



SCOPE OF SURGERY IN PUBLIC HEALTH IN BRICS NATIONS

Sanjay Maitra¹ | Samput Mallick² | Bappaditya Halder³ | Samir Mallick⁴

¹ Associate Professor, Department of Surgery, Nil Ratan Sircar Medical College and Hospital, Kolkata, India.

² Resident, Department of Surgery, Nil Ratan Sircar Medical College and Hospital, Kolkata, India.

³ RMO, Department of Surgery, Nil Ratan Sircar Medical College and Hospital, Kolkata, India.

⁴ South Howrah State General Hospital, India.

ABSTRACT

Surgery is one of the most sought after treatment for humankind, but, globally there is shortage of surgical care, and many people die worldwide, especially in medium and low income group countries for this reason. Comparing with other types of primary care like Vitamin A distribution or immunisation against measles, many a times surgical care like emergency obstetric care in rural health set up are cheaper and cost effective strategy. Surgery can play a critical role to achieve the Millennium Development Goals (MDGs) of the United Nations. This requires change in perception to integrate surgical care and primary care, and related to growth of health spending. Since 1990s, the ratio of Total Health Expenditure (THE) as a % of GDP increasing for the BRICS countries (Brazil, Russia, India, China, South Africa), which is an indication that health expenditure of these group of countries is growing in rapid pace. Our aim is to build up a conceptual framework to integrate primary care with surgery which is based on building block model for health systems provided by World Health Organisation.

Keywords: BRICS, Framework, Primary Care, Surgical Care.

Every year, more people die from lack of access to surgical care, than the number of death occurs from diseases combined HIV/AIDS, tuberculosis, and malaria. The conditions that lack less than required number of surgery results from accidental trauma that include bone and soft-tissue injuries, tumours, obstetrical complications, congenital anomalies and peri-natal conditions, cataracts and glaucoma, male circumcision to prevent transmission of HIV, and other surgically amenable cases that include hernia, gall bladder disease, infections requiring surgical care, etc (Table 1). The economic impact of disability adjusted life years is calculated as follows:-

$$DALY = YLL + YLD$$

[DALY: Disability Adjusted Life Years; YLL: Years of Life Lost; YLD: Years Lost due to Disability]

The reduction in calculated DALY or the “DALYs averted” is the consequence of “timely institution of appropriate surgical care to alleviate certain physical conditions.

Injuries including soft tissue as well as bones are considered as the leading causes of surgical disease globally, this group alone constitute for 38% Percentage of surgical DALYs. next comes malignancies by 19% of surgical DALYs, This is followed by congenital anomalies 9%, obstetric complications 6%, cataracts and glaucoma 5%, perinatal conditions 4% and other diseases group causes 19% of surgical DALYs (Figure 2).

Surgical conditions account for 11% of global DALYs lost each year, with LMICs carrying the greatest burden. Southeast Asia plus Africa alone, accounted for 54% of DALYs in 2004. The projected Global DALYs lost will

increase from 1.48 billion in 2002 to 1.54 billion in 2030, an overall increase of only 3%. During the same period, population increase is projected to be 27%, and there will be a decrease in the global per capita burden. The overall global death rate is projected to increase by 1%. The DALY rate decreases, because the increasing number of deaths will offset by shift in age at death to older ages, resulting in fewer lost years of life. Assuming that the age-specific burden for most nonfatal causes remains constant in future, the overall burden for these conditions will increase with the ageing of the population, still there will be an overall projected decrease in global burden of disease per capita of 19% from 2002 to 2030¹.

“The fact that the poorest third of the world’s population receive only 3.5% of the estimated 234 million major surgical operations undertaken worldwide [5] serves as a startling reminder of the huge disparities in access to healthcare globally. Reported rates of surgery worldwide range from 295 operations per 100,000 of the population in Ethiopia to 23,369 per 100,000 of the population in Hungary [5]. This vast gulf in the provision of surgical care between low-income countries (LIC) and high-income countries (HIC) suggests a variance in access to care and a growing volume of unmet surgical need. Although this disparity may be partially explained by over-prescription in HICs, access to surgical care remains a significant concern in LICs. The reasons for this hiatus in access include, but are not limited to, the existence of barriers to the delivery of surgical care [6]. These barriers comprise patient, physician, institution and structural factors. In this review we have categorised these barriers under the following dimensions; problems with accessibility,

availability, affordability or acceptability" (Table 3).

