targeted
    - Piperacillin-tazobactam, cefepime, meropenem, fluoroquinolones
    - Vancomycin
- Pharmacists relay the ASP recommendations to providers

Screen Sharing

```
Run Date: 05/17/16                Avera Health Laboratory                    Page    1
Run Time: 1544                  Laboratory Specimen Report                 Facility
-------------------------------------------------------------------------------------

PATIENT: TEST,PHARMACY                ACCT: MK0002999642 LOC:  MK.ED      U: MK00888824
                                     AGE/SX: 136/F       ROOM:            REG: 09/22/15
REG DR:  Other,Dr                    DOB:    01/01/1880  BED:             DIS:
                                     STATUS: PRE ER      TLOC:
-------------------------------------------------------------------------------------

SPEC #: MK16:M0039675R    COLL: 05/17/16-1528 STATUS:  COMP -              REQ #: 09440092
                          RECD: 05/17/16-1528 SUBM DR: Other,Dr
SOURCE: ARM               ENTR: 05/17/16-1529 OTHR DR:
SPDESC:
ORDERED:  WOUND
-------------------------------------------------------------------------------------

  Procedure                          Result                          Verified          Site
-------------------------------------------------------------------------------------

  WOUND CULTURE  Final                                               05/17/16-1543     MCK

     Organism 1                      ESCHERICHIA COLI
                                     Light growth
                                     ***
     Organism 2                      STREP AGALACTIAE GROUP B
                                     Light growth
                                     ***

                                        ESC COLI                      ST AGALAC
                                        M.I.C.    RX     ABN          M.I.C.    RX     ABN
                                        --------- ------ ---          --------- ------ ---
     Trimethoprim/Sulfamethoxazole      <=20      S
     Ampicillin                         >=32      R                   <=0.25    S
     Ampicillin/Sulbactam               >=32      R
     Cefazolin                          <=4       S
     Ceftazidime                        <=1       S
     Ceftriaxone                        <=1       S
     Cefepime                           <=1       S
     Ciprofloxacin                      <=0.25    S
     Clindamycin                                                      >=8       R
     Gentamicin                         <=1       S
     Meropenem                          <=0.25    S
     Penicillin                                                       <=0.12    S
     Tetracycline                                                     >=16      R
     Tobramycin                         <=1       S
     Vancomycin                                                       <=0.5     S
     Piperacillin/Tazobactam            <=4       S
     Levofloxacin                       <=0.12    S
     Linezolid                                                        1         S


-------------------------------------------------------------------------------------

MCK - Avera McKennan Laboratory
      1325 S. Cliff, Sioux Falls, SD 57105
```

Avera Health System Antimicrobial Stewardship Program (ASP) Rounds

Suggested Script for Presentation

Pharmacy Presentation of Patient to Infectious Disease (ID) Physician During ASP Rounds

This is a *(age)* year old male/female admitted for *(chief complaint)*. *Discuss suspected infection, for example*: We are suspecting urinary tract infection. *Discuss current antimicrobial therapy*, *for example:* The patient is currently receiving Zosyn, day 3. *Discuss culture results if applicable, for example:* Urine culture from *(date)* is positive for *E. coli*. *Discuss resistance of organisms identified (if applicable), for example:* The *E. coli* is only resistant to ampicillin. *Discuss potential recommendation (if known), for example*: I thought perhaps we could suggest de-escalation to ceftriaxone or an oral agent. I wanted to get your thoughts.

Pharmacy Presentation of ASP Recommendations to Provider:

First-Time Recommendation to a Specific Provider:

For the first time you make an ASP recommendation to a provider, we suggest you start with the following statement:

I am not sure if you are aware Avera Health has developed an Antimicrobial Stewardship Program in hopes of improving antimicrobial use and limiting resistance across the system. As part of this effort, we have the opportunity to review patient cases with an ID physician through a conference call each day.

