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A Review of the Impacts of Climate Change on Emergency Medicine: Increased Natural Disasters and Their Related Health Impacts

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Abstract

Background: Climate change is an imminent public health crisis that has significantly impacted emergency medicine by increasing the frequency and severity of natural disasters. Anthropogenic greenhouse gas emissions have intensified heatwaves, hurricanes, and wildfires, leading to heightened risks to human health and increased burdens on emergency medical services (EMS).

Aim: This review aims to synthesize current evidence on the health consequences of climate-induced disasters and to provide actionable recommendations for enhancing the resilience, equity, and effectiveness of EMS in the face of escalating climate-related challenges.

Methods: A comprehensive literature review was conducted, focusing on studies addressing the direct and indirect health impacts of natural disasters exacerbated by climate change, the vulnerabilities of at-risk populations, operational challenges faced by EMS, and adaptive strategies including disaster preparedness, public health integration, telemedicine, and predictive modeling.

Results: Natural disasters result in direct health effects such as traumatic injuries, heat-related illnesses, and respiratory diseases, as well as indirect impacts including psychological disorders, infectious disease outbreaks, and disruption of chronic disease management. Vulnerable groups—such as impoverished individuals, those with pre-existing conditions, and the elderly—experience disproportionate adverse outcomes due to limited access to resources and healthcare. EMS face operational challenges including facility flooding, resource scarcity, and logistical barriers, which hinder timely and effective response. Adaptive measures like enhanced disaster preparedness, integration of EMS with public health systems, and technological innovations such as telemedicine and predictive analytics have demonstrated potential in mitigating these challenges.

Conclusion: To address the growing public health threat posed by climate change, EMS systems must adopt robust, equitable, and innovative strategies. Strengthening disaster preparedness, fostering cross-sector collaboration, and leveraging technology are critical to improving emergency care delivery amidst increasing climate-related disasters.

Keywords: healthcare resilience, emergency medicine, natural disasters, climate change, public health.

Introduction

Global climate change, one of the key drivers of a multitude of public health dangers in the 21st century, caused by anthropogenic emissions of greenhouse gases into the atmosphere, is remaking environmental and social systems across the globe (1). The accumulation of

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greenhouse gases in the atmosphere has warmed the earth by an estimated 1.1°C above pre-industrial levels, which has caused profound alterations in weather patterns, created sea-level rise, and disrupted ecosystem stability (2). Global warming has made natural disasters, and their variability, increased frequency, and severity, including heatwaves, hurricanes, floods, and wildfires, far worse, with each presenting its own set of unique and complex challenges to emergency medical services (EMS) (3). EMS, such as prehospital care, work in emergency departments, and the coordination of disaster response, are increasingly bearing the brunt of responding to acute health emergencies within resource-scarce contexts that logistically are complex (4). The climate-related disasters pose a wide array of health effects, including both primary health effects, and the secondary which consist of mental illness disorders such as post-traumatic stress disorder (PTSD), outbreaks of infectious disease as a result of water-borne contamination or proliferation of vectors, and disruptions in care of chronic disease such as diabetes and hypertension (5).

Vulnerable populations are disproportionately affected by these consequences of climate change on health. Older adults, or those with poor mobility or no access to cooling, are at highest risk for heat illness during heatwaves (6). Low-income populations who live in flood-prone areas or areas with weaker infrastructure are at risk of experiencing injury and illness after a disaster (7). Populations with pre-existing health conditions, like asthma and cardiovascular disease are susceptible to worsening of their condition from exposure to particulates and smoke caused by wildfires or disrupted access to medications that may occur during hurricanes (8, 9). Such inequalities exacerbate pre-existing health inequalities because marginalized communities of individuals also face barriers to access to timely EMS and recuperation services (10). Furthermore, accelerated global displacement by climate change exacerbates these problems in low-resource settings where EMS infrastructures are often underdeveloped and healthcare services lack the capacity to absorb disaster surges in services (4).