BRICS is acronym for an association of five major nations: Brazil (Federative Republic of Brazil), Russia (Russian Federation), India (Republic of India), China (People's Republic of China) and South Africa (Republic of South Africa). The member countries are distinguished by their large and fast-growing economies and significant influence on regional affairs. As of 2015, the five BRICS countries represent over 3.6 billion people, which is approximately 42% of the world population. The five nations have a combined nominal GDP of US\$16.6 trillion, equivalent to approximately 22% of the gross world product, combined GDP (PPP) of around US\$37 trillion and an estimated US\$4 trillion in combined foreign reserves (Table 4). Overall estimated growth of the five BRICS countries were 3.9% in 2015, 4.6% in 2016, and it will be 5.3% in the year 2017. Global health spending (i.e., governmental, private and out-of-pocket health expenditures) share of BRICS nations have shown its long term growth since 1990, in spite of their diversity and rise in out-of-pocket spending. Medium-term projections of national health spending (based on macroeconomic budgetary excess growth model) indicates that, China will achieve highest excess growth rate of 2% and increase its GDP% spent on health care from 5.4% in 2012 to 6.6% in 2025. India's health expenditure is not proportional to its overall economic growth and is slightly less than 4% of GDP. Average total per capita health spending of the BRICS nations were \$1004 Purchase Power Parity (PPP) in 2013, whereas Russia remain highest, from \$1523 PPP in 2012 reaching net gain to \$2214 PPP in 2025⁶. The increasing ratio of Total Health Expenditure (THE) as a percentage of GDP indicates that the BRICS countries' health expenditure is growing at a fast rate. The current medical care-related expenditures in BRICS countries reveal a reshaping of their health care sector with successful reforms. The published report highlights rising public expectations, extended longevity and medical innovation, which explains the accelerated growth in health spending. However, this upward trend is mainly dominated by the greater contribution of China to medical spending. The differences in individual countries' THE shows that the gap is expected to remain wide for the foreseeable time to come. Equity justified access to healthcare should echo the populations' real needs, and should aim to eliminate socio-economic and other obstacles. It is challenging to uphold the equity principle as the BRICS populations' share of THE as percentage of GDP is far less to their real needs. Rising out-of-pocket expenses threaten affordability of medical care for poor citizens of the BRICS nations. From a public health perspective, to achieve maximum benefit to the maximum percentage of the population, it is wise to apply the utilitarian principle of distributive justice for allocation of scarce medical resources⁷.

Some policy makers of the lower and middle income countries (LMICs) consider that to develop surgical services is expensive for these countries. But the surgical care, under certain circumstances, compared with other types of primary treatments, can be a cost-effective

strategy, as shown by economic evidences provided by the World Bank. The concept of surgical care should be considered as a population based globally relevant issue. By some author, surgery has been termed as the "neglected specialty in the current global health arena of global public health" and the "neglected stepchild."

"Health systems in BRICS countries are faced with high burdens of surgical disease, insufficient surgical practitioners and frequent shortages of essential implements for basic surgical care. 10 leading causes of DALYs of both sexes in the year 2010, the number for World was 910,935,400, whereas in BRICS countries it was 423,268,668.

Within countries, these deficiencies have been enumerated using WHO's Global Initiative for Emergency and Essential Surgical Care (GIEESC) Situational Analysis Tool (SAT) and other methods. Recently, the Lancet Commission for Global Surgery (www.globalsurgery.info) proposed six indicators for monitoring access to safe surgical care addressing access to timely essential surgery, specialist surgical workforce density, surgical volume, perioperative mortality rate and protection against impoverishing or catastrophic expenditures. However, current measures fail to fully describe how surgical diseases interact with broader population health concerns, or how surgical care can be more fully integrated into health systems. Health systems are defined as the institutions, organizations and resources (physical, financial and human) that provide services to improve health. WHO has expanded this definition into the building blocks model for health systems.⁸ (8. WHO. Monitoring the Building Blocks of Health Systems: a Handbook of Indicators and their Measurement Strategies. Geneva: World Health Organization; 2010.) The goal of these indicators is to organize, plan and track efforts toward improved population health and to integrate specific disease states into broader health system considerations. We propose a new framework based on WHO's building blocks model to link inputs to population impact Lancet Commission indicators, and responds to recommendations from the disease control priorities goal to assess surgical care within primary health systems. This model includes indicators in four categories: inputs and processes, outputs, outcomes and impacts. Although more discussion and validation of our proposed framework is required, we seek to broaden the dialogue by proposing a comprehensive synthesis of indicators to enhance understanding of surgical care within health systems."⁹

Ethical approval: No ethical approval was required for this work.

