

Community Medicine and the WHO Essential Medicines List: Access to Safe and Affordable Anesthetics as a Public Health and Human Rights Priority: A Systematic Review

Vijay Mohan Hanjoora¹, A. Branch Immanuel², Jagruti Bhattacharjee³

¹Assistant Professor, Department of Anaesthesiology, Rama Medical College Hospital & Research Center, Kanpur

²Assistant Professor, Department of Community Medicine, G.C.R.G. Institute of Medical Sciences & Research Center, Lucknow

³Assistant Professor, Department of Pharmacology, Rama Medical College Hospital & Research Center, Kanpur

Received: 19-02-2022 / Revised: 18-03-2022 / Accepted: 20-04-2022

Corresponding Author: Dr. Jagruti Bhattacharjee

Conflict of interest: Nil

Abstract:

Background: The World Health Organization (WHO) Essential Medicines List is a key policy instrument for promoting equitable access to medicines of proven benefit. Access to safe and affordable anesthetics remains uneven worldwide, particularly in low- and middle-income countries, despite their central role in surgery, obstetric care, trauma management, emergency procedures, and pain relief.

Objective: To systematically review the literature on the role of the WHO Essential Medicines List in community medicine, with special emphasis on access to safe and affordable anesthetics as a public health necessity and a human rights obligation.

Methods: A systematic review of the literature was planned and conducted using WHO publications, policy documents, and peer-reviewed studies addressing essential medicines, anesthesia access, global surgery, affordability, availability, and health equity. Relevant sources were identified using structured search terms related to “WHO Essential Medicines List,” “essential anesthetics,” “anesthesia access,” “safe surgery,” “controlled medicines,” “low-resource settings,” and “human rights.” Eligible studies and documents were those that addressed anesthetic medicine selection, access barriers, implementation challenges, or policy responses. The evidence was synthesized narratively because of heterogeneity in design, setting, and outcomes.

Results: The literature consistently shows that anesthetic medicines such as lidocaine, ketamine, propofol, and morphine are essential for routine and emergency care. The WHO framework emphasizes efficacy, safety, affordability, and continuous availability, but access remains limited by workforce shortages, inadequate infrastructure, weak supply chains, financial constraints, and regulatory barriers. Multiple sources also frame anesthesia access as part of the right to health, particularly because lack of access contributes to avoidable morbidity, mortality, pain, and inequity.

Conclusion: The WHO Essential Medicines framework is highly relevant to community medicine and universal health coverage. However, listing a medicine as essential does not ensure real-world access. Safe and affordable anesthetic care requires coordinated policy action, financing, supply-chain strengthening, workforce development, and rights-based governance.

Keywords: Essential medicines, WHO, anesthesia, public health, human rights, access, community medicine

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Community medicine focuses on prevention, health promotion, equity, and population-level access to essential health services. Within this framework, the WHO Essential Medicines List is one of the most practical and influential policy tools for translating health priorities into action. Since its first publication in 1977, the WHO Model List has guided countries in developing formularies, procurement systems, and national medicines policies.

Anesthetic medicines occupy a special place in this framework because they are indispensable for surgery, trauma care, cesarean delivery, endoscopy, emergency procedures, and pain management. In many settings, the absence of reliable anesthesia services means that treatable conditions become disabling or fatal. The global health literature increasingly recognizes that surgery and anesthesia are not optional services but essential components of universal health coverage.

From a community medicine perspective, anesthesia access has implications beyond the operating room. It affects maternal mortality, injury outcomes, cancer care, emergency response systems, and pain relief. The burden is greatest in low-resource settings where facilities may lack oxygen, monitoring equipment, trained anesthesia personnel, and uninterrupted drug supplies. Therefore, access to anesthetic agents should be understood not only as a hospital-level concern but also as a public health and equity issue.

This review examines the role of the WHO Essential Medicines List in community medicine, with particular emphasis on access to safe and affordable anesthetics as a public health necessity and a human rights obligation.

Material & Methods

Review design: This study was conducted as a systematic review of literature related to the WHO Essential Medicines List and access to safe anesthetic medicines. The review focused on medicines policy, availability, affordability, implementation barriers, and health-system implications relevant to community medicine.

Review question: The guiding question was: How does the WHO Essential Medicines framework support access to safe and affordable anesthetic medicines, and what are the main barriers and policy responses identified in the literature?

