

Stewardship in Africa - challenges and opportunities

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1. Introduction and MURIA

2. Anti-infectives - hospital

3. Anti-infectives - ambulatory care

4. Initiatives to improve antimicrobial use

5. Conclusions

Infectious diseases are common across Africa. Inappropriate use of antimicrobials is a concern that needs addressing

- Sub-Saharan Africa has the highest burden of infectious disease in the world – including high rates of HIV. At one stage in Botswana nearly 50% of women aged 30 to 34 years had HIV although now decreasing
- A number of factors including extensive self-medication with antibiotics tripled antibiotic consumption in sub-Saharan Africa in recent years. There is also extensive self-medication of medicines for malaria in some African countries. These concerns need to be addressed to reduce rising AMR rates
- Enhancing appropriate antimicrobial use in both hospital and ambulatory care has been hampered by lack of data and initiatives across countries. This is changing with ongoing research and national action plans, with MURIA playing a role

MURIA has now been ongoing for three years and is rapidly developing

- The Medicines Utilisation Research Group in Africa (MURIA) was officially launched at the Nelson Mandela Metropolitan University in Port Elizabeth South Africa on 27 January 2015
- It was agreed that the MURIA Group should be a multidisciplinary network of healthcare professionals striving to promote sustainable, rational medicine use in Africa
- This achieved through collaborative research and capacity building, with the objective of improving the quality of life of patients as well as the quality of medicine utilisation in Africa
- There have been a number of Pan-African and national symposia since then as well as multiple publications to develop base line data and assess initiatives to provide future direction

MURIA was officially launched at Port Elizabeth in January 2015 and taken forward with the help of UB and UNAM



The second MURIA symposium in Botswana was a great success with considerable interaction among delegates from across Africa



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High rates of antibiotic use in hospitals in Africa aided by high HIV rates. Concerns with SSIs and lack of AMS programmes

- There are high rates of antibiotic use among hospital patients in Africa exacerbated by high HIV rates in some of the countries and over use of antibiotics in ambulatory care
- PPS programmes are ongoing to lay a foundation for quality improvement programmes as part of ongoing stewardship programmes. This includes investigating issues of missed doses and the lack of IV to oral switching where appropriate
- There have also been recent studies on antibiotic prophylaxis to prevent SSIs which have identified concerns with the timing of administration and adherence to guidelines
- There are also concerns with the lack of instigation of AMS programmes across Africa. This is starting to be addressed in national action plans with South Africa leading the way with national requirements

There are high rates of antibiotic use in hospitals in Africa aided by high HIV rates. There are concerns with CST requests

In Botswana:

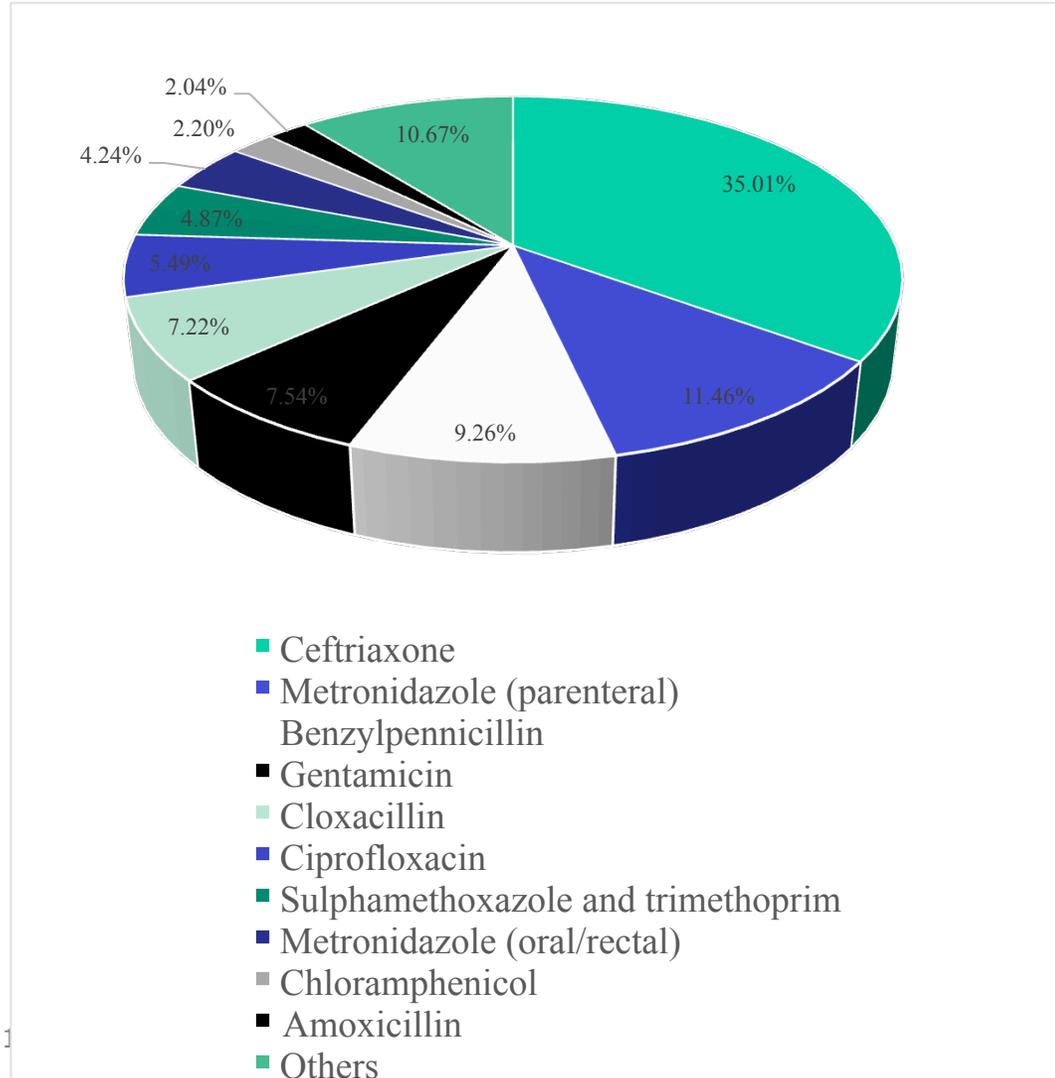
- Nearly 70% of hospitalizations in the recent PPS study involving 10 hospitals were for infectious diseases, with a high proportion of HAIs
- 982 antibiotics were prescribed for 711 patients, with up to 1.76 antibiotics per patient in tertiary hospitals
- There was a high frequency of missed doses (averaging 1.96/ patient)
- 40% of patients had HIV when tested (65% of patients), with 85% on HAART
- Cefotaxime (cephalosporins) were the most used antibiotics, with variable requesting of CST (up to 30% in Specialist hospitals) and consolidation thereafter