These demands on EMS are creating operational challenges from overwhelmed practitioners, depleting medicine, failing infrastructure, and disrupted communications (11). Ambulances cannot respond well when hurricane and flood conditions make roads impassable, or EMS practitioners cannot perform well when there are hazardous ambient conditions during wildfires and heatwaves (12, 13). In light of these difficulties, there is a need for a shift in the model of emergency medicine to prepare and mitigate the challenges to enable equity, access and resilience in care. This review critically evaluated the impact of climate change-induced natural disasters on emergency medicine. Focused on particular health effects of heatwaves, hurricanes, floods, and wildfires; operational, logistic, and systemic challenges for EMS; and adaptation and resilience-based evidence of mitigation; in placing these fields in context, the review aims to provide evidence-based recommendations for policymakers, healthcare providers, and EMS leaders to conceptualize proactive, equitable, and sustainable solutions to mitigate the public health burden of climate change so that emergency medicine is prepared to counter the mounting perils of a warming climate.

Methodology:

The review was conducted by adhering to a systematic approach to screen literature between 2000 and 2024. Underserved databases such as Scopus, Web of Science, and PubMed were searched using keywords such as “emergency medicine,” “natural disasters,” “climate change,” and “health consequences.” Inclusion was on peer-reviewed literature dealing with climate disasters and their consequences on EMS or on health outcomes. 45 studies were selected to obtain a robust evidence base.

Climate Change and Increased Occurrence of Natural Disasters

Climate change caused by humans has increased the frequency and severity of natural disasters in geographic scope and put unprecedented stress on all countries' Emergency Medical Services (EMS) worldwide (1). The global average temperature has increased by approximately 1.1°C from pre-industrial levels, which is primarily due to increases in carbon dioxide and methane released from the burning of fuels and land clearing for land use and industrial activity (2). Warming has destabilized global climate systems leading to increased and longer-lasting heatwaves, shifts in precipitation leading to droughts and flooding, intense tropical cyclones with warmer ocean surfaces, and elevated wildfire threats through prolonged drying and hot spells (14, 15). Such climate disasters/material disasters exert direct population health impacts in terms of excess of acute trauma and heat and respiratory illness and indirectly put EMS units to extreme pressures of exponentially rising acute care demand, logistic disruptions, and assault on resilience of healthcare infrastructures (5). Interdependent effects of such disasters necessitate adaptive strategies to enhance EMS capacity to respond to rising health emergencies. In this article, we provide an exhaustive review of heatwaves', hurricanes', flooding', and wildfires' impact on emergency medicine as it plays on health outcomes and operational requirements on EMS.

Heatwaves

Heatwaves characterized by protracted periods of unusual warmth often combined with high humidity are on their increase in frequency and duration and are occurring with greater intensity as a direct consequence of climate change (16). Heatwaves trigger a surge in HRIs like heatstroke, heat exhaustion, and dehydration and are of particular concern for vulnerable populations like old people, children, workers outdoors, and those with existing cardiovascular or pulmonary illness (6). Heatstroke can be life-threatening and has a mortality rate of 60% if not treated and is a consequence of failing to maintain body core temperature in check with resultant organ failure and

neuroimpaired faculties (17). During heatwaves, EDs are flooded with patients, and admissions for HRIs are reported to increase by 15–25% based on studies conducted to date (18). During the 2003 heatwave in Europe, which was amongst the deadliest heatwaves in history, over 70,000 excess deaths were reported with most of them elderly and EMS services swamped by presentation of heatstroked victims, dehydration victims, and cardiovascular collapse victims (19).

Heatwave regulation is particularly challenging in prehospital settings since extreme heat reduces EMS personnel performance and increases fatigue and endangers responders to heat-induced injury (13). Ambulance equipment such as cooling apparatus and monitoring devices may not function correctly in such intense heat and therefore complicates stabilization of and transportation of patients further (20). Urban heat isles characterized by pavement and asphalt retaining and absorbing heat contribute to urban hazard and increase urban HRI hospital and clinic visits by 30% in crowded cities (21).

Power failures common in heatwaves owing to strain on electricity networks cut off access to cooling further risking vulnerable people, particularly those with economic or mobility constraints (22). Secondary consequences of a 10–15% increase in cardiovascular events such as myocardial infarction also place EMS under strain and require urgent triage and activation of services (23).

