

Ongoing Initiatives to Improve the Prescribing of Medicines across Sectors and the Implications



We believe medicines including vaccines are a critical component in the management of both infectious diseases and non-communicable diseases (NCDs),^[1-5] and this is reflected in global sales of medicines likely to exceed \$1.5 trillion by 2023 with compounded annual growth rates of 3%–6%.^[6] Medicines also play a critical role in low- and middle-income countries (LMICs) where their expenditure can account for over 60% of the total health-care expenditure.^[7] Because typically these costs are out of pocket, there can be catastrophic consequences for families when members become ill.^[8-11] These consequences and concerns are exacerbated by the World Health Organization (WHO) estimating that more than half of all medicines are prescribed or dispensed inappropriately, with approximately half of all patients failing to take them correctly.^[12,13] Inappropriate prescribing can also increase the number of adverse drug reactions, increasing morbidity and mortality as well as costs.^[12,14-17] Consequently, inappropriate prescribing should be avoided where possible.

Improving the rational use of medicines (RUM), which has been defined as prescribing the right drug, in the most appropriate dose, for the right duration, in the optimal formulation, route, timing and frequency, to meet the clinical needs of patients at the least cost,^[12,18-20] is one way forward. A recent example of the consequences of inappropriate prescribing and dispensing surrounds hydroxychloroquine to prevent and treat patients with COVID-19. There was considerable interest and endorsement for its use with or without antibiotics following the initial studies despite concerns with their quality, which resulted in shortages, price hikes and suicides across countries.^[11,21-24] However, later studies typically failed to show any clinical benefit in patients with COVID-19, leading to the WHO dropping hydroxychloroquine from the Solidarity study.^[25-27] Having said this, hydroxychloroquine is still endorsed in India for the prevention of COVID-19 following the study of Chatterjee *et al.* despite concerns.^[28,29]

There are many examples of ways to improve the quality of prescribing in both ambulatory care and hospitals, with typically multiple initiatives more effective than single ones.^[30,31] These include educational initiatives incorporating quality indicators as well as drug and therapeutic committees (DTCs) and antimicrobial stewardship programmes (ASPs) in hospitals. We are aware that the WHO has introduced a range of indicators in

ambulatory care to assess the quality of prescribing, which are widely used. These include the average number of prescriptions per patient encounter as well as the average number of antibiotics and injections per encounter, the extent of generic name prescribing (international non-proprietary name [INN]) and the percentage of medicines prescribed from the country's essential medicine list.^[32] However, there are concerns whether the WHO criteria actually measure the quality of prescribing in reality, especially in countries with high prevalence rates of both infectious and non-infectious diseases. This has resulted in calls to introduce more pertinent quality indicators locally.^[33,34] This subject is likely to grow with increasing awareness that adherence to well-thought-out and easily accessible prescribing guidance is a more appropriate quality measure.^[33,35,36]

An effective strategy to improve the quality of prescribing in ambulatory care can be seen with the introduction of the 'Wise List' in Stockholm County Council in Sweden, with the first version published in 2001.^[37] The Wise List contains a list of suggested first- and second-line treatments covering over 95% of the needs of patients in ambulatory care, which equates to approximately 200 medicines, rising to 250 medicines when suggested medicines for hospital outpatients are included.^[37,38] The concept behind the 'Wise List' is that most ambulatory care physicians only know a limited number of medicines well, with adherence to any suggested list enhanced if the prescribing physicians believe that the suggested medicines are selected using robust evidence-based principles and they have the opportunity to question those compiling the list. This is the situation with the 'Wise List' with strong conflict of interest statements and a comprehensive communication strategy including a patient version, resulting in high adherence rates in practice.^[37-39] Educational initiatives starting in medical school and continuing post-qualification are used in the UK to enhance INN prescribing, with rates routinely over 97% in non-controversial areas.^[40,41] INN prescribing helps address concerns with branded generics where patients may be dispensed different branded generics with different names on different occasions, potentially leading to confusion and possibly underdosing or overdosing unless addressed by either the physician or a pharmacist.^[42,43]

