### The Evolving and Continuing Antimicrobial Stewardship Program

Our experience in a Tertiary Community Hospital Brookwood Baptist Medical Center Grandview Medical Center

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### Origin:



#### Timeline leading to Antimicrobial Stewardship



- Sulfonamides, penicillin and streptomycin became available
- Harnessing of antibacterial agents for clinical use begins

I	1940s

 Penicillin resistance to Staph aureus is detected

#### 1960s

- Staph aureus resistance to methicillin emerges
- isolates obtained from ICU patients in a US surveillance system
  - system
     IDSA/SHEA published
     "Guidelines for
     Antimicrobial Resistance in Hospitals"

1990s

over 53% of

 MRSA is observed in

4

#### Overview:

- Who we are..
- What we did..
- What we do..
- How did we do that..
- Where do we want to be..
- NO DISCLOSURES!!

# **Brookwood Baptist Medical Center**

Location: Birmingham, AL

Licensed Beds: 645

Adult Critical Care Beds: 58

3 ID MD Practice – 1 or 2 ID on a daily basis Annual antibiotic spend: \$1,363,000



## **Grandview Medical Center**

- Location: Birmingham, AL
- Licensed Beds: 372
- Adult Critical Care Beds: 72
- 3 ID MD Practice 2 ID on a daily basis Annual antibiotic spend: \$1,107,347



# **Brookwood Baptist Medical Center**

#### **Existing ASP Initiatives (pre-August 2016)**

- Pharmacokinetic Dosing by Pharmacy
  All vancomycin and aminoglycosides
- Renal dosing adjustments
- IV to PO conversions
- Restricted Antibiotics
- Dose Optimization Extended Infusions Pip/Tazo
- Infectious Disease Pathway Order Sets (few)

## **ASP Must Haves**

- Core Team / Champion or Leader
- Administrative Support
- Antibiograms
- Goals
- Program Metrics / Monitoring
- Regulatory Standard Compliance

**KEY DRIVERS:** Enthusiasm Passion Teamwork



#### Antibiogram 2016:

Brookwood Medical Center - 2016 Antibiogram

						inpau				· · · ·									<u> </u>
GRAM NEGATIVE	#isolates	Amaicillia	Amo×icillin/ clavula.nate	Piperacilin/ tazobactam	Cefazelin	Cettuiaxeue	Cettazidime	Cefepime	Levoflexacio	Ciprofloxacin	Gentamicin	Lebranycin	Amkasin	Tetracycline (dexycycline)	Merceenem	Limetheprim' suftemethexezel	Oxacilin	Clindamucin	Vancemusin
Enterobacter cloacae	34			71		73	67	87	79	73	91	91	100	82	94	91			
Escherichia coli	289	35	72	93		88	88	90	60	60	89	90	99	63	99	61			
Klebsiella pneumonia	117		96	94	5	89	90	90	93	94	96	96	100	82	100	90			
Proteus mirabilis	50	86	95	100	5	94	93	93	74	74	82	87	100	0	100	84			
Pseudomonas <u>aeruginosa</u>	92			96			88	86	69	83	93	95	100		91				
GRAM POSITIVE																			
Enteracoccus faecalis	94	98							69 Urine Only	69 Urine Only				24 Urina Only					98
Staph aureus	233																		
MRSA 54%	125													94		96		52	100
MSSA 46%	108													97		99	100	79	100
Staph, coag negative	108													78		48	26	50	100

#### Antibiogram - 2017:

Brookwood Baptist Medical Center 2017 Antibiogram

GRAM NEGATIVE	#isolates	Ampicillin	Amoxicillin/ claxulanate	Piperacilio/ tazebactam	Cetazolin	Cettuaxene	Cettazidime	Cetepime	Levofloxacio	Ciprofloxacin	Gentamicin	Jebramksin	Amkacin	Tetracycline (dexxcs(line)	Merceenem	Trimethoprim' suffamethoxazol	Oxacillin	Clindamosin	Xansamzein
Escherichia coli	309	37	66	91	6	85	95	100	55	55	86	87	100	68	98	64			
Klebsiella pneumonia	117		89	92	15	93	100	100	94	95	98	97	100	69	100	89			
Proteus mirabilis	41	77	95	100	10	95	100	100	67	68	78	87	100	0	70	84			
Pseudomonas aeruginosa	94			97			84	88	77	84	87	96	100		88				<u> </u>
GRAM POSITIVE																			
Enterococcus faecalis	80	96							87 Urine Only					14 Urine Only					96
Staph aureus	211																		<u> </u>
MRSA 43%	90													93		91		48	98
MSSA 57%	122													92		100	100	78	100
Staph, coag negative	126													83		49	31	48	100
Top 3 pathogens by source: Un	ine - Eco	ll. Kleb pr	ieucas Ec	112(959555	is taesall	ş Spu	tum: Sta	ph aureus	, Pseudo	monas a	ervolosa	strep y	NOROS.	Blood -S	taph ç <u>o</u> g	g neg, St	aph aureu	is, EColi	L