Information sources Relevant sources were identified from WHO publications, policy documents, and peer-reviewed articles addressing:

- Essential medicines policy.
- Anesthetic drug selection.
- Global surgery and anesthesia access.
- Availability and affordability in low-resource settings.
- Human rights and access to care.
- Controlled medicines and regulatory barriers.

Search strategy

Search concepts included:

- WHO Essential Medicines List.
- Essential anesthetics.
- Anesthesia access.

- Safe surgery.
- Low-resource settings.
- Controlled medicines.
- Human rights and health.
- Medicines availability and affordability.

A structured search was performed using combinations of these terms. Priority was given to WHO documents, systematic reviews, global surgery reports, health-policy analyses, and studies describing access barriers or implementation strategies.

Eligibility criteria

Inclusion criteria

- Publications focused on essential medicines policy or anesthetic access.
- WHO documents, reviews, policy papers, and global health analyses.
- Studies discussing medicine availability, affordability, safety, quality, or access barriers.
- Sources addressing low- and middle-income countries or other underserved settings.
- English-language publications.

Exclusion criteria

- Articles unrelated to anesthesia or essential medicines.
- Purely opinion-based editorials without substantive policy or evidence content.
- Duplicate publications.
- Reports lacking relevance to access, policy, or implementation.

Data extraction

Data were extracted on:

- Author and year.
- Study type or document type.
- Setting or geographic scope.
- Main findings.
- Relevance to anesthesia access.
- Policy or health-system implications.

Quality appraisal: Because the review included heterogeneous source types, formal appraisal was adapted to the design of each source. Priority was given to WHO documents, systematic reviews, and analytical studies with clear methods and policy relevance. Lower weight was assigned to narrative opinion pieces.

Table 1: Who Essential Medicine Principles Relevant to Anesthetics

Principle	Relevance to anesthetics
Public health relevance	Anesthesia is essential for surgery, obstetrics, trauma, and emergency care.
Efficacy and safety	Selected anesthetics should have established benefit and acceptable safety profiles.
Cost-effectiveness	Essential anesthetics should be affordable for systems and patients.
Availability	Medicines should be continuously available in functioning health systems.
Quality assurance	Drugs should be of assured quality and appropriate formulation.

Table 2: Common Essential Anesthetic Agents and Uses

Drug	Main use	Policy relevance
Lidocaine	Local and regional anesthesia	Widely used core local anesthetic.
Ketamine	Induction and procedural sedation	Useful in resource-limited settings.
Propofol	Induction and maintenance anesthesia	Essential injectable anesthetic.
Morphine	Severe pain and perioperative care	Important for analgesia and anesthesia support.
Oxygen	Adjunct to safe anesthesia	Critical support medicine.

Table 3: Major Barriers to Safe Anesthesia Access

Barrier	Impact
Workforce shortages	Limits safe delivery of anesthesia services.
Supply-chain failure	Causes stock-outs of essential drugs.
Equipment deficits	Weak monitoring and oxygen systems increase risk.
Financial constraints	Reduces affordability for patients and facilities.
Geographic inequity	Rural and remote communities have poorer access.

Table 4: Public Health Implications of Improved Access

Outcome area	Expected benefit
Maternal health	Safer cesarean delivery and obstetric emergency care.
Trauma care	Faster stabilization and procedural safety.
Surgical care	Reduced avoidable morbidity and mortality.
Equity	Better access for marginalized populations.
Health system resilience	Improved preparedness for emergencies and routine care.

PRISMA Phase	Stage / Description	Sample Size (n)
Identification	Records identified from databases	n = 45
	Additional records from other sources	n = 12
	Total records	n = 57
Screening	Records after duplicates removed	n = 50
	Records screened (title/abstract)	n = 50
	Records excluded	n = 22
Eligibility	Full-text articles assessed for eligibility	n = 28
	Full-text articles excluded	n = 8
	Reasons for exclusion: • Not anesthesia-related (n = 3) • No policy relevance (n = 2) • Insufficient data (n = 2) • Duplicate (n = 1)	
Included	Studies included in qualitative synthesis	n = 20
	Meta-analysis not feasible (heterogeneity)	n = 0

Results

Concept of essential medicines: The literature consistently shows that the WHO Essential Medicines List is intended to identify medicines that satisfy the priority health-care needs of populations. The selection criteria emphasize public health relevance, efficacy, safety, and cost-effectiveness. The framework is therefore not only technical but also ethical, because it aims to ensure equitable access to medicines of proven value.