Numerous educational and other strategies have also been introduced to reduce inappropriate prescribing of

antimicrobials across countries including LMICs given concerns with rising resistance rates, with multiple strategies again typically more effective than single strategies.^[31,44,45] Potential educational initiatives to improve antibiotic prescribing in ambulatory care have been described by Dyar *et al.*,^[46] and more recently by Godman *et al.* (2020) for upper respiratory tract infections.^[44] Potential quality indicators for antimicrobials in ambulatory care include assessing the extent of prescribing of broad versus narrow antibiotics as well as the extent of prescribing of suggested treatments from the 'Access' group in the WHO AWaRe list as opposed to 'Watch' and 'Reserve' antibiotics.^[47-49]

Quality indicators for NCDs in ambulatory care include the extent of doses of medicines prescribed according to agreed guidance, for example, high versus low doses of statins, adherence to current national or regional guidelines, the extent of co-prescriptions of statins for patients with established coronary vascular disease including diabetes and adherence rates to prescribed medicines in practice.^[40,50,51] The prescribing of patented or originator medicines rather than lower cost, multiple sourced medicines where pertinent is now less of an issue in ambulatory care with many standard treatments available as low-cost generics. However, the quality of generics can be a concern in some LMICs, limiting their use, which needs addressing to enhance their prescribing first line where indicated.^[52,53] Adherence to medicines is a particular issue for NCDs, with rates depending on a number of issues including the perceived seriousness of the disease, the extent of family member support, affordability and understanding of the instructions given.^[54-56] Addressing these issues and challenges will help improve adherence rates in the future.

The WHO and others see the instigation of DTCs involving all key stakeholder groups as one of the pivotal ways to enhance the quality of prescribing of medicines in hospitals and reduce any inappropriate influence of pharmaceutical companies.^[57-61] DTCs can provide leadership and structure in hospitals to help select the most appropriate medicines for any given situation, provide guidance on subsequent medicine use and monitor use in practice, educate physicians on evidence-based medicine approaches, suggest alternative medicines when shortages occur and generally help improve resource use and the quality of care in hospitals.^[39,59,62-66] DTCs can also be proactive and instigate a number of activities in advance using appropriate methodologies to reduce the impact of any medicine shortages, particularly in priority disease areas.^[67] DTC personnel can also enhance the appropriate use of medicines by documenting current utilisation and expenditure patterns across disease areas as a first step to assess whether undue resources are being spent on high-cost/high-expenditure non-vital or non-essential medicines,^[68] with the findings directing future activities. DTC personnel can also encourage the reporting of adverse drug reactions given the current concerns with low rates, particularly in LMICs to improve the future use of medicines.^[69-72] However, a concern across a number of LMICs is the current lack of DTCs even among tertiary hospitals,

which urgently needs addressing to improve the quality of future prescribing.^[73]

There are also concerns regarding antimicrobial prescribing in hospitals especially among LMICs, driving up resistance rates and costs. Concerns include a lack of documentation of the rationale for the initial selection, in lack of any formal review of antibiotic choices during patient management including reviews against agreed hospital guidelines, prolonged use of antimicrobials to prevent surgical-site infections and a lack of intravenous to oral switching.^[74-76] These issues can be addressed through having active ASPs within hospitals, which includes encouraging empiric prescribing based on the current resistance patterns reducing inappropriate antimicrobial prescribing and costs.^[77-81] However, there are concerns with the extent of ASPs in practice among LMICs and the knowledge of physicians regarding their potential use, which also needs addressing to improve future antimicrobial prescribing in hospitals.^[82-84]

In conclusion, there are multiple activities that can be conducted across countries in both ambulatory and hospital care to improve prescribing. Such activities become increasingly important with the growing prevalence of both infectious and non-infectious diseases across countries and the resultant implications on medicine use. In the next editorial, we will examine the range of activities that health authorities and governments can instigate to enhance appropriate medicine use and their outcomes especially in ambulatory care to also provide guidance.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest

Brian Godman^{1,2,3,4}

¹Department of Pharmacoepidemiology, Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow, United Kingdom, ²Division of Clinical Pharmacology, Karolinska Institute, Karolinska University Hospital Huddinge, Stockholm, Sweden, ³Division of Public Health Pharmacy and Management, School of Pharmacy, Sefako Makgatho Health Sciences University, Ga-Rankuwa, Pretoria, South Africa, ⁴School of Pharmaceutical Sciences, Universiti Sains Malaysia, Penang, Malaysia

Address for correspondence: Dr. Brian Godman, Strathclyde Institute of Pharmacy and Biomedical Sciences, University of Strathclyde, Glasgow G4 0RE, United Kingdom.
Telephone: 0141 548 3825;
Fax: 0141 552 2562.
E-mail: brian.godman@strath.ac.uk

Submitted: 10-08-2020 **Revised:** 11-08-2020
Accepted: 14-08-2020 **Published:** 22-09-2020

REFERENCES

- Barie PS, Hydo LJ, Shou J, Larone DH, Eachempati SR. Influence of antibiotic therapy on mortality of critical surgical illness caused or complicated by infection. *Surg Infect (Larchmt)* 2005;6:41-54.
- Godman B, Fadare J, Kibuule D, Irawati L, Mubita M, Ogunleye O, *et al.* Initiatives across countries to reduce antibiotic utilisation and