## ASP – Existing Challenges

- Prolonged use of "empiric therapy"
- No follow-up for duration of therapy
- No de-escalation based on C&S information
- Optimizing Vancomycin
- Evolving Resistance patterns
- Corporate push to decrease pharmacy expense
- Lack of process to address all microbiology data

# **Re-Building the Team**

- ID physician
- Dedicated Antimicrobial Stewardship Pharmacist
- Pharmacy Staff / Management
- Infection Control
- Informatics pharmacist
- Administration
- Micro Lab

# Pharmacy Structure: Old vs. New

#### **Clinical Pharmacy Specialist**

- Scheduling:
  - M-F: CL1 (0700 1730) and CL2 (1100 – 2130)
    - 9 pharmacists rotated through these shifts
  - Sat, Sun: CL1 (0700 1730)
    - 3 rotating pharmacists

#### **Antimicrobial Stewardship Pharmacist**

- Scheduling:
  - ASP (0700 1730)
    - 3 rotating pharmacists who work M-Th or F - Su
  - M-F: CL2 (1100 2130)
    - 5 pharmacists rotate to cover

### Consistency and Communication are KEY

## Education

- Weekly Rounds: Q&A with ID physician
- Surgery PI In-service for pre-op antibiotics
- Vancomycin In-service for nursing units
- ASP module with post test for all nurses and pharmacists

MAD-ID Training – May 2017

- Basic training completed by 11 pharmacists
- Advanced training in process for 4 pharmacists

### **ASP Pharmacist Responsibilities**

- Weekly meeting/rounding with ID physician
- Monthly Antimicrobial Stewardship Committee (ASP, pharmacy management, infection control, informatics, administration)
- Vancomycin and aminoglycoside dosing for critical care
- Restricted Antibiotics
- Day of Therapy (DOT) notifications
- Inappropriate therapy interventions (Drug Bug mismatch, etc)
- De escalation of broad therapy
- Prospective Audit and Feedback to Prescribers

# Low Hanging Fruit

- DOT Notifications
- Expand restricted antibiotics and re-work criteria
  - Meropenem, micafungin
- Drug Bug mismatch
- Development of criteria for pharmacy to consult ID
- Automatic stop date for certain antibiotics (oral vancomycin, fidaxomicin)



# Day of Therapy Notifications

ASP pharmacist will communicate with prescriber (chart reminder, phone call or face-to-face interaction) about day of antibiotic therapy

Day of Antibiotic Therapy	Disease State	Action
7	Empiric antibiotic use, uncomplicated cellulitis or UTI	Contact prescriber
12	HAP, CAP that failed OP treatment, complicated cellulitis or complicated UTI	Contact prescriber
14	All except exclusions* (*osteomyelitis, endocarditis)	ID Consult by pharmacy

## **Restricted Antibiotics**

#### **Restricted to ID Approval / Consultation**

- Colistin (colistimethate)
- Cubicin (daptomycin)
- Noxafil (posaconazole)
- Teflaro (ceftaroline)
- Tygacil (tigecycline)
- Ambisome (Lip Amp B)

#### **Restricted by Criteria - Pharmacy Review**

- Merrem (meropenem)
- Mycamine (micafungin)
- Vfend (voriconazole)
- Zyvox (linezolid)

# Technology

- EMR = Cerner Millennium
  - Indication Required for all antimicrobial prescribing
  - ASP work page consolidated page that displays micro, antibiotic duration of therapy, labs, vital signs, *C.diff* risk assessment, prior ASP documentations
  - ASP Pharmacist Alerts
    - DAILY task for each patient on antibiotics 48 hours or longer
    - IV to PO candidate
    - Renal Dosing candidate
    - Drug Bug Mismatch, Positive Culture No Therapy