In Zimbabwe:

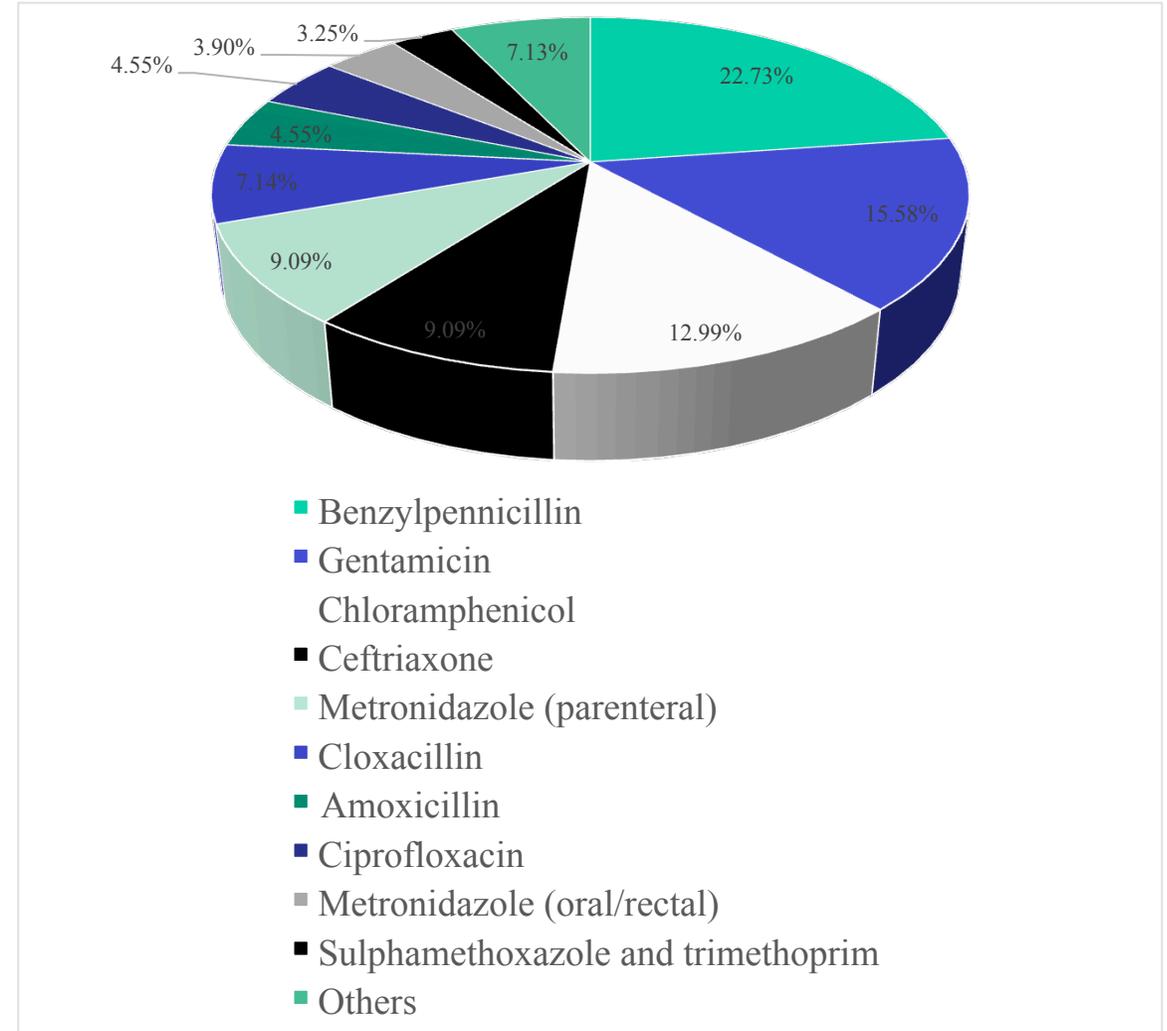
- 810 records analysed among 18 health institutions with 1523 antibiotics prescribed
- Most common antibiotics were ceftriaxone injection in 406 patients (27%) followed by benzylpenicillin
- Culture and sensitivity testing was undertaken in only 91(11%) of these patients

In Zimbabwe there was variation in the antibiotics used depending on the hospital type, e.g.

Central Hospitals



District Hospitals



There are high rates of antibiotic use in hospitals in Africa aided by high HIV rates with concerns with lack of switching in some

In South Africa (pilot study):

- 512 patient files were surveyed from 39 wards in a recent pilot study in a leading tertiary hospital in SA
- The overall prevalence of antimicrobial use was 38%, with beta lactamase inhibitors and antimicrobials for TB drugs being the most prevalent antimicrobials prescribed
- A high percentage of antibiotics were modified following CST results, and almost 100% of antimicrobials prescribed complied with the national essential medicine list and guidelines
- However, there were concerns with the lack of IV to oral switching where appropriate

There are concerns with the use of antibiotics to prevent SSIs among hospitals in Africa, which is being addressed

In Botswana:

- A prospective study involving 400 patients has recently been undertaken in a leading tertiary hospital in Botswana with all enrolled patients followed-up for 30 days post discharge
- 35.8% of surgical procedures were emergency and 64.2% elective. The most common operations were exploratory laparotomy, appendectomy and mastectomy
- Antibiotics were given in three quarters of the patients, mainly postoperatively with the most commonly prescribed antibiotics being cefotaxime and metronidazole
- The overall incidence of SSI was 9%. However, concerns with the high rate of antibiotic administration post operatively has already resulted in programmes to address this as well as improve the appropriateness of antibiotics prescribed

There are concerns with the use of antibiotics to prevent SSIs among hospitals in Africa, which is being addressed (cont.)