Recommendation Presentation:

Your patient *(name)* was discussed at ASP rounds. Based on review of the patient's chart, including documentation and culture results (if applicable), our antimicrobial stewardship physician *(Name)* is suggesting *(recommendation)*. *For example: Dr. Nazir suggests changing Zosyn to ceftriaxone (or an oral agent that could be specified) for this patient to complete 7 days of therapy.*

Date of Recommendation

Month	Day	Year
Sep	20	2016

Facility: *

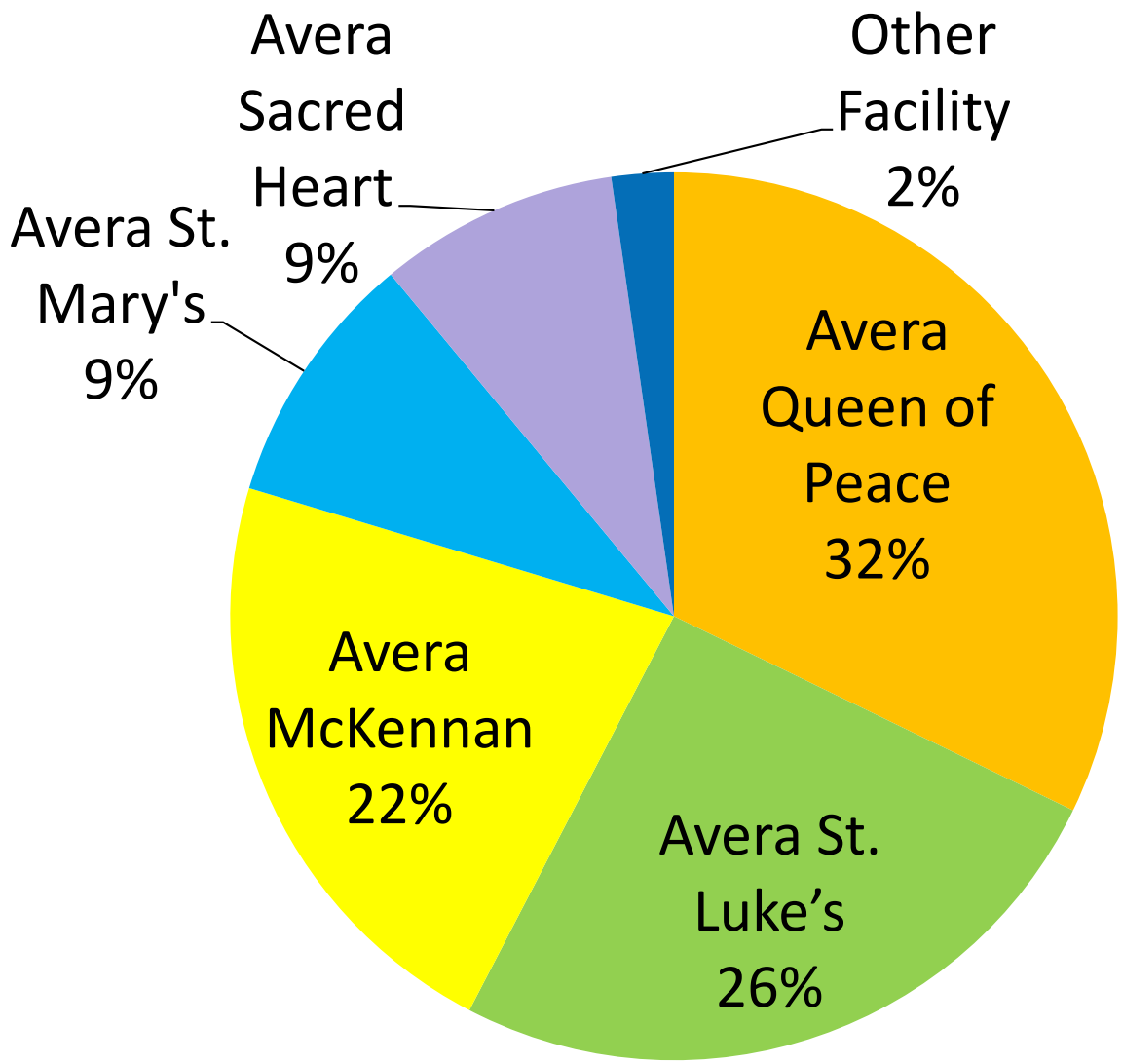
- ○ Avera McKennan
- ○ Avera St. Mary's
- ○ Avera St. Luke's
- ○ Avera Queen of Peace
- ○ Avera Marshall
- ○ Avera Sacred Heart
- ○ Other