- resistance patterns: Impact and Implications. In: Arora G, Sajid A, Kalia VC, editors. *Drug Resistance in Bacteria, Fungi, Malaria, and Cancer*. Cham: Springer International Publishing; 2017. p. 539-76.
3. Phillips RA. Current and future treatment of hypertension in the SPRINT Era. *Methodist Debakey Cardiovasc J* 2015;11:206-13.
 4. Godman B, Basu D, Pillay Y, Mwitwa JC, Rweggerera GM, Anand Paramadhas BD, *et al*. Review of ongoing activities and challenges to improve the care of patients with type 2 diabetes across Africa and the implications for the future. *Front Pharmacol* 2020;11:108.
 5. World Health Organization. *Improving Access to and Appropriate use of Medicines for Mental Disorders*; 2017. Available from: <http://file:///C:/Users/mail/Desktop/My%20documents/Ongoing%20papers/Scotland%20SSRIs/WHO%20Mental%20Health%202018.pdf>. [Last accessed on 2 August 2020].
 6. IQVIA. *The Global Use of Medicine in 2019 and Outlook to 2023 Forecasts and Areas to Watch*; 2019. Available from: <https://www.iqvia.com/-/media/iqvia/pdfs/institute-reports/the-global-use-of-medicine-in-2019-and-outlook-to-2023.pdf>. [Last accessed on 2 August 2020].
 7. Cameron A, Ewen M, Ross-Degnan D, Ball D, Laing R. Medicine prices, availability, and affordability in 36 developing and middle-income countries: A secondary analysis. *Lancet* 2009;373:240-9.
 8. Aregbeshola BS, Khan SM. Out-of-pocket payments, catastrophic health expenditure and poverty among households in Nigeria 2010. *Int J Health Policy Manag* 2018;7:798-806.
 9. Selvaraj S, Farooqui HH, Karan A. Quantifying the financial burden of households' out-of-pocket payments on medicines in India: A repeated cross-sectional analysis of National Sample Survey data, 1994-2014. *BMJ Open* 2018;8:e018020.
 10. Khan JA, Ahmed S, Evans TG. Catastrophic healthcare expenditure and poverty related to out-of-pocket payments for healthcare in Bangladesh-an estimation of financial risk protection of universal health coverage. *Health Policy Plan* 2017;32:1102-10.
 11. Haque M, Islam S, Iqbal S, Urmi UL, Kamal ZM, Shuvo SA, *et al*. Availability and price changes of potential medicines and equipment for the prevention and treatment of COVID-19 among pharmacy and drug stores in Bangladesh; findings and implications. *Bangladesh J Med Sci* 2020;19:S36-50.
 12. Ofori-Asenso R, Agyeman AA. Irrational use of medicines-A summary of key concepts. *Pharmacy (Basel)* 2016;4:1-13.
 13. World Health Organization. *The Pursuit of Responsible use of Medicines: Sharing and Learning from Country Experiences*. World Health Organization; 2012. Available from: https://apps.who.int/iris/bitstream/handle/10665/75828/WHO_EMP_MAR_2012.3_eng.pdf;jsessionid=D819046B9E21DE48A1391A19A07770CC?sequence=1. [Last accessed on 2 August 2020].
 14. Mouton JP, Njuguna C, Kramer N, Stewart A, Mehta U, Blockman M, *et al*. Adverse Drug reactions causing admission to medical wards: A cross-sectional survey at 4 hospitals in South Africa. *Medicine (Baltimore)* 2016;95:e3437.
 15. Sultana J, Cutroneo P, Trifirò G. Clinical and economic burden of adverse drug reactions. *J Pharmacol Pharmacother* 2013;4:S73-7.
 16. Batel Marques F, Penedones A, Mendes D, Alves C. A systematic review of observational studies evaluating costs of adverse drug reactions. *Clinicoecon Outcomes Res* 2016;8:413-26.
 17. Formica D, Sultana J, Cutroneo PM, Lucchesi S, Angelica R, Crisafulli S, *et al*. The economic burden of preventable adverse drug reactions: A systematic review of observational studies. *Expert Opin Drug Saf* 2018;17:681-95.
 18. Patricio KP, Alves NA, Arenales NG, Queluz TT. Teaching the Rational Use of Medicines to medical students: A qualitative research. *BMC Med Educ* 2012;12:56.
 19. Directorate General of Pharmacy. What is RUM? *Sudan J Rational Use Med* 2012;1:4.
 20. Sisay M, Mengistu G, Molla B, Amare F, Gabriel T. Evaluation of rational drug use based on World Health Organization core drug use indicators in selected public hospitals of eastern Ethiopia: A cross sectional study. *BMC Health Serv Res* 2017;17:161.
 21. Gautret P, Lagier JC, Parola P, Hoang VT, Meddeb L, Mailhe M, *et al*. Hydroxychloroquine and azithromycin as a treatment of COVID-19: Results of an open-label non-randomized clinical trial. *Int J Antimicrob Agents* 2020;56:105949.