In Kenya, a recent prospective study analysing the use of antibiotics to prevent SSIs in patients with neurotrauma found that:

- The incidence of SSIs was 37.7% with ceftriaxone the most common antibiotic used
- Not surprisingly patients on prophylaxis were less likely to have an SSI than those who did not receive prophylaxis
- The presence of an epidural haematoma was a risk factor for the development of SSIs (Crude RR 2.456, 95% CI 1.474-4.090)
- Antimicrobial prophylaxis was most effective in patients who underwent evacuation of hematoma by craniotomy (risk reduction, 62.5% (CI, 29.0% -96.0%))

There were also concerns with compliance to SAP guidelines for pediatric patients among private and public hospitals in SA

- Compliance to surgical antimicrobial prophylaxis (SAP) guidelines for paediatric patients undergoing surgery were assessed in one of four surgical sub-specialties in both public and private hospitals in South Africa based on an eight month retrospective chart review
- Prescriptions of antimicrobials as SAP was compared to current SAP guidelines, consolidated from a literature review, regarding 5 criteria - appropriate antimicrobial selection, dosing, timing of administration, redosing and duration of treatment
- 224 charts we reviewed (112 from each type – private and public hospitals). The majority of patients received SAP when indicated. However, 21.1% and 45.9% of patients received antimicrobials without an indication, respectively, from public (teaching) and private hospitals
- Compliance to all five of the criteria was not met by either hospital type although the teaching hospital met the most criteria (three out of five) in 58.8% of situations
- Overall, current SAP practices in South Africa's teaching and private hospitals diverge from current SAP Guidelines. Non-compliance was largely attributed to inappropriate selection and dosing. Quality improvement interventions are already happening

There are ongoing initiatives to improve appropriate prescribing in hospitals but variable across Africa

- In Namibia, the level and predictors of compliance to national antibiotic standard treatment guidelines (NSTGs) for the management of acute infections in hospitals was recently analysed
- The majority of prescriptions (62%) complied with the NSTGs; however, lower than national targets (95%). Most prescriptions were empiric and prescribers typically made reference to the NSTG (58%)
- Good concurrence between signs and symptoms with the diagnosis; diagnosis of upper respiratory tract, oral-dental and urogenital infections
- Prescribing of penicillins or combination antibiotics and amphenicols were independent predictors of compliance to the NSTGs
- The main behaviours associated with antibiotic prescribing were patient influences, clinical state, and access to guidelines

There were also good adherence to ceftriaxone guidance in a leading hospital in Ghana providing direction

- A cross-sectional study was recently undertaken to evaluate the appropriateness of ceftriaxone prescribing in a leading hospital in Ghana
- Ceftriaxone prescribing in patient record cards was assessed using modified WHO drug utilization evaluation criteria as well as referencing the national standard treatment guidelines in Ghana and the ceftriaxone package insert
- 251 patients were assessed. Ceftriaxone was most commonly prescribed for comorbid malaria with bacterial infections, urinary tract infections, sepsis and gastroenteritis.
- The appropriateness of the indication was 86.9%, with the doses most prescribed being 1 g (41.4%) and 2 g (39.4%)
- Stat dosing and a once daily dosage regimen constituted 51.4% and 84.5% of prescriptions respectively, with the most common duration of treatment being 1 (51.4%) and 2 days (35.1%)
- Overall appropriateness of prescribing was 93.0% against a pre-set threshold of 97.9% enhanced by educational activities. Additional activities are ongoing to further improve appropriateness

There are concerns with the level of AMS programmes across Africa that urgently needs addressing

- There are considerable deficiencies in AMS programmes among even tertiary facilities in Nigeria
- Completed questionnaires from 17 out of 25 tertiary healthcare facilities showed only 6 (35.3%) had a formal organizational structure dealing with AMS and a team responsible for ASP
- Facility-specific treatment recommendations based on local antimicrobial resistance pattern were available in only 4 (23.5%) facilities
- A policy on approval for prescribing specified antimicrobials, and a formal procedure for reviewing their appropriateness, was present in only 2 (11.8%) facilities
- The cumulative antimicrobial susceptibility reports from the previous year were available in only 3 (17.6%) facilities while results of antimicrobial audits were communicated to prescribers in only one facility. This needs addressing

There are concerns with the level of AMS programmes among the 10 hospitals in Botswana that took part in the PPS study

#	Indicator	Score (%)
1.	Availability of a formal ASP	20%
2.	ASP part of hospital's Organizational Structure	40%
3.	An Appointed ASP team	20%
4.	ASP lead by a Physician	20%
4a.	Who provides leadership? (Pharmacist)	10%
5.	Have an accessible Microbiologist	50%
6.	Have a responsible Pharmacist to ensure appropriate use of antibiotics	50%
7.	Receive salary support for ASP activities	0%
8.	Have IT support for ASP activities	40%
9.	Have a functioning Microbiology lab	100%
10.	Number of culture tests done in last 3 months = 4261	Median 139 IQR 37.5-346.5

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There are considerable concerns with the prescribing and dispensing of antibiotics in ambulatory care across Africa

- There are concerns with the prescribing and dispensing of antibiotics (and anti-infectives) across Africa with high rates of self-medication with antimicrobials especially where no universal health care
- This includes countries such as Uganda and Zambia; however, encouragingly more limited self-purchasing/ medication of antibiotics now seen in Kenya
- There are also concerns with the prescribing of antibiotics as well as ongoing methods to assess the quality of antibiotic prescribing among PHCs in Africa
- This is leading to suggestions to develop new indicators – building on the original WHO indicators - as these were developed in 1985 before the HIV/ AIDS epidemics in Sub-Saharan Africa as well as the rise in NCDs, e.g. in South Africa, 70% of women are either overweight or obese with a 50% prevalence of hypertension among adults in some African countries

High rate of self-purchasing of anti-infectives in Tanzania, Uganda and Zambia – less in Kenya

- In Uganda, out of the 200 households surveyed most ARI cases in children under 5 were inappropriately managed with high prevalence of antibiotic use at 43%. Amoxicillin (31.4%) and cotrimoxazole (30%) were the most self-medicated antibiotics
- In Zambia, 97% of community pharmacists stated that clients frequently requested non-prescribed antibiotics. Encouragingly, pharmacists usually asked clients' indications (94%), counselled on dosing (96%) and suggested changes to antibiotic choices (97%). However, all pharmacies (100%) dispensed non-prescribed antibiotics
- Limited self-purchasing of antibiotics in Kenya - only 12.6% in a recent study (lower than previously) - with no dispensing of antibiotics for influenza or a common cold. Generally good dispensing processes among selected community pharmacists in Kenya aided by educational inputs
- In Tanzania, high rate of self-purchasing of antibiotics and antimalarials. Variable knowledge of preventive treatment in pregnancy (IPTp) in pharmacies, which needs addressing

There were concerns with antibiotic prescribing in Botswana PHCs.