Suspected Infection Type By Site (Select all that apply) *

- ☐ Urinary
- ☐ Respiratory
- ☐ Skin / Soft Tissue
- ☐ Bone / Joint

Interventions By Avera Facility

October 16, 2015 to August 16, 2016



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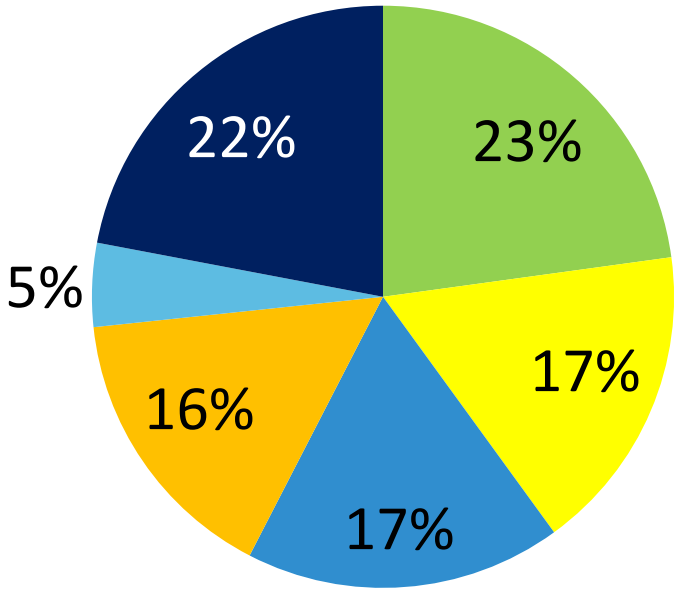
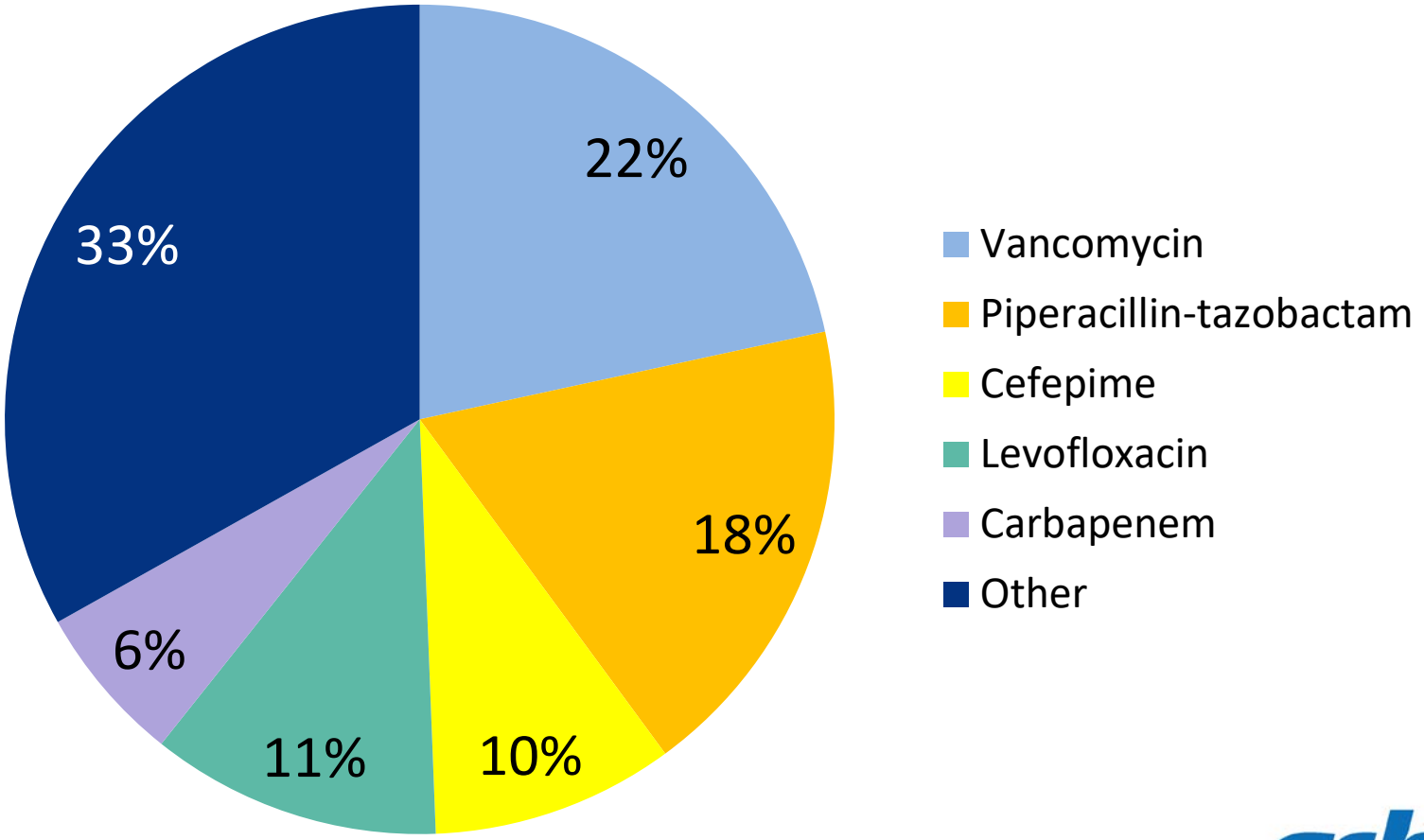
Type of Recommendation

