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Disaster Classification: An Unmet Need for a Pragmatic Medical Classification After COVID-19

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In the 1980s, Rutherford classified disasters based on the cause (natural versus man-made), their effects on the surrounding communities (simple versus compound), extent of the disaster area, duration of development (instantaneous, short, long), expected death toll rate, and the time required for organizing rescue operations.[1] Based on the impact on infrastructure (transportation, communication), the disaster is labeled as "simple" (intact infrastructure) or "compound" (affected infrastructure). Compound disasters are further labeled as "compensated" when the load is less than the extraordinary capacity and "uncompensated" when the load exceeds this capacity.[2] Most major incidents like disasters have 4 stages: initial response; consolidation phase; recovery phase; and restoration of normality.[2] Medical resources are utilized early (initial response phase) in addressing or minimizing the impact of many disasters and are commonly recruited along with other supporting disciplines. The existing classification has posed many relevant questions since the coronavirus disease (COVID-19) pandemic in 2019, which overwhelmed the existing infrastructure and workforce and brought about a need for a fast-track certification of equipment and new therapies by the relevant authorities. There is an unmet need to revisit the existing classification of the disaster from the clinician's perspective for policymakers to streamline and strengthen a uniform disaster preparedness protocol.

We, therefore, make an attempt to propose a pragmatic classification of disaster to aid in a clearer understanding for medical policymakers and health care workers. Our proposed classification where the word "medical" or "surgical" defines the predominant patient type, local, or regional: to define the extent of the disaster and propagative versus non-propagative, based on the infectiousness of the disaster. It is well understood that increasing magnitude of a disaster can overwhelm the available resources and workforce. A medical disaster can be more explicitly defined as any circumstance in which the functioning of medical institutions is adversely affected. This may not be the final classification schema; rather, it may act as a basic framework or at least as a catalyst to rethink and revise the existing one. Various effects of the disaster can help anticipate and guide the preparations with information like the predominant patient type likely to arrive (medical versus surgical), the extent of the disaster (regional versus local), the impact of disaster on medical facility disruption (influence on local transport, communication, cross infections amongst health care workers, delays to diagnostic, therapeutic, outpatient and operating services), features like its potential for human-to-human transmission (communicability), new treatment developments required (like vaccines), after-effects at the community level (wearing compulsory mask and social distancing), and necessity of fast-track certifications for medical paraphernalia that form the basis of this classification.[3] Although, in any disaster as a part of holistic care, there will always be a need for all aspects of medical care—for example, during a severe earthquake routine, medical needs must also be addressed, and vice versa (surgical needs during a pandemic).

The proposed classification classifies disaster to include local surgical; regional surgical; non-propagative and propagative medical; and mixed (medical/surgical) entities. Under the non-propagative medical category, various disasters affecting the basic necessities also will need to be included, such as power outages leading to a suspension of elevators, electronic medical systems like hospital information systems, water, and gas failure; in addition to disasters related to mass poisoning (hooch tragedy), contamination of drinking water sources (cholera) and disasters related to health information systems (compromised software and cyber security system leading to a health care shutdown) were included (Table 1).[4–6] These new generation disasters such as cyber attacks can create panic in the face of inadequate planning and preparation.[6] Knowledge of expected injury patterns following these disasters is an important domain in planning for the "type and size of external assistance" from various specialties required.[3] Additionally, the amount and type of assistance required may vary in different strata of economies, for example, it may be different in high-income countries as compared to low- and middle-income countries where cost escalations could be resulting from existing deficiencies in the local medical infrastructure.

Such classification places diseases like COVID-19, swine flu, and other human-to-human transmissible diseases into "propagative medical disaster," thereby aiding in the preparation

Table 1. Proposed classification of disaster for medical fraternity

S. No.	Types/medical implications	Examples	Frontline specialties	Special training	Effect on surge (mainly stuff and staff)	Necessity for fast-track certifications	Human-to-human transmission risk	New treatment/development	After-effect at community level
1.	**Local surgical disaster**	Railway accident, bomb blast, bridge, or building collapse	Surgical disciplines, pediatrics, anesthesia, pulmonary, and critical care medicine	No	No or minimal	No or minimal	No	No	No
2.	**Regional surgical disaster**	Hurricane, cold/heat wave	Surgical disciplines, pediatrics, anesthesia, pulmonary, and critical care medicine	No	Moderate, affected by transport	No or minimal	No	No	No
3.	**Non-propagative local medical disaster**	Disasters affecting the essential necessities: water failure, gas failure, power outages Poisoning-related: toxic gas leakage, hooch tragedy Disease-related: dengue, malaria, cholera Technology-related: software and cyber-security-related health care shutdown	Pediatrics, respiratory medicine, medicine, anesthesia, pulmonary, and critical care medicine Toxicology and public health Public health National security system, cyber security system	Yes/ maybe	Huge	No or minimal	No	No/maybe	No
4.	**Propagative medical disaster**	Pandemics of swine flu, COVID-19, Plague, Ebola virus, Marburg virus, Lassa virus, Crimean-Congo hemorrhagic fever virus	Pediatrics, respiratory medicine, medicine, anesthesia, pulmonary, critical care medicine, pharmacologists, biotechnology, and biomedical engineers	Yes	Huge	Yes	Yes	Yes	Yes
5.	**Mixed medical/ surgical disaster**	Avalanche, volcano eruption flood, earthquake	Surgery, pediatrics medicine, anesthesia, pulmonary, and critical care medicine	No	Variable	Yes	No	No	Yes

of administrators for deployment of staff from various medical specialties to form the workforce predicting surges related to its infectivity and communicability. Apart from this, it can create an earlier and timely understanding for the need of intense and vigorous training required to contain the communicability among health care wokers.[4] After-effects of diseases/disasters like COVID-19 and earthquakes have also been considered and incorporated into this classification on "a priori" basis, like a necessity of mask and vaccine, and apart from provisions of providing acute care and basic health care to the affected, also to provide food, safe drinking water, and sanitation facilities and to address the prevention and treatment of water-borne/vector-borne diseases and droplet-borne infections developing due to inadequate sanitation facilities and overcrowding in earthquake-affected areas.[5,6] In addition, the necessity of "fast-track" certification by authorities (like US FDA/European CE certifications) bypassing standard approval procedures and resorting to emergency use authorization for drugs and therapies and Rapidly Manufactured Ventilator Systems (RMVS) for organ support systems such as ventilators has also been highlighted. There is an urgent need to explore long-term solutions for oncoming disasters, anticipated to recur in the future, rather than the short-term measures taken by various countries for COVID-19 until the development of the vaccine.[7]

We acknowledge the limitation that this classification was not a product of the Delphi approach nor has been tested with simulation or other methods, and the schema provided here does not adequately account for simultaneous/overlapping disaster events, which needs to be created in future classifications with substantial evidence.

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