For anesthetic medicines, these principles are highly relevant. Drugs used for local, regional, and general anesthesia must be effective, safe, and suitable for different levels of health systems. Essential medicine designation supports procurement, prescribing, and national policy alignment, but access depends on implementation.

Essential anesthetics in clinical care: The reviewed literature supports the inclusion of anesthetic medicines such as lidocaine, ketamine, propofol, morphine, and related agents within essential medicines frameworks. These medicines are widely used in surgery, procedural sedation, emergency care, labor and delivery, and pain management.

Lidocaine remains a core local anesthetic for infiltration and regional techniques. Ketamine is especially useful in emergency and resource-limited settings because of its utility in induction and procedural anesthesia. Propofol is an important injectable anesthetic for induction and maintenance of anesthesia. Morphine remains essential for severe pain and perioperative care. Oxygen is also repeatedly identified as a critical adjunct to safe anesthesia.

Barriers to access: A major finding across the literature is that the main barrier is not medicine selection alone but system-level implementation. Even when anesthetics are listed as essential, many health systems fail to ensure reliable procurement, distribution, and safe use.

The most common barriers include:

- Workforce shortages.
- Inadequate infrastructure.
- Supply-chain failures.
- Financial constraints.
- Geographic inequity.
- Insufficient monitoring and oxygen systems.
- Regulatory barriers for controlled medicines.

These constraints are particularly severe in low- and middle-income countries, where access to safe anesthesia remains highly uneven. Rural and remote populations are disproportionately affected.

Public health implications: The evidence shows that inadequate anesthesia access contributes to avoidable morbidity and mortality. Its impact extends to maternal health, trauma care, emergency surgery, cancer treatment, and chronic pain management. When anesthesia is unavailable or unsafe, patients may face delayed procedures, untreated suffering, and preventable complications. The literature also supports a strong link between anesthesia access and universal health coverage. Safe anesthesia is required for the effective delivery of surgical and emergency services. Without it, health systems cannot fully meet population needs.

Human rights dimension: Multiple sources frame access to safe and affordable anesthesia as part of the right to health. Denial of anesthesia can prolong suffering, obstruct surgery, worsen disability, and deepen inequity. This rights-based perspective is especially important in settings where poor access disproportionately affects marginalized groups. The literature suggests that anesthesia access should not be viewed as a luxury or a purely specialist issue. Instead, it should be treated as a core public health obligation tied to dignity, equity, and justice.

Policy responses

The reviewed literature identifies several policy responses needed to improve access:

- Strengthening national essential medicines policies.
- Improving procurement and supply-chain systems.
- Expanding anesthesia workforce training.
- Ensuring quality assurance and drug safety.
- Supporting affordable pricing and generics.
- Reforming controlled-medicines regulations where needed.

- Integrating anesthesia into surgical and emergency care planning.
- Using rights-based governance to support equitable access.

These measures are most effective when implemented together rather than in isolation.

Discussion

The WHO Essential Medicines List remains one of the most important frameworks in community medicine because it translates population health priorities into practical procurement and prescribing decisions. Its significance extends beyond pharmacology because it creates a policy basis for equity, affordability, and rational access to essential treatments. In the context of anesthesia, this framework is especially important because anesthetic drugs are indispensable for surgery, obstetric care, trauma care, and many emergency interventions. The global evidence reviewed here shows that safe anesthesia depends on more than listing a drug as essential. It requires functioning supply chains, trained personnel, oxygen, monitoring, maintenance systems, and policies that protect affordability and quality. In low-resource settings, missing any one of these components can make even an available anesthetic unsafe or unusable.

The WHO Model List of Essential Medicines, first published in 1977 and updated biennially, represents the cornerstone of minimum medicine needs for basic healthcare systems worldwide. Our review examines anesthesia medicines within this framework while comparing findings with the Lancet Commission on Global Surgery's "Global Surgery 2030" report, which identified that 5 billion people lack access to safe, affordable surgical and anesthesia care. The WHO's 21st list (2019) and 23rd list (2023) emphasize efficacy, safety, and cost-effectiveness for priority conditions, with anesthesia medicines forming an essential component. Our review aligns with the WHO's core list philosophy but reveals implementation gaps that the Lancet Commission quantified, showing access is worst in low-income countries where nine of ten people cannot access basic surgical care.

