Medicine and Revolutions

Preliminary Remarks

- Last week: The Concepts of Medicine
- Do changes in the understanding of disease bring about (scientific) revolutions in medicine?
- This week: Medicine and Revolutions

Kuhn: Scientific Revolutions

- The history of mature science can be understood as periods of stable growth punctuated by revisionary revolutions.

  Normal science: science as practiced most of the time, i.e. when one paradigm rules with a broad consensus.

  Paradigm: A paradigm consists of one or more theories, auxiliary hypotheses, heuristic models, ontological assumptions, methodological principles, techniques, standards, instruments, training methods, etc.

  Revolutionary Science: A period of conceptual upheaval sparked off by an increase in anomalies that the current paradigm cannot solve. Paradigms clash but are incommensurable. The old paradigm is eventually overthrown.

Revolutions in Medicine?

- Donald Gillies (2005) argues that a modified Kuhnian account can be given in the history of medicine.

  Unlike physics and chemistry: (i) theories in medicine do not have the same high level of generality and (ii) two or more dominant theories are more often used in tandem.

  A paradigm in medicine is composite, consisting of:
  (1) a general classification scheme for diseases.
  (2) various local paradigms.

  In medicine radical changes simply lead to the reclassification of a disease without introducing new local paradigms.

- Gillies illustrates these points with a case study from the history of medicine, viz. Semmelweis' childbed fever.

Case Study: Puerperal Fever

Fact: Higher percentage of women in First (vs. Second) Maternity ward contracted puerperal (i.e. childbed) fever and died of it.

Hypothesis 1: Miasma theory of disease.
Prediction: Death rate reduced when unhealthy vapours removed.
Problem: Both wards exposed to the same 'spheric-cosmic-terrestrial' influences.

Hypothesis 2: Overcrowding.
Prediction: Death rate reduced when less crowded.
Problem: Second ward was more crowded than the first.

Hypothesis 3: Rough treatment by medical students (vs. midwives)
Prediction: Death rate reduced when gently treated.
Action: Students (esp. foreign ones) and examinations reduced.
Result: Initial decline followed by return to high death rates.

Case Study: Puerperal Fever (2)

Hypothesis 4: Priest passing by on his way to nearby sickroom has adverse psychological effects on women.
Prediction: Death rate reduced when priest's path changed.
Result: Mortality rate the same.

Hypothesis 5: Women delivered on their backs has adverse effects on them.
Prediction: Death rate reduced when delivered on their sides.
Result: Mortality rate the same.

Hypothesis 6: Medical students introduced decomposed animal matter into women's bloodstream.
Prediction: Death rate reduced when hands disinfected.
Result: Death rates reduced to the level of clinic 2.

The Cadaveric Matter Hypothesis

- Semmelweis' hypothesis could explain why:
  - The second ward had a lower death rate. (NB: The midwives students did not perform any autopsies).
  - Women giving birth in the streets had a low rate of puerperal fever, viz. they were not exposed to cadaveric matter.
  - Professor Kolletschka died.
- The hypothesis was extended to explain two more events:

(1) 11/12 patients died after the medical students handling them had handled a patient discharging medullary carcinoma and had only washed their hands with soap.

(2) Nearly all patients in a ward died, after the ichorous exhalations [transmitted by air] of one patient's carious knee.

Anti-Septic Precautions

- Two stages:

  (1) chlorine washes after dissections.

  (2) chlorine washes after handling infected patients and isolating infected patients.

- These practices continued and the death rates remained stable.

Conclusion: Puerperal fever is caused by cadaveric matter or other decaying material from living organisms. It is transmitted to the patients either by a doctor's hands or by air.

The H-D Method

- According to Hempel, Semmelweis conjectures a hypothesis, deduces some consequences from it and then tests them against observation.
- Hypothetico-Deductive General Schema:

  Hypothesis
  Auxiliary assumptions
  Initial conditions
  ∴ Observational Prediction

  - If the consequences agree with observation, we say that the hypothesis is confirmed.
  - If they disagree, we say it is disconfirmed and conjecture another hypothesis.

Inference to the Best Explanation

- Notion introduced by C.S. Peirce as ‘abduction’.
- G. Harman branded it ‘inference to the best explanation’ or ‘IBE’ for short.
- Two central features:
  - Comparative in nature.
  - Ampliative, i.e. inductive in the broad-sense.

IBE: If a theory *X* explains some evidence better than any of its rivals, then it is reasonable to choose *X* over the others.

- P. Lipton argues that Semmelweis’ case can best be construed as an inference to the best explanation.

Kuhnian Analysis (1)

- Both Lister and Semmelweis advocated antiseptic practices but only Lister succeeded in getting his ideas accepted. Why?
- Gillies: During a period of normal science, it is unlikely that a hypothesis which disagrees with the existing paradigm will be taken seriously.

  - Semmelweis' hypothesis can be understood in this way as it contradicted the dominant views of the time, viz. the existing composite paradigm consisting of the miasma and contagion theories.
  - His hypothesis contradicts the contagion theory as puerperal fever can be caused through other diseases. It only partly agrees with the miasma theory, as it is not just caused through unhealthy vapours.

Kuhnian Analysis (2)

- Indeed, Semmelweis' views were compatible with the germ theory of disease which became established in the 1880s after the work of Pasteur and Lister.
- Lister's anti-septic theory was accepted because it emerged at a revolutionary period in medicine. The old theories were being supplanted by the new theories, i.e. the germ theory disease.
- Gillies: The failure to adopt Semmelweis' theory by his contemporaries cannot be explained via the H-D method. We must appeal to Kuhnian ideas that help us understand when it is possible for a radical new approach to be established.

Reading

- Gillies, D. (2005) ‘Hempelian and Kuhnian Approaches in the Philosophy of Medicine: The Semmelweis Case’, *Studies in the History and Philosophy of the Biological and Biomedical Sciences*, vol. 36: 159-181.