

HEQ1.2 Elderly Susceptibility PBL-Case

Elder Susceptibility to Climate Change and Related Disruptions

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Resource Map:

[PHRC Metrics:](#)

2023 PHRC Medical School, Curriculum, 1.2.

2023 PHRC Medical School, Curriculum, 1.3.

2023 PHRC Medical School, Curriculum, 1.5.

2023 PHRC Medical School, Curriculum, 1.6.

2023 PHRC Medical School, Curriculum, 1.7.

2023 PHRC Medical School, Curriculum, 1.8.

2023 PHRC Medical School, Curriculum, 1.9.

[GCCHE Core Concepts](#)

2023 GCCHE Concept 1.2.1.

2023 GCCHE Concept 1.3.3.

2023 GCCHE Concept 1.5.1.

2023 GCCHE Concept 3.3.1.

2023 GCCHE Concept 5.3.1.

[Medicine for a Changing Planet](#)

MCP 5 Food Security

MCP 7 Extreme Heat.

FACILITATOR GUIDE

Goal:

Educate healthcare trainees on the association between climate change, geriatric health and healthcare disparities, and appropriate responses to these challenges.

Learning objectives:

Below are starting learning objectives. Please feel free to add your own as needed.

1. Explain why the elderly are more susceptible to heat and pollution-related exacerbations of cardiovascular and pulmonary illness.

2. Discuss the impact of climate-change related disruptions (power outages, food scarcity, transportation limitations) on the health of older adults.
3. Outline ways that healthcare trainees can advocate for equitable climate change action and environmental justice with regard to geriatric populations.
4. Explain how social determinants of health and social isolation compound physical vulnerabilities in the elderly to increase the risks of health harms from climate change

Case Vignette

Patient Name: Mr. James Mitchell

Age: 78

Presenting Complaint: Increased confusion, dizziness, and difficulty breathing

Mr. James Mitchell is a 78-year-old retired schoolteacher with a history of hypertension, chronic obstructive pulmonary disease (COPD), and type 2 diabetes. He lives alone in a small apartment in a city experiencing an extreme heatwave, with temperatures reaching 110°F (43.3°C). His apartment does not have air conditioning, and he has been relying on a fan for cooling. His daughter, who lives in another state, called emergency services after he sounded confused over the phone.

[Facilitator: prompt student to ask questions to the patient and use the information below to answer them. Students should conduct a full history. Students should have access to all the information after asking all their questions]

Review of Symptoms

- Mr. Mitchell reports dizziness, fatigue, and increased shortness of breath over the past two days.
- He states that he has not been eating well due to a lack of groceries, as he hasn't left the house to get groceries during the heatwave as well as decreased appetite.
- He has been using his inhaler more frequently, without improvement in his shortness of breath, and has not been urinating much.
- No recent fever, chest pain, or lower extremity swelling.

[Facilitator: Prompt students to ask about Mr. Mitchell's medical history, medications, social history, and living conditions.]

Past Medical History:

- Hypertension
- COPD
- Type 2 Diabetes
- Uses home oxygen concentrator for oxygen requirements as needed with his COPD, requiring significant electricity use

Medications: *[Facilitator: ask the students to explain why the patient may be taking each medication or medical device and to describe their mechanisms of action]:*

- Amlodipine
- Lisinopril
- Inhaled budesonide daily
- Tiotropium
- Salmeterol
- Home oxygen via oxygen concentrator for oxygen requirements when ambulating (requires significant electricity use)
- Metformin

Surgical History

- Cholecystectomy in 2010

Allergies

- Pollen (seasonal)
- Bee stings (anaphylaxis)

Social and Environmental History

- Lives alone; daughter checks in by phone weekly.
- Limited access to transportation; relies on delivery services for groceries due to poor ambulation, due to exercise intolerance, and need for ambulatory oxygen. Has not been able to obtain groceries during the heatwave from the delivery service.
- No air conditioning; uses a fan for cooling. ***[Facilitator: at high enough temperatures, fans have no effect on cooling].***
- High dependence on electricity for medical equipment.
- No alternative energy sources available during power outages, has not prepared food and water supplies to use in case of emergency
- 45 pack-year history of smoking, quit 4 years ago.

[Facilitator: Discuss how heat exacerbates existing comorbidities, particularly cardiovascular and respiratory diseases.]

