OBJECTIVE 1: Describe the epidemiology of sepsis in the U.S. and compare this to the developing world.

Sepsis is a life-threatening condition that arises when the immune system overreacts to infection, triggering widespread inflammation that may lead to organ dysfunction. Sepsis is a global public health problem, affecting 30 million people worldwide (1).

In the U.S., over 1.6 million people are diagnosed with sepsis each year. The mortality rate of sepsis is estimated to be between 28%-50%. Sepsis is the most common cause of death in non-coronary ICUs, and the 10th leading cause of death in the U.S. It claims more lives than prostate cancer, breast cancer and AIDS combined (2) (3). The incidence of sepsis has been increasing over the years. This is attributed to the aging population, improved recognition of sepsis, and change in coding practices which favors reimbursement (4). Two-thirds of patients who develop severe sepsis are aged 65 and over- a patient population with more comorbidities and higher susceptibility to infection (5). The most common source of sepsis is respiratory infection, followed by urinary tract and gastrointestinal infection. Bacteria is the main causative organism. Over the past 27 years, gram-positive bacteria overtook gram-negative bacteria as the leading cause of sepsis in the U.S. (Figure 1) (6). A recent study demonstrated Staphylococcus aureus as the most common causative organism, followed by Pseudomonas species and Escherichia coli (4) (7).

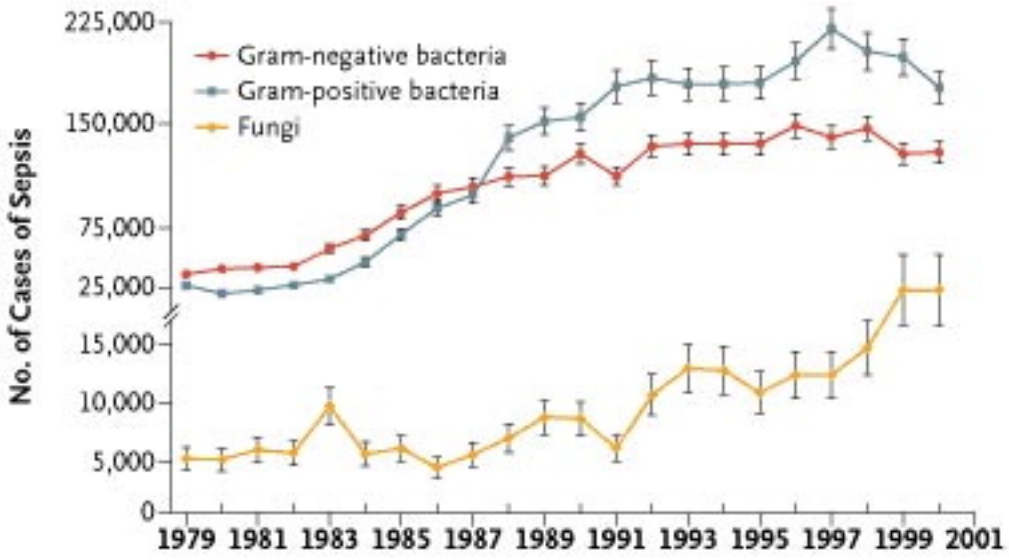


Figure 1. Causative organism of sepsis in the United States, 1979-2000. (6)

In developing countries, epidemiological data of sepsis is limited. The incidence and mortality of sepsis are likely to be higher. 60-80% of death which occur in developing countries are attributed to sepsis (1). Paediatric and maternal sepsis are also more common in developing countries. These are attributed to low hygiene standard,

widespread malnutrition and lack of access to basic healthcare including vaccination (8). Bacteria is also the most common cause of sepsis. In contrast to the U.S, gram-negative bacteria are the predominant causative organism (7). For instance, the most common organism type in Brazil is Pseudomonas, followed by Klebsiella and Staphylococcus aureus (9).

OBJECTIVE 2: Describe how critical care service is provided in the U.S., and compare this to the U.K.

In the U.S., health care is provided by many different organizations. The hospitals can be broadly classified into community hospitals and federal government hospitals. Community hospitals are defined as *"all nonfederal, short-term general, and other special hospitals that provide specialty services."* The difference between community and federal hospitals is the hospitals' source of funding. Federals hospitals are fully funded by federal tax revenues, which includes veteran and military hospitals. In contrast, the funding for community hospitals may come from federal health insurance programs e.g. Medicare and Medicaid, state government, private insurance companies or self-paying patients. The community hospitals are further divided into non-government not-for-profit, government-owned and for-profit (Chart 1) (10).