There is a need to develop new QIs

- The average number of medicines per prescription among PHCs in Botswana was 2.8; 78.6% of the prescribed antibiotics were by INN and 96.1% complied with the Botswana Essential Drugs List
- However, the overall rate of antibiotic prescribing was high (42.7%) with 14.7%, 5.9% and 1.3% of prescriptions having two, three and four antibiotics respectively
- Systemic antibiotics (J01C) were most (45.1%) commonly prescribed of which amoxicillin accounted for 28.4% and metronidazole 14.4% of all antibiotic prescriptions - driven by a high prevalence of gynaecological and sexually transmitted infections
- Encouragingly, low use of co-amoxiclav (0.3%). Third generation cephalosporins and macrolides accounted for 9.8% and 6.2% of antibiotic prescriptions respectively, with no prescribing of fluoroquinolones. The majority of indications (87%) for antibiotic prescriptions were also according to ICD classification
- There is an identified need to further improve prescribing practices in PHCs in Botswana through training as well as developing an effective management tool for monitoring antibiotic prescribing including developing robust QIs

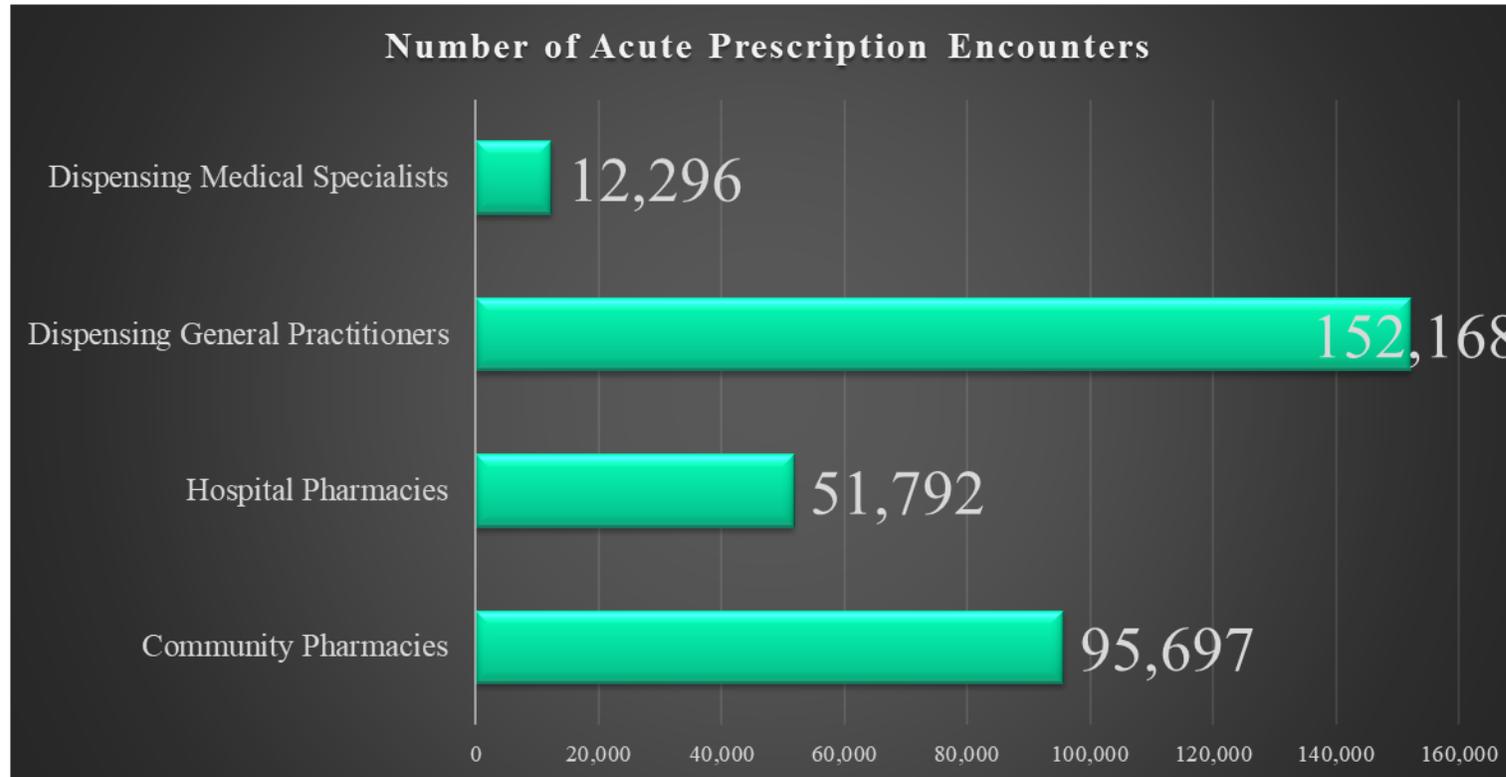
Concerns with WHO/ RUD indicators is leading to suggestions to develop more pertinent QIs, e.g. Botswana and Namibia:

WHO/INRUD Indicator	WHO Targets	Namibia targets		Indicator measures (current status in Namibia 2012 – 2015)
		Target	Acceptable	
a) Average # of medicines per prescription	< 2	<2	2.5	Polypharmacy (1.6 – 3.1)
b) % of prescriptions with an antibiotic	< 30%	<25%	35%	Antibiotic use (56 – 80%)
c) % of prescriptions with an injection	< 20%	<10%	15%	Safe medication use (44 – 50%)
d) % of medicines with generic name	100 %	100%	80%	Cost-effective brand prescribing (83% – 74%)
e) Compliance to EMLs	100%			
f) Compliance to STG	>80 %		> 80%	

There was also an identified need to improve the management of STIs among PHCs in South Africa

