Medical Requirements During a Natural Disaster:  
A Case Study on WhatsApp Chats among Medical Personnel during the 2015 Nepal Earthquake

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Medical Requirements During a Natural Disaster:
A Case Study on WhatsApp Chats among Medical Personnel during the 2015 Nepal Earthquake

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ABSTRACT

Objective: The objective of this study is to explore a log of WhatsApp messages exchanged among members of a health-care group “Doctors For You” (DFY), while providing medical relief in the aftermath of the Nepal earthquake in April 2015. The motivation is to identify the medical resource requirements during the disaster, in order to help the government agencies and other responding organizations to be better prepared to address the potential medical requirements during any upcoming disaster.

Methods: A large set of WhatsApp messages exchanged among DFY members during the Nepal earthquake was collected and analyzed to identify the medical resource requirements during different phases of the relief operations.

Result: The study reveals detailed phase-wise requirement of various types of medical resources, including medicines, medical equipment, and medical personnel. The data also reflects some of the problems that were faced by the medical relief workers in the earthquake-affected region.

Conclusions: The insights from this study might help not only the Nepal government, but also authorities in other earthquake-prone regions of the world, to better prepare for similar disasters in future. Moreover, real-time analysis of such online data during a disaster would aid decision makers to formulate resource-mapping strategies dynamically.

Keywords: Disaster, Nepal 2015 earthquake, medical resource requirements, disaster preparedness, medical relief strategy
INTRODUCTION:

On April 25, 2015, Nepal was hit by a 7.8 magnitude earthquake, which destroyed 0.3 million houses and left more than eight million people in desperate need of assistance. The earthquake devastated several vulnerable portions of the country’s infrastructure and debilitated 90% of the local health care system and social welfare institutions. Subsequently, many international Non-Governmental Organizations (NGOs) like CISAR, Red Cross, WHO, UNICEF, QRCS, and others moved to Nepal for providing humanitarian assistance.

One of the NGOs which was actively involved in the relief operations in the aftermath of the Nepal earthquake was Doctors For You (abbreviated as DFY), a pan-India humanitarian organization with international presence, that focuses on providing medical care to the vulnerable communities during crisis and non-crisis situation. The members of DFY used the popular social networking platform WhatsApp, which allows formation of a discussion group and exchange of short messages via smart phones, to communicate among themselves, and plan the relief operations. The present study is an in-depth analysis of these WhatsApp messages exchanged among the medical personnel of DFY. The primary advantage of this data is that, since it contains conversations among medical experts, there is significant amount of micro-level information about the requirement of different medical resources. In analyzing this data, the primary objectives of this work are two-fold:

1) Identifying the requirement for different types of medical resources in the aftermath of an earthquake, taking the Nepal earthquake as a case-study

2) Analyzing the temporal aspect of the requirements, such as what resources are required at what stage of the relief operations.
Overall, the motivation of this study is to provide guidelines to Government / non-Government organizations about the medical requirements in the aftermath of an earthquake, which might help in better preparedness and resource mapping during future disaster events.

There have been few prior studies on various aspects of the relief operations after the 2015 Nepal earthquake, e.g., on the medical rescue operations by Chinese medical teams3,4, and on damages to buildings due to the earthquake5. Extensive research has also been carried out by medical experts on preparedness and hazard mitigation strategies in the area of disaster management.6-8 However, none of the prior studies have used social media data for the purpose. In contrast, the present work relies on social media (WhatsApp) data from medical experts who were actually present at the site of the disaster. Hence the data is reliable, and contains detailed description of resource requirements. To the best of our knowledge, no prior study has reported the requirements of medical resources after a disaster in such diminutive details as in this study.

**METHOD:**

A WhatsApp group was formed within the members of DFY on April 27, 2015 (two days after the earthquake struck Nepal) for intra-organizational interactions. The messages posted in this group during the first 3 months after the disaster, i.e., from April 27 to July 30, 2015, were collected and analyzed. Each message contains the timestamp when the message was posted, the mobile number from which the message was posted, and the message text. The messages were first cleaned and pre-processed using computer programs. Also, Personal Identifiable Information (PII) in the messages (e.g., names, cell numbers) was substituted to preserve the privacy of the members posting the messages. The sanctified set of messages was then given to
three human volunteers, who were asked to identify the various types of medical resources that were reported as required in the dataset.

It can be noted that, apart from medical resources, the dataset also contained information about requirement / availability of other types of resources, such as tents, electric power sources, and so on. But in the present study, we are focusing specifically on the medical resources.

**Stages of the relief operation:** As stated earlier, one of the objectives of this work is to analyze the temporal aspects of the resource requirements, such as what resources are required at what stage of the relief operations. To this end, the guidelines set down by the American Red Cross are followed, which states that during the first three months after a disaster, the relief operations transit through the following (overlapping) stages: Heroic Phase (that occurs immediately after a disaster strikes), Honeymoon Phase (from about a week to six months after the disaster), Disillusionment Phase (that begins couple of months after the disaster).