Funding: No funding was received to support this work.

Conflict of interest statement: The authors have no conflicts of interest to declare.

Authors' contributions:

Sanjai Maitra: idea, literature review, writing and critical review of manuscript.

Samput Mallick: idea, writing and critical review of manuscript.

Bappaditya Halder: literature review, writing and critical review of manuscript.

Samir Mallick: writing and critical review of manuscript

Disease group	Percentage of global DALYs
Cardiovascular and circulatory disease	11.8%
Injuries	11.2%
Neonatal disorders	8.1%
Neoplasms	7.6%
Mental and behavioural disorders	7.4%
Musculoskeletal disorders	6.8%
Diabetes, urogenital, blood and endocrine	5.0%
Chronic respiratory diseases	4.7%
Lower respiratory infection	4.6%
HIV/AIDS	3.6%
Neurological disorders	3.0%

DALY: disability-adjusted life-year.
Data from the Global Burden of Disease Study, 2010

Table 1: The leading causes of global burden of disease

(C.J. Murray, T. Vos, R. Lozano, M. Naghavi, A.D. Flaxman, C. Michaud, et al., Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990 to 2010: a systematic analysis for the Global Burden of Disease Study 2010, Lancet 380 (9859) (2012) 2197-2223)

Disease group	Percentage of surgical DALYs
Injuries	38%
Malignancies	19%
Congenital anomalies	9%
Obstetric complications	6%
Cataracts and glaucoma	5%
Perinatal conditions	4%
Other causes	19%

DALY: disability-adjusted life-year.
Data from the Disease Control Priorities Project, 2nd Edition, 2006

Table 2: The leading causes of surgical disease globally

(H.T. Debas, R. Gosselin, C. McCord, A. Thind, Surgery, in: D.T. Jamison, J.G. Breman, A.R. Measham, G. Alleyne, M. Claeson, D.B. Evans, et al. (Eds.), Disease Control Priorities in Developing Countries, second ed., Oxford University Press, New York, 2006, pp. 1245e1259.)

Type of barrier	Patient-related	Physician-related	Intuition-related	Structure-related
Accessibility	<ul style="list-style-type: none"> Lack of health education Absence of social support 	<ul style="list-style-type: none"> Poor communication with the patient or the patient's family 	<ul style="list-style-type: none"> Lengthy waiting times Health facility opening times 	<ul style="list-style-type: none"> Disincentives to care seeking behaviour (e.g. disability grants) Limited means of transport Lack of coordination between health service providers. Limited number of facilities able to provide certain procedures
Availability	<ul style="list-style-type: none"> Lack of awareness about the importance of treatment 	<ul style="list-style-type: none"> Health worker shortages and lack of adequately skilled staff Poor remuneration Poor patient outcomes 	<ul style="list-style-type: none"> Lack of adequate infrastructure Lack of equipment Weak referral systems 	<ul style="list-style-type: none"> Poor management of services and staff Insecurity associated with healthcare delivery in areas of conflict
Affordability	<ul style="list-style-type: none"> Direct and indirect financial costs 			
Acceptability	<ul style="list-style-type: none"> Traditional beliefs about disease processes Stigma 			

Table 3: Summary of the barriers to improving surgical capacity in low- and middle-income countries

(R. Ologunde et al. / International Journal of Surgery 12 (2014) 858e863)

Country / Year	Gross Domestic Product (GDP)	Gross National Income (GNI) - PPP	GNI per capita, PPP (*)	Income Gini coefficient (**)	Human Development Index (HDI) (***)
	bi US\$	international bi \$	international \$		
	2011	2011	2011		2011
Brazil	2,476,7	2,245,8	10,086	57,4 (2005) - 54,7 (2009)	0,718
Russian Fed.	1,857,8	2,917,7	13,897	37,5 (2005) - 40,1 (2009)	0,755
India	1,847,9	4,460,5	3,175	33,4 (2005)	0,547
China	7,318,5	11,270,8	7,404	42,5 (2005) - 49,1 (2009)	0,687
South Africa	408,2	541,9	9,463	67,4 (2006) - 63,1 (2009)	0,619
BRICS	13,909,1	21,436,7			
World	70,201,0	78,980,0			
BRICS as % world	19,80	27,10			

(*) Gross National Income converted to international dollars (\$) using purchasing power parity rates. An IS has the same purchasing power over GNI as a U.S. dollar has in the United States.

