Inputs, Processes, Functions, and Systems– Let Us Be Clear

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Language is the only instrument of science, and words are but the signs of ideas.

Samuel Johnson
Preface to his *Dictionary*

Language is the picture and counterpart of thought.

Mark Hopkins
Address, 01 December 1841

On it goes in disaster and emergency health—our failure to truly communicate because we lack a common terminology. Confusion reigns; as we continue to imprecisely and improperly use some English words related to disaster and emergency health. Such use confounds our ability to communicate. In current discussions, the words "processes"; "functions", and "systems" often are being used inappropriately. For example, the term "Emergency Medical Services (EMS) Systems" often is used to describe an individual, specific function of an EMS System, when actually, the EMS System encompasses the numerous functions that make up an EMS System. These functions include discovery, system entry, dispatch, responses, assessments, treatments, conveyance to a medical facility, and the emergency department. However, when referring to building an EMS System for some community or country, most often, the reference is exclusive to the responses to the call for help and the conveyance of the person in distress to a medical facility; the other functions that comprise an EMS System, generally, are not included in the plan.

Actually, the terms, "inputs", "processes"; "function", and "systems" are part of a hierarchy that begins with an input(s) and ends with a composite called a "whole". The components of this hierarchal continuum include:

Inputs → Processes → Functions → Systems → the Whole

As health professionals, we do not have trouble using these words correctly when discussing patient care. But, in other aspects of our world, we frequently intermix these terms. Definitions of these terms must be culled and agreed upon.

Inputs and processes have been discussed previously in this column.[1] In that discussion, focus was placed on production processes. Useful definitions of *process* include: a series of operations, events, or steps leading to the achievement of specific results; a series of operations, events, or steps leading to the achievement of a specific results;[2] a series of actions, changes that bring about a result; and a series of operations performed in making or treatment of a product—a manufacturing process.[3] Therefore, *processes* produce a product. Physiologically, processes combine to produce a function, e.g., digestion, protection, or detoxification/elimination of harmful substances that may be by-products of other processes.

Definitions of a *function* include: the special, normal, or proper physiologic activity of an organ or part;[2] and a mode of action or activity by which a thing fulfills its purpose.[4] Therefore, a function is made up of many processes.

A *system* is defined as: a set or series of interconnected or interdependent parts or entities (objects, organs, or organisms) that function together in a common purpose or produce results impossible of achievement by one of them acting or operating alone;[2] and a group of interacting, interrelated, or interdependent elements forming a complex whole.[3]

The "whole" is: not less than; all there is of; entire; complete;[4] containing all components; complete.[3] For humans, the *whole* is the person, who functionally is composed of many organ systems. Similarly, a society (the whole) consists of multiple societal systems. A societal system consists of many functions, and societal functions consist of many processes.

Just as the operations of body systems are assessed according to organ systems and their respective functional status, we can assess the disturbances in the functions of a specific societal system to identify the needs of an affected society.

One of the areas in which these terms are confused is in disaster management. The coordination of responses (both relief and recovery) to disasters has been and remains an ongoing problem. Disaster responses often appear to be helter-skelter, with every organization doing its own thing. The lack of coordination of relief and recovery responses following the earthquake and tsunami in the Indian Ocean in 2004, led the UN Office for the Coordination of Humanitarian Affairs (UN-OCHA), through its Inter-Agency Standing Committee (IASC), to develop and implement the Humanitarian Reform movement. Part of this reform was the formation of Clusters. The Clusters seem to encompass an attempt to form a system for humanitarian responses, i.e., a humanitarian system. While this strategy seemingly has been associated with some successes in encouraging coordination, it has only the mandate without the necessary authority and resources to codify a system either within specific clusters or in the whole humanitarian community. The lack of a system comprising all of the entities (non-governmental, inter-governmental, and governmental organizations) are a part, prevents real coordination. The creation of the Clusters represents a start, but will not be successful until a system or set of systems is formed. Currently, a Humanitarian System does not exist although operational organizations exist that are in need of

a system. To be truly effective and efficient, the Clusters must evolve into a system(s) in which all of the operational stakeholders are a part.

An example of the successful use of a systems approach lies in the development and implementation of Trauma Systems. Repeatedly, it has been demonstrated that victims who have sustained injuries from a physical impact fare much better when they are managed in a Trauma System compared to those without access to a Trauma System. A Trauma System provides all of the functions necessary for the diagnosis and optimal treatment of such victims. A Trauma System includes discovery, access to the system, rapid responses by the prehospital function (including stabilization and prevention of further injury), and rapid transport to a trauma center where specialized personnel assess the injuries not apparent on observation, diagnose the injuries (generally by evaluation of the physiological status of the organ systems), obtaining necessary diagnostic studies, surgical intervention, and recovery including rehabilitation. Other functions that contribute to a successful Trauma System include the blood bank, laboratory, clergy, hospital admissions, arranging for safe transportation within and outside the receiving hospital, physical therapy, dietary, pharmacy, and audits. Each of these functions is comprised of many processes that combine into functions that, in turn, combine to constitute a "Trauma System". Knowing the processes and their respective outputs (effects) allows the identification of critical points of failure. This same type of hierarchical functions must be applied to the organization of disaster responses and preparedness (i.e., disaster management).

However, the formation, utilization, and appreciation of the value of Trauma Systems were not achieved easily—initially, there was huge resistance from the medical community. Ultimately, its adaptation followed proof of the value of the System by some brave visionaries, such as Don Trunkey.[5] Data supported its efficacy, and gradually, the medical community came to understand and endorse the implementation of Trauma Systems.

Although the vision that includes system development in disaster health is at hand, in order to gain acceptance, we need data to show that disaster management and EMS Systems work; this means that their performance and benefits must be codified. The ability of the Clusters to morph into systems will not occur overnight; resistance to the development of such systems will not wane without evaluations of their impacts and effectiveness. Such evaluations must be conducted with scientific rigor sufficient to produce results that are beyond question. Like the acceptance of other innovative systems, it will take some pushing and shoving.

The World Association for Disaster and Emergency Medicine (WADEM) is in a unique position to assist with the development of the mechanisms required to capture the information necessary to demonstrate the validity of systems. This applies not only to disaster responses, but also to the development of EMS Systems and Preparedness Systems. The human body and societies run on systems that rely on functions that are made up of processes. While moving forward, let's keep the path straight. Above all, let us be clear about what is needed and the use of common terminology to communicate why, where, and how we can get to where we need to be.

Language—human language—after all is but little better than croak or cackle of fowls, and other utterance of brute nature—some not so adequate,

Hawthorne, *American Note-books* 14 July 1850

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