

Disease States Monitored by MedStar

For the purposes of this study, we have chosen Congestive Heart Failure (CHF), Chronic Obstructive Pulmonary Disease (COPD), Hypertension, Asthma, and Diabetes as the chronic illnesses that we will monitor. These diseases were chosen because they affect a large number of sufferers, and all are significant causes of death in the United States. We will make no attempts to simulate a biological attack, but will instead collect data on the monitored patients as a means of monitoring an affected population after an attack. It is very possible that individual patients will be monitored for multiple diseases.

1. **Congestive Heart Failure (CHF)** -- CHF, a clinical syndrome defined as a chronic inadequate contraction of the heart muscle resulting in insufficient cardiac output, is a manifestation of one or more underlying conditions, including systemic or pulmonary hypertension or a history of other heart diseases (e.g., myocardial infarction, atherosclerosis, cardiomyopathy, congenital heart disease, or rheumatic fever). In 1990, a total of 37,935 deaths resulted from CHF¹. In the United States, an estimated 1-2 million persons aged 25-74 years are affected by CHF². Blood Pressure and weight will be the primary monitored data for these patients.
2. **Chronic Obstructive Pulmonary Disease (COPD)** -- In 1999, there were 112,584 deaths from COPD³, and over 13.5 million Americans are thought to have COPD⁴. COPD includes the diseases emphysema, chronic bronchitis, and other progressive airflow obstruction ailments. Advanced stages of airflow obstruction can lead to certain types of heart disease and heart failure. Peak expiratory oxygen flow rate (Peak Flow), measured through a spirometer, and blood pressure will be the primary monitored data for these patients, although addition of weight might be indicated for advanced cases with heart disease complications.
3. **Diabetes** -- The Center for Disease Control (1999) reported that the number of adults with diagnosed diabetes in Michigan has risen from 357,000 to 442,000 (reported for 1997). Diabetes is the seventh leading cause of all deaths in Michigan (Michigan Critical Health Indicators, January 2001). In Southeastern Michigan, rates have risen from 194,880 in 1996 to 225,300 in 1998. In Wayne County and Detroit, numbers have increased with the largest ethnic and gender group being African American women: 33,850 and 30,360 in those locations respectively (Michigan Department of Community Health, October 2000). In central city Detroit, diabetes was the fourth highest chronic disease (23%) self-reported by respondents (Center for Healthcare Effectiveness Research, 2001). In a recent report comparing Michigan to the nation as a whole, Michigan ranked poorly due to underlying causes (Michigan Health Indicators, January, 2001). A significant risk factor for many chronic conditions like diabetes is overweight.

¹ Morbidity and Mortality Weekly Report, 2/11/94, www.cdc.gov

² Schocken DD, Arrieta MI, Leaverton PE, Ross EA. Prevalence and mortality of congestive heart failure in the United States. *J Am Coll Cardiol* 1992;20:301-6.

³ Center for Disease Control, National Center for Health Statistics, www.cdc.gov

⁴ National Heart, Lung and Blood Institute, www.nhlbi.nih.gov

Michigan ranks ninth in the nation in 1998 with 35.8% of the population being overweight, and with African American females more likely to be overweight than males or Caucasian women (Michigan Health Indicators, January, 2001). Across the United States as a whole, approximately 1,700 new cases are diagnosed daily⁵. Glucose levels and weight will be the primary monitored data for these patients, however hypertension and heart disease are common complications for advanced cases.

4. **Hypertension** -- Hypertension was listed as a primary or contributing cause of death in more than 10% of all deaths in the United States in 1997, and was responsible for more than 400,000 hospitalizations. Hypertension is also listed as a leading cause of heart failure, renal disease, and stroke. Approximately 1 in 5 adults have high blood pressure.⁶ Blood Pressure and weight are the primary monitored data for these patients.
5. **Asthma** -- Asthma affected approximately 10.6 million Americans in 1998, with around 2 million emergency room visits, 500,000 hospitalizations, and 5,438 deaths⁷. Peak expiratory oxygen flow rate (Peak Flow) and FEV1, measured through a spirometer, will be the primary monitored data for these patients.
6. **Post Operative** – Hospitals may be saving money because postoperative patients are being discharged sooner, but costs and patient well-being may actually be shifted to other health-care providers. Because post-operative patients use outpatient nursing services and extended care facilities after being discharged from the hospital, what appears to be cost savings is actually cost shifting. Dr. Harold Lazar⁸ says "Although it is entirely appropriate to utilize extended care facilities for patients who cannot be discharged home in a timely fashion, these facilities may actually consume more health-care resources than in the hospital setting."
7. **Biological Attack Management – Homeland Security** -- There is very little information on the statistics of a biological attack because it can take on many forms. There is also no way that we can simulate such an attack within the scope of this study. However, the management of massive populations of affected patients can be studied. Patients who are suffering from the above diseases will be considered to be the massive suffering population. To support this mission, we will evaluate inclusion of additional sensors into the telemedicine system based on discussions with USAMRMC⁹, CDC,¹⁰ the American Red Cross, and our medical advisory board. A simple sensor available in the MedStar system, but not used above, is temperature.

⁵ Center for Disease Control, National Center for Health Statistics, www.cdc.gov

⁶ The Sixth Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure. National Heart, Lung and Blood Institute; November 1997.

⁷ Center for Disease Control, National Center for Health Statistics, www.cdc.gov

⁸ Schwartz, Joan, Shifting Costs, Research Briefs, Boston University, May 10, 2001, <http://www.bu.edu/news/research/2001/5-10-shifting-asthma.htm>, Accessed April 27, 2003.

⁹ U.S. Army Medical Research and Materiel Command

¹⁰ Centers for Disease Control and Prevention