## Cerner ASP Workpage

							_
MPages Vew							
	Isola	tion: Visit Reason: PANCR	EATITIS				
Anti-Hicrobial Stewardship	=* @	Microbiology (8)					
at New Documentation		Last 6 months for all visits	*				
+ Suveilan	ce documentation	Pagert (	Torus .	Starth 11	3.45	(dent)	
A Notifications		MRSA Screen, PCR	Completed	Note		05/18/17	
New microbiology result Specmen: Perpheral	05/23 05:00	Blood Culture	Completed	Nobe		05/17/17	
Draw	(New York, New York,	Blood Culture	Completed	Note		05/17/12	
No growth at 5 days.		CDiff Tax Amp M	Completed	Note		05/0417	
New microbiology result Specimen: Peripheral	05/23 05:00	Giardia lamb Ag	Completed	twote		85/04/17	
Draw		Ova/Parasit Sti	Completed	Note		05/04/17	
No growth at 5 days.		Stool Culture	Completed	Note		05/04/17	
New microbiology result Specimen: Peripheral Draw	05/22 05:57	Urine Culture	Completed	Note		05/03/17	
1.00		Labs					· · · ·
Pharmacokinetic monitoring		ALC: NOT THE OWNER OF THE OWNER O	_	_	_		
Scheduled follow-ups		Last 3 days for all visits					
a Prior Documentation			Largert			Tractica	
No change	05/21 09:25	And a second second second	4894			within .	
BROWN PharmD, SAMANTHA: Day 5 of oral vanc for C Diff and day 5 of	0.0244.09-63	4 Therapeutic levels (D)					
metronidaple for pancriatitis		# CHEMISTRY (18)					
No change	05/19 11:54	Sodium Lal	143		143		
BROWN PharmO, SAMANTHA: Day 3 of oral vanc for C Diff and day 3 of			4.044		1 dust		
metronidazole for pancreatible		Potamium Lvl	*3.1		3.5	1.04	e
			A bee		2 Perce		
C-Dill Kisk Assessment	E+ 0	Chioride Lvil	* 111		* 112		- 1 - E
		Contra Co	# hrs		7.64/4		
Antimicrobial therapy	E* 4	002	23		20		2
Antimiscroteat therapy		Contract of the second s	Aba		2,044		
4 Current therapy		AGAP	12		12		
metroNIDA2OLE (Pagyl)		and the second s	4.64		3-bert		
500 mg = 2 tab, Oral, Q8hr		Caldum tul	*8.2		8.7	1.00	53
Indication: GUIntra-abdominal infection		and and a second se	4144		4.		
metroNIDAZOLE therapy: 7 days		OUN.	+3			-	
amebicides therapy: 7 days		Contraction Contraction	4.04		3 deat		
miscellaneous antibiotics therapy: 7 days		Creatinine Lvl	6.67		0.65	-	
vancomycin			4.555		1.044		

### **Cerner ASP Pharmacist Alerts**

Brook	kwood Medical Center ·	BMC - 5M, BMC - C1 + P	harmacy Anti-Microbial Ste	ware *	Submit	Sort: Patient No	eme - Asci =	Pa	tient Information
	050	MARK VOICH 1948	energing, officer ex.				1	25	
9	ø ∎ ⊌	Loc: BMC - 5M - 521.0	AdmitReg: 05/20/2017 Sex: Male					Notify	ASP Open ASP Summary
1	702702	54 Yes							
9	× 69	Loc: BMC - CV - 9235.2	AdmitReg: 05/09/2017 Sex: Male					Pharmacy /	Anti-Microbial Stewardshi notification
	(EE)		-			1000	100	Task Date/Time	05/23/17 05:00
-	1.4.1.2.2	58	Tears					Task Status	Pending
9	A 60		Admit/Reg: 05/11/2017 Sex: Female					Task Subject	New microbiology result
	调		A	0	0		1	Task Text	Specimen: Peripheral Draw No growth at 5 days.
		581	rears					and a state of the	05/22/17 14:13
9	\$ 60		Admit/Reg: 05/09/2017						
			Sex Female						
			- 49 Years						
	A 60		Admit/Reg: 05/17/2017	-		_	-		
	in o		Sex: Female						
•	<i>⊭</i> ы		Admit/Reg: 05/16/2017		-		-		
	Ĩ.		Sex: Female						
	S ( )		AdmitReg: 05/20/2017						
-	A 69		Sex: Male						

# Technology (cont)

#### **MedMined**

- Infection control
- Antibiogram
- Antibiotic Days of Therapy Tracking
- Annual Antibiotic Use Assessment And Benchmarking

# Technology (cont)

#### **Excel Daily Reports**

- Day of Therapy Notifications
- Restricted Drugs
- IV to PO
- Dose Optimization
- Interventions (Drug/Bug Mismatch, + Culture/No Abx, Escalation, De-escalation)
- Problems or Questions
- Focused reviews (meropenem)

# Day of Therapy Tracking

1				DAY OF T	HERAPY	NOTIFICATION	S - APRIL 2017			
	Date DOT placed on							Recommendations to DC abx accepted		
2	chart	FIN	Pt (Last, First)	Drug	DOT	Prescriber	Comments	within 72 hrs	DC'ed	DOT
3	4/3			Zosyn	10d			N	11d	Y
4	4/3			Fluconazole	7d			N	9d	Y
5	4/3			Vancomycin	7d			Y	9d	N
6	4/3			Vancomycin	8d			Y	9d	N
7	4/3			Zosyn	8d			Y	9d	N
8	4/3			Azithromycin	8d			N	14d	N
9	4/3			Levaquin	7d			N	14d	N
10	4/4			Levaquin	13d			Y	14d	N
11	4/4			Metronidazole	18d			Y	20d	N
12	4/5			Ceftriaxone	8d			Y	9d	N
12 13	4/5			Levaquin	8d			Y	9d	N
14	4/6			Cipro	6d			N	12d	N
15	4/6			Zosyn	13d		ID consult	N	15d	N

