H2. After the Single Use: Pasts, Presents, Futures of Plastics in Medicine

H2:1 Eloïse Richard, *Toxic Asepsis: Chemical Sterilization and the Rise of Disposable Medical Devices in the 20th Century*

During World War II, the U.S. Army Chemical Corps at Fort Detrick conducted research on sterilizing agents in anticipation of a biological war, identifying the gas ethylene oxide (EtO) as a promising agent to fight deadly germs. After the war, chemical companies identified a new commercial market for EtO: the sterilization of medical devices to guarantee perfect asepsis. Hospitals and medical device manufacturers were eager to find new methods to sterilize the growing range of plastic-based devices that could not withstand traditional sterilization by heat and steam. The introduction of gas sterilization thus enabled the massive growth of disposable plastic medical devices in the mid-twentieth century. EtO was quickly associated with serious occupational health hazards for hospitals and industry workers, as well as for patients (it would later be classified as both carcinogenic and mutagenic). Yet, the use of EtO expanded dramatically in the post-war years constituting a new iatrogenic dimension of modern medicine.

Drawing on trade and hospital journals, industry documents, and governmental publications in the United States in the post-war period, this paper examines the controversies surrounding the use of EtO for sterilization in hospitals and industries, and the convergence of interests of the chemical and medical device industries in preventing regulation of this toxic chemical. By situating EtO within the broader history of hospital infrastructures, this paper explores how a chemical developed for military defense was transformed into a hallmark of medical hygiene. Hospitals and medical device manufacturers promoted EtO as safe and indispensable, thereby normalizing this toxic chemical, as well as plastics, as part of modern healthcare.

Learning Outcomes

- Analyze the historical contribution of EtO sterilization to the rise of disposable plastic medical devices.
- Understand the occupational and patient health risks associated with EtO use and how these risks were historically minimized.
- Consider the ongoing implications of the history of EtO regulatory debates for current practice and material choice.

H2:2 Amanda Mahoney, *"A non-expendable disposable,": Nurses, Central Supply, and the Problem of Tubing in U.S. Hospitals, 1915-1965*

Current systems of staffing, supply, and use in hospitals are deeply entrenched around single-use supplies. Safe and effective hospital care relies on the ready availability of disposables, typically manufactured and packaged in plastic and often sterilized during the manufacturing process. This reliance was made painfully apparent by shortages of personal protective equipment (PPE) during the first year of the COVID-19 crisis. Healthcare workers were forced to reuse disposable items such as respirators, dozens of times. Norms around infection control, safety, and waste shifted during the emergency. A similar, though less urgent shift in beliefs about safety, infection control, and "wastefulness" among healthcare workers occurred during the mid-20th century transition from reusable equipment to disposables in healthcare.

Highly functional systems of maintaining durable medical equipment were the norm in hospitals before and during the messy shift to single-use items. Hospitals were designed around the extensive infrastructure required by systems of reuse including large Central Supply departments equipped with autoclaves, plumbing that allowed for high-pressure cleaning of tubing, huge laundry departments, and small incinerators. While these structures are often no longer extant, they did not abruptly disappear in the late 1940s with the arrival of early medical disposables. Rather, durable and disposable supplies and systems overlapped and worked in tandem until the late 20th century.

Sometimes, disposable and reusable systems of use intertwined in baffling ways that defy our assumptions of what drove hospitals towards single-use supplies. Tubing, ubiquitous as early as 1900 and employed in large quantities throughout the 20th century had an especially interesting journey from reusable rubber to single-use plastic equipment, a transition that both meets our assumptions about what drove the disposables transition (e.g. convenience) and absolutely contradicts them (infection control). Using the example of tubing, this paper will explore the forces that drove hospitals towards single-use disposables, most significantly the need to direct as much trained nursing labor as possible to the patient bedside. Tracing the history of tubing in U.S. hospitals will also reveal much about the infrastructure of reuse in hospitals and the fluidity of what defined safe and effective infection control.

<u>Learning Outcomes</u>

- Understand the systems of maintenance and use of durable or non-disposable medical equipment in U.S. hospitals prior to the 1970s.
- Identify key shifts in the cultural, scientific, and labor landscape of mid-20th-century hospitals that made the adoption of single-use disposables increasingly popular over durable options.
- Develop an understanding of the uneven and relatively slow adoption of single use disposables in healthcare.

H2:3 Sloane Wesloh, *Personal health devices, chronic disease, and the consumerization of risk*

Since the 1980s, health care has increasingly moved out of the clinic and into the hands of patients. Personal health devices, like continuous glucose monitors, advertise the ability for patients to track biomarkers like glucose at home. These devices have played a key role in managing chronic diseases like diabetes by providing patients with information about risk: e.g., high glucose signals the potential risk for future organ damage.

The Make America Healthy Again (MAHA) movement has specifically targeted chronic disease, framing it as an epidemic driven by personal choice. I argue that MAHA does this by flipping the narrative of risk. According to MAHA, the epidemic stems from poor diet, lack of exercise, and over-medicalization, which contributes to risk of disease. To combat this, the Centers for Medicare and Medicaid Services recently launched the Make Health Tech Great Again initiative, pledging to "return power to the patient" through partnerships with companies producing personal health devices and services for chronic diseases. Implicit in this framing is the assumption that responsibility for managing these conditions rests primarily with individuals rather than medical professionals.

Yet the history of the personal health device, MAHA's chosen weapon in the war on chronic disease, tells a different story. Chronic diseases, like diabetes, and pre-disease states, like pre-diabetes, have been coproduced as companies turned risk into a consumer product. By developing tools that allow patients to manage their own risk, these companies blurred the line between disease and pre-disease. What is now framed as "personal responsibility" is a byproduct of the consumerization of risk, reflecting only a narrow slice of pre-disease states. By treating all chronic disease primarily as a matter of individual discipline, MAHA obscures the role of industry in shaping risk, producing rhetoric that is both historically inaccurate and potentially harmful.

<u>Learning Outcomes</u>

- Analyze the historical development of personal health devices and their role in shaping patient management of chronic diseases, like diabetes.
- Critically evaluate the political and commercial framing of chronic disease as a matter of personal responsibility, with attention to initiatives like MAHA's "Make Health Tech Great Again."
- Reflect on the social, commercial, and technological forces that blur the boundaries between disease, pre-disease, and risk in contemporary health care.
- Build historical context and sensitivity for how patients use personal health devices and think about chronic disease in varying ways