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WHITE PAPER

Global Surgical Ecosystems: A Need for Systems Strengthening

Catherine R. deVries, MS, MD, FACS, FAAP, Jenna S. Rosenberg, MD, MBA
Salt Lake City, UT

Abstract

BACKGROUND As surgery is gaining recognition as a critical component of universal health care worldwide, surgical communities have come together with unprecedented unity to advocate for systems to support surgical care. This community has long believed that much care could be performed in a cost-effective manner even in low resource settings, despite skepticism voiced by many in public health. To do so will require the development of new systems and re-vamping of old systems that are not effective. In the last five years, coalitions, expert panels, commissions, consortia and alliances have emerged to address these issues and there has been landmark success in advocacy with a new resolution at the 2015 World Health Assembly to include surgical care as a component of universal health coverage. It is critical to understand the ecosystem that constitutes the surgical environment. A surgical ecosystem could be described as a network of people, processes, and materials necessary for surgical services in the context of the facilities and environment in which it functions.

METHODS We describe components of a functioning surgical ecosystem in terms of administration, support staff and clinicians, and the necessary sub-systems for providing consumable materials such as anesthetic medication and suture and sterile instruments. Related systems that must be integrated are facilities and utilities such as electricity, lighting, plumbing and waste management and even laundry. But especially in low and middle income countries (LMICs) lack of any one of these may be rate-limiting. The World Health Organization (WHO) has developed situational analyses and checklists for first level district hospitals to identify missing elements.

CONCLUSIONS A siloed approach cannot solve a systems problem. However, to scale up rapidly and to develop and sustain quality standards, a holistic "ecosystem" approach, including local and global professional societies and advocacy organizations will need to become engaged.

KEY WORDS global surgery, ecosystem, health systems strengthening, surgical facilities standards, surgical quality

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Both authors had access to data and participated in writing the manuscript & creating illustrations.
From the Department of Surgery Center for Global Surgery, University of Utah, Salt Lake City, UT. Address correspondence to C.R.d.V. (Catherine.devries@hsc.utah.edu).

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INTRODUCTION

Momentum for addressing the unmet burden of surgical disease in resource-constrained settings has been building over the last 40 years.[1-9] As surgical care in wealthy countries has developed ever more technical sophistication, the gap in access to safe and affordable essential surgical care between wealthy and poor countries has widened.[4] Diverse groups, including nongovernmental organizations (NGOs), academic institutions, and missionary organizations have tried to fill these gaps by providing direct care or surgical education. These programs have temporarily eased the burden on overworked local hospitals, especially for specific procedures not available at those hospitals. However, visiting surgeons rarely have offered sufficient capacity to sustain ongoing care provision at a local level.[10] In disaster settings, mobile platforms dispatched from governments and NGOs have provided critical short-term surgical care, but they too have failed to mitigate systemic problems that require improvements in facilities, surgical infrastructure, equipment supply chain, personnel, and education. Despite the apparent need for such improvements, surgery has been largely absent from global public health advocacy and policy, and surgeons have been tasked with proving to skeptics that treatment can be cost effective.

Over the past 10 years, the emergence of robust global surgery and anesthesia communities has led to a new cooperation to strengthen global health care systems through collaborative academic initiatives, advocacy, policy, and interdisciplinary partnerships. As global surgery and anesthesia communities have explored avenues for improving surgical capacity, they have also continually refined their understanding of surgical ecosystems. Much successful surgical advocacy has historically focused on singular disease entities like vesicovaginal fistula, cataracts, or river blindness. However, a new model is emerging that incorporates the role of surgery within broader modalities like maternal and child health, a topic traditionally discussed within the public health domain. The ecosystem model builds on the idea that investment in surgical systems can improve care across all surgical domains and specialties. For example, system requirements critical to providing caesarian sections are similar to those necessary to treat a perforated appendix or fractured femur. These same systems requirements support 4 major categories of surgical care provision, also known as "G4"[7]: surgery, anesthesia, trauma, and obstetrics and gynecology—or, put another way, the "SAO": surgery, anesthesia, and obstetrics. However they are categorized, these systems have a very similar appearance.

The Ecosystem Concept: Deconstructing the Black Box of the "Surgical System". Donella Meadows, in *Thinking in Systems,* states that "A system is a set of things—interconnected in such a way that they produce their own pattern of behavior over time."[11(p2)] Further, "A system is an interconnected set of elements that is coherently organized in a way that achieves something."[11] Google defines ecosystem as "a biological community of interacting organisms and their physical environment (in general use), a complex network or interconnected system."[12]

Every type of ecosystem has its own characteristics and physical constraints, but most would agree that except in disaster situations, sustainable surgery of acceptable quality occurs within the physical construct of a hospital facility in a dedicated restricted access room, or "theater" capable of supporting invasive operations. It is an isolated and closed environment having requirements for sterile field, movement of a surgical team, and placing of necessary equipment. At the most fundamental level, every surgical operation requires 4 essentials: light, medication, sterile instruments and supplies, and a practitioner or team trained to perform the necessary tasks. From the most basic surgical care setting to tertiary hospitals, the complexity of technical considerations increases exponentially. But even the most basic systems require consideration of the patient and the work flow in order to minimize the inherent risks and cost of surgery and to maximize efficiency and patient-centered outcomes.

Within the black box of the operation room (OR) and separated entirely from the primary care and public health community, many surgical staff members and physicians are not well versed in the roles of others in the complex system that supports safe and successful surgical care. For example, surgeons are often unaware of sterilization standards, anesthesiologists and anesthetists often do not interface with primary care or the community, and nursing and support services may struggle to establish a culture of respect where their skills and expertise are recognized for the important role they play in surgical outcomes.

THE SURGICAL ENVIRONMENT: FACILITIES

As in any ecosystem, health providers function in a physical environment. The building structure has its