Project Name: Carbon footprint impact of reduction in unnecessary medical testing in a hospital clinic

Organization Name: Yale-New Haven Hospital (YNHH), Department of Anesthesiology, Pre-operative Admission Testing (PAT) Clinic

Preceptor Name(s) and Contact Information:
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Brief Description of Organization:
YNHH is a 1,541 bed, private, nonprofit teaching hospital that ranks among the premier medical centers in the nation. It is the largest acute care provider in southern Connecticut and one of the Northeast's major referral centers, servicing 1.1 million patient visits and performing 50,000 surgeries annually. The primary York Street Campus is located in New Haven. The PAT Clinic manages pre-operative admission testing for YNHH.

Project Description:
The objective of this project is to quantify the magnitude of greenhouse gas emissions reduction associated with implementation of a new, centrally coordinated pre-operative admission testing protocol based on national guidelines for safe anesthesia care. The project will focus on healthy elective surgery patients.

The US healthcare sector is responsible for nearly 10% of the nation’s greenhouse gas emissions. If the US healthcare sector were a nation itself, it would rank 13th in the world for greenhouse gas emissions. One-third of US healthcare has been deemed wasteful and unnecessary, and thus reducing waste is an important way to reduce the carbon footprint of US healthcare.

Pre-operative admission testing (e.g., blood tests, X-rays, electrocardiograms) is performed to assess the health status of surgical patients and to provide the anesthesiologist the information needed to plan the patient’s anesthesia and optimize the probability that it will be administered safely and effectively. The specific tests needed depend on the medical history of the patient and the type of surgery. More than 30 million surgeries take place in the US each year, and excessive pre-operative admission testing has gained much attention recently. Factors contributing to unnecessary testing include medico-legal worries, concerns about averting surgical delays or cancellations due to missing test results, and lack of awareness of current evidence and guidelines. Unnecessary pre-operative admission testing wastes an estimated $10 billion annually and thus presents an opportunity for cost reduction. Furthermore, prevention of unnecessary testing, including travel to and from testing sites, provides an important opportunity for greenhouse gas emissions reduction. Adherence to current testing guidelines and management of testing by a dedicated anesthesia clinic have been shown to reduce unnecessary testing.

Historically, pre-operative admission testing at YNHH was uncoordinated and disorganized, with each individual surgeon deciding upon and ordering tests on their own, resulting in excessive and duplicative testing. However, the PAT Clinic recently implemented a new centrally-coordinated pre-operative screening process with evidence-based pre-operative testing guidelines created by a multi-disciplinary team consisting of anesthesiologists, surgeons, and perioperative nurses (the Centrally-Managed, Guideline-Based PAT Program). All patients scheduled to undergo surgery at YNHH now receive a pre-operative nursing phone call (triage call) to ascertain whether the patient needs to come to the hospital for pre-admission testing and visit with an anesthesia care provider. For convenience,
YNHH arranges all the necessary testing for the patient’s surgery to take place during this one visit. Recommended testing is based on national guidelines for safe anesthesia care, according to patient health status and type of surgery.

Quantification of greenhouse gas emissions reduction resulting from the new PAT procedures could help motivate broader adoption of current international initiatives to avoid wasteful and unnecessary medical care, such as the Choosing Wisely Campaign. Results of this project could also motivate healthcare providers to lead by example in mitigating the climate crisis, as is advocated by the Lancet Commission on Health and Climate Change.

The project will have two aims:

**Aim 1: Based on retrospective data for healthy patients, quantify averted miles driven and averted pre-operative admission tests resulting from implementation of the Centrally-Managed, Guideline-Based PAT Program.**

Students will review electronic medical records for healthy patients who underwent elective surgery at YNHH before and after implementation of the Centrally-Managed, Guideline-Based PAT Program. Students will extract data on whether the patient received a triage call, whether the patient was seen in the PAT clinic, what tests were completed both at YNHH and at other locations, and distance traveled based on home zip code and testing location.

**Aim 2: Based on Aim 1 results, quantify the greenhouse gas emissions reduction resulting from the Centrally-Managed, Guideline-Based PAT Program.**

Students will learn and apply methodology to calculate emissions reduction in terms of carbon dioxide equivalents. Approaches will include standard EPA conversions for averted miles driven, test cost as a surrogate for averted tests, and possibly more complex ("process based") life cycle assessment (LCA) methods.

**Expected Work-Product and Deliverables:**

The project will include the following steps:

1. Data extraction and management: creation of dataset based on medical record review
2. Data analysis: calculation of averted miles driven and averted tests
3. Data analysis: calculation of greenhouse gas emissions reduction
4. Report written in manuscript form, including introduction, methods, results, and discussion
5. Optional collaboration with preceptors for academic publication