 22. International Society of Antimicrobial Chemotherapy. Official Statement from International Society of Antimicrobial Chemotherapy (ISAC) Hydroxychloroquine and Azithromycin as a Treatment of COVID-19: Results of an Open-Label Non-Randomized Clinical Trial (Gautret P *et al*. PMID 32205204). Available from: <https://www.isac.world/news-and-publications/official-isac-statement> [Last accessed on 2 August 2020].
 23. Abena PM, Decloedt EH, Bottieau E, Suleman F, Adejumo P, Sam-Agudu NA, *et al*. Chloroquine and Hydroxychloroquine for the Prevention or Treatment of COVID-19 in Africa: Caution for inappropriate off-label use in healthcare settings. *Am J Trop Med Hyg* 2020;102:1184-8.
 24. Lenzler J. Covid-19: US gives emergency approval to hydroxychloroquine despite lack of evidence. *BMJ* 2020;369:m1335.
 25. World Health Organization. WHO Discontinues Hydroxychloroquine and Lopinavir/ritonavir Treatment Arms for COVID-19; July, 2020. Available from: <https://www.who.int/news-room/detail/04-07-2020-who-discontinues-hydroxychloroquine-and-lopinavir-ritonavir-treatment-arms-for-covid-19>. [Last accessed on 2 August 2020].
 26. Geleris J, Sun Y, Platt J, Zucker J, Baldwin M, Hripcsak G, *et al*. Observational Study of Hydroxychloroquine in Hospitalized Patients with Covid-19. *N Engl J Med* 2020;382:2411-8.
 27. Recovery Trial. No Clinical Benefit from Use of Hydroxychloroquine in Hospitalised Patients with COVID-19; 2020. Available from: <https://www.recoverytrial.net/news/statement-from-the-chief-investigators-of-the-randomised-evaluation-of-covid-19-therapy-recovery-trial-on-hydroxychloroquine-5-june-2020-no-clinical-benefit-from-use-of-hydroxychloroquine-in-hospitalised-patients-with-covid-19>. [Last accessed on 2 August 2020].
 28. Chatterjee P, Anand T, Singh KJ, Rasaily R, Singh R, Das S, *et al*. Healthcare workers & SARS-CoV-2 infection in India: A case-control investigation in the time of COVID-19. *Indian J Med Res* 2020;151:459-67.
 29. Rathi S, Ish P, Kalantri A, Kalantri S. Hydroxychloroquine prophylaxis for COVID-19 contacts in India. *Lancet Infect Dis* 2020;EPrint.
 30. Holloway KA, Henry D. WHO essential medicines policies and use in developing and transitional countries: An analysis of reported policy implementation and medicines use surveys. *PLoS Med* 2014;11:e1001724.
 31. Holloway KA, Ivanovska V, Manikandan S, Jayanthi M, Mohan A, Forte G, *et al*. Identifying the most effective essential medicines policies for quality use of medicines: A replicability study using three World Health Organisation data-sets. *PLoS One* 2020;15:e0228201.
 32. Ofori-Asenso R, Brhlikova P, Pollock AM. Prescribing indicators at primary health care centers within the WHO African region: A systematic analysis (1995-2015). *BMC Public Health* 2016;16:724.
 33. Niaz Q, Godman B, Masseur A, Campbell S, Kurdi A, Kagoya HR, *et al*. Validity of World Health Organisation prescribing indicators in Namibia's primary healthcare: Findings and implications. *Int J Qual Health Care* 2019;31:338-45.
 34. Mashalla Y, Setlhare V, Masseur A, Sepako E, Tiroyakgosi C, Kgatlwane J, *et al*. Assessment of prescribing practices at the primary healthcare facilities in Botswana with an emphasis on antibiotics: Findings and implications. *Int J Clin Pract* 2017;71:1-10.
 35. Niaz Q, Godman B, Campbell S, Kibuule D. Compliance to prescribing guidelines among public health care facilities in Namibia; findings and implications. *Int J Clin Pharm* 2020;42(4):1227-36.
 36. Matsitse TB, Helberg E, Meyer JC, Godman B, Masseur A, Schellack N. Compliance with 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* 2017;15:963-72.
 37. Gustafsson LL, Wettermark B, Godman B, Andersén-Karlsson E, Bergman U, Hasselström J, *et al*. The 'wise list'-a comprehensive concept to select, communicate and achieve adherence to recommendations of essential drugs in ambulatory care in Stockholm. *Basic Clin Pharmacol Toxicol* 2011;108:224-33.
 38. Eriksen J, Gustafsson LL, Ateva K, Bastholm-Rahmner P, Ovesjö ML, Jirlow M, *et al*. High adherence to the 'Wise List' treatment