(**) Measure of the deviation of the distribution of income or consumption among individuals or households within a country from a perfectly equal distribution. A value of 0 represents absolute equality, a value of 100 absolute inequality (all incomes are commanded by the richest person in the economy).

(***) Combines indicators of health (life expectancy at birth), education (mean years of schooling and expected years of schooling) and living standards (gross national income per capita).

Source: The World Bank. 2011: UNDP. 2011.

Table 4: Socio-economic and income indicators of BRICS countries

(www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-12902014000200390)

Country / Year	Risk factors					NCD		
	Estimated Healthy life expectancy (HALE)* at birth	10 leading causes of DALYs**	Obese adults 20 y.o.+	Alcohol consumption adults 15 y.o.+	Prevalence for current smoking adults 15 y.o.+	Cancer Cardiovascular diseases and diabetes	Chronic respiratory diseases	
	both sexes combined	in thousands	%	litres of pure alcohol per person per year	%	deaths per 100,000 (M - F)	deaths per 100,000 (M - F)	deaths per 100,000 (M - F)
	2010	2010	2008	2008	2009	2008	2008	2008
Brazil	69,8	21,749,6	16,5	10,1	22	136 - 95	304 - 226	54 - 32
Russian Federation	59,9	32,755,4	18,4	16,2	59	194 - 89	772 - 414	41 - 9
India	56,2	209,784,1	1,3	2,7	26	79 - 72	386 - 283	178 - 125
China	67,8	140,460,6	4,6	5,6	51	182 - 105	312 - 260	118 - 89
South Africa	51,0	18,518,9	23,2	10,2	24	207 - 124	328 - 315	87 - 44

* Healthy life expectancy (HALE). Average number of years that a person can expect to live in "full health" by taking into account years lived in less than full health due to disease and/or injury.

** Disability Adjusted Life Years (DALYs). The sum of years of potential life lost due to premature mortality and the years of productive life lost due to disability.

Source: IHME, 2013; WHO, 2012, 2013.

Table 5: Healthy life expectancy at birth, leading causes of DALYs in BRICS, risk factors which can lead to non-communicable disease and some NCD indicators

(www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-12902014000200390)

Country	Physicians		Nursing workforce and midwifery personnel		Dentistry personnel		Pharmaceutical personnel		Health expenditure per capita PPP int \$
	Number	Density (per 10,000 population)	Number	Density (per 10,000 population)	Number	Density (per 10,000 population)	Number	Density (per 10,000 population)	
Brazil	341,819	18	1,243,804	64	227,141	12	104,098	5	1,028.29
Russian Federation	614,183	43	1,214,292	85	45,628	3	11,521	1	998.36
India	757,377	7	1,146,915	10	93,332	1	578,179	5	132.20
China	1,905,436	14	1,854,818	14	51,012	0	341,910	3	378.91
South Africa	-	7	-	39	-	-	-	-	934.95
Global	8,652,107	14	16,689,250	28	1,227,822	2	2,114,282	4	

Source: WHO, 2012, 2013; MSF, 2007.

Table 6: Human health resources and expenditures

(www.scielo.br/scielo.php?script=sci_arttext&pid=S0104-12902014000200390)

	Life Expectancy at Birth ¹	Infant Mortality per 1,000 Live Births ²	Child Mortality under 5 per 1,000 Live Births ³	Maternal mortality ratio (per 100 000 live births) ⁴
Russia Federation	71	9	10	24
Brazil	74	12	14	69
South Africa	59	33	44	140
China	75	11	13	32
India	66	41	53	190

Source & Note:

- * Life expectancy at birth data is of 2012; maternal mortality ratio is of 2010; all the others are of 2013.
- 1. Life expectancy data by country. WHO. 2013. <http://apps.who.int/gho/data/node.main.688?lang=en> (access April 15 2015)
- 2. Mortality rate, infant (per 1,000 live births). The World Bank. 2013. <http://data.worldbank.org/indicator/SP.DYN.IMRT.IN> (accessed April 15 2015)
- 3. Mortality rate, under-5 (per 1,000 live births). The World Bank. 2013. <http://data.worldbank.org/indicator/SH.DYN.MORT> (accessed April 15 2015)
- 4. Marten, Robert, et al. "An assessment of progress towards universal health coverage in Brazil, Russia, India, China, and South Africa (BRICS)." *The Lancet* 384.9960 (2014): 2164-2171.