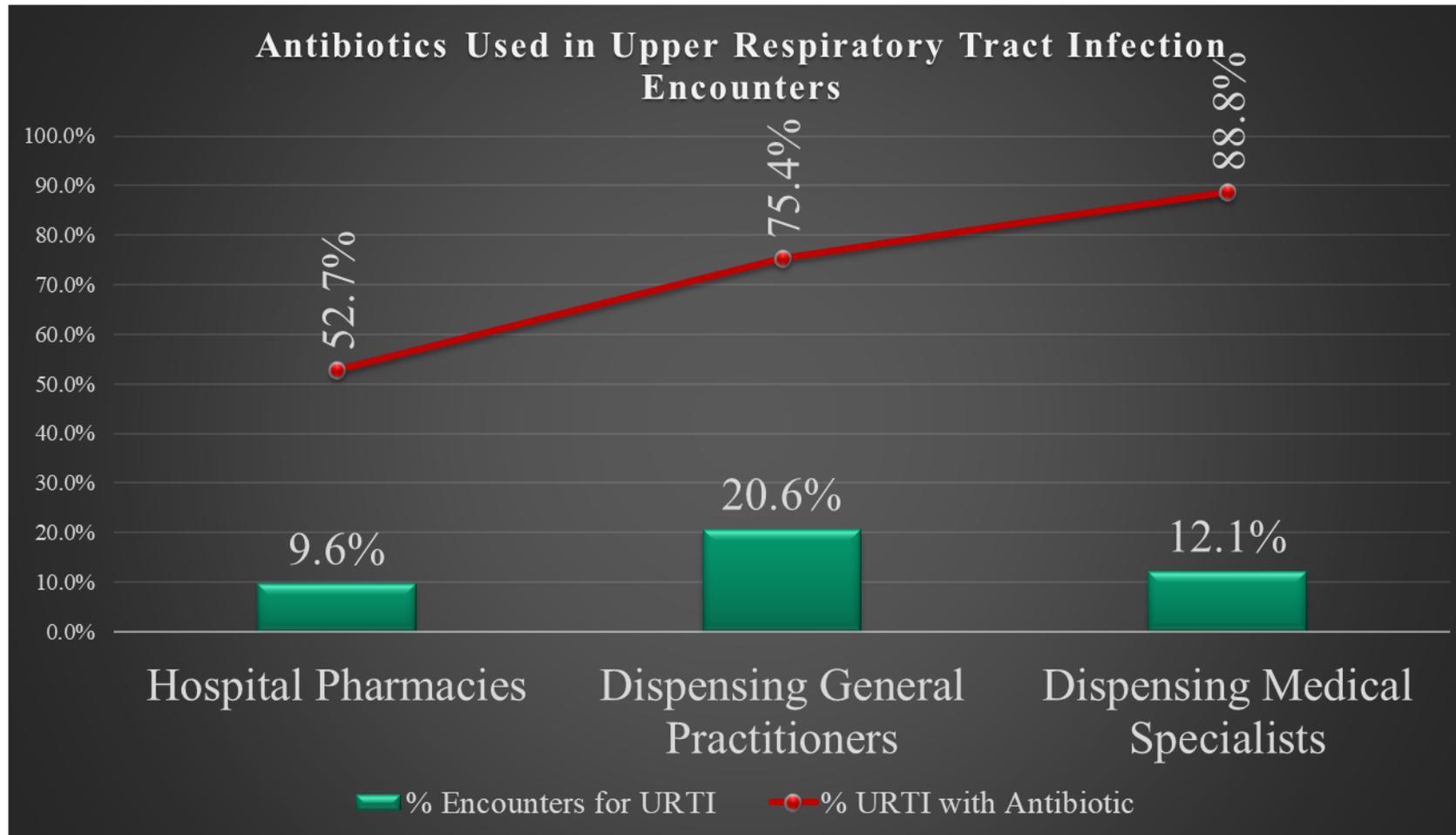
- An investigational descriptive study, including retrospective and prospective data, was conducted over an eight month period among correctional centres in South Africa to investigate the management of STIs (likely highest prevalence)
- Male urethritis syndrome, lower abdominal pain and genital ulcer syndrome were the three most common STIs
- Doxycycline, ciprofloxacin and metronidazole were prescribed for most of the STIs
- Overall compliance to the 2008 PHC STGs/EML was low for all STIs
- Consequently, there is a need to implement antimicrobial stewardship programmes, including educational activities, to promote the rational use of antimicrobials for STIs and monitor their use among PHCs in SA. This is being followed up

Need to develop new robust QIs for all patients in Botswana illustrated by concerns with management of URTIs in the private sector

