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ORIGINAL RESEARCH

Primary Care in Extreme Environments: Medical Clinic Utilization at Antarctic Stations, 2013–2014

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Objectives.—The unique challenges posed by the Antarctic environment include both physiological and psychological stressors to the individual as well as the limited onsite medical capabilities available to address them. This report compares medical clinic utilization among 3 US Antarctic stations to identify differences in diagnostic frequency and utilization of clinic resources under current medical prescreening regimes for summer and winter seasons.

Methods.—Clinic data from 3 Antarctic locations (McMurdo Station, Amundsen-Scott South Pole Station, and Palmer Station) for the 2013−2014 Antarctic year were reviewed for patient encounter frequency by season, and provider-assigned visit diagnostic category. Differences between relative diagnosis frequencies among stations were analyzed, and per-capita clinic utilization was compared.

Results.—The McMurdo clinic recorded 1555 patient encounters, with South Pole Station reporting 744 and Palmer with 128 encounters over the year. The most frequent reasons for clinic visits were orthopedic and dermatologic, with increased visits at McMurdo for respiratory illness and at the more remote locations for neurologic complaints and insomnia. Altitude-related visits were reported only at McMurdo and South Pole stations.

Conclusions.—The clinic volume predictably correlated with station population. Insomnia and headache complaints, reported only at the South Pole Station, are likely associated with the increased elevation at that site, although they could be attributable to psychological stress from the isolated environment. Although the majority of cases could not be prevented with current screening, we suggest several changes to the current concept of operations that may decrease medical utilization and provide significant improvements to health care delivery on the ice.

Key words: austere environment, remote environment, Antarctica, South Pole, altitude sickness, MEDEVAC, isolation

Introduction

The unique challenges posed by the Antarctic environment to the human body have been previously well described.[1,2] These challenges encompass both physiological and psychological stressors to the individual as well as limited onsite medical capabilities available to address them. Decreased physical activity, exposure to prolonged day and night periods during the progression of the Antarctic year, relative isolation, and severe and often rapid changes in altitude all contribute to changes in cardiovascular, endocrine, circadian, and psychological response.[3–5] As medical issues arise, health care providers on the ice must utilize available resources to meet the majority of needs at the point of discovery without reliance on remote support.

The University of Texas Medical Branch (UTMB) Center for Polar Medical Operations, through the National Science Foundation's Antarctic Support Contract, has provided the training and deployment of medical support personnel to all 3 stations of the US Antarctic Program since 2012. These stations vary significantly in accessibility and relative isolation, population, and environmental factors. McMurdo Station (MCM) is the largest community on the continent, located on the coast at 21 m above sea level, whereas Amundsen-Scott South Pole Station (SP) has a field elevation of 2834 m and density altitudes frequently >3353 m.[2] Palmer Station (PAL) is located on

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Table 1. US Antarctic station average populations and clinic medical staffing resources by season

Station	*Season*	*Population*	*Medical staff*[*]	*Providers*
McMurdo Station	Winter	141	2	1 physician 1 mid-level
	Summer	570	7.75	2 physicians 1 nurse administrator 1 flight nurse 1 mid-level 1 radiology technician 0.75 pharmacy technician[†]
Amundsen-Scott South Pole Station	Winter	44	2	1 physician 1 mid-level
	Summer	96	2.25	1 physician 1 mid-level 0.25 pharmacy technician[†]
Palmer Station	Winter	26	1	1 physician
	Summer	36	1	1 physician

[*] Staffing numbers represent on-the-ground personnel during the 2013−2014 season.
[†] A part-time resource pharmacy technician was shared between McMurdo and Amundsen-Scott South Pole stations.

Anvers Island, north of the Antarctic Circle, and is a coastal station with routine maritime traffic throughout the year. Average station populations by season are reflected in Table 1.

Each Antarctic station provides primary care via onsite medical clinics, staffed by medical providers year-round. Medical staffing varies significantly with station population, particularly at MCM where station populations undergo the largest seasonal variation (Table 1). Clinic visits range from preventive medicine, such as screening examinations and immunizations required for transfer to the more remote stations, to regular management of known conditions, to more emergent presentations. The majority of medical conditions are managed via the resources available at each clinic, although truly emergent conditions may prompt medical evacuation (MEDEVAC) to more capable facilities, such as MCM, or even off the ice. Alternatively, onsite providers can recommend and implement Medical Administrative Movements (MAMs), which are planned transports to definitive care or further diagnostic testing. MAMS do not involve a medical escort, nor do they require emergent scrambling of resources for evacuation.

Because of the less reliable access of resupply and MEDEVAC resources to all US stations during the winter months, extensive screening for physical and psychological wellness has been instituted. Separate criteria have been established for a spectrum of chronic disease states, but the classification scheme is the same: Patients' disease control will fit criteria for summer deployment only (least stringent), winter deployment (most stringent), or be deemed unsafe for either. Given the large variations in seasonal population at MCM and SP, a segment of the population who may be deemed unfit for winter deployment will be present for the summer season, implying good but not ideal disease management. Given the scarcity of resources in an austere environment, a desire exists to optimize such screening thresholds to identify individuals who may currently meet screening criteria but will place a disproportionate burden on clinic or evacuation resources. Differences in medical utilization between stations may similarly suggest high or lower-risk locations, which could be useful in medical resource planning.

This report compares medical clinic utilization during the March 2013 to February 2014 Antarctic year to identify differences in relative diagnostic frequency and utilization of clinic resources toward these goals.

Methods

Clinic visit tracking was reviewed using 2 different sources for each Antarctic station. First, medical providers at each station produce weekly situation reports (Sitreps) that record clinic utilization data, MEDEVACs, dental examinations and procedures, laboratory studies, physical therapy utilization, and similar metrics, itemized in Table 2. These deidentified reports are submitted to the Center for Polar Medical Operations in the course of standard operating procedure and, in aggregate, comprise the Sitrep Database. Each station has a secondary Clinic Log for recording additional detail on patient encounters. MCM utilizes a Microsoft Access Clinic Database, in which providers may include information on medical