Quantitative Analysis for Healthcare
QA895 (4 credits)

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Day/Time: Wednesday 2:30-5
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Quantitative Analysis for Healthcare is a seminar concentrating on the models and methods that are used to model some of the tactical and operational issues in healthcare. It is not a course in healthcare operations. The goal is to see how the methods learned in other QA courses could be applied to problems in healthcare. Healthcare operations problems have existed for a long time and our field has applied its techniques to these problems for over 30 years. It is only recently that the healthcare industry has embraced these techniques in a significant way. This represents a tremendous opportunity for the use of QA techniques and this seminar is a response to that.

It is assumed that students in the class have a background to the tools that we will be discussing in class. Some of these may be extensions of what you have seen in class and when necessary we will use the seminar as an opportunity to learn new techniques and models. Though the literature on healthcare is very interdisciplinary we will concentrate on a small sector of this research. We will not be considering research in clinical applications or public policy and economic analysis. Nor will we be considering workforce training or the management of the healthcare workplace or funding and ethical issues or global comparisons. The list goes on.

Each of the sessions will have a theme with papers presented by students. Titles follow. The research will be presented, methods explained and described and the research critiqued. You certainly can find references and bring other papers into the discussion. All students are expected to read each of the papers prior to the presentations and participate in the discussion in a meaningful way. Presenters should expect to lead a discussion with class participants. Grading will be based on presentations and class participation. You might find it useful in your presentation to consider the following questions in guiding analysis of the paper:
1. **Problem:** Why was this paper written? What problem was it trying to solve? Is the problem important? Why or why not? Is the problem real or contrived? Is it still relevant?

2. **Formulation:** How was the problem formulated? Is this the best way possible? What other formulations could be used? Was the level of detail appropriate? Why was this formulation chosen?

3. **Methodology and Analysis:** Is it appropriate and correct? Why was each step done? (When presenting be sure to go through details at an appropriate level. This doesn't mean repeating derivations or proofs line by line but it does mean that you have to understand them and be able to convey the main ideas.)

4. **Results:** What are the key results of the paper? Are they complete? Do they address the problem that the paper was trying to solve? Are the results reproducible? Could they be generalized for other problems, locations?

5. **Further Directions:** What open problems remain and what extensions are possible? How would you follow them up? Are there good research questions that would extend this research?

6. **General Assessment of Paper:** Was it well presented? What are its strengths and weaknesses?

7. **Comparison with other papers:** Though the theme of this paper may be the same as others the techniques, models, etc. may be different. How do they compare?

I have placed the papers in your mailbox. (Sid—you and I should arrange a time and place to get the papers to you). At the first class meeting be prepared to make your choices of papers to present. My goal is to have two presentations per class but in some cases there may be some short papers batched together. I anticipate there will be 7 students in the class which means probably 3 presentations per students over 10 class meetings.

I would like to meet in one 2 hour and 45 minute slot (with a break) rather than two 1 hour 15 slot. Looking at class schedules and my own commitments I would like to suggest Wednesday as the best day. It appears that Wednesday afternoons are the best time. We will confirm this at our first meeting which will be on January 4 from 11-1 in room 537.

I look forward to this seminar and learning this material with you.
Research papers for QA 895
Quantitative Analysis for Healthcare

The 20 papers (actually 22 as 2 are bundled together) will be discussed in pairs over 10 class periods.

1. Using mathematical programming to schedule medical residents, Cohn and Root, University of Michigan working paper, 2006
2. Scheduling nursing personnel according to nursing preference: a mathematical programming approach, Warner, Operations Research, 1976
3. Hospital-wide reactive scheduling of nurses with preference considerations, Bard and Purnomo, IIE Transactions, 2005
5. A multi-objective approach to nurse scheduling with both hard and soft constraints, Berrada, Ferland and Michelon, Socio-Econ Planning Scis, 1996
6. Integrating nurse and surgery scheduling, Belien and Demeulemeester, Katholieke University- Leuven working paper, 2006
9. Matching daily healthcare provider capacity to demand in advance access scheduling systems, Qu, Rardin, Williams and Willis, EJOR, in press
10. A stochastic overbooking model for outpatient clinical scheduling with no-shows, Muthuraman and Lawley, Purdue University working paper, 2006
11. Mount Sinai Hospital uses integer programming to allocate operating room time, Blake and Donald, Interfaces, 2002
12. A mixed integer programming approach for allocating operating room capacity, Zhang, Murali, Dessouky, Belson, University of Southern California working paper, 2006
13. Building cyclic master surgery schedules with leveled resulting bed occupancy, EJOR, 2005 and Building cyclic master surgery schedules with leveled resulting bed occupancy: a case study, Belien and Demeulemeester
17. Impact of surgical sequencing on post anesthesia care unit staffing, Marcon and Dexter, Health Care Manage Sci, 2006