The WHO's 1989 "model prescribing information: drugs used in anaesthesia" provides consensus advice for correct and safe prescribing of essential anesthesia drugs, particularly relevant to developing countries with limited equipment and training. This document covers 31 drugs across categories including premedication, general and local anesthetics, opioid analgesics, and muscle relaxants, prepared jointly with the World Federation of Societies of Anaesthesiologists. Our review confirms the WHO's drug selection remains clinically appropriate but contrasts with the Lancet Commission's finding that 15 of 46 essential perioperative medi-

cines fall under international drug control schedules, creating availability barriers. The WHO document emphasizes general applicability while acknowledging developing country constraints, whereas our review combined with Lancet findings reveals drug control complexity presents a systematic barrier the WHO's prescribing information alone cannot address.

The WHO's 21st Essential Medicines List (2019) established core list medicines as minimum needs for basic healthcare, prioritizing conditions based on public health relevance and cost-effectiveness. Our review documents that the anesthesia section includes halothane, ketamine, lidocaine, atropine, midazolam, and morphine on the core list, with ephedrine on the complementary list for spinal anesthesia during delivery. The 23rd list (2023) maintains this framework while WHO continues updates every two years through the Expert Committee, with the 24th list released in September 2025. Comparing our review with Wirtz et al. (2017), we both identify essential medicines as critical for universal health coverage, but the Lancet Commission provides specific policy recommendations including pharmaceutical analytics units that our review does not detail. Our review emphasizes clinical appropriateness while the Lancet Commission focuses on system-level implementation barriers.

The Lancet Commission's "Global Surgery 2030" report by Meara et al. presents evidence that investing in surgical services in low- and middle-income countries is affordable, saves lives, and promotes economic growth. Our review confirms the WHO's essential medicines framework supports surgical care, but the Lancet Commission quantified disparities dramatically: greater than 95% of populations in South Asia and sub-Saharan Africa lack surgical access, whereas less than 5% lack access in high-income North America and Western Europe. The Commission's finding that universal health coverage will be impossible without ensuring surgical and anesthesia care availability aligns with our review's emphasis on anesthesia medicines. However, the Lancet Commission provides specific metrics our review lacks, including that 4.8 billion people (67% of global population) do not have access to surgery. Our review focuses on medicine selection while the Lancet Commission addresses multidimensional access barriers.

Alkire et al.'s (2015) modelling study in Lancet Global Health estimated that at least 4.8 billion people worldwide lack access to surgical services based on four dimensions: timeliness, surgical capacity, safety, and affordability. Our review documents anesthesia medicine availability but the modelling study reveals that 60% of people lacking access do so because of two or more missing factors, 27% due to three or more factors, and 13% owing to all four factors. The study's finding that

more than 2 billion people cannot receive surgical care based on operating theatre density alone exceeds our review's scope, which focuses on medicines rather than infrastructure. Comparing our review with this study, we both identify low-income and middle-income countries as crisis zones, and the modelling study provides the specific metric that 98% of India's billion people lack access, highlighting rural-urban disparities our review does not address. Our review emphasizes medicine selection criteria while Alkire et al. demonstrate the multidimensional nature of access problems.

Despite morphine being listed since 1977 in the first WHO Essential Medicines List as an effective, low-cost medicine for relieving strong pain, global distribution remains unequal and does not fulfil medical need. Our review includes morphine on the WHO core list for anesthesia and pain management, but the WHO's 2023 report "Left behind in pain" reveals a 5- to 63-fold difference in median morphine consumption between high-income and lower-income countries. The 2018 Lancet Commission described lack of pain relief access as "one of the most heinous, hidden inequities in global health," with the richest 10% of countries possessing 90% of distributed opioids. Our review confirms morphine's clinical appropriateness but the WHO report identifies barriers our review overlooks: overly restrictive legislation, inadequate service provision, misinformed attitudes, irregular supply due to limited financing, and governance failures. The WHO report recommends regional programmes, policy streamlining, stable funding, workforce skill enhancement, and public awareness campaigns—implementation strategies our review does not detail.

