
Preliminary Results of Antibiotic Utilization Studies Using Point Prevalence Survey In Botswana

Bene D Anand Paramadhas, Joyce Kgatlwane, Celda Tiroyakgosi, Matshediso Matome, Amos Massele, Jaran Eriksen, Lars L Gustafsson, Arno Muller, Brian Godman



BACKGROUND

- Bacterial resistance to antibiotics is a recognized emerging public health problem.
- A burden for public health systems.
- Threatens the progress in achieved health gains of countries.
- Inappropriate and indiscriminate use and disposal of antibiotics across human and veterinary health sectors and by industry are the main factors that promote evolution of bacterial resistance.
- The extent and appropriateness of antibiotic use in Botswana remains unknown.
- Countries are expected to develop a national action plan as per recent WHA resolution

OBJECTIVES

- To describe the extent and appropriateness of antibiotic use in hospitalized patients;
and
- Assess the structural capacity for promotion of appropriate antibiotic use in hospitals

METHODOLOGY

- **Study design** is quantitative observational descriptive.
- **Study method** involved a structured point prevalence survey to describe the extent and appropriateness of antibiotic use and to assess the institutional capacity for promotion of appropriate antibiotic use.
- **Study variables** had categorical and discrete at hospital, ward and patient levels.
- **Study settings** included 9 public and 1 private for profit hospitals representing all geographical regions of the country offering primary, secondary, tertiary and specialized care services.
- **Sampling frame** involved medical records of all inpatients that remained admitted overnight on the date of survey in the above 10 hospitals
- **Study sample** involved medical records of all patients or an authorized person who provided a voluntary verbal informed consent.

METHODOLOGY

- **Inclusion Criteria**

Medical records of all inpatients that remained admitted overnight on the date of survey

- **Exclusion Criteria**

Medical records of:

- ☐ Patients or authorized persons who do not grant consent
- ☐ Accident & emergency outpatients
- ☐ Consulted outpatients
- ☐ Patients kept in observation after chemotherapy or minor procedures who did not stay overnight
- ☐ Discharged patients lodging in ward due to lack of transport to their facility or homes
- ☐ Patients in labour ward
- ☐ Psychiatric in-patients and
- ☐ Inpatients who are exclusively on TB treatment.

METHODOLOGY

Definitions

- **Extent of antibiotic use** is the description of the pattern of antibiotic prescriptions made in reference to the various settings, patient and disease characteristics.
- **Appropriateness of antibiotic use** is the assessment of antibiotic prescriptions against the current national antimicrobial guidelines for adherence.
- **Structural capacity** means the ability of the hospitals to provide for the needs to promote appropriate antimicrobial use for achieving appropriate outcomes.
- **Point Prevalence** measures the prevalence of antibiotic use during an hospitalization episode (not what is prescribed on the date of survey)

METHODOLOGY

Ethical Considerations

- **Ethical consent granted** by the Health Research and Development Division (I3/I8/I X(560) and by all hospital research and ethics committees or managements.
- **Hospital employees who were trained** by MURIA & University of Botswana on “Principles in Research Ethics” and on the “Structured Data Collection Tool”.
- **Patients or authorized persons were explained** about the study and assurance of confidentiality through anonymizing collected data, clarified their doubts to receive verbal voluntary informed consent.
- **All collected data were de-identified** by data collectors at their hospitals to anonymize data before emailed to investigators.
- **Investigators assured of results** to be shared with their respective hospitals.

METHODOLOGY

Data Collection

- Data collected through hospital employees who were trained by MURIA & University of Botswana on “Principles in Research Ethics” and on the “Structured Data Collection Tool”.
- Communication support provided through telephonic and email communications to clarify any doubts.
- Data collected in hard copies of the tool and captured on the standardized Excel template with drop-down menus.
- Data collected in 30 working days in 10 hospitals (3rd May to 14th June 2017)
- Data collection took 1 day for Primary and Specialized hospitals with 1 and 5 data collectors respectively; 3 to 5 days in District hospitals with 1 to 2 data collectors and 10 days in referral hospital with 2 data collectors.
- Data was reviewed to verify any typographical errors, incorrect identification and to recognize the missing values in preparation for the analysis.
- Data presented with frequency and percentages.

**For patients who did not grant consent fill only these variables; mark as not consented and do not collect any data further!*

Section 1 - To be completed for all admitted patients

*Hospital Code:		*Ward Code:		*Patient Code:		*Consented:		Admission Date:		Age:		Sex:	
Admission Diagnosis?					Readmission?			Type of Infection:					
Employed?		Transferred in?		Any Hospitalization < 90days?				Any antibiotic use in past 90 days?					
Any Catheterization?	Any Intubation?		Malaria?		Malnourished?		State the ATC codes & duration of Antibiotics used in < 90days						
			HIV Status?		D4 Count < 6m:								
			TB Status?		On HAART								
the Patient on Antibiotics during this admission?:							(If you answered "Yes" then fill Section 2 below)						

Section 2 - To be completed only for patients currently on Antibiotic therapy other than for TB (Do not proceed further if the patient is treated only for TB)