n = 495



- Stop Antimicrobials (s)
- De-escalation
- Change to adequate coverage
- Dosing adjustment or IV to PO
- Facilitate Discharge
- Other

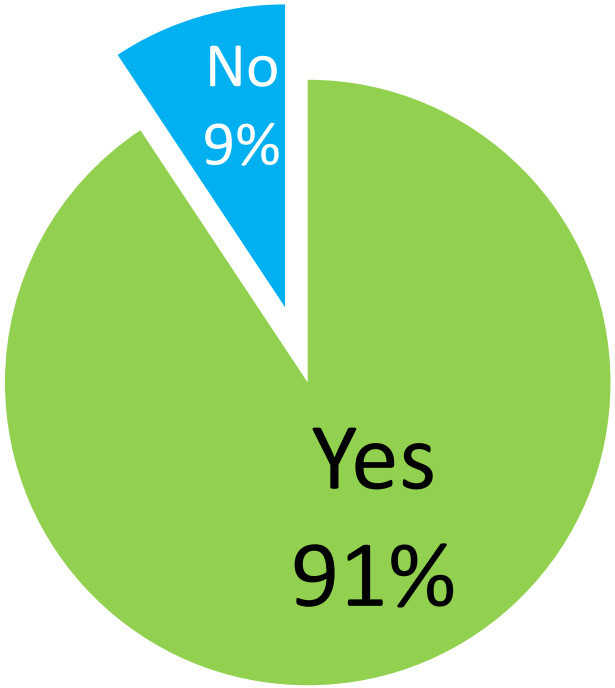
Antimicrobials Involved



Recommendation Accepted & Implemented

October 16, 2015 to August 16, 2016

n = 354



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How much time does this really take?

- July 1st – August 31st, 2016
- Averaged 1 ID physician and 5 Pharmacists per call
- 90 patients presented / 33 call days (2.7 patients per call)
- 23 minutes per call

Sharing of Knowledge

- Examples of Educational Topics Discussed
  - The Joint Commission ASP standard
  - New HAP/VAP guidelines
  - Fluoroquinolone resistance trends locally and nationally
  - Clostridium bacteremia treatment
  - Evaluation of Pseudomonal susceptibility trends locally
  - Enterobacter and drugs of choice
  - Asymptomatic bacteruria treatment
  - Cefazolin and MSSA susceptibility testing
  - HCAP in nursing home patients
- Literature commonly distributed for further education

Is it possible to use existing personnel to implement a health-system ASP?

A. YES
B. NO

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Avera Queen of Peace Hospital

- 120 Bed Regional Medical Center
- Emergency
- Medical
- Surgical
- Intensive Care
- Maternal Care
- Pediatrics
- Cancer Center
- Telemedicine, Rehab Services, Outpatient Therapy
- No formal Antimicrobial Stewardship Team

Queen of Peace Hospital

Corn Palace

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Where we started – Antimicrobial monitoring

- Microbiology/Pharmacy interface
- Pneumonia diagnosis review
- Appropriate Fluoroquinolone utilization
- Duplicate coverage monitoring
- Aminoglycoside/Vancomycin Protocols
- IV to PO conversion

Getting started

- Administration commitment
- Pharmacy buy in
- Physician education/recruitment
- Implementation