**Limitations of the study:** The observations made in this study are limited to the information contained in the messages exchanged among the DFY members, and do not reflect an exhaustive picture of the relief efforts in the aftermath of the Nepal earthquake. Hence, the observations in this study should be considered as indicative, and not exhaustive.

**RESULTS:**

Table 1 describes the detailed phase-wise requirements of different types of medical resources, e.g., medicines, medical equipment, and medical personnel, during different phases of
the relief operation. The medicines have been categorized considering the essential medicine classification of the World Health Organization.\textsuperscript{10}

**TABLE 1: Timeline-wise Aggregated Requirements for Different Resource Types**

**Heroic phase:** During the *heroic phase* (immediately after the earthquake), the primary focus was to deal with the earthquake-allied injuries, which essentially needed surgical dressing debridement. Thus, the requirements include appliances typically related to surgical support and orthopaedics like x-ray, implant, implant fixator, plasters, spinal needles, and anaesthetics. Moreover, "Anti-Infective-Medicines" were also required for rapid recovery of surgical patients. Urgent necessity of ventilators was evident, since a large number of trauma patients from several earthquakes affected districts of Nepal were in need of ventilator support. Requirement of supplementary food for infants was also manifest.

There was also a huge requirement of doctors and medical personnel, because a large fraction of the resident medical personnel were themselves affected by the earthquake. Primarily, Orthopaedic Surgeons, Anaesthetists, Gyneochologists, and Emergency Medicine Specialists were required to deal with earthquake-related injuries and maternal death. Occupational Therapists were also needed for helping people come out of trauma resulting from the disaster.

**Honeymoon phase:** A week after the earthquake, in the *Honeymoon Phase*, infection of respiratory tract, gastrointestinal tract, and skin were the most common ailments, leading to the requirement of Anti-Infective Medicines, Gastrointestinal Medicines and Inhalers. Further, some aftershocks of the original earthquake hit Nepal, regenerating the need for maternal health care medicines and surgical equipment. The multiple earthquakes had a large impact on water
quality. Consequently, Disinfectants like chlorine tablet or chlorine solution were needed to
disinfect the water to avert the probable spread of diarrhoeal diseases. Furthermore, requirements
of orthopaedic equipment and consumables were observed in this phase due to large number of
secondary infection or wound infection cases coming to hospitals from various districts of Nepal.

Among medical personnel, primarily Psychologists and Physiotherapists were sought, along with Gyneochologists. However, need for orthopaedic doctors were not as acute as in the
heroic phase, since most injuries had been operated within the first week after the earthquake.

Additionally, preventing maternal deaths, ante-natal care, safe delivery services, and post-partum care for pregnant woman were of prime concern during the heroic and honeymoon phases. Hence, resources like cord clamps, labor room equipment, Oxytocics and Antioxytocics were in demand. According to UNICEF, three-fourths of the pregnant women in Nepal were anemic, thus requirement of Medicines affecting the blood, i.e., drugs like Iron folic acid tablets and calcium tablets for antenatal care were prevalent.

Disillusionment Phase: In the Disillusionment Phase also, several aftershock earthquakes hit Nepal, leading to the need for First Aid kits and Medicines for Pain and Palliative Care. Additionally due to the trauma of aftershocks several team members of DFY as well as earthquake victims could not sleep peacefully at night. Therefore, Post-traumatic Stress Disorder Medicine was entailed to improve mental health of the victims as well as volunteers. Furthermore, due to heavy rainfall and flooding from the monsoon, there was spread of food-borne and water-borne diseases, as well as vector-borne diseases. Therefore, Gastrointestinal Medicines and Anti-Infective Medicines were sought. A wide range of medicines and kits were also required during this phase, including Hygiene Kits, Inhalers, Delivery Kits, Dressing Kits,
Dermatological Medicines, Medicines Affecting The Blood, Antiallergics, Delivery and Preterm Infants Care Unit, and so on. There was still a large requirement of medical personnel, especially Paediatricians, Gyneochologists, Emergency Medicine Specialists, Nurses, Anaesthetists, and other Support Staff.

**DISCUSSION:**

In this research, we attempted to analyze the requirement of medical resources that emerge post an event like the Nepal earthquake. Apart from the requirement of resources, the dataset also indicates various auxiliary problems faced by the DFY members, such as contamination of water sources, problems in transportation of medical personnel and supplies, difficulty in operating hospitals due to unavailability of electric power, stress-related issues of the relief workers themselves, and so on. These observations indicate typical problems that might be faced by any medical team working in an area affected by an earthquake, and can potentially help medical teams / Government agencies to be more prepared for such problems. For instance, it is not only sufficient to dispatch medical resources and medical personnel, but also alternative power sources need to be arranged for, so that hospitals can operate even without electricity.

