Health Systems Qualifying Exam
September 2016

1. [ALAGOZ/WERNER] Health information systems such as Electronic Medical Records are considered to be backbone of the health care delivery systems. Describe briefly 3 barriers to the implementation of health information systems, and propose possible solutions that involve industrial engineering approaches for those barriers. Try to justify these barriers using support from the literature when appropriate.
2. [CARAYON/WERNER] How would you use the SEIPS model to represent the breast cancer screening process? In you analysis make sure to include both the patient's perspective as well as the role of different healthcare providers. You will need to describe the different work system elements and provide examples of different interactions between work system elements. You will also need to define the beginning and the end of the process.
3. **[LI]** Consider a drop-in clinic with three doctors. In such a clinic, no appointment is needed so that the patients may not see the same doctor on every visit. However, a patient may request a specific doctor on returning visit. If the doctor is available then the considerations are usually made. Assume that a patient’s preference for a doctor is completely determined by the doctor he/she visited during the last visit and the random factor of when the doctor will be available. If he/she visited Doctor 1 in last visit, then there is probability 0.72 to see Doctor 1 again, and probabilities 0.18 and 0.10 to see Doctors 2 and 3, respectively. Similarly, if Doctor 2 was visited, there is probability 0.85 to see the same doctor but probabilities 0.09 and 0.06 to see Doctors 1 and 3 respectively. If Doctor 3 was visited last time, the revisiting probability is 0.64, and the probabilities to see Doctors 1 and 2 are 0.21 and 0.15 respectively. Assume the clinic has 300 patients that return on a regular basis and at beginning each doctor will see 100 of them.

   (1) Define the states.

   (2) Derive the transition matrix.

   (3) Estimate the number of patients each doctor will have after one and two rounds of visits.

   (4) Explain how you would estimate the number of patients that each doctor will have in the long run (you do not need to calculate it, just explain how you would make that calculation)
4. [ALAGOZ] Hundred new cases of measles are reported in a small urban area. This is the first report of measles in the area in several years. All of the cases are for children ages between 8 and 15 whom previously received only one measles vaccination. This schedule was recommended at the time these children were infants, but it is now known not to confer complete and lifelong immunity to measles in everyone who is vaccinated. The problem is to decide whether to recommend those children who were vaccinated only once be revaccinated.

The relevant event that follows revaccinating or not revaccinating children is exposure to an infectious case of measles. Upon exposure to an infectious case, children either contract or do not contract measles. Measles can cause blindness and death, where blindness and death are mutually exclusive outcomes. Remember that a child can remain well in spite of measles.

In the context of an epidemic of measles in an inner-city population, experts estimate that 15 out of 100 children between ages 8 and 15 will come in contact (be exposed to) with an infectious case of measles each year. Literature reveals that the probability of getting measles if exposed to an infectious case is 0.27 in a child who had only one measles vaccination and 0.03 in a child who is revaccinated. The probability of getting measles in children who are not exposed to measles is zero. During the current epidemic, the probability of dying from measles if a child gets measles is 19 per 10,000 cases, whereas the probability of blindness following measles is 39 cases per 10,000 cases of measles. It is assumed that the probability of death or blindness from measles in children who don’t get measles is zero.

a) Draw the decision tree corresponding to the given problem, clearly state the probability of each case.
b) Find the expected number of cases of blindness and deaths for both revaccination and no-revaccination, assuming 50 children had only one vaccination and 50 children are revaccinated.
c) Suppose you are asked to conduct a cost-effectiveness analysis using quality-adjusted life years (QALYs) as the effectiveness measure. Explain how you would estimate the utility values used in QALYs? Discuss the advantages and disadvantages of using a disease-specific utility assessment technique or a generic utility assessment technique for estimating health-related quality of life in this problem.