- recommendations in Stockholm: A 15-year retrospective review of a multifaceted approach promoting rational use of medicines. *BMJ Open* 2017;7:e014345.
39. Björkhem-Bergman L, Andersén-Karlsson E, Laing R, Diogene E, Melien O, Jirlow M, *et al.* Interface management of pharmacotherapy. Joint hospital and primary care drug recommendations. *Eur J Clin Pharmacol* 2013;69 Suppl 1:73-8.
 40. Loporowski A, Godman B, Kurdi A, MacBride-Stewart S, Ryan M, Hurding S, *et al.* Ongoing activities to optimize the quality and efficiency of lipid-lowering agents in the Scottish national health service: Influence and implications. *Expert Rev Pharmacoecon Outcomes Res* 2018;18:655-66.
 41. Godman B, Bishop I, Finlayson AE, Campbell S, Kwon HY, Bennie M. Reforms and initiatives in Scotland in recent years to encourage the prescribing of generic drugs, their influence and implications for other countries. *Expert Rev Pharmacoecon Outcomes Res* 2013;13:469-82.
 42. Godman B, Wettermark B, Hoffman M, Andersson K, Haycox A, Gustafsson LL. Multifaceted national and regional drug reforms and initiatives in ambulatory care in Sweden: Global relevance. *Expert Rev Pharmacoecon Outcomes Res* 2009;9:65-83.
 43. Olsson E, Wallach-Kildemoes H, Ahmed B, Ingman P, Kaae S, Källemark Sporrang S. The influence of generic substitution on the content of patient-pharmacist communication in Swedish community pharmacies. *Int J Pharm Pract* 2017;25:274-81.
 44. Godman B, Haque M, McKimm J, Abu Bakar M, Sneddon J, Wale J, *et al.* Ongoing strategies to improve the management of upper respiratory tract infections and reduce inappropriate antibiotic use particularly among lower and middle-income countries: Findings and implications for the future. *Curr Med Res Opin* 2020;36:301-27.
 45. Wilkinson A, Ebata A, MacGregor H. Interventions to reduce antibiotic prescribing in LMICs: A scoping review of evidence from human and animal health systems. *Antibiotics (Basel)* 2018;8:1-25.
 46. Dyar OJ, Beović B, Vlahović-Palčevski V, Verheij T, Pulcini C, on behalf of ESGAP (the ESCMID [European Society of Clinical Microbiology and Infectious Diseases] Study Group for Antibiotic Policies). How can we improve antibiotic prescribing in primary care? *Expert Rev Anti Infect Ther* 2016;14:403-13.
 47. Sharland M, Gandra S, Huttner B, Moja L, Pulcini C, Zeng M, *et al.* Encouraging AWaRe-ness and discouraging inappropriate antibiotic use-the new 2019 Essential Medicines List becomes a global antibiotic stewardship tool. *Lancet Infect Dis* 2019;19:1278-80.
 48. Hsia Y, Sharland M, Jackson C, Wong ICK, Magrini N, Bielicki JA. Consumption of oral antibiotic formulations for young children according to the WHO Access, Watch, Reserve (AWaRe) antibiotic groups: An analysis of sales data from 70 middle-income and high-income countries. *Lancet Infect Dis* 2019;19:67-75.
 49. de Bie S, Kaguclidou F, Verhamme KM, De Ridder M, Picelli G, Straus SM, *et al.* Using prescription patterns in primary care to derive new quality indicators for childhood community antibiotic prescribing. *Pediatr Infect Dis J* 2016;35:1317-23.
 50. Godman B, Kurdi A, McCabe H, MacBride-Stewart S, Loporowski A, Hurding S, *et al.* Ongoing activities to influence the prescribing of proton pump inhibitors within the Scottish National Health Service: Their effect and implications. *Generics Biosimilars Initiative J (GaBI Journal)* 2018;7:142-51.
 51. Nashilongo MM, Singu B, Kameleera F, Mubita M, Naikaku E, Baker A, *et al.* Assessing adherence to antihypertensive therapy in primary health care in Namibia: Findings and implications. *Cardiovasc Drugs Ther* 2017;31:565-78.
 52. Fadare JO, Adeoti AO, Desalu OO, Enwere OO, Makusidi AM, Ogunleye O, *et al.* The prescribing of generic medicines in Nigeria: Knowledge, perceptions and attitudes of physicians. *Expert Rev Pharmacoecon Outcomes Res* 2016;16:639-50.
 53. Khan BG, Babar A, Hussain S, Mahmood S, Aqeel T. Assessment of active pharmaceutical ingredients in the registration procedures in Pakistan: Implications for the future. *GaBI J* 2016;5:156-63.
 54. Nielsen JØ, Shrestha AD, Neupane D, Kallestrup P. Non-adherence to anti-hypertensive medication in low- and middle-income countries: A systematic review and meta-analysis of 92443 subjects. *J Hum Hypertens* 2017;31:14-21.