Daily Antimicrobial Stewardship Call

- Identify Patients to present
- Presentation of Patient to Infectious Disease (Daily call)
- Follow-up with Prescribing Physician
- Documentation

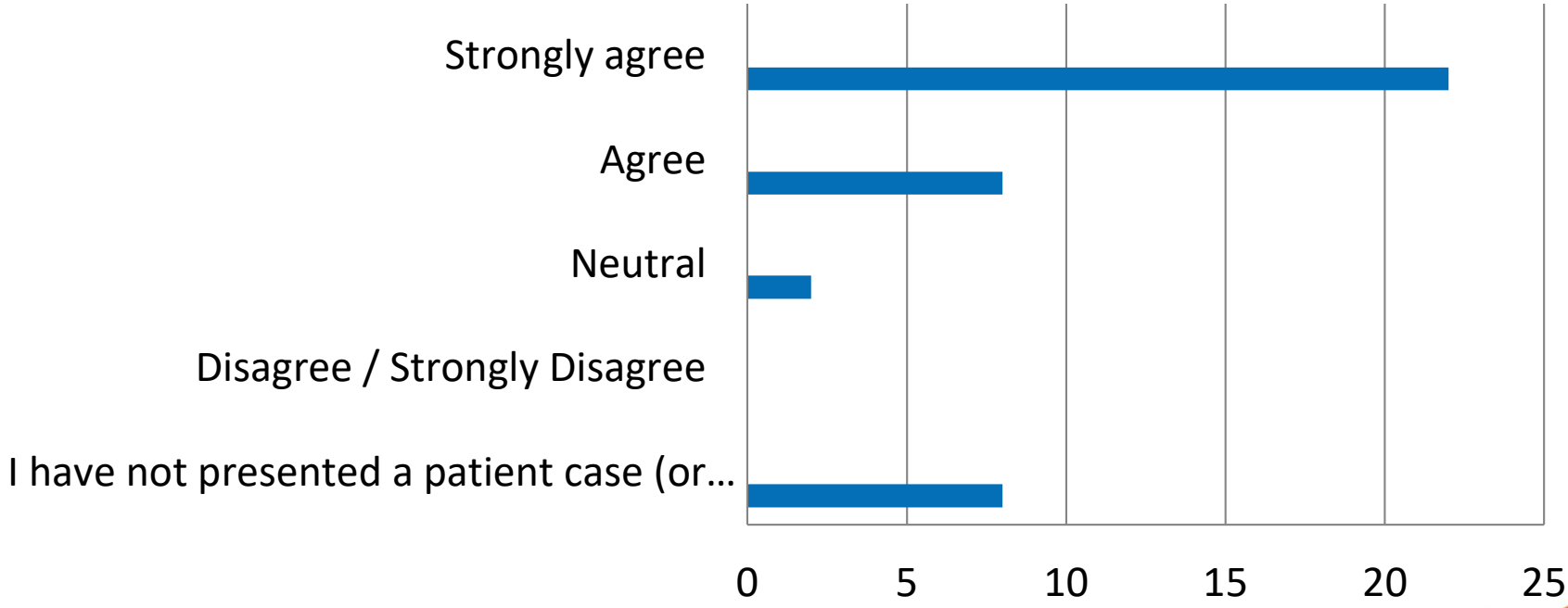
Tips/Lessons learned

1. Start Slow
2. Be Selective – Start with wins
3. Provide a service

Stewardship – not Police Presence

Pharmacist Survey – All Responses

If you have presented a patient case (or had one presented on your behalf), do you feel the advice given during the Daily ASP Call has made your recommendations more effective?