Name of the Antibiotic: 1		Indication		Dose:		Frequency:		Route		IV-B/I
Prophylaxis/Treatment?		Medi. or Surg Prophylaxis?		Duration of surg. Prophylaxis				Prescribed by		
Start Date		No. of Doses Missed:		Antibiotic O/S?				GIT stable? prescription on DrugSheet		
CST ordered?		CST Results?		Name of Bacteria:				Changed to sensitive Abx? Oral Switch?		
Name of the Antibiotic: 2		Indication		Dose:		Frequency:		Route		IV-B/I
Prophylaxis/Treatment?		Medi. or Surg Prophylaxis?		Duration of surg. Prophylaxis				Prescribed by		
Start Date		No. of Doses Missed:		Antibiotic O/S?				GIT stable? prescription on DrugSheet		
CST ordered?		CST Results?		Name of Bacteria:				Changed to sensitive Abx? Oral Switch?		
Name of the Antibiotic: 3		Indication		Dose:		Frequency:		Route		IV-B/I
Prophylaxis/Treatment?		Medi. or Surg Prophylaxis?		Duration of surg. Prophylaxis				Prescribed by		
Start Date		No. of Doses Missed:		Antibiotic O/S?				GIT stable? prescription on DrugSheet		
CST ordered?		CST Results?		Name of Bacteria:				Changed to sensitive Abx? Oral Switch?		
Name of the Antibiotic: 4		Indication		Dose:		Frequency:		Route		IV-B/I
Prophylaxis/Treatment?		Medi. or Surg Prophylaxis?		Duration of surg. Prophylaxis				Prescribed by		
Start Date		No. of Doses Missed:		Antibiotic O/S?				GIT stable? prescription on DrugSheet		
CST ordered?		CST Results?	Yes/No	Name of Bacteria:				Changed to sensitive Abx? Oral Switch?		
Name of the Antibiotic: 5		Indication		Dose:		Frequency:		Route		IV-B/I
Prophylaxis/Treatment?		Medi. or Surg Prophylaxis?		Duration of surg. Prophylaxis				Prescribed by		
Start Date		No. of Doses Missed:		Antibiotic O/S?				GIT stable? prescription on DrugSheet		
CST ordered?		CST Results?		Name of Bacteria:				Changed to sensitive Abx? Oral Switch?		
If the prescribed Antibiotics how many were in INN (generic name)?				Did patient undergo any surgery in hospital - unrelated to admission diagnosis?						
Of all the prescribed Antibiotics how many were from BEDL?				If Yes name of the Surgery:						

RESULTS & DISCUSSION

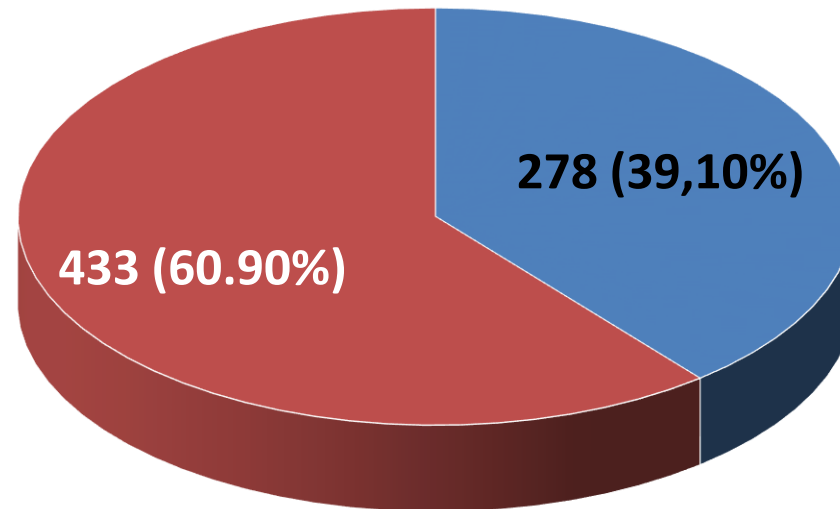
Patient Population (N=773)	Admissions	Consented	% Consented
No of Hospitalizations in Primary Hospital	69	67	97,10
No. of Hospitalizations in District Hospital	330	280	84,85
No. of Hospitalizations in Referral Hospital	311	307	98,71
No. of Hospitalizations in Specialized Hospital	63	57	90,48
Total no. of Hospitalizations & Consent	773	711	92,37

RESULTS & DISCUSSION

Ward Admissions & Consent (N=773)	Admissions	Consented	% Consented
Paediatric Intensive Care Unit (PICU)	6	6	100,00
Obstetrics & Gynaecology (OBGY)	209	199	95,22
Adult Medical Ward (AMW)	207	192	92,75
Adult Surgical Ward (ASW)	177	164	92,66
Paediatric Surgical Ward (PSW)	34	31	91,18
Adult Intensive Care Unit (AICU)	19	17	89,47
Paediatric Medical Ward (PMW)	68	59	86,76
Neonatal Intensive Care Unit (NICU)	53	43	81,13

