

## The Montserrat Post-Disaster Surgical Experience: A Model for Affordable Surgical Facilities and Services for Isolated Communities with Limited Resources

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**Received:** April 27, 2020; **Published:** April 30, 2020

**DOI:** 10.31080/ecec.2020.04.00280

### Abstract

Affordable surgical facilities are crucial for small island and rural communities that are isolated and subject to significant disruptions of services by natural disasters. This review presents the experiences of the Ministry of Health, Montserrat regarding the interruption of standard surgical procedures following natural disasters and severely damaged hospital facilities. Essential elements of surgical services during and after natural disasters were identified. The outcomes of the Montserrat post-disaster surgical experience provides a model of affordable surgical facilities and services for isolated communities with limited resources.

**Keywords:** Disaster; Isolated Communities; Limited Resources; Surgery; Surgical Facilities

### Abbreviation

MInSRE: Montserrat Institute of Surgical Research and Education

### Introduction

Low-cost surgical facilities are vital for small island and rural communities that are isolated and subject to significant disruptions of services by natural disasters. The forty-two square miles island of Montserrat (a British Overseas Territory) in the Eastern Caribbean has experienced significant disruptions of health care services by hurricanes and volcanic eruptions.

This review presents a summary of these events, describes the impact of these events on the local health sector and depicts the mitigating measures that reduced the impact of the adverse events. The events surrounding and actions of the Montserrat post-disaster surgical experience, in the public and private sector, include the adverse impact of hurricanes Irma and Maria in August 2018, hurricane Hugo in 1989, and the volcanic eruptions of 2006 to the present day.

The "Discussion" section offers a review of the experiences of the Ministry of Health, Montserrat regarding the interruption of routine surgical services following the impact of past hurricanes and the ongoing eruptions of the Soufriere Hills volcano, which have reduced the island's population from more than 10,000 persons to less than 5,000 persons.

A proposed training program is presented for non-specialist medical personnel who are expected to cope with similar natural disasters. Also included is a summary of the proposed activities for a private sector Institute of Surgical Research and Education (MInSRE).

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**Citation:** Lewis LL, Ogarro A, Cassel R, Kerna NA. "The Montserrat Post-Disaster Surgical Experience: A Model for Affordable Surgical Facilities and Services for Isolated Communities with Limited Resources". *EC Emergency Medicine and Critical Care* 4.5 (2020): 66-69.

The objective of this research was to evaluate the essential elements required for the provision of essential surgical services in the aftermath of natural disasters that disrupt existing services.

## **Discussion**

Glendon Hospital, on the Caribbean island of Montserrat, was severely damaged by natural disasters. In the aftermath of these natural disasters, 40 cases were managed with Ketamine and local anaesthesia only, in an appropriately modified basement of a private house following hurricane Hugo in 1989. Also, 128 cases—that occurred between October 1997 and June 2000 in a district clinic converted into an operating theatre following the Soufriere Volcano eruption that destroyed the Glendon Hospital in Plymouth—are summarized as follows:

- 128 surgical procedures: 61 males; 67 females
- 38 in-patients and 90 out-patients per day
- 40 general anaesthesia cases; 82 local anaesthesia cases
- 89 minor operations, including 51 excisions of skin and cutaneous lesions
- 22 intermediate operations, including 14 herniae
- 17 major operations, including 8 hysterectomies, 6 laparotomies, 1 thyroidectomy, and 1 above-knee amputation
- 5 complications were recorded, including 3 wound infections

A trained nurse anaesthetist administered general anaesthesia. From 1995 to 1997, the nurse anaesthetist administered 313 (of 507) general anaesthetics, in collaboration with and under the supervision of the resident anaesthetist, with first-rate results. There were no perioperative anaesthetic deaths and only 3 complications related to anaesthesia.

## **What was learned**

The following features were identified as essential for a disaster surgical facility:

- A protected location with secure access, communication network, and utilities (e.g., electric and water supply)
- Accommodations for on-call staff
- Service areas (atmosphere standards)

Level 1 operating theatre: sterile atmosphere, filtered and bacteriocidal air conditioning, with ceiling to floor airflow.

Level 2 preop and postop areas: dust-free with double-door controlled airflow; no direct access to outdoor airflow, and air-conditioned.

Level 3 clean area: direct access to outdoors but air-conditioned.

## **A model facility is born**

From these experiences, measures have been taken to design and build a low-cost facility to ensure minimal disruption of essential surgical services in any future catastrophic events and to provide guidelines for the rapid provision of such services for similar events in small-scale, remote communities. This facility, now registered as the Montserrat Institute of Surgical Research and Education (MInSRE), is expected to provide 1) a model for such facilities, 2) methods of ensuring appropriate atmospheric standards, 3) maintenance of secure

access, communications, and utility services, 4) utilization of low-tech construction methods, 5) traditional surgical skills, and 6) adjunct herbal remedies. The MInSRE model is expected to reduce the need for medical evacuations by air; thus, there should be significant cost-savings regarding emergency medical services.

### **Additional facilities proposed**

Progress continues on an innovative and unique multipurpose education, research, and entertainment centre—a Caribbean facility—in honor of the lives and achievements of the first author's mother, father, and family members. The center is located in Brades at a site chosen by the first author's father, J. D. Lewis, who once said, "I like the ghaut, a hurricane cannot touch us there".

The proposed centre will be a multi-purpose, four-story building that is home to the first author and private medical offices. The property is comprised of three comfortable residential apartment units, one on each of the three floors of the building. A medical research and service facility will include the following:

- A first floor that will be comprised of an outpatient clinic, operating theatre, and teaching suite.
- A second floor that will be comprised of two in-patient or staff accommodation units, a surgical teaching gallery, and a seminar room (that is also designed to serve as an ambulance reception garage, emergency reception, and resuscitation unit).
- A third floor that will be comprised of a suite (for lectures, seminars, and conferences), a dining room, and a telerobotic surgical suite.
- A fourth floor that will contain a satellite communication unit for distance education and surgical services as well as the broadcasting of cultural activities.

Previously, this site served as accommodations for visiting local and international sports teams. Currently, it has a capacity for twenty-five persons. The capacity will increase to forty persons when additions to the first and second floors are completed. The garden and grounds provide parking for twenty vehicles. The facility is also being prepared for hosting cultural performances on the grounds and in the third floor meeting room.

The official opening of the facility was planned for June 30, 2020; however, due to recent and unexpected delays (including the COVID-19 crisis), the opening might be postponed. Invitations have been sent to various international educational institutions that might be interested in joint collaborative research and educational programs.

### **Conclusion**

Low-cost and cost-effective surgical procedures are vital for small island and rural communities that are remote and subject to significant interruptions of services by natural disasters. This paper presented the encounters of the Ministry of Health, Montserrat concerning the interruption of routine surgical procedures following natural disasters and critically damaged hospital facilities. Elemental aspects of surgical services during and after natural disasters were specified. The outcomes of the Montserrat post-disaster surgical experience offers a model of affordable surgical facilities and services for isolated communities with limited resources.

### **Conflict of Interest Statement**

The authors declare that this paper was written in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest. The first author acknowledges proprietary interests in the proposed MInSRE and multipurpose education, research, and entertainment centre.

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**Volume 4 Issue 5 May 2020**

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