

**UNIVERSITY OF TORONTO**  
**FACULTY OF APPLIED SCIENCE AND ENGINEERING**

**FINAL EXAMINATION**

Friday, April 27, 2001

**Fourth Year - Program 04**

**MIE 561S - HEALTH CARE SYSTEMS**

**Exam Type: A**

Examiner - M. W. Carter

Examination is worth a total of 40 marks  
and counts for 40% of final grade

**MARKS**  
**(Out Of 40)**

1. Briefly define the following terms:
  - a. Fee-for-service
  - b. The four faces of health care
  - c. Tragic Choices

**6**
2. Briefly describe the five basic principles of the Canada Health Act of 1977. 

**5**
3. Daryl Urquhart from the Shouldice Hospital talked about the "Focused Health Care Model". Briefly describe the model as it relates to Shouldice. 

**4**
4. Brent McGaw spoke to the class about various health care funding models. In particular, he described differences between the funding models in Alberta and Ontario. Describe and contrast the basic funding models in these two provinces. 

**5**
5. Mark Hundert of the Hay Health Care Consulting Group described a recent project where his company was commissioned by the Ministry of Health and Long-Term Care to perform an operational review of a hospital in response to the hospital's seriously deteriorating financial position. At the same time, the hospital had requested a review to help resolve and remedy both its finances and its funding relationship with the Ministry. The hospital had a deficit of over \$31 million in 1999/2000 and they project a deficit of \$70 million for the current fiscal year, 2000/2001. What were some of the key issues, and how did the Hay Group approach the problem? 

**5**

**6. Mini-case: Impact of an Electronic Pharmacy Process at Sunnybrook**

**15**

In his presentation, Glen Geiger from Sunnybrook & Women's College Health Science Centre discussed some of the problems associated with the primarily manual method that they use to order drugs within the hospital.

The current process (as described by Glen) is as follows:

- The doctor hand-writes a prescription on paper and gives it to a nurse.
- The nurse records the drug order on the "Medical Administration Record" (MAR) and forwards a (paper) copy of the order to the Pharmacist
- The Pharmacist reviews the order, and transcribes it into the Pharmacy computer.
- Based on the computer order, the "Pharmacy Robot" dispenses the drugs, and they are "mailed" back to the ward.
- The nurse receives the drugs, checks the MAR, and then administers the drugs to the patient.
- The nurse records the fact that the drugs were administered on the MAR.

This process is primarily manual (except the part where the Pharmacist sends an order to the robot), and it is open to errors. Dr. Geiger did a survey of 433 drug orders, and discovered that 111 or 25.4% of the orders were not administered "successfully". Glen defined a successful administration to be the correct drug, in the correct dosage within a reasonable period of time. (Most of the failures were not delivered within one day.) In one U.S. study of 289, 411 medication orders, they estimated 3.13 medication errors per thousand, and 1.81 *significant* errors per thousand where these errors caused an "adverse event". Since the average inpatient gets a number of medication orders during a hospital stay, your chances of an adverse event are ... scary.

What is wrong with the current process?

- Doctor relies on memory/knowledge
  - to determine the dose of the medication
  - to think of patient allergies
  - to remember drug-drug interactions
- Pharmacist often has to page doctor for clarification and correction
- Nurse may not know
  - an order has been written

- the drug has arrived
- Lots of transcription
  - increases the possibility of error
  - is non-value-added work
- Physical transport of the order wastes time
  - There is one robot and Sunnybrook is a big place!

During the summer (beginning next week), I will be working at Sunnybrook with Glen, three undergrad IE students, a Pharmacist, a Clinical Analyst, a Medical student and someone from the Error Management Unit on a project to “analyze and measure the impact of an electronic pharmacy process on patient care”.

In structuring this project, we have defined five “hypotheses” about an automated process:

1. The Electronic Drug ordering and administration process will be more efficient and less costly than the current process.
2. The Electronic Drug ordering process will create savings through the use of drug protocols, limited use medications, automatic substitution, and formulary reduction.
3. The full automation of the drug ordering and delivery process will provide complete information on drug prescribing practices supporting accountability for drug utilization at all levels of the organization, and creating opportunities for further refinement of formulary control measures.
4. The provision of decision support tools within the physician medication order entry interface will reduce medication error
5. The design of the medication order entry interface, the electronic formulary, and the decision support tools contained therein will facilitate physician order entry by providing real value to physicians

Definition: “**Formulary**: A collection of formulas, recipes, and prescriptions.

*The National Formulary is published by the American Pharmaceutical Association every 5 years and gives the composition, description, method of preparation, and dosage for drugs. The British National Formulary is a twice-yearly source on prescribing, dispensing and administering medicines, intended primarily for use by physicians, pharmacists, nurses and other health-care professionals.” (from MedTerms.com)*

In the Sunnybrook context, Pharmacy maintains a list of drugs that they carry in stock, and I believe this is their *formulary*. They do not keep all drugs in all dosages.

I need your help. I want you to organize this project. What would you do to try to validate the hypotheses? The key thing to remember is that we need to be able to demonstrate that this project and our efforts are very cost effective in a short period of time. We need to decide what we can do over the next four months to prove our case. How would you approach this problem? What kinds of analyses would you perform? What actions would you suggest? Clearly state any assumptions that you feel you need to make in your report.

Your report should be brief, about three to four pages, double-spaced (approximately 1,000 words). [If the report is significantly longer than this, I may stop reading before I get to the end.] It should be written in the standard case report format adopted for this class, and should include: Executive Summary, Problem Statement, Analysis, Recommendations, Conclusions, and Future Research.