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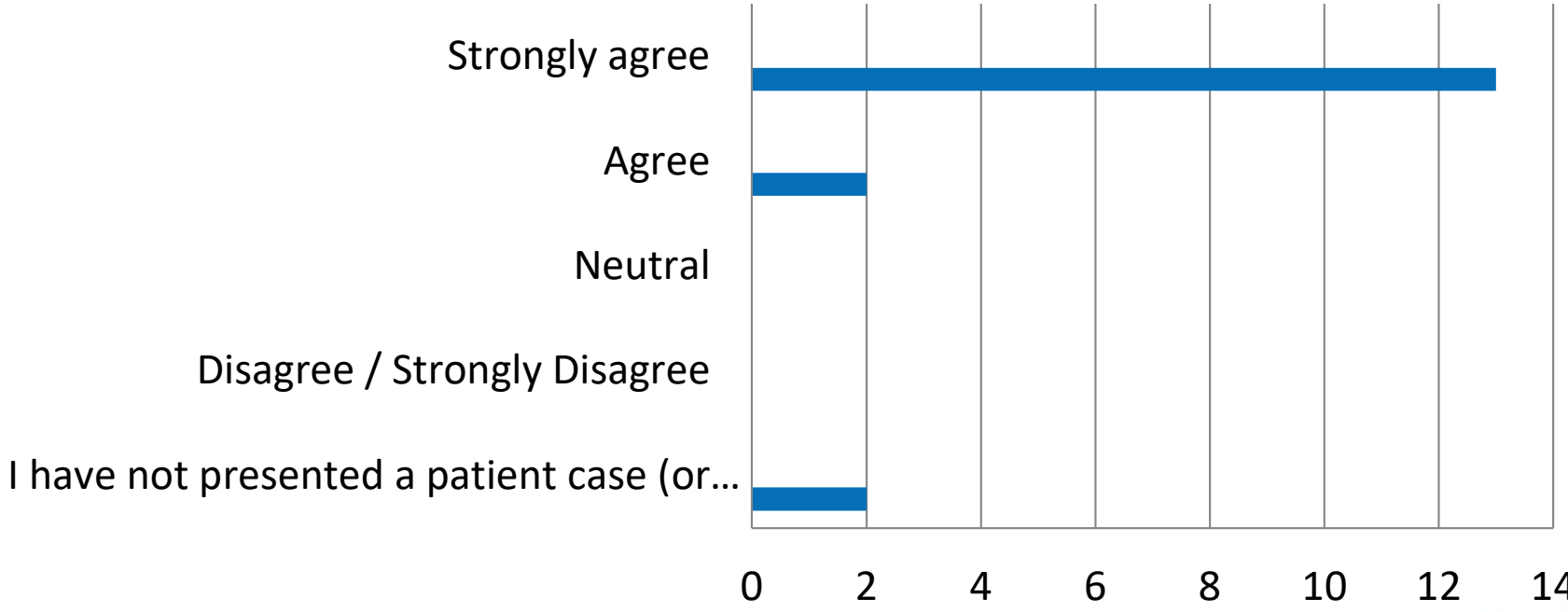
Pharmacist Survey – Non-MCK Responses

If you have presented a patient case (or had one presented on your behalf), do you feel the advice given during the Daily ASP Call has made your recommendations more effective?



