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### **Simulations Teaching Clinical Skills and Knowledge of the Health Effects of Climate Change**

How many banquets have been spoiled for you by a dean's frosty response at the cocktail reception when you offered to help train students on the health effects of climate change? If you got beyond stunned and offended silence, you probably heard something like:

- The curriculum for this health profession is already jammed.
- Even if we created a time slot to offer this information, students wouldn't attend because they are focused solely on materials covered by the standardized exams.
- If we required attendance (or offered the honeypot of free food), attendees would just catch up on class assignments, sleep, or play on social media.
- We don't have faculty qualified for, or interested in, teaching this subject.
- We are training students to practice now, not in 2100 when the world may or may not be warmer.
- If health professions students want to learn about climate change, they should find a lecture in the atmospheric sciences department or go to a movie released by some environmental organization.

For us, the pain of rejection and gloom about the critical shortfall in healthcare training were eased by the wine flowing at such banquets and the eventual development of a solution for many health training programs.

While there may continue to be medical educators with a blind spot for this subject for years to come, we are excited about spreading a clinical-skills based approach to teaching the health effects of climate change. Students are eager to learn clinical skills, and curricula provide a range of simulated standardized patients (including objective structured clinical examinations, or OSCEs) and other active learning exercises.

Climate change is already affecting patients' symptoms, risks, and healthy behaviors; simulated patient exercises teaching respiratory, cardiovascular, infectious, mental, and many other illnesses can and should incorporate climate-related facts. Also, climate change is already affecting public health needs, actions, and plans; active learning exercises teaching community health improvement planning, health impact assessments, emergency responses, and many other activities can and should integrate climate-related facts.

Attached are three sets of simulations we used in 2018 at three training programs for health professionals – University of Illinois College of Medicine in Peoria, University of Illinois School of Public Health in Chicago, and American University of Antigua College of Medicine. Two of the sets of simulations use direct clinical approaches, and the last set uses a reverse clinical approach (described below).

Before each simulation, we presented for about one hour PowerPoints and video clips describing the health effects of climate change and ways to integrate this knowledge into actions for students and healthcare professionals. In the simulation exercises, the students worked for thirty minutes in groups ranging from two to ten people. The instructors checked with the groups to answer questions and provide guidance. The exercises ended with a representative of each group presenting the team's work to the class and answering questions from the instructors.

In the first set of clinical simulations, ten medical students at the American University of Antigua College of Medicine worked in small groups on these four exercises:

- Two cases that develop skills in history taking, physical exam, diagnosis, and communication with patient:
  - 29 year old woman who migrated from Puerto Rico to New York City following Hurricane Maria. The patient complains of wheezing, coughing, a rash, and a runny nose. Also, she states that she is experiencing anxiety and difficulty sleeping.
  - 9 year old boy seen at a clinic in Chicago. He complains of coughing and shortness of breath during outdoor physical activity. His chart reveals his sensitivity to pollen and past asthmatic symptoms.
- Two cases that develop skills in public communication, advocacy, and planning:
  - Medical student working with the staff of a committee to plan health care services and facilities for the area. Part of the committee’s task is to consider the risks related to climate change to health and health care services.
  - Medical student testifying on several shortfalls in a proposed climate action plan. The proposed plan fails to address the health impacts of climate change, actions for healthcare facilities, and health benefits of some strategies to reduce greenhouse gases.

In the second set of clinical simulations, twelve graduate students in public health at the University of Illinois worked in teams on four other exercises:

- Graduate student working with a hospital on a community health needs assessment. The student develops suggestions for the assessment to reflect climate-related health risks to the community and actions that the hospital could be taking to address climate-related community health needs.
- New staff person in the U.S. Department of Transportation has a degree in public health. The Secretary of Transportation wants to integrate health impacts and climate change analyses into all major decisions on transportation issues.
- New staff person in a county public health department. The department needs to prepare for migrants into the county from areas struck by heavy rains causing river flooding, drought with widespread wildfires, and heat waves with power outages.
- Public health advisor to the chief sustainability officer at a multinational corporation. The corporation wants a health impact analysis to guide and support possible targets to make its operations more energy efficient, use electricity generated by wind and solar power, purchase electric vehicles, and use recycled content materials in packaging.

For the third set of clinical simulations, we had favorable experiences with a reverse clinical approach to exercises with 22 students at the American University of Antigua College of Medicine and 60 students at the University of Illinois College of Medicine. Instead of the instructors describing a few patients with climate-related conditions and symptoms, each group of students learned about and discussed a broad range of health impacts of climate change. Before the exercises, the instructors gave the students short background readings on the various impacts of climate change on children’s health, conditions affecting elderly people, and mental health. The written materials included the following instructions:

Three patients present for clinical examination by medical students – one child, one elderly person, and one young adult. You will choose one patient and work with a few other students to develop a case scenario for portrayal by a standardized patient.