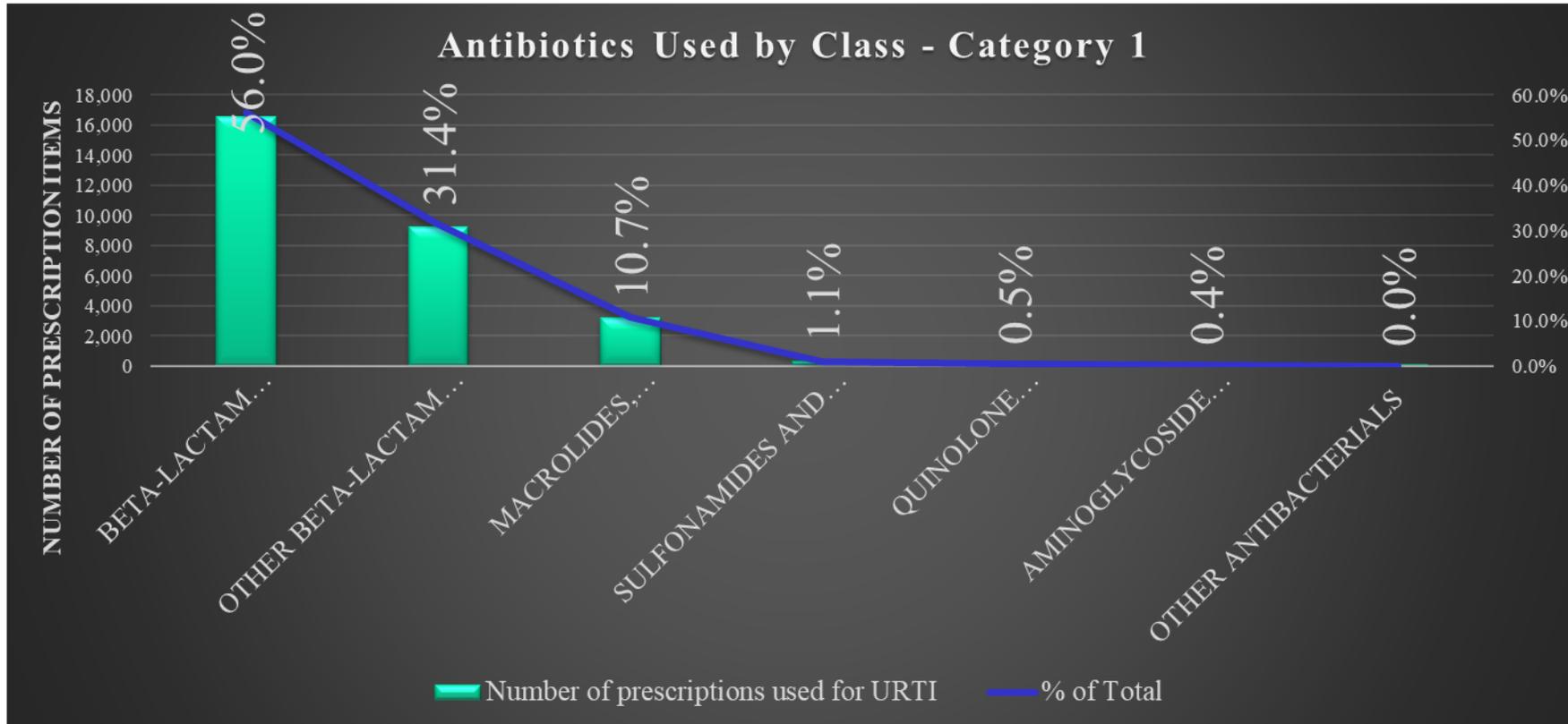


- A total of **311,953** recent acute prescription encounters involving patients in the private sector in Botswana were included in a recent analysis
- **49%** of the prescriptions were dispensed by **GPs (Dispensing GPs)** followed by **30%** by **Community Pharmacy (following a prescription from a private physician)**, **16%** by **Hospital Pharmacies** with only **3.9%** being due to **Medical Specialists**

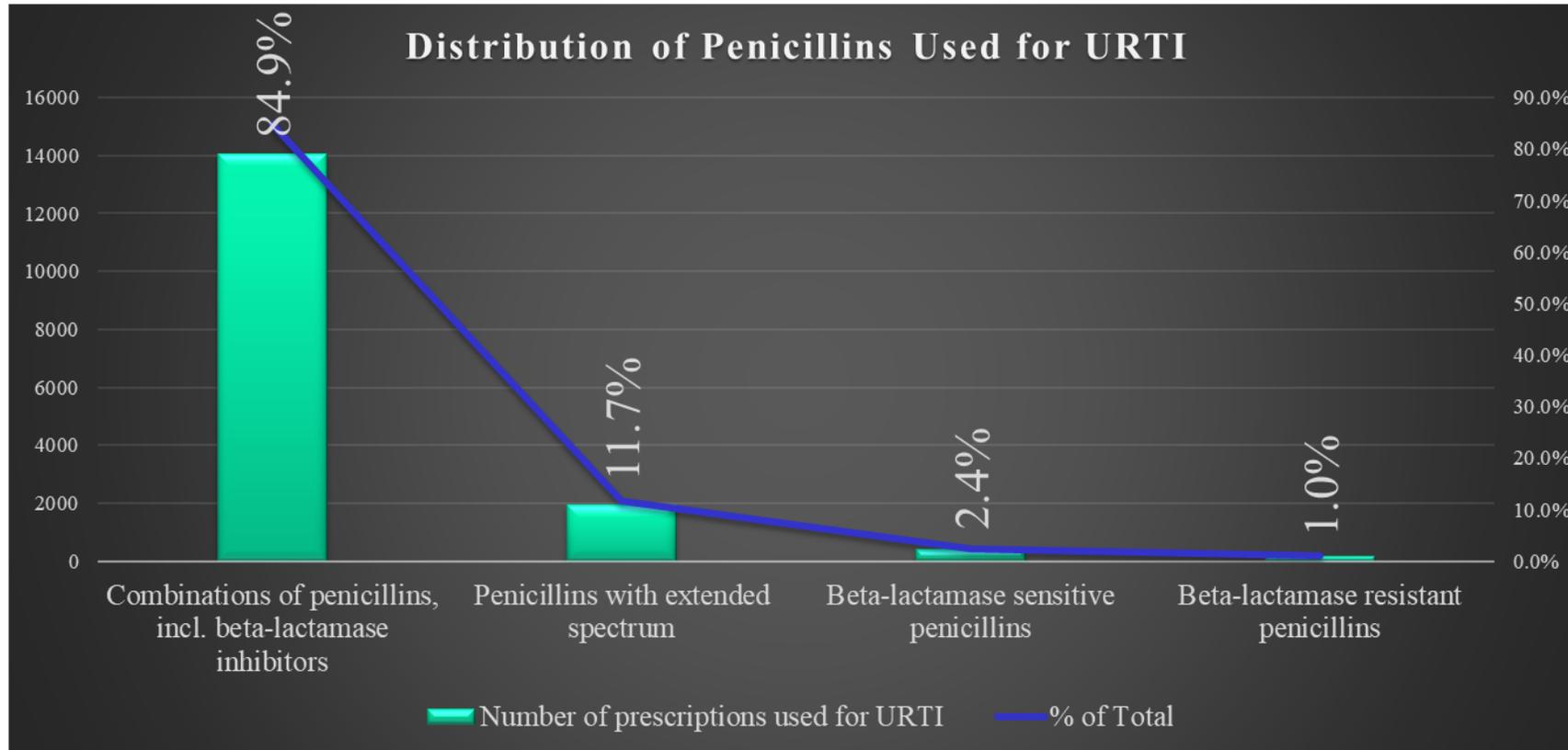
A high proportion of antibiotics were prescribed for patients with Upper Respiratory Tract Infections (17.4% of encounters). 72.9% of patients with URTIs had at least one antibiotic



Penicillins were the most prescribed antibiotics for URTIs in the private sector with limited use of fluoroquinolones (restricted in the national guidelines)