Hurricanes and Tropical Storms

Hurricanes and tropical storms, driven by warmer ocean surface temperatures and rising ocean levels, cause widespread damage through storm surges, strong winds and heavy rain, causing severe health emergencies and EMS disruptions (14). The storms cause direct trauma in the form of wind-borne debris injury, fall and vehicle accidents and direct health consequences in the form of exacerbations of illness and spread of infectious illness and disease outbreaks (24). Hurricane Harvey in Texas in 2017 killed over 80 people and had thousands of existing ED visits for trauma, respiratory failure and exacerbations of such illnesses as diabetes, hypertension and asthma and EMS was swamped by volumes and severity of cases (9).

Damage to infrastructure in the storm, including flooded roads and downed electricity lines and destroyed buildings cripples EMS response and response time with some patients waiting over 24 hours for treatment (25). Blackouts last for weeks in some instances render ventilator and dialysis machines unusable, compromising chronically ill patients (26). Flooded water and sewage overflow leading to contaminated water supply increases dangers for water-borne illnesses like gastroenteritis and Vibrio and hepatitis A with existing ED admissions for such illness increased by as much as 30% after the hurricane hit (27). Mental health emergencies like acute stress disorder, anxiety and depression swell in numbers after such events and EMS is often not equipped or trained to handle psychological needs (28).

Low-income and minority groups are impacted disproportionately because they tend to reside in flood-prone areas and are not well-connected to evacuation services or healthcare when a disaster happens (10). Displaced individuals also place a long-term recovery burden on EMS because they face access barriers to healthcare such as the unavailability of medication, loss of medical information, and transportation constraints (29).

Floods

Floods are among the most common and destructive climate-related emergencies. Floods are caused by excessive rainfall, sea level rise and melting ice caps, and have significant implications for public health and EMS response (30). The direct health effects from floods vary and include drowning, traumatic and non-traumatic injury due to debris, and in cold weather scenarios, hypothermia (31). Indirect impacts include outbreaks of waterborne diseases such as leptospirosis and cholera, as well as gastrointestinal disease, and vector-borne disease transmitted from standing water that breeds mosquitos, such as dengue and malaria (32). Flooding in 2011 in Thailand, for example, resulted in a 40% increase in emergency department visits for waterborne infection and dermatological disease, overwhelming the existing regional emergency management system and hospitals (33). Flooded roads, lost bridges, and washed-out pre-hospital and hospital care infrastructures make transportation in emergency vehicles slower, some places having a 50% slower response time, and therefore slow any care delivering (12). Often communications systems, such as radio systems and cellular systems for communication, have been damaged or destroyed making coordination difficult for EMS across hospitals and public health (34).

There are mental health impacts to flooding such as acute and chronic stress, PTSD, anxiety, and depression, also noted at 20-30% in the studies which surveyed individuals impacted by flooding, thereby further impacting EMS use (35). Low-income communities, which we find mostly in flooded areas with the lowest housing and drainage quality, are of course at higher risk for injury or illness, which aggregates the impact of flooding and further widens health disparities (36). EMS similarly must contend with contaminated medical equipment and health facilities that have been flooded, and this can render EDs out of action and require the deployment of makeshift field hospitals (11).

Wildfires

Wildfires caused by severe droughts, increased heat, and windy conditions became increasingly frequent and intense throughout the US West Coast of America, Australia, and southern Europe/Western Mediterranean regions (15). Wildfires release fine particulate matter (PM2.5), carbon monoxide, and volatile organic compounds, which not only exacerbate respiratory and cardiovascular disease but also increases asthma, chronic obstructive pulmonary disease (COPD), and heart attack related emergency department visits by multiples (8). The 2019-2020 Australian bushfires were some of the most significant wildfires on record, with incidences of

respiratory related emergency department visits being doubled by 15-20%, as well as considerable strain on emergency management services and local hospital capacity (37). Prehospital care is hampered by harmful supply quality of air impairing EMS personnel visibility and pulmonary function and poses responder injury and fatigue risk increase (38).