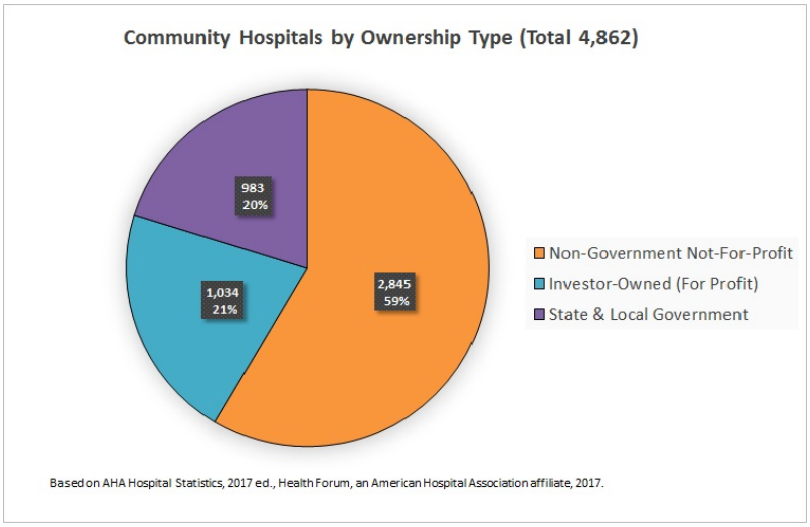
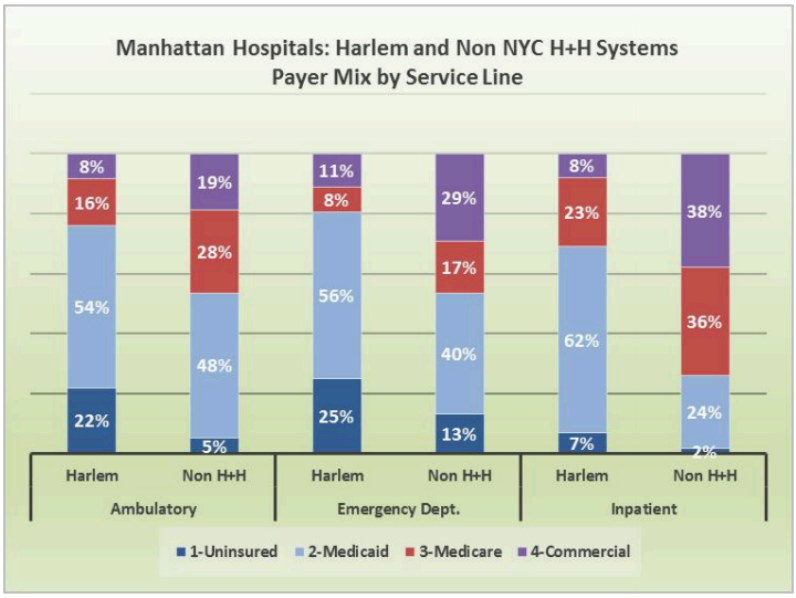


Chart 1. Community hospitals by ownership type (10).

Harlem Hospital is part of New York City Health+ Hospitals (NYC H+H)- a network of public hospitals which serves more than 1.2 million New Yorkers regardless of their ability to pay. According to Chart 2, Harlem hospital provided a significantly higher proportion of inpatient services to the uninsured and Medicaid population (69%) compared to Manhattan's Voluntary not-for-profit hospitals (31%) (11).



Sources and Notes: 2014 Hospital Institutional Cost Report, 2014 DTC Cost Report for HHC using internal data, and 2013 Health Center Cost Report for all other DTCs. Includes all NYC acute, general care hospitals and related wholly owned or controlled community health centers, including HHC DTCs. Discharges exclude normal newborns. ED visits include treat and release, and visits that result in admission. Clinic visits include comprehensive care and primary care visits only.

Chart 2. Payer Mix at Harlem Hospital compared to Non- NYC H+ hospital (11).

In the U.K., the health services are largely provided by the National Health Service (NHS). The NHS is a publicly funded universal healthcare system, and most healthcare services are free at point of use. In recent years, an increase in private healthcare services are noted in the U.K. These services may be provided in private hospitals, or in NHS hospitals whereby private sectors pay and use NHS facilities. Most private hospitals only offer routine operation and do not have facilities for intensive care. In cases of unexpected emergencies, these patients would require transfer to a NHS hospital for intensive care, which may place patients at a greater risk during transportation (12).

In terms of critical care service, there is 7 times more ICU bed in the U.S. compared to the U.K. In the U.S., more patients are admitted directly from the emergency department (ED) to the ICU. In contrast, patients in the U.K may spend longer on general wards and are sicker before ICU admission is warranted. The mortality rate of ICU appeared to be higher in the U.K. compared to the U.S. This may be due to differences in patient population and the health care system. A subgroup analysis comparing patients with similar illness severity, who were admitted straight from the ED and mechanically ventilated within the first 24 hours of admission, demonstrated similar mortality rate (13).

OBJECTIVE 3: Describe an example of good practice in the delivery of critical care service

In 2002, the Surviving Sepsis Campaign (SSC), an international joint collaboration was launched in an effort to reduce the high mortality of sepsis. The SSC aims to develop evidence-based clinical guideline to improve sepsis diagnosis and treatment.