However concerns with the extent of combination penicillins currently being prescribed for URTIs among private physicians in Botswana which needs addressing



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There is an ongoing need to improve antibiotic prescribing in Africa. There are a number of initiatives to address this

- We have shown that there is variable quality in the prescribing and dispensing of antibiotics across all sectors in Africa based on the examples shown
- However, there is enthusiasm to start documenting prescribing and dispensing practices as well as starting to develop/ initiate/ progress measures and reforms to improve future antibiotic prescribing and reduce AMR rates. This will continue especially given promotional activities in some countries, e.g. Nigeria
- This includes PPS studies in hospitals as well as the development/ further instigation of AMS programmes as well as QIs in ambulatory care. In addition, exploring and communicating potential ways to reduce inappropriate self-medication with antimicrobials in pharmacies/ medicine outlets
- South Africa is one of the countries leading the way with national initiatives around AMS programmes. There are also National Action plans ongoing across Africa with the help of the WHO, UN, British Government and others to improve antibiotic use and reduce AMR rates

There are concerns with the level of promotional activities in some African countries negatively impacting on rational use

- A cross-sectional questionnaire-based study recently conducted among practicing physicians working in tertiary hospitals in the four regions of Nigeria found that 87.5% of physicians had medicines promoted to them in the previous three months, with most encounters taking place in outpatients' clinics and clinical meetings
- Information about potential adverse effects and drug interactions was provided in 41.5% and 27.3% of cases, respectively
- Food, in the form of lunch or dinner, was the most common form of incentive (70.5%) given to physicians to entice them to attend promotional activities
- 61% of physicians felt motivated to prescribe the drug promoted to them, with the quality of information provided being a driving factor. Encouragingly though, most physicians agreed to some form of regulation of the relationship between medical doctors and the pharmaceutical industry

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In conclusion

- As mentioned, there is appreciable variation in the quality of antimicrobial prescribing across Africa – not helped by the lack of studies analysing use
- This is beginning to change with a number of global, regional and national initiatives to enhance their appropriate use – these will grow building on exemplars across countries including South Africa
- However much still needs to be done – hampered though by data collection activities. This is beginning to change with APPs being developed to undertake PPS studies in hospitals and improvement in data collection activities in ambulatory care, e.g. South Africa helped by their chronic disease management initiatives
- Your help is need to further enhance appropriate antimicrobial usage to reduce the high AMR rates in the region with the highest prevalence of infectious diseases

MURIA publications to date involving anti-infectives (with authors from 2 or more countries illustrating joint working)

- Massele A, Godman B, Adorka M, Fadare J, Gray A, Lubbe M, Ogunleye O, Truter I. Initiative to progress research on Medicine Utilisation in Africa – formation of the MURIA group. [Expert Rev Pharmacoecon Outcomes Res.](#) 2015 Aug; 15(4):607-610
- Massele A, Burger J, Katende-Kyenda NL, Kalemeera F, Kenaope T, Kibuule D, Mbach O, Mubita M, Oluka M, Olusanya A, Anand Paramadhas B, van Zyl P, Godman B. Outcome of the first Medicines Utilisation Research in Africa Group meeting to promote sustainable and rational medicine use in Africa. [Expert Rev Pharmacoecon Outcomes Res.](#) 2015;15(6):885-8
- Gaida R, Truter I, Grobler C, Kotze T, Godman B. A review of trials investigating efavirenz-induced neuropsychiatric side effects and the implications. [Expert Rev Anti Infect Ther.](#) 2016;14(4):377-88
- Kalemeera F, Mbango C, Mubita M, Naikaku E, Gaida R, Godman B. Effect of changing from first- to Second- Line Antiretroviral Therapy on Renal Function: A Retrospective Study based on data from a Single Health Facility in Namibia. [Expert Rev Anti Infect Ther.](#) 2016;14(8):777-83
- [Kibuule D](#), [Kagoya HR](#), Godman B. Antibiotic use in acute respiratory infections in under-fives in Uganda: findings and implications. [Expert Rev Anti Infect Ther.](#) Expert Rev Anti Infect Ther. 2016;14(9):863-72
- Kalungia CV, Burger J, Godman B, de Oliveira Costa J, Simuwelu C. Non-prescription sale and dispensing of antibiotics in community pharmacies in Zambia. [Expert Rev Anti Infect Ther.](#) 2016;14(12):1215-1223
- Ezenduka CC, Nworgu CE, Godman B, Massele A, Esimone CO. Antimalarial drugs treatment pattern among pregnant women attending antenatal care clinics in Nigeria and the future implications, [Int J Clin Pract.](#) 2016 Dec;70(12): 1041-1048
- Massele M, Tiroyakgosi C, Matome M, Desta A, Muller M, Anand Paramadhas B, Malone B, Kurusa G, Didimalang T, Moyo M, Godman B. Research activities to improve the utilisation of antibiotics in Africa. [Expert Rev Pharmacoecon Outcomes Res.](#) 2017 Feb;17(1):1-4
- Kibuule D, Mwangana M, Naikaku E, Kalemeera F, Godman B, Sagwa E. An analysis of policies for cotrimoxazole, amoxicillin and azithromycin use in Namibia's public sector: findings and therapeutic implications. [Int J Clin Pract.](#)

MURIA publications (cont – up to early Feb 2018)