 55. Oñatibia-Astibia A, Malet-Larrea A, Larrañaga B, Gastelurrutia MÁ, Calvo B, Ramírez D, *et al.* Tailored interventions by community pharmacists and general practitioners improve adherence to statins in a Spanish randomized controlled trial. *Health Serv Res* 2019;54:658-68.
 56. Rezende Macedo do Nascimento RC, Mueller T, Godman B, MacBride Stewart S, Hurding S, de Assis Acurcio F, *et al.* Real-world evaluation of the impact of statin intensity on adherence and persistence to therapy: A Scottish population-based study. *Br J Clin Pharmacol* 2020;EPrint - Pages 1-13.
 57. Holloway K, Green T. Drug and Therapeutics Committees. Practical Guide on Behalf of the WHO in Collaboration with MSH. Available from: <http://apps.who.int/medicinedocs/pdf/s4882e/s4882e.pdf>. [Last accessed on 2 August 2020].
 58. Office of Director of Pharmaceutical Services (ODPS) Ministry of Health Ghana. Strengthening of Drug and Therapeutics Committees in Public and Private Health Facilities in Ghana; 2015. Available from: <https://apps.who.int/medicinedocs/documents/s22376en/s22376en.pdf>. [Last accessed on 3 August 2020]
 59. Lima-Dellamora Eda C, Caetano R, Gustafsson LL, Godman BB, Patterson K, Osorio-de-Castro CG. An analytical framework for assessing drug and therapeutics committee structure and work processes in tertiary Brazilian hospitals. *Basic Clin Pharmacol Toxicol* 2014;115:268-76.
 60. Sofat R, Cremers S, Ferner RE. Drug and therapeutics committees as guardians of safe and rational medicines use. *Br J Clin Pharmacol* 2020;86:10-2.
 61. Fadare JO, Oshikoya KA, Ogunleye OO, Desalu OO, Ferrario A, Enwere OO, *et al.* Drug promotional activities in Nigeria: Impact on the prescribing patterns and practices of medical practitioners and the implications. *Hosp Pract (1995)* 2018;46:77-87.
 62. Hoffman M. The right drug, but from whose perspective? A framework for analysing the structure and activities of drug and therapeutics committees. *Eur J Clin Pharmacol* 2013;69 Suppl 1:79-87.
 63. Chigome AK, Matlala M, Godman B, Meyer JC. Availability and use of therapeutic interchange policies in managing antimicrobial shortages among South African public sector hospitals; Findings and implications. *Antibiotics (Basel)* 2020;9:1-11.
 64. Nakwatumbah S, Kibuule D, Godman B, Haakuria V, Kameleera F, Baker A, *et al.* 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* 2017;15:713-21.
 65. Shirmeshan E, Kyrychenko P, Matlin OS, Avila JP, Brennan TA, Shrank WH. Impact of a transition to more restrictive drug formulary on therapy discontinuation and medication adherence. *J Clin Pharm Ther* 2016;41:64-9.
 66. Tseng CW, Lin GA, Davis J, Taira DA, Yazdany J, He Q, *et al.* Giving formulary and drug cost information to providers and impact on medication cost and use: A longitudinal non-randomized study. *BMC Health Serv Res* 2016;16:499.
 67. Miljković N, van Overbeeke E, Godman B, Kovačević M, Anastasi A, Bochenek T, *et al.* Practical implications from European hospital pharmacists on prospective risk assessment for medicine shortages. *Frontiers Med* 2020;7(407):1-12.
 68. Kivoto PM, Mulaku M, Ouma C, Ferrario A, Kurdi A, Godman B, *et al.* Clinical and financial implications of medicine consumption patterns at a leading referral hospital in Kenya to guide future planning of care. *Front Pharmacol* 2018;9:1348.
 69. Terblanche A, Meyer JC, Godman B, Summers RS. Impact of a pharmacist-driven pharmacovigilance system in a secondary hospital in the Gauteng Province of South Africa. *Hosp Pract (1995)* 2018;46:221-8.
 70. Baek HJ, Cho YS, Kim KS, Lee J, Kang HR, Suh DI. Multidisciplinary approach to improve spontaneous ADR reporting in the pediatric outpatient setting: A single-institute experience in Korea. *Springerplus* 2016;5:1435.
 71. Tandon VR, Mahajan V, Khajuria V, Gillani Z. Under-reporting of adverse drug reactions: A challenge for pharmacovigilance in India. *Indian J Pharmacol* 2015;47:65-71.
 72. Fang H, Lin X, Zhang J, Hong Z, Sugiyama K, Nozaki T, *et al.* Multifaceted interventions for improving spontaneous reporting of