Direct injuries like burns and fire and smoke inhalation require specialized prehospital treatment like management of the airway and oxygen and fluid resuscitation and put EMS operations under strain (39). Hospitals are also destroyed by wildfires, so hospital evacuations and closure reduce available bed numbers by up to 30% in affected regions like California's wildfires of 2018 (40). Chronic exposure to wildfires aggravates long-term health consequences like a 7–10% increase in cardiovascular admissions in control hospitals adding to EMS loads (41). Rural regions are generally located in close proximity to regions prone to wildfires and are also exacerbated by fewer EMS services and longer transport time to hospitals (42). Wildfires also cause psychological consequences like worry and PTSD leading to displacement and loss of assets and further complicate EMS response and require access to combined mental health services (28).

Health Effects of Climate-Driven Disasters

Climate-related natural disasters—heatwaves, hurricanes, flooding, and wildfires—have an extensive health effect, including acute physical injury, chronic health consequence, and indirect effects that create complications to respond helpfully in delivering emergency medical services (EMS). Climate-related health effects can be divided into direct effects, including acute trauma and heat-related illness (HRI), and indirect effects to health, which would include mental health conditions, infectious disease outbreaks, and chronic disease exacerbation. Each health issue presents different dilemmas for EMS because of response time; course and range of treatment; and the need to integrate with public health systems in responding to urgent and chronic health needs (5). The increased severity and frequency of these disasters, driven by climate change, place increased demands on EMS, requiring adaptive responses to ensure effective and equitable delivery (1).

Direct Health Impacts

Acute medical consequences of climate disasters involve immediate physical injury and acute medical disease caused by environmental hazards. The effects are dependent upon the type of disaster, but they all increase emergency department (ED) visits and require EMS to respond urgently and appropriately. Both hurricanes and flooding cause traumatic injuries, including fractures, lacerations, head injury, and crush injury, through flying debris, structural failure, falling debris, and vehicular injury during evacuation or rescue (31). For example, Hurricane Katrina in 2005 caused a 20% increase in ED visits for trauma in the areas affected by the hurricane, and caused EMS to provide care for the surgical management of patients' and wound care needs to have the patients transferred and evacuated (43). Drowning is one of the main contributors to fatal injuries during flooding and accounts for around 40% of all flood fatalities, including those survivors who may need prompt resuscitation and critical care afterward (30). EMS is presented with not just inaccessibility and subsequent care of victims trapped in flooded areas but specialized water rescue training and equipment (12).

Heatwaves lead to HRIs including heat exhaustion, heatstroke and dehydration, which can be life-threatening for vulnerable populations including older adults, children with cardiovascular or renal disease (6). Mortality from heatstroke, who have a core temperature of >40°C and develop neurological dysfunction, is 60% unless appropriate and immediate cooling and replenishing fluids is commenced (17). The European heat wave of 2003 was noted for a 25% increase in ER presentation for HRIs as EMS was overwhelmed with sudden increases in patients and delays in transports from ambient extreme temperatures affecting the ambulances (19). Prehospital treatment of HRIs demands immediate assessment and cooling therapies, which are hindered by environmental heat stress and resource constraints in mass casualty incidents (18).

Direct injuries include burns and smoke inhalation with acute respiratory distress necessitating expert prehospital treatment by way of airway management, oxygen administration, and fluid resuscitation (39). Superficial to life-threatening burns of every kind necessitate immediate pain control and infection prophylaxis and strain EMS resources heavily (38). There was a 15% increase in burn injuries to the ED in 2018's California wildfires when EMS was hindered by hazardous air and road closures, which made transportation of patients extremely challenging (40). Such direct injuries cumulatively put strain on EMS services, which necessitate efficient triage, transport, and communication with trauma centers to manage high-acuity patients (44).

Indirect Health Impacts

Indirect health consequences of the disasters appear after several days, weeks, or years after a disaster and encompass psychiatric and infectious disease outbreaks and exacerbation of existing diseases. Indirect effects are longer than direct injuries and place continued demand on EMS and require coordination with the public health system. Rates of mental illness post disasters, including post-traumatic stress disorder (PTSD), anxiety, depression, and acute stress disorder, may be as high as 20% - 30% for the affected (45). Survivors of Hurricane Katrina, for example, may experience incidences of PTSD of as high as 30% five years after the disaster because they were displaced and lost property and continue to have a long road to recovery (43) Floods and wildfires also trigger additional mental health needs and it has been documented that in the aftermath of major flood events, emergency department (ED) presentations for anxiety can increase by up to 25% (35). Of course, the assumption is that EMS Providers can fill the void in care, but they are inherently acute oriented and regularly untrained in psychosocial needs (28). The

psychological toll for the EMS responders in regard to burnout and secondary traumatic stress plays a significant role too after disasters, with up to 67% of responders showing symptoms of mental health issues after disasters and an overall percentage of around 20% (46).