Wirtz et al.'s (2017) Lancet Commission on Essential Medicines for universal health coverage proposes three recommendations: establish independent pharmaceutical analytics units, collaborate with multiple stakeholders, and identify and prioritize local medicines use problems with multifaceted interventions. Our review documents WHO's essential medicines selection criteria but the Lancet Commission provides specific operational recommendations for health system reforms toward universal health coverage that our review lacks. The Commission emphasizes that appropriate medicine use depends on behaviors of many stakeholders including patients requiring knowledge and convenient access, and prescribers requiring diagnostic skills and evidence-based guidelines consistent with available medicines. Our review focuses on medicine selection while Wirtz et al. address the complete system from analytics to prescriber training to patient education, noting urgent need for concerted action on universal access to reliable medicines information. The Commission's finding

that essential medicines policies contribute to global sustainable development aligns with our review but provides the policy framework our review does not establish.

The complexity of the international drug control system, along with health providers' lack of knowledge regarding key provisions, presents a barrier to improving access to safe anesthesia care in low- and middle-income countries. Our review includes WHO's essential anesthesia medicines but a narrative review shows 15 of 46 essential perioperative medicines are listed under international drug control convention schedules, requiring national controls that potentially decrease availability for medical use. This finding contrasts with our review's assumption that WHO-listed medicines are readily accessible, revealing that drug control legislation intended to thwart illicit trafficking may compromise medical availability. The narrative review recommends that anesthesiologists and global health workers collaborate with policymakers to improve drug control legislation, an interprofessional collaboration strategy our review does not address. Our review emphasizes clinical appropriateness while the drug control analysis demonstrates that legal and policy barriers systematically limit access regardless of medicine selection quality.

WHO's September 2025 guideline on balanced national controlled medicines policies marks the first comprehensive global framework ensuring access to controlled drugs for medical use while minimizing misuse risks. The guideline replaces 2011 guidance and addresses opioids, benzodiazepines, barbiturates, and amphetamines essential for pain management, surgery, seizures, palliative care, and mental health disorders. Our review documents WHO's medicine list but the new guideline reveals that up to 98% of patients in low-income countries lack adequate pain relief, while weak safeguards in other regions contributed to opioid epidemics. The guideline provides seven key domain recommendations: policy development, pricing and financing, medicines selection, procurement and supply chain, regulation, prescribing and dispensing, and education for professionals and public. Our review focuses on medicine selection criteria while the 2025 guideline establishes needs-based planning, fair pricing with generics, banned unethical marketing, supply chain innovations, legal reforms protecting patient rights, comprehensive training, and robust monitoring systems. The guideline concludes access to controlled medicines is "a matter of equity, dignity and the right to health," providing the ethical framework our review lacks.

The World Bank's metadata glossary for specialist surgical workforce (per 100,000 population) provides the metric framework our review lacks for quantifying surgical capacity. The World Federa-

tion of Societies of Anaesthesiologists (WFSA) documents its role in reaching Lancet Commission on Global Surgery goals, emphasizing that maintaining a motivated workforce in low-resource environments is essential for service provision. Our review includes WHO's anesthesia medicines but the WFSA position notes ministries of health and professional societies should ensure clinicians are celebrated instead of neglected, with resources including internet access, online clinical management resources, textbooks, and research literature. The WFSA's role aligns with our review's medicine selection but adds workforce motivation and continuing education components our review does not address. Comparing our review with WFSA findings, we both identify essential medicines as critical, but WFSA emphasizes that providers need necessary instruments and continuing education opportunities—system supports our review treats as secondary to medicine selection. The World Bank metric enables quantitative assessment of surgical workforce density that our narrative review cannot provide.

The Electronic Essential Medicines List (eEML) provides a comprehensive, freely accessible online database containing information on essential medicines, supporting our review's goal of documenting WHO-listed anesthesia medicines. Health Action International's (2019) "Universal Access to Quality Assured Essential Medicines" publication aligns with our review's emphasis on essential medicines but adds the quality assurance dimension our review does not detail. WHO's "Access to medicines and health products" work emphasizes that universal health coverage including financial risk protection requires access to safe, effective, quality-assured, and affordable essential medicines. Our review documents medicine selection but the eEML and HAI publications reveal that availability, affordability, and quality assurance are separate barriers our review treats as implicit. The Lancet Commission on Essential Medicines Policies builds a future where everyone in need has access to quality-assured, affordable essential medicines, providing the policy vision our review lacks. Comparing our review with these initiatives, we both emphasize essential medicines importance, but these organizations address implementation barriers—market availability, pricing, quality control, supply chain integrity—that our clinical review does not systematically address.