RESULTS & DISCUSSION

Gender Distribution N=711

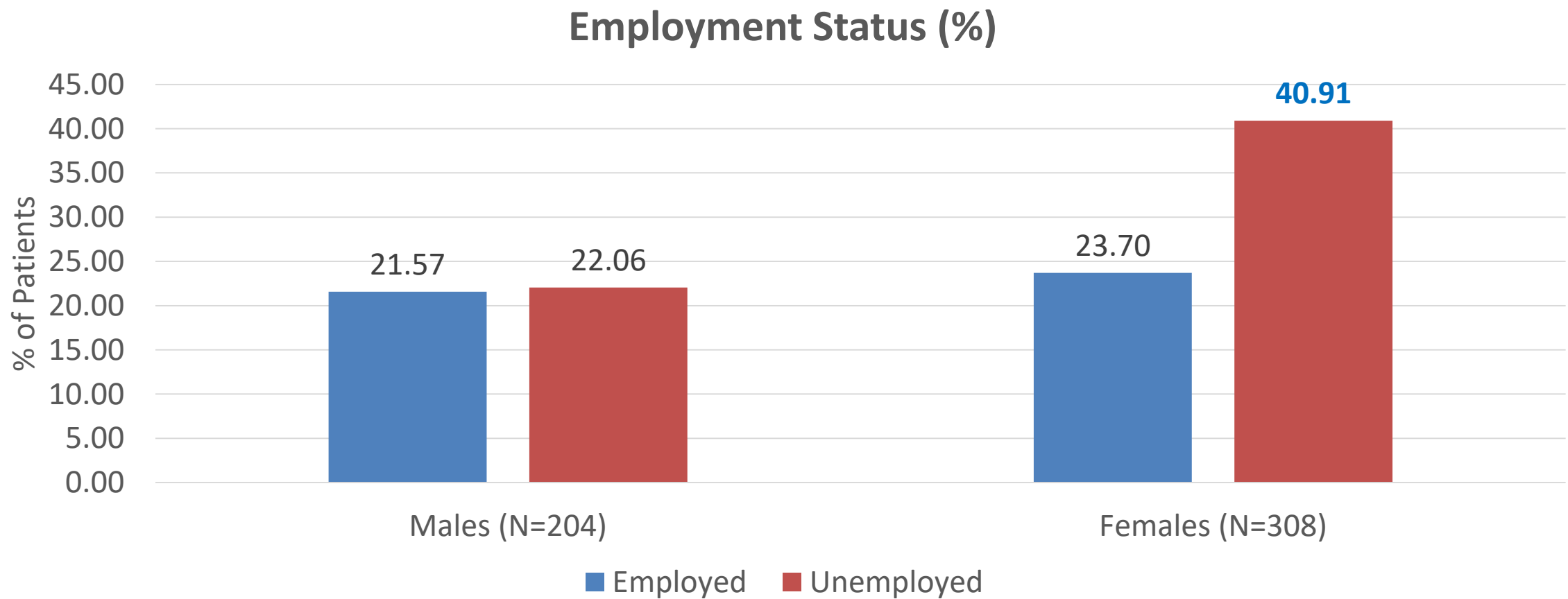


■ Males ■ Females

RESULTS & DISCUSSION

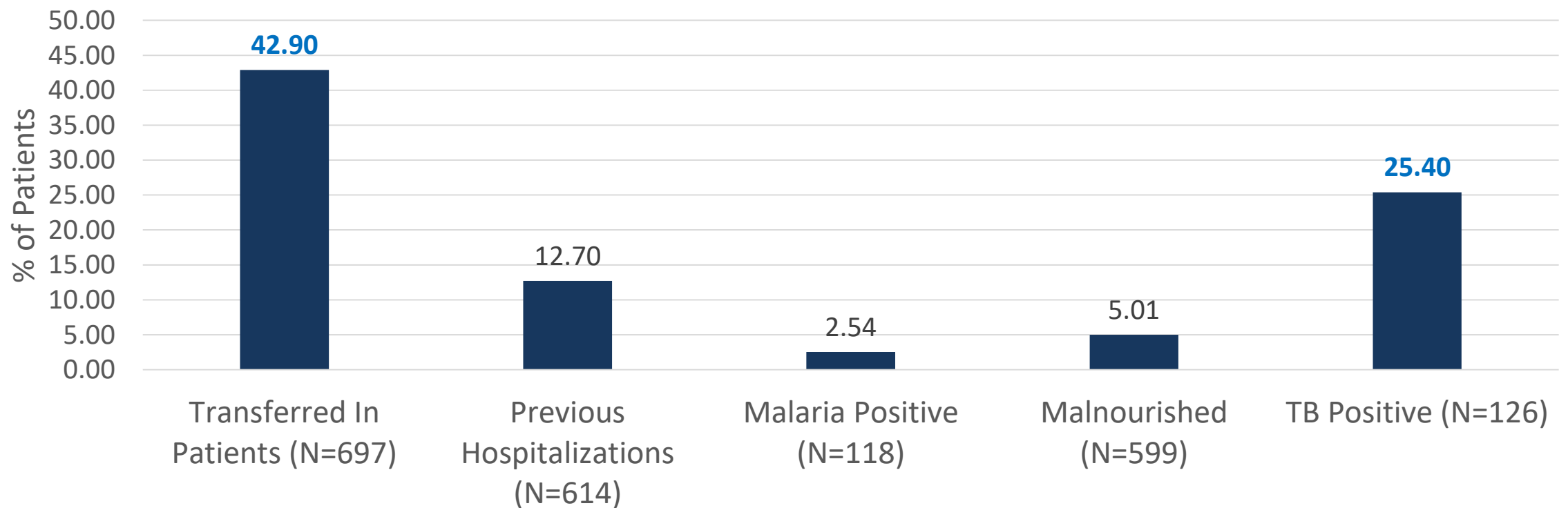
	Total	Age (Median)	Standard Deviation
Adult (Years)	627	38.79	22.28
Children (Years)	21	10.48	1.29
Infants (Months)	22	3.95	2.26
Neonates (Days)	41	4.83	6.95
Total	711		