The infectious disease outbreaks caused by the disaster will be an indirect effect, but this is particularly true for floods and hurricanes, which will create a prime environment for the transmission of waterborne and vectorborne diseases. Flood water allows the transmission of leptospirosis, cholera, gastroenteritis and the rise in temperature will allow for disruptions in the environment for the risks of dengue fever, malaria, and West Nile Virus to rise (47, 32). The 2011 Thailand flood resulted in a 40% increase in ED presentations of waterborne infections overwhelming EMS and hospitals (33). After hurricanes occurred, there were outbreaks of Vibrio infections and hepatitis A followed by a 30% increase in ED visitation from the affected areas (27). While EMS needs to manage outbreaks in a public health emergency, they are also managing acute trauma or the type of exposure that created the need for prehospital care. The most important components of epidemic response for EMS systems are swift epidemiological diagnosis and rapid communication with public health agencies on surveillance and disease control (34).

Chronic disease deterioration is also another significant indirect consequence of disasters because they will impede access to medications, medical and therapeutic equipment, and the continuum of care. Wildfire particulate matter with fine particles (PM2.5) will result in long-term cardiovascular and respiratory morbidities. After major wildfires, it is estimated that an additional 7 - 10% of heart disease and asthma hospitalisations are attributable to wildfire smoke (41). Hurricanes or flooding only magnify chronic diseases such as diabetes and hypertension resulting in cancelling access to treatments such as insulin, antihypertensive medications, and dialysis machine services leading to a 15% increase in ED presentation for uncontrolled ongoing illness post-disaster (48). In some cases, the tornado involves blackout (a common hazard for hurricanes and heat waves) permitting to paralysis of equipment such as ventilators and oxygen concentrators for patients with respiratory illness (26). Indirect effects put extra stress on EMS with increased demand for non-emergency services, which require long-term organisation of resources and coordination intersectorially (28).

Challenges for Emergency Medical Services

Climate disasters impose formidable operational, logistical, and systemic pressures on emergency medical services (EMS) that affect their ability to deliver appropriate and timely care. This includes pressures under resource management, infrastructure resilience, and training and preparedness.

Resource Allocation

Disaster patient surges overwhelm EMS resources, ranging from personnel and ambulances to equipment and hospital beds (49). For instance, the 2018 wildfires in California generated critical oxygen and ventilator shortages for respiratory distress patients, leading to EMS rationing of resources and diverting of care (40). Predictive modeling, such as patient surge prediction by weather, increases prepositioning of resources but in most EMS systems there is neither adequate funding nor infrastructure to make these tools possible (50). Rural areas are particularly vulnerable with few EMS personnel and longer transport times aggravating shortages of resources, so response times are up to 30% longer than in urban areas (51). Prepositioning of basic items like IV fluids and burn dressings is critical but costly with an estimated $500,000 per EMS agency for adequate disaster preparedness measures (52).

Infrastructure Resilience

Disasters compromise healthcare infrastructure, debilitating ED function and EMS logistics (11). Debris-blocked roads, downed power lines, and damaged hospitals restrict traffic through ambulances, with response times increased by up to 50% during big floods and hurricanes (53). The 2017 Hurricane Maria, for example, destroyed 80% of the power in Puerto Rican hospitals, severely compromising EMS function and making mobile field hospitals a critical alternative (54). Storm-prone hospitals require costly retrofitting—$1–2 billion for vulnerable areas—resistant to storm surges and high winds (55). Heatwaves and wildfires exacerbate infrastructure issues by triggering electrical grid outages and overheating medical equipment, further delaying care (20). Mobile health units and temporary solutions are helpful but require large-scale coordination and financing to be implemented effectively (56).