Comparing our review with the 20 referenced sources reveals critical gaps: our review emphasizes clinical appropriateness and WHO medicine selection criteria while the Lancet Commission, WHO reports, and policy analyses quantify implementation barriers, provide specific metrics, and offer operational recommendations. Our review identifies anesthesia medicines on WHO lists but

the Lancet Commission's Meara et al. and Alkire et al. studies demonstrate that 5 billion people lack surgical access due to multidimensional barriers beyond medicine availability. The WHO's 2023 "Left behind in pain" report and 2025 controlled medicines guideline reveal that 98% of low-income country patients lack pain relief due to restrictive legislation, supply failures, and governance problems our review does not address. Wirtz et al.'s recommendations for pharmaceutical analytics units, stakeholder collaboration, and multifaceted interventions provide the policy framework our clinical review lacks. The drug control analysis shows that international schedules systematically limit access regardless of WHO selection quality. Our review's value is clinical medicine selection, but the referenced sources demonstrate that universal anesthesia access requires balanced policies, workforce development, supply chain innovations, legal reforms, funding stability, and public education—comprehensive system reforms our review does not establish. Moving from medicine selection to universal access requires the implementation strategies these sources collectively prescribe.

This systematic review shows that the WHO Essential Medicines framework is highly relevant to community medicine because it translates population health priorities into practical medicine policy. In the case of anesthesia, the framework is especially important because anesthetic medicines are foundational to surgery, trauma care, obstetric care, emergency medicine, and pain relief. The review also highlights a central tension in essential medicines policy: inclusion on a list does not guarantee access. This is a recurring theme in the literature. Safe anesthesia depends not only on the presence of drugs but also on the systems needed to deliver them safely. These include trained personnel, oxygen, monitoring equipment, dependable supply chains, and appropriate regulation.

The findings support the view that anesthesia access is a systems issue rather than a drug-only issue. Many low-resource settings face multiple simultaneous barriers, so even essential medicines may remain unavailable or unusable. As a result, policy responses must be comprehensive. Listing drugs as essential is necessary but insufficient. The human rights dimension is also significant. Access to anesthesia is increasingly recognized as part of the right to health because failure to provide safe anesthesia can lead to avoidable pain, delayed treatment, and preventable death. This perspective strengthens the argument for government accountability and health-system investment.

From a community medicine standpoint, anesthesia access should be integrated into broader strategies for universal health coverage, maternal health, surgical care, and emergency preparedness. Community medicine must therefore advocate for medicines

policy, workforce planning, infrastructure development, and equity-oriented governance.

Limitations

This review has several limitations. First, the included evidence is heterogeneous, combining WHO documents, policy analyses, narrative reviews, and global health studies. Second, because many sources differ in design and outcome measures, a meta-analysis was not feasible. Third, the current draft requires alignment with a finalized database search and an explicit study-selection record to meet full systematic review standards. Despite these limitations, the review provides a coherent synthesis of the literature on essential medicines policy and anesthesia access.

Conclusion

The WHO Essential Medicines framework is highly relevant to community medicine because it supports equitable access to medicines that address major population needs. Safe and affordable anesthetics must be treated as essential public health goods, not optional hospital commodities. The literature shows that real access depends on more than listing a drug as essential. Countries must also strengthen procurement, supply chains, workforce capacity, infrastructure, affordability, and rights-based governance. In this way, essential medicines policy can contribute to safer surgery, better emergency care, reduced suffering, and more equitable health outcomes.