RESULTS & DISCUSSION



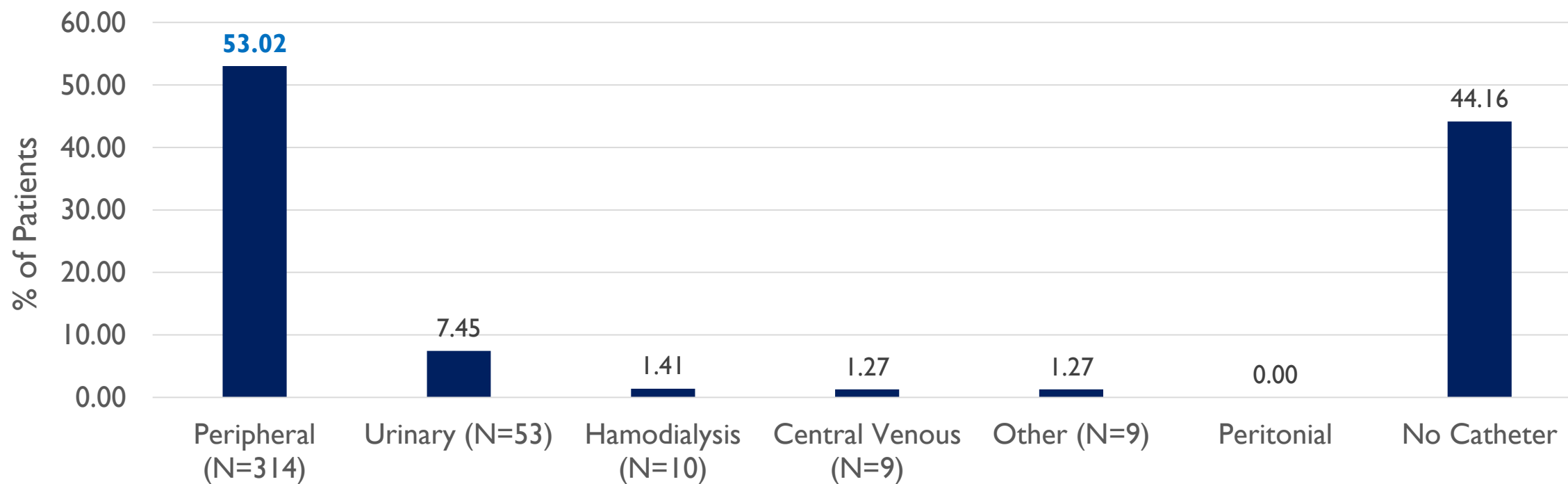
RESULTS & DISCUSSION

Risk Factors for use of Antibiotics



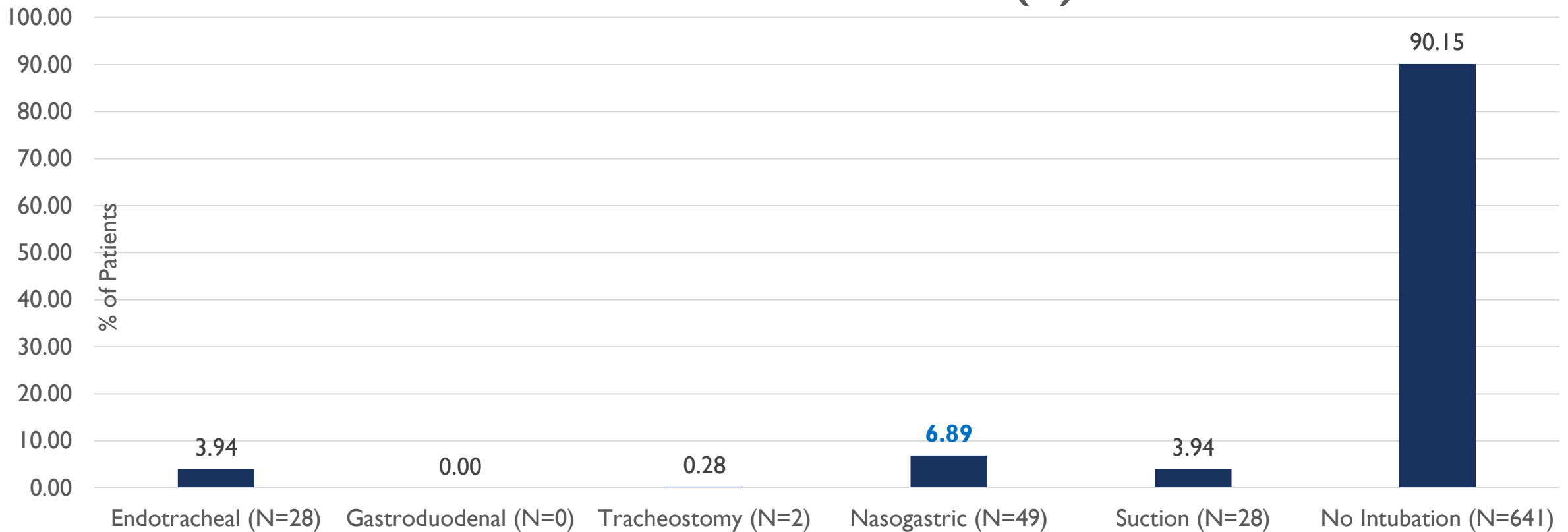
RESULTS & DISCUSSION

Risk Factors -Catheter Use (%)