[Facilitator: Prompt students to discuss how social isolation, medical dependence, and limited access to healthcare increase vulnerability.]

Physical Exam Findings

- Alert, oriented to self and place, not time.
- Temp: 101.2°F (38.4°C)
- BP: 95/60 mmHg
- Pulse: 112 bpm (tachycardic)
- Respirations: 24/min, slightly labored

- Oxygen Saturation: 91% on room air
- Skin: Warm, dry, decreased skin turgor, no edema
- Cardiovascular: tachycardia, normal S1, S2, strong pulses
- Respiratory: Moderate scattered expiratory wheezes

[Facilitator: Prompt students to explain the physical exam findings consistent with dehydration and heat exhaustion via intravascular volume depletion.]

Discussion and Management Plan and Public Health Measures

- **Immediate Actions:** IV fluid resuscitation, cooling measures, and oxygen therapy as needed, albuterol and ipratropium for COPD exacerbation
- **Assessment of Social Determinants:** Ensure access to cooling centers, community resources, and follow-up care with a primary care provider. Educate patient on development of an emergency plan such as safety checks from a neighbor, locations for cooling, or any places to stay due to heat.
- **Patient Education:** Hydration, recognizing early signs of heat stress, and medication adjustments during extreme heat events.
- **Long-Term Interventions:** Advocate for policies promoting climate resilience in geriatric communities, including improved infrastructure, social support, and healthcare access.
- **Special Considerations:** Evaluate access to power-dependent medical devices, refrigerated medication storage, and transportation for emergency services.
- **Mental Health and Resilience:** Assess climate-related distress and provide coping resources for anxiety and social isolation

[Facilitator: Engage students in discussing preventive strategies for climate-related health impacts on older adults.]

Mini Case

Mr. James Mitchell, a community-dwelling, independent of all ADLs and some IADLs 78-year-old man with hypertension, COPD on albuterol, and type 2 diabetes, presents with dizziness, confusion, and difficulty breathing during an extreme heatwave. He lives alone in an apartment without air conditioning, relying on a fan. His daughter, concerned about his worsening condition, called emergency services.

On examination, Mr. Mitchell is tachycardic, hypotensive, and mildly hypoxic, with dry skin and decreased skin turgor, suggesting dehydration and heat exhaustion. His COPD has worsened due to heat and poor air quality. Management includes IV fluids, cooling measures, and oxygen therapy. Addressing social determinants of health is crucial: he lacks transportation, access to cooling centers, and support for medication management.

Healthcare providers should screen older adults for climate vulnerability and provide guidance on mitigating heat-related health risks. Community-based interventions, such as social services and policy advocacy, are essential to protecting this high-risk population from climate change effects.

Answers to Learning Objectives

1. Why are older adults more susceptible to climate-related health risks including longitudinal risks such as excess heat and air pollution, but also natural disasters?

- Older adults face unique physiological vulnerabilities that make them more susceptible to heat-related illness and air pollution exposure, both of which can exacerbate cardiovascular and pulmonary conditions (McDermott-Levy et al., 2019).
- Age-related changes in thermoregulation impair the body's ability to dissipate heat through sweating and vasodilation, increasing the risk of heat exhaustion, heat stroke, and dehydration (Sewell, 2023). This is particularly concerning for older adults with preexisting cardiovascular disease, as heat stress places additional strain on the heart (Singam et al., 2020). In hot environments, the body compensates by increasing cardiac output and redistributing blood flow, which can lead to worsening heart failure, myocardial infarctions, and arrhythmias in patients with compromised cardiovascular function.
- Air pollution further compounds the risk of poor health outcomes such as hospitalization or mortality, especially in elderly individuals with chronic obstructive pulmonary disease (COPD), asthma, or other respiratory conditions. Pollutants such as fine particulate matter trigger inflammation, airway constriction, and oxidative stress, leading to increased hospitalizations for respiratory distress (Dong et al., 2024). Additionally, medications can exacerbate climate-related risks in older adults:
 - i. Cardiovascular medications such as beta-blockers can blunt the heart's ability to respond to heat stress, while diuretics may contribute to dehydration and electrolyte imbalances. Blood pressure medications may also cause volume depletion, dehydration, and hypotension which can lead to hospitalization or syncope.
 - ii. Respiratory medications, such as inhaled corticosteroids and bronchodilators, may be less effective during episodes of poor air quality or extreme heat, requiring more frequent use and increasing side effect risks.
- Importantly, many older adults experience multi-morbidity—cardiovascular, respiratory, cognitive, and other chronic issues that interact with one another. Climate-related stressors often exacerbate these conditions simultaneously, creating complex diagnostic and management challenges.