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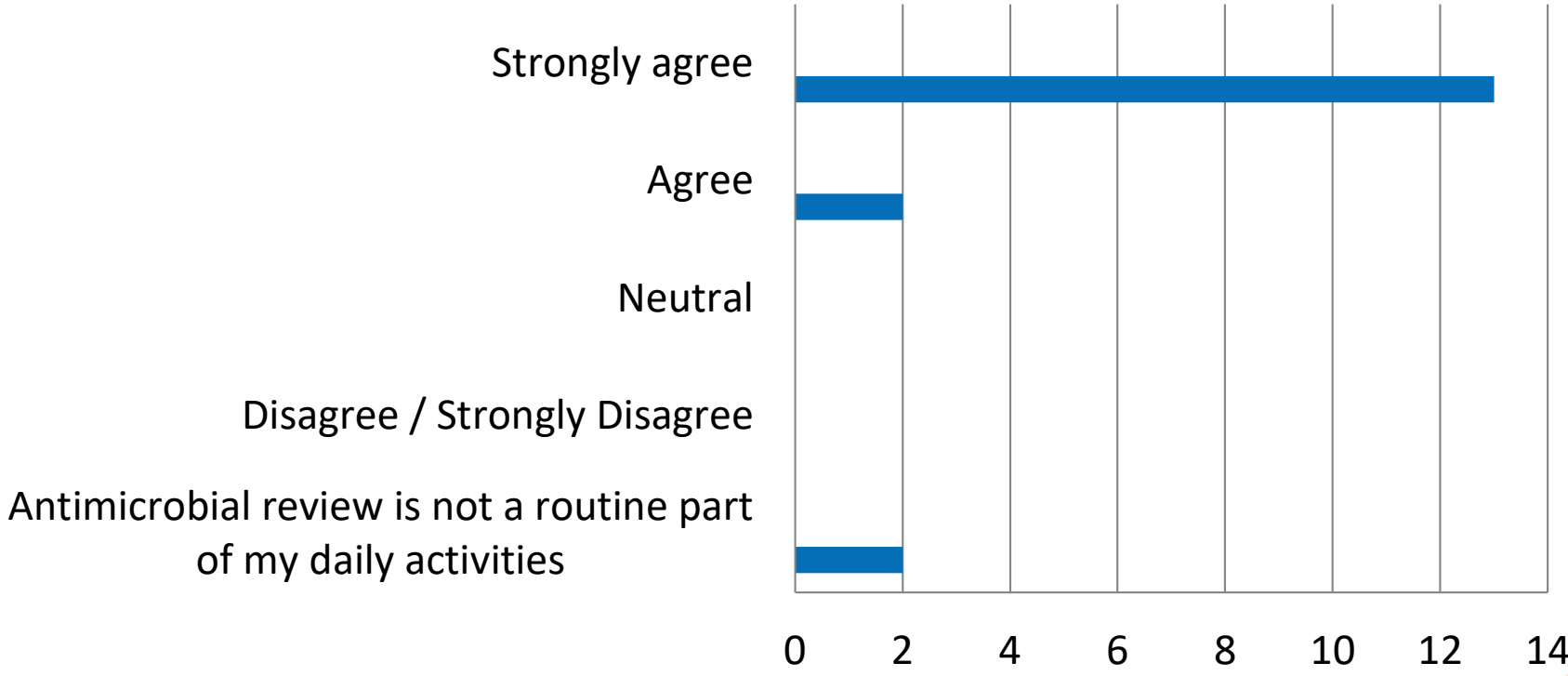
Pharmacist Survey – Non-MCK Responses

Are you likely to present a patient case (or have one presented on your behalf) during the Daily ASP Call in the future?



n = 17

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Pharmacist Survey – Non-MCK Responses

- Additional comments of note:
  - "It is a great resource and I feel has made a significant impact."
  - "It is great to get advice from specialist on a subject where many providers struggle. The process is expedient and professional. Thank you for all the support."
  - "I appreciate this call being available to our hospital."
  - "Even when not presenting a patient, the information/advice given is very helpful for future reference."
  - "**This tool is greatly appreciated by the entire patient care team... pharmacists, physicians and nursing. It provides an extra means of best practice clinical care for our patients.**"
  - **"Hospitalists are very receptive to the recommendations provided by the ID physicians and receiving this information from the pharmacist that participated during the ASP call. Hospitalist service often contacts pharmacy to have a patient case discussed during the daily call."**

Provider Feedback

- 91% acceptance rate, but how do the individual physicians feel about it…

"Together with my colleagues, I am extremely elated and happy to endorse the Antibiotic Stewardship Program in cooperation with The Avera Infectious Disease Specialists. Not only that this adds to the highest quality of patient care but it also augments my medical education and to the students under my preceptorship."

"This is a valuable service. We are able to get expert consultation on appropriate antibiotic use for our patients. This is a cost-savings as well as an appropriate use of antibiotics. We should continue this service."

Case Presentation #1

- 90 yr old female admitted with cellulitis of right leg
- Initiated on Nafcillin 2 gm IV every 6 hr plus Vancomycin 800 mg IV every 24 hr

Initial SCr = 1.01

Case Presentation #2

- 82 year old, end-stage COPD
  End of life vs possible early pneumonia
- Started on Ceftriaxone + Azithromycin
- Condition deteriorates over 2 days

Antibiotic Stewardship at Queen of Peace Hospital

- Optimizing antibiotic utilization to improve outcomes
- Service – not policing prescribers

Final thoughts

- It’s not always going to be black and white
- Listen to the patient

Can a health-system ASP make a substantial impact on an individual facility?

A. YES
B. NO

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Key Takeaways

- Set yourself up for success by developing an antimicrobial formulary, order sets/treatment pathways, renal dosing/IV to PO policies before tackling multidisciplinary prospective audit & feedback

- Existing resources can be used to deliver effective antimicrobial stewardship, even at a health-system level

- System-wide stewardship programs can positively impact individual facilities through education and support rather than policing antimicrobial use