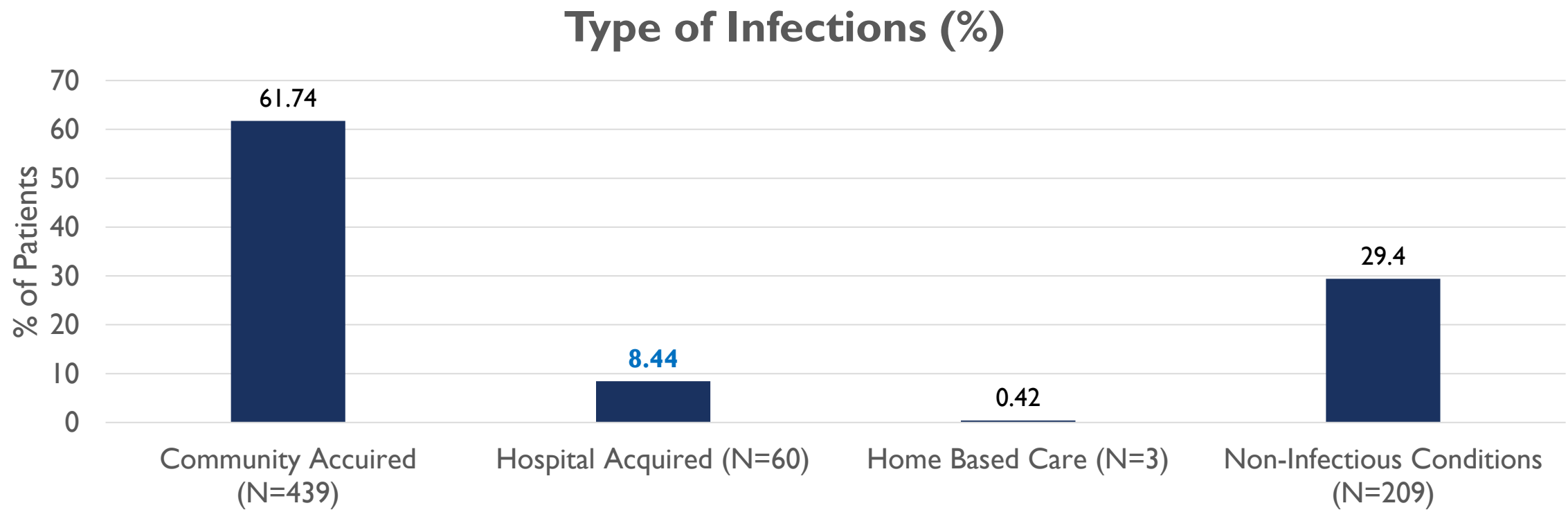


RESULTS & DISCUSSION

Risk Factors - Intubation (%)



RESULTS & DISCUSSION

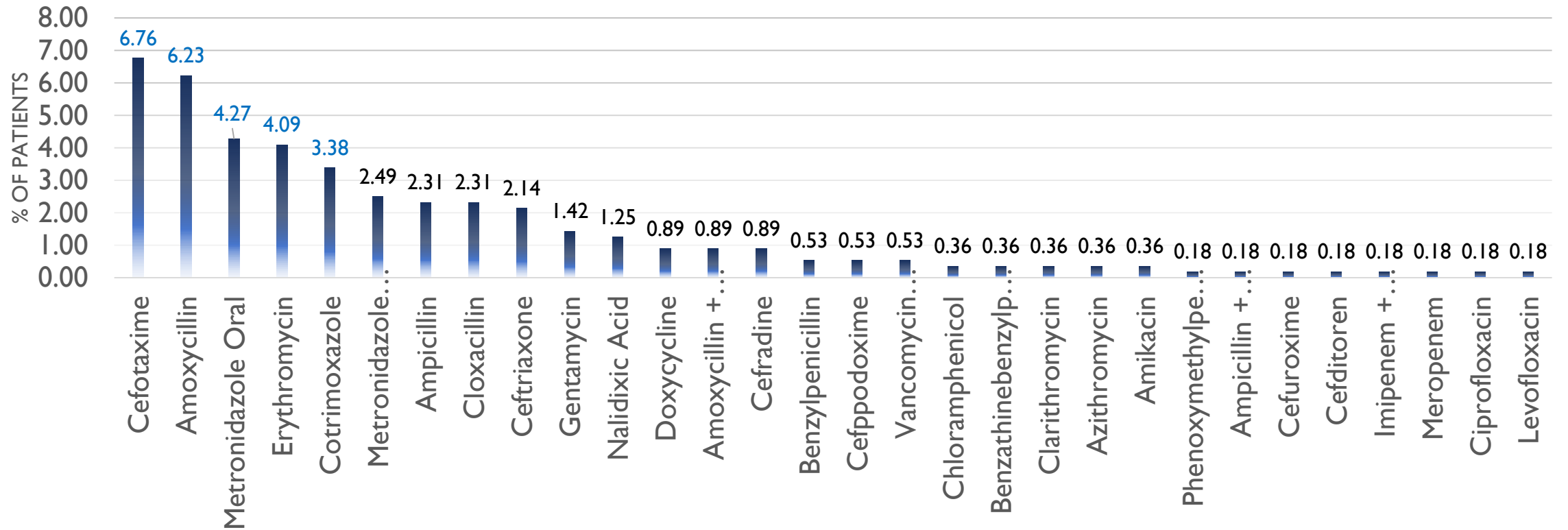


RESULTS & DISCUSSION

HIV Status Among Hospitalized					
	Admissions	Tested	Positive	Negative	On HAART
Total	711	462	185	277	158
Percentage	100	64,97	40,04	59,95	85,40