### Interventions

			NON-PHARMACOKINETIC INTERVENTIONS - APRIL 2017
Date	FIN	Patient Name	Intervention
4/3			MD note stated to discontinue vancomycin/merrem - still active called MD and abx discontinued
			Patient on ceftriaxone and pip/tazo for E.coli UTI (sensitve to both) left note on chart to de-escalate to one abx;
4/10			ceftriaxone d/c'ed
4/18			Spoke with about ESBL e coli UTI. He gave me a verbal order to switch from cefepime to nitrofurantoin.
	_		Spoke with Company up on the floor. I asked him about de-escalating vancomycin for MSSA. He said he would de-
4/20			escalate to oral clindamycin and send the patient home.
			Ancef as surgical prophylaxis with no stop date/duration and order comment stated not to continue past 24h after
4/24			surgery. Confirmed with RN patient had received 24h of Ancef after surgery. Discontinued Ancef.
4/24			Blood cx - Streptococcus Grp A on vancomycin report on chart - changed to Ceftriaxone
			Urine cx- > 100,000 cfu/ml E coli - no note - patient in process of being discharged spoke with RN he said patient
4/25			did not have S&S of UTI but would give results to daughter if had symptoms take to MD
4/28	-		Called Dr Mitchell and made him aware that patient is C Diff positive. He said he will add flagyl.
			NON-PHARMACOKINETIC INTERVENTIONS - MAY 2017
Date			Intervention
5/1			Patient on vancomycin for cellulitis and doxycycline also started for cellulitis. Contacted doctor and vancomycin d/c'ed
			Note in chart stated to d/c vancomycin but was not d/c'ed in Cerner. Contacted doctor and gave verbal order to
5/1			discotinue vancomycin
			Post-op Ancef with no stop date/duration with order comments not to exceed 24h past surgery. Called RN to
5/2			confirm 24h since surgery and d/c'ed Ancef.
			Read pt's progress notes and it said to start vancomycin and Levaquin but no orders entered; they had been
			entered under incorrect pt. Called doctor and vancomycin and Levaquin started on right patient and d/c'ed on
5/2			incorrect pt.
5/2		and the second second	Patient on Levaquin for UTI; urine cx - VRE. C/S left on chart> changed to Zyvox

### Metrics

Decide what to measure? Decide how to measure? Decide who to tell?

BBMC developed a concise scorecard reported at the monthly Antimicrobial Stewardship Committee meeting

2017 BBMC ANTIMICROBIAL STEWARDSHIP SCORECAR										
	GOAL	JAN	FEB	MAR						
Antimicrobial Spend		\$107,264.79	\$107,015.60	\$135,912.57						
Antimicrobial Spend per Adjusted Patient Day (APD)	<\$10	\$5.79	\$6.10	\$6.94						
Pharmacy-Monitored Vancomycin Patients		188	158	173						
Pharmacy-Monitored Aminoglycoside Patients		11	11	8						
Pharmacokinetic Monitoring, Total Intervention Count		1109	844	925						
Pharmacokinetic Monitoring and Intervention, Time Spent		286 h 30 m	228 h	251 h 40 m						
Days of Therapy (DOT) Notification Acceptance		66% (43/65)	87% (55/63)	89% (41/46)						
DOT Intervention Count		69	65	50						
Patients Discharged		4	63	4						
Antimicrobial IV to PO Intervention Count		28	28	38						
Antimicrobial Dose Optimization - EIPT		40	54	54						
Stewardship Interventions (Drug-Bug Mismatch, Positive										
Culture/No Abx, Abx Escalation/De-escalation)		22	21	29						
Restricted Drugs		36	41	51						
Anti-Infective Renal Dosing Intervention Count		41	59	78						
All Antimicrobial Monitoring, Total Intervention Count		1135	1377	1829						
Total Monitoring Time		138 h	166 h 30 min	220 h 5 m						

# What's Next? Higher Hanging Fruit

- Infectious Disease Treatment Pathways
- Accelerated Days of Therapy Notification
- Additional Restricted Antibiotics and Criteria
- Peri-Operative Antimicrobial Use
- Antifungal Stewardship
- Clostridium difficile Risk Reduction Strategies
- Rapid Diagnostics



### The Battle is on....