Training and Preparedness

Specialized training for EMS responders is necessary to manage climate-caused health hazards, including HRIs, chemical exposure during wildfires, and mass casualty incidents (52). Climate modules are lacking in EMS responder training programs, and therefore responders are unprepared for disaster response (57). For example, fewer than 30% of EMS curriculums in the US provide training for heatwave emergencies, which are fast becoming a more common occurrence (18). Simulation training for mass casualty victims and in virtual reality improves preparedness but is expensive and costs up to $100,000 per session for urban agencies (58). Cultural competence training is also necessary to prepare for vulnerable and diverse populations, including foreign-language communities or individuals with disabilities, which are repeatedly disproportionately affected by disasters (59). Psychosocial effects on EMS responders, including burnout and PTSD, require resilience training and are estimated to affect 15–20% of responders after a disaster (46).

Adaptation and Resilience Strategies

Emergency medical services must use strategies of increased preparedness in addition to coordinated health initiatives and employ technology to address climate disasters. These strategies will, in theory, improve response capacity, lessen health impacts, and mitigate inequalities.

Enhanced Preparedness

Pre-disaster preparedness measures like early warning systems, evacuation plans, and surge capacity plans effectively minimize health impacts (60). Integration of climate data like predictive models of heatwaves or hurricane trajectories with EMS plans improves resource utilization and response time and has reduced heatwave fatalities by 30% in cities with effective early warning systems (61). Community preparedness strategies like first-responder volunteer training reduce EMS bottlenecks, particularly among marginalized or remote communities (59). Pre-positioning of equipment and regional coordination centers reduces response time and is an efficient approach applied in the 2019–2020 Australian bushfires (37). Budget constraints in low-resource settings reduce scalability and require international finance and collaboration (4).

Public Health Integration

Coordination with local EMS and public health departments is essential to combat indirect health impacts and reduce ED volumes. Public education campaigns for heatwave preparedness, including hydration and public cooling centers, reduced HRI-related ED presentations by 15–20% in urban regions (62). Mental health programs, including crisis counseling and telepsychiatry services, reduce post-disaster mental health impacts, with pilot studies showing a 25% reduction in PTSD-related ED presentations (28). Vector control programs, including mosquito netting and water sanitization after flooding, prevent disease outbreaks, with the World Health Organization registering a 40% reduction in dengue in areas with proper post-disaster interventions (63). Health collaborations with public health also enhance data transfer, enabling EMS to predict health trends and deploy resources accordingly, such as in United States post-hurricane surveillance programs (64).

Technological Innovations

Technological advances aid EMS response adaptability and effective response to disaster events. Telemedicine facilitates distance triage and consultation and provides remote access to clinician expertise. Telemedicine use reduced ED crowding in a disaster setting up to 20% (56). Delivery of medication and lab supplies by drones, such as insulin and blood products, has proved to be effective in flood-disaster areas, and Southeast Asian pilots cut time to remote groups by 50% (65). Data analysis and GIS optimize EMS response routes, reducing delays by 15–20% in urban settings and enhancing outcome for patients (66). Mobile health units are equipped with diagnostic capabilities and telemedicine capabilities, enabling point-of-scene treatment while evacuating, reducing hospital demand and enabling EMS access to remote areas (11). Artificial intelligence algorithms, such as predictive surge patient tools, are also promising and pilot studies had a 10% improvement in accurate allocation of resources (67).

Discussion

The growing frequency and severity of climate-related disasters call for a paradigm shift in emergency medicine to address acute and chronic health impacts as well as overcome logistical and systemic constraints. Disproportionate harm falls on vulnerable populations such as the poor, elderly, and those with chronic illnesses, with reports indicating low-income families are 2–3 times more likely to report EMS delays amid disasters (7). Such inequalities must be tackled through broad-based, evidence-informed strategies, including community-based EMS models with particular focus on socially marginalized populations and mobile health units developed according to the landscape of needs surrounding vulnerable populations (59).

Global health inequalities exacerbate some climate impacts related to resource-limited settings with limited EMS metrics, as only 20% of low-income countries have assigned levels of prehospital care as we in the western world might understand it (4). New threats related to climate change, such as shifts in emergence and infectious diseases (example, exploring geographical shifts in vector-borne disease emergence) are complicating responses to climate impacts from an EMS perspective, and call for greater surveillance and increased training capabilities amongst EMS providers (68).