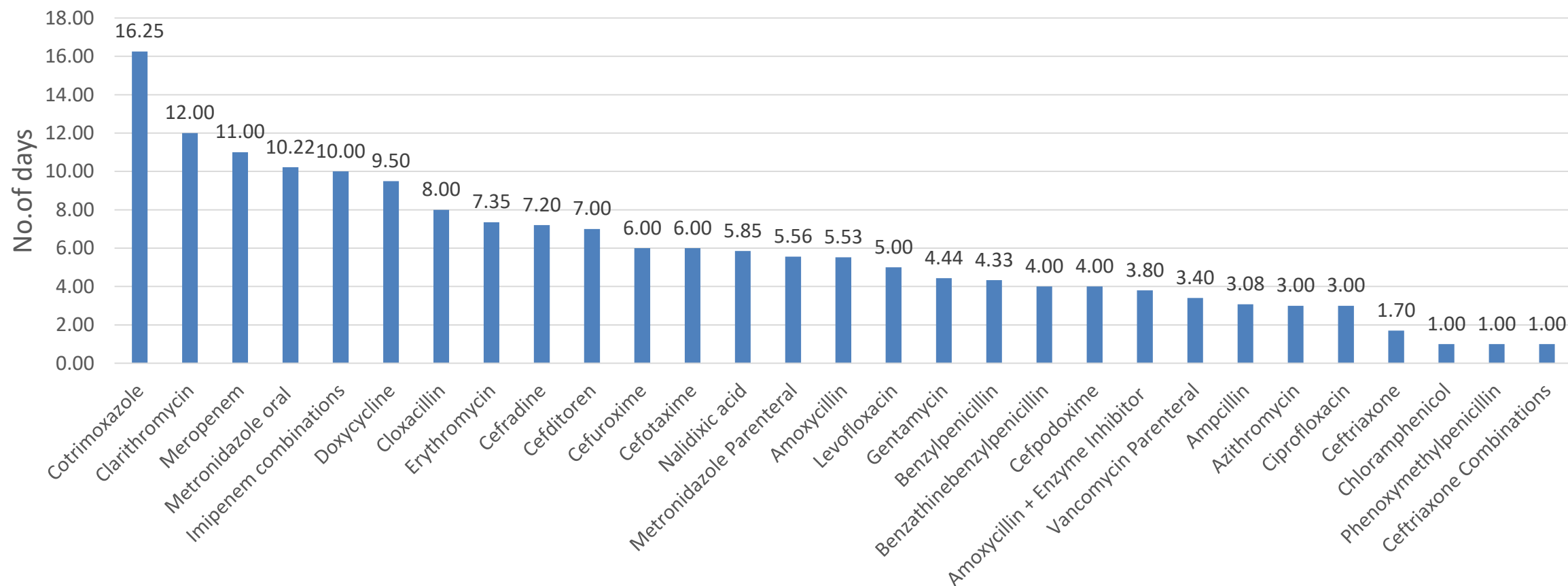
RESULTS & DISCUSSION

Previous Antibiotic Exposure N=134 (%)