The findings from this research might aid in strengthening the National Strategy for Disaster Risk Management in Nepal. Furthermore, the study can provide invaluable inputs for preparatory provisioning of various medical resources at earthquake-prone regions, so that they can be readily available in the event of a disaster. Thus, it is hoped that, the observations in this study would help authorities in not only Nepal but also other earthquake-prone regions to better prepare for resource mapping during similar disasters in future.
CONCLUSION:

This post-hoc study analyzes a dataset of WhatsApp messages exchanged among members of ‘Doctors For You’ in the aftermath of the Nepal earthquake in April 2015. In contrast to prior works, the data in this study is more reliable since it is obtained from medical experts who are known to have been present at the disaster site. The main contribution of the study is the identification of the requirements of various medical resources, during different phases after the disaster.

The study also demonstrates that real-time (i.e., actually during the disaster) analysis of such online data would aid decision makers in forming resource mapping strategies dynamically. These results could then assist disaster management authorities in assessing the requirement, allocating resources, providing logistic support in real time, which in turn will reduce loss of human life during disasters.

REFERENCES

1. Peleg K. Notes from Nepal: Is There a Better Way to Provide Search and Rescue? 


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<th>Timeline</th>
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<td>April 28- May 03</td>
<td><strong>HEROIC PHASE</strong>&lt;br&gt;<strong>Medicines:</strong> Anesthetics (e.g., Ketamine), Oxytocics and Antioxytocics (e.g., Misoprostol), Medicines affecting the blood (e.g., Iron Folic Acid), Anti-Infective medicines&lt;br&gt;<strong>Medical equipment:</strong> Ventilators, Spinal Needles, Cord Clamps, Labor Room equipment, Supplementary Foods, Digital X-Rays, Implants, Surgical Appliances,&lt;br&gt;<strong>Medical personnel:</strong> Gyneochologists, Anesthesiologists, Emergency Medicine Specialists, Orthopaedic surgeons, Physiotherapists, Occupational Therapists</td>
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<td>May 04- May 31</td>
<td><strong>HONEYMOON PHASE</strong>&lt;br&gt;<strong>Medicines:</strong> Anti-Infective medicines (e.g., Ciprofloxacin, Albendazole, Antifungal Ointments, IV Fluids), Medicines affecting the blood (e.g., Folic Acid, Iron supplement), Vitamins and Minerals (e.g., Calcium, Vitamin A, Multivitamin), Oxytocics and Antioxytocics (e.g., Misoprostol), Disinfectants (e.g., Chlorine Tablets, Medichlor Chlorine Solution), Inhalers (e.g., Bronchodilators), Medicines for diseases of joints (e.g., Allopurinol), Gastrointestinal medicines (e.g., ORS)&lt;br&gt;<strong>Medical equipment:</strong> Ventilators, Muac Strip, Ortho Equipment, ambulance, telemedicine, C-Arm Machine&lt;br&gt;<strong>Medical personnel:</strong> Psychologists, Physiotherapists, Gyneochologists</td>
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<td>June 01- July 31</td>
<td><strong>HONEYMOON + DISILLUSION-MENT PHASE</strong>&lt;br&gt;<strong>Medicines:</strong> Gastrointestinal medicines (e.g., Zinc Sulphate, Lactobacilles, ORS powder), Medicines for pain and palliative care (e.g., Aceclofenac, Paracetamol), Anti-Infective medicines (e.g., Neomycin + Bacitracin Ointment, Cotrimoxazole Powder for oral suspension, Sulfamethazole, Trimethoprim, Cefixime Syrup, Moxifloxacin Vaginal Pessaries, Skin Ointments, Antifungals Ketoconazole Cream, Cotrimazole Cream, Albendazole, Monostat Antifungal Cream for Vaginal Itching, Abacavir, Metro Tab), First aid kit (e.g., Tongue Depressor Wood, Alcohol Swabs, Cotton Ball, Antacid Syrup, Gentamycin Cream, Volini Gel, Soaps, Tongue Depressor, Talcum Powder), Inhalers, Dermatological medicines (topical) (e.g., Silver Sulfadiazine Cream 1%, Permethrine Cream, Calamine Lotion, Hydro Corticosteroid Ointment), Medicines affecting the blood (e.g., Tonophoren Syrup, Iron Tablets), Antiallergics (e.g., Cetrizine), Post-traumatic stress disorder medicine (e.g., Paroxetine Tab), Vitamins And Minerals (e.g., Calcium Tablets, Multivitamin, Vitamin A, B complex, C, D3 Sachet, E), Zytee Gel, Cough Syrup&lt;br&gt;<strong>Medical equipment:</strong> Delivery and Preterm Infants Care Unit (e.g., Labor Room, Newborn Corner, Focus Lights (Episiotomy Lights), Number 0 Mask (Preterm), Incubator Repair Adult Ambu with Mask Mixer, Forceps for OT (Internal Iliac Ligation)), BP Apparatus, Glucometers, Hygiene Kits, Delivery Kits, Dressing Kits&lt;br&gt;<strong>Medical personnel:</strong> Emergency Medicine Specialist, Paediatrician, Gyneochologist, Anaesthetist, Doctors, Nurses, Support staff</td>
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