Table 7: Health status of in BRICS Nations in 2013

(https://wagner.nyu.edu/files/faculty/publications/SSRN-id2598570_2.pdf)

	GDP per capita in PPP ¹	GNI Per Capita ²	Human Development Index ³	Gini Index ⁴	Public Expenditure on Health (% of GDP) ⁵	Private Expenditure on Health (% of GDP) ⁶	Total Expenditure on Health (% of GDP) ⁷	Out-of-pocket Health Expenditure (% of Private Health Expenditure) ⁸	Out-of-pocket Health Expenditure (% of Total Health Care Expenditure) ⁹
Russian Federation	24,805	22,710	0.778	0.40	3.8	2.4	6.3	88.0	33.52
Brazil	16,096	14,350	0.744	0.53	4.3	5.0	9.3	57.8	31.08
South Africa	13,046	11,970	0.658	0.65	4.2	4.6	8.8	13.8	7.21
China	12,880	10,920	0.719	0.37	3.0	2.4	5.4	78.0	34.67
India	5,855	5,080	0.586	0.34	1.3	2.7	4.0	86.0	58.05

- Note & Sources:
- * GDP per capita in PPP of 2014; Human Development Index is of 2013; Gini index for China and South Africa is of 2011. All the rest of the data is of 2012.
 - 1. World Economic Outlook Database, April 2015, International Monetary Fund. Database updated on 14 April 2015. Accessed on 14 April 2015.
 - 2. GNI per capita, PPP (current international \$). The World Bank. 2012. <http://data.worldbank.org/indicator/NY.GNP.PCAP.PP.CD>
 - 3. Human Development Report. UNDP. 2013. <http://hdr.undp.org/en/content/table-1-human-development-index-and-its-components>
 - 4. GINI index. The World Bank. <http://data.worldbank.org/indicator/SI.POV.GINI?page=1>
 - 5. Health expenditure, public (% of GDP). The World Bank. 2012. <http://data.worldbank.org/indicator/SH.XPD.PUBL.ZS>
 - 6. Health expenditure, private (% of GDP). The World Bank. 2012. <http://data.worldbank.org/indicator/SH.XPD.PRIV.ZS>
 - 7. Health expenditure, total (% of GDP). The World Bank. 2012. <http://data.worldbank.org/indicator/SH.XPD.TOTL.ZS>
 - 8. Out-of-pocket health expenditure (% of private expenditure on health). The World Bank. 2012. <http://data.worldbank.org/indicator/SH.XPD.OOPC.ZS>
 - 9. Calculated based on private expenditure on health (% of GDP), total expenditure on health (% of GDP), out-of-pocket health expenditure (% of private health care expenditure)

Table 8: Health Expenditure in BRICS Nations in 2012

(https://wagner.nyu.edu/files/faculty/publications/SSRN-id2598570_2.pdf)

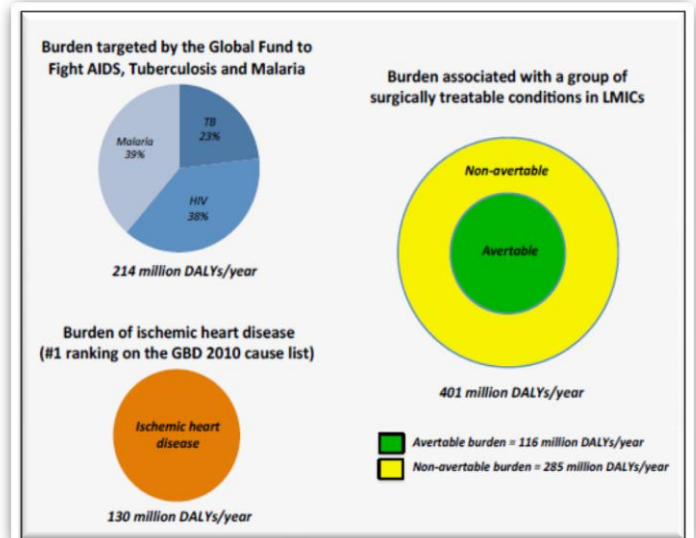


Figure 1: Surgery amongst other global health priorities

(Bickler S W. Global Burden of Surgical Disease. The Lancet Commission on Global Surgery. January 16, 2013)