2. Impact of climate-related disruptions:

- Hyperthermia and heat-stroke are examples of emergent conditions that older adults are at a higher risk for and can lead to hospitalization or death.
- Age-associated vulnerabilities exacerbate the impact of climate-related disruptions such as power outages, food scarcity, and transportation limitations—have severe consequences for elderly populations, particularly those with chronic illnesses and limited mobility.
- Power outages during extreme heat events can be life-threatening for seniors who rely on air conditioning for temperature regulation, electrically powered medical devices (e.g., oxygen concentrators, CPAP machines), or refrigeration for medications like insulin (Casey 2020). Without access to these essential resources, older adults face an increased risk of hyperthermia, respiratory failure, and medication-related complications.
- Food scarcity, exacerbated by climate-induced supply chain disruptions, disproportionately affects elderly individuals who may already struggle with malnutrition, dietary restrictions, or fixed incomes (Myers 2017, Swinburn 2019). Limited access to fresh food can worsen diabetes, hypertension, and cardiovascular disease, while dehydration from poor nutrition increases the risk of falls, cognitive decline, and hospitalizations.
- Transportation challenges further limit access to medical care, particularly in rural or urban communities with inadequate public transit options (Henning-Smith, 2018). Extreme weather events—such as hurricanes, wildfires, and flooding—can make it difficult for seniors to attend routine medical appointments or pick up essential medications, as well as disrupt emergency medical services. For those with dementia or limited social support, these barriers can be particularly devastating, leading to delayed care and preventable complications.
- Social isolation and lack of community connections significantly increase risk, particularly for older adults living alone without family nearby. These individuals may not receive timely assistance or health check-ins during climate emergencies.
- Other vulnerabilities, such as cognitive impairment, vision and hearing loss, and mobility limitations, further hinder adaptive responses to climate disruptions. Individuals with these impairments may not recognize warning signs, access help, or physically evacuate during emergencies.

3. Healthcare provider role in climate resilience:

- Healthcare trainees play a crucial role in advocating for climate-resilient healthcare systems and equitable environmental policies that protect older adults.
- At the individual level, medical students and trainees should integrate environmental risk assessment into clinical encounters by asking about a

patient's housing conditions, access to cooling centers, and exposure to air pollution. Educating patients and caregivers on preventive measures, such as staying hydrated, adjusting medications during extreme heat, and identifying nearby cooling shelters, can reduce hospital admissions for heat-related illnesses.

- There are also programs that can help decrease electricity and gas bills for those with lower incomes that older adults may qualify for.
- Beyond direct patient care, trainees can engage in community-based advocacy by working with public health organizations to expand access to emergency preparedness resources, climate-adaptive housing, and transportation services for elderly patients. Partnering with policymakers to promote green infrastructure, heat mitigation programs, and improved air quality standards can help reduce health disparities among older adults living in high-risk environments.
- Healthcare institutions also have a responsibility to prepare for climate-related health challenges. Trainees can advocate for hospitals and clinics to develop emergency response protocols for extreme weather events, establish backup power systems for critical care patients, and ensure outreach programs target vulnerable elderly populations. Involvement in medical societies, environmental health organizations, and interdisciplinary research on climate change and geriatric health can further strengthen their advocacy efforts.

Suggested Resources

1. U.S. Climate Vulnerability Index (<https://climatevulnerabilityindex.org/>)
2. Climate Resilience Toolkit (<https://toolkit.climate.gov/>)
3. WHO's Social Determinants of Health: Addressing Health Disparities (2022).

Citations

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Helpful Resources

Michelle Brennan, Paula M O'Shea, Eamon C Mulkerrin, Preventative strategies and interventions to improve outcomes during heatwaves, *Age and Ageing*, Volume 49, Issue 5, September 2020, Pages 729-732, <https://doi.org/10.1093/ageing/afaa125>