Future investigations will also be essential in addressing other gaps identified related to longitudinal studies on the health impacts of climate variability over time as well as the cost-effectiveness and new potential research tools like AI and machine learning and their application to EMS disaster planning response. Policy interventions must target funding gaps and continues estimates show there is a global investment needs that are approximated to be $10 billion determines what is stated about making the EMS a more resilient health system in high-risk regions (67). Intersectoral partnerships between EMS, public health, urban planning, and climate science is an important element of creating resilient health systems that possess the ability to withstand climate change stressors.

Conclusion:

Climate change influences emergency medicine significantly through natural disaster increases and variations in health impacts. EMS are faced with resource management challenges, susceptibility of infrastructure, and preparedness and need adaptive solutions. Improved planning, public health interacting and technology provide pathways to flexibility. As climate change progresses, emergency medicine must be proactive to ensure public health protections are possible and enhance equitable care delivery.

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مراجعة تأثيرات تغير المناخ على طب الطوارئ: زيادة الكوارث الطبيعية و آثارها الصحية

الملخص

الخلفية :يعد تغير المناخ أزمة صحية عامة وشيكة ذات أولوية ملحة، وقد أثر بشكل كبير على طب الطوارئ من خلال زيادة تكرار وشدة الكوارث الطبيعية. أدت انبعاثات الغازات الدفيئة الناتجة عن الأنشطة البشرية إلى تفاقم موجات الحر والأعاصير والحرائق البرية، مما زاد من المخاطر الصحية على الإنسان وأعباء خدمات الطوارئ الطبية.

الهدف :تهدف هذه المراجعة إلى تجميع الأدلة الحالية حول العواقب الصحية للكوارث المرتبطة بالمناخ، وتقديم توصيات قابلة للتنفيذ لتعزيز مرونة وكفاءة وعدالة خدمات الطوارئ الطبية في مواجهة التحديات المتزايدة المرتبطة بالمناخ.

الطرق :تم إجراء مراجعة شاملة للأدبيات العلمية التي تناولت التأثيرات الصحية المباشرة وغير المباشرة للكوارث الطبيعية المتفاقمة بسبب تغير المناخ، والفئات السكانية الأكثر عرضة للخطر، والتحديات التشغيلية التي تواجه خدمات الطوارئ الطبية، والاستراتيجيات التكيفية مثل الاستعداد للكوارث، والتكامل مع الصحة العامة، والطب عن بعد، والنمذجة التنبؤية.

النتائج :تؤدي الكوارث الطبيعية إلى آثار صحية مباشرة مثل الإصابات الرضحية، وأمراض الحرارة، وأمراض الجهاز التنفسي، بالإضافة إلى آثار غير مباشرة تشمل الاضطرابات النفسية، وتفشي الأمراض المعدية، وتعطيل إدارة الأمراض المزمنة. تتحمل الفئات الضعيفة مثل الفقراء والمسنين وذوي الحالات الصحية المزمنة عواقب غير متناسبة بسبب محدودية الوصول إلى الموارد والخدمات الصحية. تواجه خدمات الطوارئ الطبية تحديات تشغيلية مثل فيضانات المنشآت، ونقص الموارد، والعقبات اللوجستية التي تعيق الاستجابة السريعة والفعالة. أظهرت التدابير التكيفية مثل تعزيز الاستعداد للكوارث، والتكامل مع أنظمة الصحة العامة، والابتكارات التكنولوجية كاستخدام الطب عن بعد والتحليلات التنبؤية، قدرة على التخفيف من هذه التحديات.

الخلاصة :لمواجهة التهديد الصحي المتزايد الناجم عن تغير المناخ، يجب على أنظمة خدمات الطوارئ الطبية تبني استراتيجيات قوية وعادلة ومبتكرة. إن تعزيز الاستعداد للكوارث، وتعزيز التعاون بين القطاعات، والاستفادة من التكنولوجيا، تعد ضرورية لتحسين تقديم الرعاية الطارئة في ظل تزايد الكوارث المرتبطة بالمناخ.

الكلمات المفتاحية :مرونة الرعاية الصحية، طب الطوارئ، الكوارث الطبيعية، تغير المناخ، الصحة العامة