- Godman B, Fadare J, Kibuule D, Irawati L, Mubita M, Ogunleye O, Paramadhas BDA et al. Initiatives across countries to reduce antibiotic utilization and resistance patterns; impact and implications. 2017; 539-576 in Drug Resistance in Bacteria, Fungi, Malaria, and Cancer - Arora, Sajid, & Kalia Eds. Publisher Springer Nature. ISBN 978-3-319-48682-6. Available at URL: <http://www.springer.com/us/book/9783319486826#>
- Massele M, Burger J, Kalemeera F, Jande M, Didimalang T, Kalungia AC, Matshotyana K et al. Outcome of the second Medicines Utilisation Research in Africa Group meeting to promote sustainable and appropriate medicine use in Africa. Second MURIA Group Workshop and Symposium. *Expert Rev Pharmacoecon Outcomes Res.* 2017;17(2):149-152
- Ezenduka CC, Faleiros DR, Godman B. Evaluating the treatment costs for uncomplicated malaria at a public healthcare facility in Nigeria and the implications. *Pharmacoeconomics Open* 2017; 1:185–194
- Ambetsa MO, Oluka MN, Okalebo FA, Mulwa NC, Fadare J, Godman B. One-day out-patient prescribing patterns at a national referral hospital in Kenya. *Afr. J. Pharmacol. Ther.* 2017. 6(2): 96-101
- Nakwatumbah S, Kibuule D, Godman B, Haakuria V, Kalemeera F, Baker A, Mubita M. Compliance to guidelines for the prescribing of antibiotics in acute infections at Namibia's national referral hospital: a pilot study and the implications. [Expert Rev Anti Infect Ther.](http://www.tandfonline.com/doi/abs/10.1080/14737175.2017.1350000) 2017;15(7):713-721
- Fadare JO, Oshikoya KA, Obimakinde OS, Sijuade AO, Afolayan JM, Adeleke AA, Godman B et al. Drug Prescription Patterns for Dental Outpatients in Nigeria; findings and implications. [Acta Odontol Scand.](http://www.tandfonline.com/doi/abs/10.1080/00016341.2017.1350000) 2017;75(7):496-506
- Afriyie DK, Amponsah SK, Dogbey J, Agyekum K, Kesse S, Truter I, Meyer JC, Godman B. A pilot study evaluating the prescribing of ceftriaxone in hospitals in Ghana: findings and implications. [Hosp Pract.](http://www.tandfonline.com/doi/abs/10.1080/09638186.2017.1350000) 2017;45(4):143-149
- Ngambi PG, Kalungia AC, Law MR, Kalemeera F, Truter I, Godman B, et al. Evidence on the cost-effectiveness of lifelong antiretroviral therapy for prevention of mother-to-child transmission of HIV: implications for resource-limited countries in sub-Saharan Africa. [Expert Rev Pharmacoecon Outcomes Res.](http://www.tandfonline.com/doi/abs/10.1080/14737175.2017.1350000) 2017;17(5):459-467
- Matsitse TB, Helberg E, Meyer JC, Godman B, Massele A, Natalie Schellack N. Compliance to the Primary Health Care Treatment Guidelines and the Essential Medicines List in the Management of Sexually Transmitted Infections in Correctional Centres in South Africa: Findings and Implications. [Expert Rev Anti Infect Ther.](http://www.tandfonline.com/doi/abs/10.1080/14737175.2017.1350000) 2017;15(10):963-972
- Mataranyika PA, Kibuule D, Kalemeera F, Godman B, Rennie WT, Kaura H. Liver enzyme elevations in a cohort of HIV/AIDS patients on first-line antiretroviral therapy in Namibia: Findings and implications. *Alex J Med* (2017), <http://dx.doi.org/10.1016/j.ajme.2017.03.002>

MURIA publications (cont up to early Feb 2018)

- Mwita S, Jande M, Marwa K, Hamasaki K, Katabalo D, Burger J, Godman B et al. Medicines dispenser's knowledge on the implementation of an artemisinin-based combination therapy policy for the treatment of uncomplicated malaria in Tanzania. *J Pharm Health Serv Res.* 2017;8:227-33
- Matlala M, Gous AG, Godman B, Meyer JC. Structure and activities of Pharmacy and Therapeutics Committees among Public Hospitals in South Africa; findings and implications. [Expert Rev Clin Pharmacol.](#) 2017;10(11):1273-1280
- Meyer JC, Schellack N, Stokes J, Lancaster R, Zeeman H, Defty D, Godman B et al. Ongoing initiatives to improve the quality and efficiency of medicine use within the public healthcare system in South Africa; a preliminary study. *Front. Pharmacol.* 8:751. doi: 10.3389/fphar.2017.00751
- Opanga SA, Mwang'ombe NJ, Okalebo FA, Brian Godman B, Oluka M, Kuria KAM. DETERMINANTS OF THE EFFECTIVENESS OF ANTIMICROBIAL PROPHYLAXIS AMONG NEUROTRAUMA PATIENTS AT A REFERRAL HOSPITAL IN KENYA: FINDINGS AND IMPLICATIONS. *J Infect Dis Preve Med* 2017, 5:3
- Kalemeera F, Cockeran M, Mubita M, Kibuule D, Naikaku E, Masele A, Godman B. The Potential Effect of Using the Cockcroft-Gault Method on Tenofovir- Associated Renal Impairment Reports and on Clinical Decisions Regarding Tenofovir Use in Individual Patients: Implications for the Future. *J Infect Dis Preve Med* 2017, 5:3
- Bester T, Schellack N, Gous AGS, Stolz A, Meyer JC, Godman B. Evaluating initial antimicrobial use in an adult medical intensive care unit at an academic teaching hospital in Pretoria, South Africa. *African Journal for Physical Activity and Health Sciences.* October 2017 (Supplement 1:1): 1-16
- Mashalla M, Setlhare V, Masele A, Sepako E, Tiroyakgosi C, Kgatlwane J, Chuma M, Godman B. Assessment of prescribing practices at the primary health care facilities in Botswana with an emphasis on antibiotics; findings and implications. [Int J Clin Pract.](#) 2017;71(12)
- Ogunleye OO, Fadare JO, Masele A, Godman B, Gustafsson L. Third Training Workshop on Drug Utilization Research in Africa. *Pharmacology International.* 2017; 89:11-15
- Schellack N, Bronkhorst E, Coetzee R, Godman B, Gous AGS et al. SASOCP position statement on the Pharmacist's role in antibiotic stewardship. *South African Journal of Infectious Disease* 2018;33(1):4
- Fadare JO, Oshikoya KA, Ogunleye OO et al. Drug promotional activities in Nigeria: Impact on the prescribing patterns and practices of medical practitioners and the implications (Accepted for publication Hospital Practice)

Thank You - Any Questions!

MURIA membership forms are available on the Internet. Details of the three MURIA symposium and the recent antibiotic symposium in Botswana (October 2017) can be found on: <http://muria.mandela.ac.za/>. Membership is free of charge with MURIA currently self-funded, with generally low costs for conference – just principally to cover subsistence and administration

African countries involved to date in MURIA include: Botswana, Ghana, Kenya, Namibia, Nigeria, Tanzania, Rwanda, South Africa, Swaziland, Uganda, Zambia, and Zimbabwe

You are all welcome to MURIA 4 (18 – 21 June 2018) in Namibia

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