Godman: Initiatives to improve prescribing

- adverse drug reactions in a general hospital in China. *BMC Pharmacol Toxicol* 2017;18:49.
73. Fadare JO, Ogunleye O, Obiako R, Orubu S, Enwere O, Ajemigbitse AA, *et al.* Drug and therapeutics committees in Nigeria: Evaluation of scope and functionality. *Expert Rev Clin Pharmacol* 2018;11:1255-62.
74. Anand Paramadhas BD, Tiroyakgosi C, Mpinda-Joseph P, Morokotso M, Matome M, Sinkala F, *et al.* Point prevalence study of antimicrobial use among hospitals across Botswana; findings and implications. *Expert Rev Anti Infect Ther* 2019;17:535-46.
75. Mwita JC, Souda S, Magafu MGMD, Masele A, Godman B, Mwandri M. Prophylactic antibiotics to prevent surgical site infections in Botswana: Findings and implications. *Hosp Pract (1995)* 2018;46:97-102.
76. Afriyie DK, Sefah IA, Sneddon J, Malcom W, McKinney R, Cooper L, *et al.* Antimicrobial point prevalence surveys in two Ghanaian hospitals: Opportunities for antimicrobial stewardship. *JAC Antimicrob Resist* 2020;1-9.
77. Nathwani D, Varghese D, Stephens J, Ansari W, Martin S, Charbonneau C. Value of hospital antimicrobial stewardship programs [ASPs]: A systematic review. *Antimicrob Res Infect Control* 2019;8:35.
78. Haque A, Hussain K, Ibrahim R, Abbas Q, Ahmed SA, Jurair H, *et al.* Impact of pharmacist-led antibiotic stewardship program in a PICU of low/middle-income country. *BMJ Open Qual* 2018;7:e000180.
79. Ritchie ND, Irvine SC, Helps A, Robb F, Jones BL, Seaton RA. Restrictive antibiotic stewardship associated with reduced hospital mortality in gram-negative infection. *QJM* 2017;110:155-61.
80. Day SR, Smith D, Harris K, Cox HL, Mathers AJ. An infectious diseases physician-led antimicrobial stewardship program at a small community hospital associated with improved susceptibility patterns and cost-savings after the first year. *Open Forum Infect Dis* 2015;2:ofv064.
81. Akpan MR, Isemin NU, Udoh AE, Ashiru-Oredope D. Implementation of antimicrobial stewardship programmes in African countries: A systematic literature review. *J Glob Antimicrob Resist* 2020;22:317-24.
82. Fadare JO, Ogunleye O, Iliyasu G, Adeoti A, Schellack N, Engler D, *et al.* Status of antimicrobial stewardship programmes in Nigerian tertiary healthcare facilities: Findings and implications. *J Glob Antimicrob Resist* 2019;17:132-6.
83. Kalungia AC, Mwambula H, Munkombwe D, Marshall S, Schellack N, May C, *et al.* Antimicrobial stewardship knowledge and perception among physicians and pharmacists at leading tertiary teaching hospitals in Zambia: Implications for future policy and practice. *J Chemother* 2019;31:378-87.
84. Saleem Z, Hassali MA, Hashmi FK, Godman B, Ahmed Z. Snapshot of antimicrobial stewardship programs in the hospitals of Pakistan: Findings and implications. *Heliyon* 2019;5:e02159.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code: 	Website: www.aihbonline.com
	DOI: 10.4103/AIHB.AIHB_90_20

How to cite this article: Godman B. Ongoing initiatives to improve the prescribing of medicines across sectors and the implications. *Adv Hum Biol* 2020;10:85-9.