One of the quality improvement tool introduced by the SSC is the sepsis care bundle, which is currently known as "the Severe Sepsis 3-Hour Resuscitation Bundle" and "the 6-Hour Septic Shock Bundle" (Figure 2). These bundles consist of elements of good practices that when delivered together maximize patient outcome. Hospitals that adopted the sepsis bundle demonstrated improvement in sepsis mortality (14).

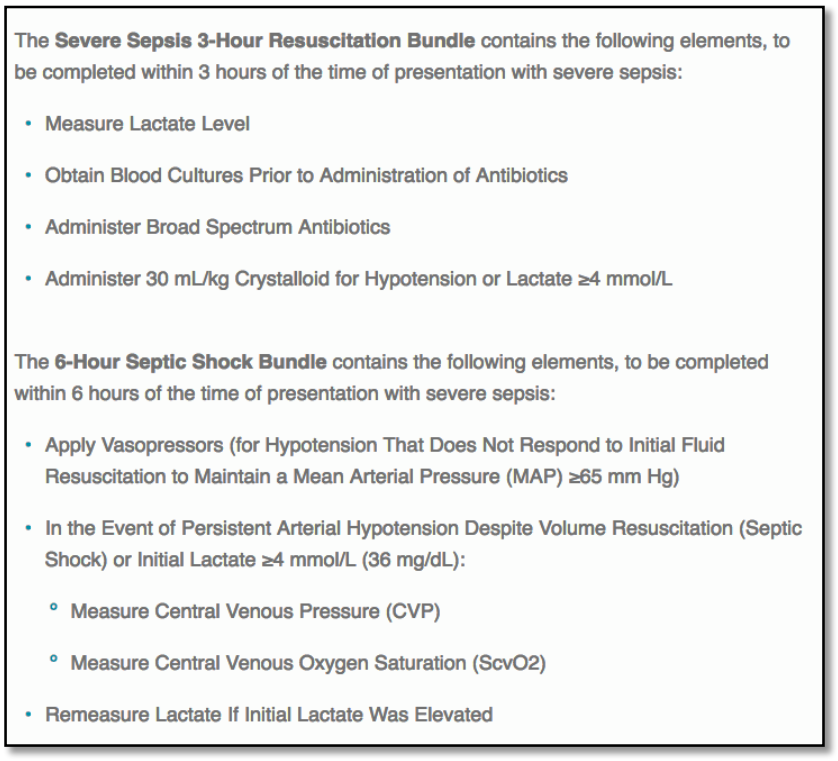


Figure 2: Elements of the sepsis bundle as recommended by the SSC (15).

The New York State Department of Health (NYSDOH) also launched The New York State Sepsis Initiative to drive improvement in sepsis care. This initiative makes it mandatory for hospitals to develop and implement evidence-based sepsis protocols. By monitoring individual hospital performance, the NYSDOH aims to identify and promulgate clinical practices that brings positive impact (16).

The collective initiative taken to tackle sepsis is commendable. Sharing and evaluation of evidences from various parties will undoubtedly optimize sepsis care, and improve patient outcome.

OBJECTIVE 4: Describe the experience, and the opportunities to develop clinical and non-clinical skills during the elective placement.

One of the most enjoyable aspect of this elective is being assigned a patient to follow, and presenting the patient's progress during rounds. On my first week, I felt overwhelmed by the complexity of ICU patients who often suffer from multi-organ failure. Initially, I felt my presentation skills was disorganized. After multiple practices and acquiring feedback from the team, I was able to present my findings in a clear and systematic manner. I also learned to recognize and discuss findings that are significant to the patient's care. For instance, while caring for burn patients, it is vital to closely monitor patient's pain and fluid status.

I also gained exposure to a wide range of conditions managed in the ICU. These included respiratory failure, severe burns, shock and malnutrition. Moreover, I developed procedural skills, such as wound care and blood drawing from arterial and central venous line.

I experienced my first code which left me with mixed emotions. Although it was sad that the patient died despite multiple resuscitative attempts, I was glad that my first experience of cardiac arrest reflected a well-organized and supportive team effort. I also had the opportunity to perform CPR under supervision, which increased my confidence to manage similar situation in future.

Interaction with other healthcare professionals also allowed me to fully appreciate the value of communication between different members of the ICU team. For example, I obtained clearer understanding of the patients' progress after speaking to the nurses. I also learned tremendously from the pharmacist, who regularly explained the rationale of selecting specific medications.

The opportunity to observe the delivery of bad news to a patient's family was a valuable learning experience. I admire the ability of the attending to acknowledge the family's feeling in an empathetic manner, to address their concern calmly and to allow ample time for the family to process the information.

This elective had given me a good insight into critical care medicine, and strengthen my interest to pursue it as a career. The skills I developed during this elective made me feel more prepared to start work as a doctor.

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