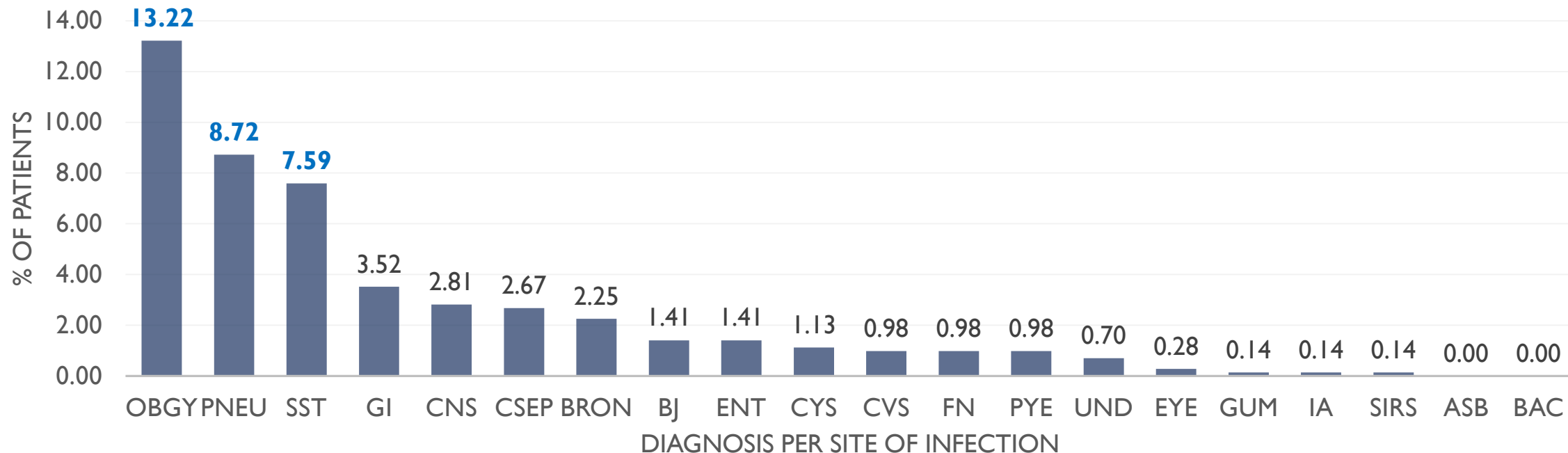
RESULTS & DISCUSSION

Mean Duration of Pre-hospitalization Exposure of Antibiotics



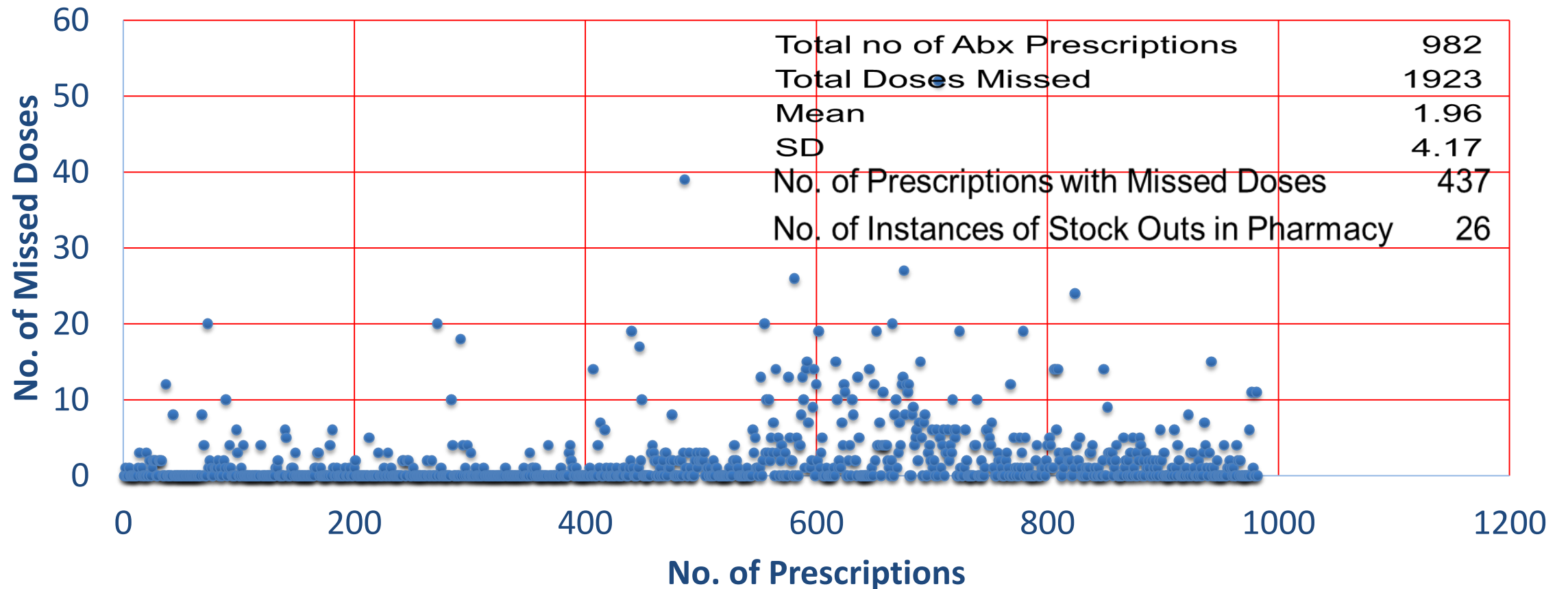
RESULTS & DISCUSSION

Admission Diagnosis as Per ECDC Diagnosis Codes (%) N=339



RESULTS & DISCUSSION

Missed Doses



RESULTS & DISCUSSION

	Primary	District	Tertiary	Specialty
Total No. of Antibiotic Prescriptions	77	283	541	81
No. of Medical Records Reviewed (Consented)	67	280	307	57
No. of Admissions for Bacterial Infection/ Surgical Prophylaxis	59	155	114	14
Antibiotic Prescribing Ratio Per Patient	1.31	1.83	4.75	5.79

Prescription Pattern Among Hospitals in Botswana

ATC Code	Name	No. of Prescription	Specialist	Tertiary	District	Primary
J01DD01	Cefotaxime	199	17	101	67	14
J01XD01	Metronidazole Parenteral	126	12	67	35	12
J01CA01	Ampicillin	95	1	57	27	10
J01CA04	Amoxycillin	82		41	31	10
J01CR02	Amoxycillin + Enzyme Inhib	79	7	62	7	3
P01AB01	Metronidazole oral	77		42	31	4
J01EE01	Cotrimoxazole	49		32	14	3
J01GB03	Gentamycin	43	2	24	13	4
J01XA01	Vancomycin Parenteral	31	7	15	9	
J01GB06	Amikacin	28	1	27		
J01DD04	Ceftriaxone	26	16		8	2
J01FA01	Erythromycin	26	1	5	17	3
J01AA02	Doxycycline	24		14	9	1
J01DC02	Cefuroxime	17	2	10	4	1
J01DH02	Meropenem	16	3	12	1	
J01MB02	Nalidixic acid	14		7	3	4
J01CF02	Cloxacillin	13		8	2	3
J01DB09	Cefradine	7		6		1
J01CR05	Piperacillin + Enzyme Inhib	7	3	4		
J01DH51	Imipenem combinations	5	5			
J01DD13	Cefpodoxime	4	2	1	1	
J01FF01	Clindamycin	4		2	2	
J01MA12	Levofloxacin	2		1	1	
J01FA10	Azithromycin	1				1
J01CE01	Benzylpenicillin	1				1
J01DB04	Cefazolin	1	1			
J01DD02	Ceftazidime	1		1		
J01DB01	Cephalexin	1	1			
J01BA01	Chloramphenicol	1		1		
J01FA09	Clarithromycin	1			1	
J01GA01	Streptomycin	1		1		
	Total	982	81	541	283	77