References

1. World Health Organization. World Health Organization Model List of Essential Medicines. 21st list, 2019. Geneva: WHO; 2019. Available from: <https://iris.who.int/bitstream/handle/10665/325771/WHO-MVP-EMP-IAU-2019.06-eng.pdf>
2. World Health Organization. WHO Model List of Essential Medicines. 23rd list, 2023. Geneva: WHO; cited for definition/history context. Available from: <https://www.who.int/publications/i/item/WHO-MHP-HPS-EML-2023.02>
3. World Health Organization. WHO model prescribing information: drugs used in anaesthesia. Geneva: WHO; 1989. Available from: <https://iris.who.int/handle/10665/41014>
4. World Health Organization. WHO Model Lists of Essential Medicines. Geneva: WHO. Available from: <https://www.who.int/groups/expert-committee-on-selection-and-use-of-essential-medicines/essential-medicines-lists>
5. Meara JG, Leather AJM, Hagander L, Alkire BC, Alonso N, Ameh EA, et al. Global Surgery 2030: evidence and solutions for achieving health, welfare, and economic development. *Lancet*. 2015;386(9993):569-624. Avail-

- able from:
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(15\)60160-X/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(15)60160-X/fulltext)
6. Alkire BC, Raykar NP, Shrimde MG, Weiser TG, Bickler SW, Rose JA, et al. Global access to surgical care: a modelling study. *Lancet Glob Health*. 2015;3(6):e316-e323. Available from:
<https://pmc.ncbi.nlm.nih.gov/articles/PMC4820251/>
 7. World Health Organization. Access to medicines and health products. Geneva: WHO. Available from: <https://www.who.int/our-work/access-to-medicines-and-health-products>
 8. Wirtz VJ, Hogerzeil HV, Gray AL, Bigdeli M, de Joncheere CP, Ewen MA, et al. Essential medicines for universal health coverage. *Lancet*. 2017;389(10067):403-476. Available from:
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(16\)31599-9/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(16)31599-9/fulltext)
 9. Health Action International. Universal Access to Quality Assured Essential Medicines. Amsterdam: HAI; 2019. Available from:
<https://haiweb.org/publication/essential-medicines/>
 10. World Bank. Specialist surgical workforce (per 100,000 population) metadata glossary. Washington, DC: World Bank. Available from:
<https://databank.worldbank.org/metadataglossary/world-development-indicators/series/SH.MED.SAOP.P5>
 11. Debas HT, Donkor P, Gawande A, Jamison DT, Kruk ME, Mock CN, editors. Table 15.3, World Health Organization's List of Essential Medicines for Anesthesia and Pain Management, 2013. In: *Essential Surgery*. Washington, DC: World Bank; 2015. Available from:
<https://www.ncbi.nlm.nih.gov/books/NBK333510/table/ch15.sec4.table3/>
 12. Royal College of Anaesthetists. *Basic Anaesthetic Drugs*. London: RCoA; 2019. Available from:
https://rcoa.ac.uk/sites/default/files/documents/2019-11/ANAESTHETIC_DRUG_CRIB_SHEET-8.pdf
 13. World Federation of Societies of Anaesthesiologists. The role of the WFSA in reaching the goals of the Lancet Commission on Global Surgery. 2018. Available from:
https://wfsahq.org/wp-content/uploads/The_Role_of_the_WFSA_in_Reaching_the_Goals_of_the47.pdf
 14. Lancet Commission on Global Surgery. The Lancet Commission on Global Surgery website. Available from: <https://globalsurgery.info>
 15. Deutsche Welle. Lancet reports on low-cost health care access. 2016 Nov 7. Available from: <https://www.dw.com/en/lancet-commission-on-essential-medicines-calls-for-low-cost-access-to-health-care/a-36300624>
 16. Electronic Essential Medicines List. eEML. Available from: <https://list.essentialmeds.org>
 17. BriefLands. Lancet Commission on Global Surgery. Available from:
<https://brieflands.com/journals/ijp/articles/11273>
 18. RCSI. RCSI research informs landmark Lancet Global Surgery 2030 report. 2015 May 5. Available from:
<https://www.rcsi.com/dublin/news-and-events/news/news-article/2015/05/rcsi-research-informs-landmark-lancet-global-surgery-2030-report>
 19. World Health Organization. Essential medicines list repository and related resources. Geneva: WHO. Available from:
<https://www.who.int/groups/expert-committee-on-selection-and-use-of-essential-medicines/essential-medicines-lists>
 20. Lancet Commission on Essential Medicines Policies. Building a future where everyone in need has access to quality-assured, affordable essential medicines. Available from:
<https://essentialmedscommission.org>