

Assignment 1

Single-use versus multi-use surgical instruments: what are the costs and benefits?

Problem statement

During the last decades several instruments (disposables and reusables) have been developed to be used by gynaecologists in laparoscopic surgery. Disposable instruments create a lot of medical waste but require less maintenance. Reusable instruments are more expensive to purchase and need to be sterilized, but reduce the creation of waste.

This assignment focuses on instruments used by gynaecologists in the case of ectopic pregnancy in a patient. An ectopic pregnancy is a pregnancy that is implanted outside of the womb, usually in one of the fallopian tubes. These fallopian tubes connect the ovaries to the womb. An ectopic pregnancy cannot develop into a normal pregnancy. Besides expectant management and medication, one of the treatment options is surgery: where the fallopian tube containing the ectopic pregnancy will be removed (if the contralateral fallopian tube seems normal). In order to do so, it is possible to use disposable instruments (e.g. Harmonic scalpel, Ligasure) or (semi-)reusable instruments (e.g. Olympus sonosurg or 'simple' coagulation and cutting). From the perspective of environmental sustainability and cost-effectiveness: which one is better?

Research question(s)

1. What is the environmental impact of the use of disposable instruments compared to (semi-)reusable instruments to cut and coagulate tissue in case of an ectopic (tubal) pregnancy?
2. What are the costs and benefits of each choice in instrument?

Suggested academic backgrounds

This research assignment is open to any graduating Master students from Leiden University, TU Delft and Erasmus Rotterdam

- MSc Industrial Ecology students, for life cycle assessment
- MSc Global Business and Sustainability, for cost-benefit analyses
- MSc Healthcare Management, for multi-criteria analyses
- MSc Technical Medicine

Expected type of work

Literature review, life cycle assessment, interviews

Available data/reports or other relevant information sources for the assignment

Schulz et al. Environmental footprint of single-use surgical instruments in comparison with multi-use surgical instruments. *Glocalized Solutions for sustainability in manufacturing*, 623-628 (2011)

Leiden et al. Life cycle assessment of a disposable and a reusable surgery instrument set for spinal fusion surgeries. *Resources, Conservation & Recycling* (2020)

Ibbotson et al. Eco-efficiency of disposable and reusable surgical instruments – a scissors case. *Int J Life Cycle Assess* (2013) 18:1137–1148

Yung et al. Cost comparison of reusable and single-use ultrasonic shears for laparoscopic bariatric surgery. *Obes Surg*. 2010 Apr;20(4):512-8.