Each patient has been affected by a climate-related natural disaster (such as hurricane, flooding, or wildfire) or by another environmental condition related to climate change (such as heatwave, drought, elevated pollen, intensified air pollution, or contaminated water).

Your group will:

1. Consider several types of climate-related health threats for your patient
2. Select one of the threats you identified for your case

3. Create a case scenario for portrayal by a standardized patient. Include:
  - a. Patient's age, gender and geographic location
  - b. Patient's description of chief complaint/symptoms
  - c. History, including
    - i. exposure to climate-related conditions
    - ii. vulnerabilities to climate-related conditions, including patient's medical and socio-economic conditions as well as community characteristics
  - d. Physical exam, including vital signs and other key points
4. Consider how a student will approach the clinical exam of this patient
  - a. What additional sources of information would you consult on the patient's climate-related health effects?
  - b. Possible recommendations for the patient to reduce the climate-related risks

The groups created a range of scenarios for simulated patients, reflecting the students' understanding of the diverse health impacts of climate change. For each type of patient, the following describes one group's scenario in some detail and lists the others.

- Child
  - 8 year old boy goes for a walk in the woods in North Carolina to see foliage colors in October. Recent days have been hotter and rainier than usual. He develops bulls-eye rashes behind both ears, and complains of headaches, fevers, chills, muscle aches and nausea. He is allergic to pollen and had to take medication longer this year. The medical student diagnoses Lyme Disease. The student explains to the parents that the incidence of Lyme Disease has been increasing because of longer summer heat and expanded geographic range for the ticks. The student recommends using bug spray, checking for ticks, wearing long sleeves and pants, and educating families on the threats of diseases from insect bites.
  - 5 year old in Michigan experiencing sneezing, runny nose, coughing, wheezing, watery eyes, and skin irritation; his family lives in a basement apartment that was flooded by a heavy storm and developed mold.
  - 7 year old living in Peoria suffering from respiratory difficulty and sneezing during the summer, related to worsened air quality during heatwaves.
  - Teenager in Illinois developed bulls-eye rashes after fishing in a marsh area, diagnosed as Lyme Disease.
- Elderly person
  - 65 year old female in Bakersfield, California enjoys gardening. She has diabetes, does not smoke, and suffered from asthma as a child. She has been experiencing shortness of breath and other respiratory symptoms, especially when working outdoors during the summer. The medical student informs the patient that the heat and wildfires worsen the outdoor air quality, and recommends checking the daily air advisory for the area, staying indoors more on days with high pollen and smog levels, and installing air purifiers in her home. The medical student informs the local public health department about the patient's symptoms and participates in community education programs on the effects of climate change on outdoor air quality.
  - 70 year old man in Peoria experiencing diarrhea and abdominal cramps; was unable to engage in his daily outdoor walks because of heat; and instead went swimming in a pool contaminated by cryptosporidium.
  - 65 year old female living in Illinois experiencing worsening cough and shortness of breath, with a history of chronic obstructive pulmonary disease controlled by

- medication and smoking; social history reveals that the patient traveled to a music festival in California and was exposed to dust, wildfire smoke, and smog.
- 78 year old female living in Florida suffering from headaches, fever and muscle cramps; on a diuretic for hypertension, she attended an outdoor sports tournament on a hot day and developed dehydration and heat stress.
  - 67 year old female lives alone in Phoenix in an apartment without air conditioning; presents with fever and hypotension; diagnosed as dehydrated with heat exhaustion.
  - Mental health
    - 23 year old female living near New Orleans experienced weight loss, fatigue and anxiety. Drinks 2 to 3 glasses of wine nightly. Following Hurricane Katrina, her husband lost his job and their home was flooded. Two years later, they live with her mother-in-law, and the patient has a long daily commute to her job. The medical student recommends psychological therapy, medications for depression and anxiety, and participation in support groups for victims of the hurricane. The student gets involved in community health planning for long-term mental health support of persons affected by hurricanes and flooding.
    - 31 year old female in Peoria suffering from insomnia; home was destroyed by river flooding from early snow melt and heavy rains.
    - 25 year old female living in Puerto Rico suffering from anxiety, depression and heart palpitations; husband was killed by Hurricane Maria; no access to transportation or fresh fruits and vegetables.
    - 75 year old female who lived in coastal area that flooded and is experiencing depression and signs of malnutrition; husband was killed by flood
    - 43 year old single mother living in Houston area suffering from anxiety and insomnia; living in disaster relief structure months after her home was destroyed by Hurricane Harvey; she had no flood insurance because her house was outside of the area designated as floodplain

We hope that these materials and experiences will be helpful at other training programs. Please let us know your suggestions and questions. Warren Lavey [lavey@illinois.edu](mailto:lavey@illinois.edu) and Dr. Holly Rosencranz [harosen@illinois.edu](mailto:harosen@illinois.edu) Perhaps we could celebrate together at some future banquets for our steps forward in training health professionals through clinical exercise on the health effects of climate change.