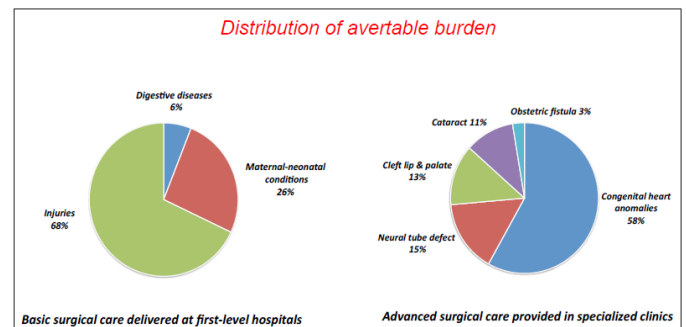


Figure 2: Scaling-up surgical care in BRICS

(Bickler S W. Global Burden of Surgical Disease. The Lancet Commission on Global Surgery. January 16, 2013)

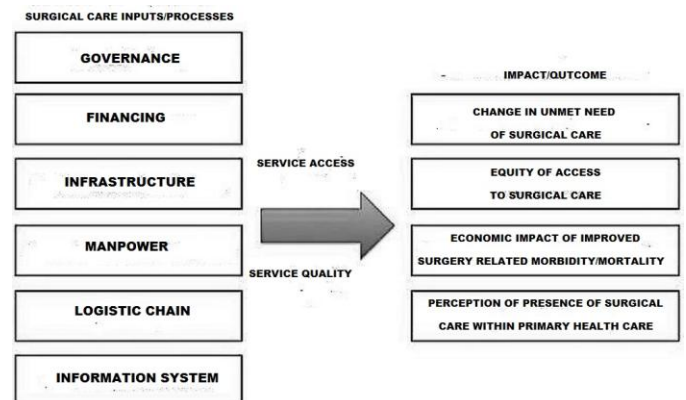


Figure 3: Proposed framework to integrate surgery and primary care

REFERENCES

1. Mathers C. D., Loncar D.; *Projections of Global Mortality and Burden of Disease from 2002 to 2030.*

PLoS Med. 2006 Nov; 3(11): e442.

2. Johnson W. D. *Surgery as a Global health issue.* *Surg Neurol Int.* 2013; 4: 47.

3. Alkire B.C., Shrimme M.G., Dare A.J., Vincent J.R., Meara J.G. *Global economic consequences of selected surgical diseases: a modelling study.* *Lancet Glob Health.* 2015;3 Suppl 2:S21-7.

4. *Global Burden of Disease Health Financing Collaborator Network. Future and potential spending on health 2015-40: development assistance for health, and government, prepaid private, and out-of-pocket health spending in 184 countries.* *Lancet.* 2017; 389(10083):2005-2030.

5. Dieleman J.L., Templin T, Sadat N, Reidy P, Chapin A, Foreman K, Haakenstad A, Evans T, Murray C.J., Kurowski C. *National spending on health by source for 184 countries between 2013 and 2040.* *Lancet.* 2016; 387(10037):2521-35.

6. Jakovljevic, M., Potapchik, E., Popovich, L., Barik, D., and Getzen, T. E. (2017) *Evolving Health Expenditure Landscape of the BRICS Nations and Projections to 2025.* *Health Econ.,* 26: 844–852.

7. Buttigieg S.C., Grima S., Camilleri C. *Commentary: Comparison of historical medical spending patterns among the BRICS and G7.* *Front Pharmacol.* 2016; 7: 213.

8. (GBD 2010 Arrow Diagram. Available at: <<http://vizhub.healthdata.org/irank/arrow.php>>. Access in: June 2 2014.

9. Bae J. Y., Groen R.S., Kushner A. L. *Surgery as a public health intervention: common misconceptions versus the truth.* *Bull World Health Organ.* 2011; 89(6): 394.

10. Bendix P.G., Anderson J.E., Rose J.A., Noormahomed E.V., Bickler S.W. *Improving surgical systems in low- and middle-income countries: an inclusive framework for monitoring and evaluation.* *International Health.* 2015; 7(6):380-383.

11. Vasan A., Hudelson C.E., Greenberg S.L., Ellner A.E. *An integrated approach to surgery and primary care systems strengthening in low- and middle-income countries: building a platform to deliver across the spectrum of disease.* *Surgery.* 2015; 157(6):965-70.

12. C.J. Murray, T. Vos, R. Lozano, M. Naghavi, A.D. Flaxman, C. Michaud, et al., *Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990 to 2010: a systematic analysis for the Global Burden of Disease Study 2010,* *Lancet* 380 (9859) (2012) 2197-2223.