RESULTS & DISCUSSION

Prevalence of:	Specialist (%) N=57	Tertiary (%) N=307	District (%) N=280	Primary (%) N=67
Injectable antibiotic use	136.84	121.82	60.00	67.16
Oral antibiotic use	5.26	54.40	40.36	47.76

RESULTS & DISCUSSION

Duration of Surgical Prophylaxis	Specialist (%) N=27	Tertiary (%) N=58	District (%) N=31	Primary (%) N=2
1 dose Surgical Prophylaxis	25.93	0.00	6.45	0.00
1 day Surgical Prophylaxis	7.41	0.00	3.23	0.00
> 1day Surgical Prophylaxis	66.67	100.00	90.32	100.00

RESULTS & DISCUSSION

CST Indicators	Specialist (%) N=57	Tertiary (%) N=307	District (%) N=280	Primary (%) N=67
Culture & Sensitivity Ordered	29.82	2.61	3.57	22.39
Culture & Sensitivity reported	58.82	50.00	70.00	26.67
Antibiotic therapy consolidated	100.00	100.00	0.00	100.00



ASSESSMENT OF INSTITUTIONAL CAPACITY FOR PROMOTION OF ANTIMICROBIAL STEWARDSHIP



A. Infrastructure		Specialist (N=1)	Tertiary (N=1)	District (N=4)	Primary (N=4)
1	Formal ASP	100	0	25	0
2	ASP part of Hospital Organogram	100	0	50	25
3	An appointed ASP Team	100	0	25	25
4	ASP lead by Physician	ID Physician	0	25	0
	If not who?		Pharmacist	None	None
5	Microbiologist accessible	100	100	25	25
6	Pharmacist responsible for ASP	100	100	25	25
7	Salart Support for ASP	0	0	0	0
8	IT support for ASP	100	100	25	25
9	Functioning Microbiology Lab	100	100	100	75
10	Total number of culture tests conducted in the past 3 months?	2508	739	588	396
11	Continuous supply of reagents for culture media available in the last 3 months?	100	100	75	75
12	Number of days in the past 3 months when cultures ingredients unavailable for preparing the culture media.	0	0	20(1)	5(1)
13	Was there a continuous supply of Antibiotic Discs in the hospital in the last 3 months?	100	100	100	75
14	Number of days in the past 3 months when Sensitivity Tests could not be performed?	0	0	0	0
15	Number of days when Sensitivity Tests could not be performed due to a breakdown of equipment in the past	0	0	0	0
16	Botswana Antimicrobial Guidelines 2012 available in the ward?	0	100	50	50
17	Functioning Infection Prevention & Control Committee in the hospital?	100	100	100	75
18	Functioning Drugs and Therapeutics Committee in the hospital?	100	0	100	75
19	Was the current Botswana Essential Drug List June 2016 version available/accessible in the ward?	100	100	25	25

19	Was the current Botswana Essential Drug List June 2016 version available/accessible in the ward?	100	100	25	25
B. Policy and Practice					
20	Facility have specific treatment recommendations based on local antimicrobial susceptibility	0	100	50	0
21	Facility have a written policy that requires prescribers to document an indication in the medical record	100	0	50	0
22	Preauthorization for specified antimicrobial agents to be approved by a physician or pharmacist.	0	100	50	25
23	Procedure for a physician, pharmacist to do post prescription review after 48hrs?	0	0	0	0
24	Antimicrobial guidelines used at wards for empiric decision making?	0	0	75	25
25	Current antibiogram available in the hospital (with data from last 12 months)?	100	100	0	0
26	Continuing education provided to prescribers on local Antimicrobial Resistance pattern	0	100	0	0
C. Monitoring and Feedback					
27	Facility produced a cumulative antimicrobial susceptibility report in the past year?	100	100	0	0
28	Facility monitors if the indication is captured in the medical record for all antimicrobial prescriptions?	100	0	25	0
29	Facility audits or reviews surgical antimicrobial prophylaxis choice and duration?	100	0	25	0
30	Antimicrobial audits or reviews communicated directly with prescribers?	0	0	25	0
31	Facility monitors antimicrobial use by grams (Defined Daily Dose [DDD]) or counts (Days of Therapy [DOT]) of antimicrobial(s) by patients per days?	0		0	0
32	ASP team produces an annual report focused on antimicrobial stewardship the past year?	0	0	0	0

LIMITATIONS

- No on-site support for data collectors
- Committed time for staff in service to collect data was difficult though released from work due to staff shortages.
- Confusion with several terminologies for diagnosis: Impression, Assessment, Query??? Rule out..... Etc.
- No standard template used for taking patient history; information may not be available, a times to search volumes of notes. E.g. previous hospitalization, medication history etc...
- Some tests are not indicated for the admitted condition; therefore TB, Malaria, CD4 counts or HIV wasn't tested.
- Difficult to confirm a HAI as not recorded as the diagnosis and not elaborately defined in data collection tools.
- Field for "Antibiotic Stop date" was not provided
- Discrepant prescription orders: Electronic prescriptions when stopped; it wasn't stopped in drug administration sheets – the later used for the study as nurses use this to administer medications.
- Obtaining consent at some settings difficult due to participant bias (Moms of Paediatric and Neonatal)

ACKNOWLEDGEMENTS

- Ministry of Health and Wellness Botswana
- Health Research and Development Unit MOHW Botswana
- University of Botswana
- Hospital managements and Research & Ethics Committees.
- All In-service staff who extended their valuable service time for Data Collection