

Economic Considerations in Laparoscopic Surgery: Disposable Versus Reusable Instruments

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The subject of the economic considerations involved in using disposable versus reusable instrumentation has become a controversial issue. The economic evaluations performed purely by economists may not appeal to the surgeon and may not be applicable in different parts of the world. The quality of disposable instruments and their convenience in laparoscopic surgery is not at issue; the controversy, instead, centers on the question of the cost-effectiveness of disposable equipment. High-quality instruments enable safe, successful operations.¹ Some instruments are not available in reusable form and the quality of some reusable instruments (e.g., laparoscopic scissors) is sometimes questionable, particularly as they are periodically in need of servicing or repair. For a routine cholecystectomy, clips can be mounted on a reusable applier to ligate the cystic duct and artery. This can save considerable cost. However, disposable clips and their appliers should be available in the operating room (OR) in case of emergencies such as uncontrolled bleeding.

It is recommended that the first port passed be disposable with a plastic guard. However, this is not a total guarantee that viscera will not be damaged. There is always a short duration and distance when the trocar protrudes in the abdominal cavity without being covered by the plastic guard because it is still folded back on the peritoneum. The same is true for both disposable and reusable Veress needles. The peritoneum can be displaced considerably

because the areolar tissue is rather loose between peritoneum and abdominal wall. Obtaining pneumoperitoneum by "open technique" is safe, cost-effective, and can be achieved without using Hasson's cannula. Air leakage is not a problem. However, when leakage does occur, it can be remedied with a purse string suture. After passing the first disposable port in the abdomen, the other ports can be reusable.

The cost per use of reusable instrumentation is difficult to calculate. A reusable port can be used hundreds of times, though it needs maintenance and repairs, such as resharpener and valve replacement. Assuming it can be used for at least 100 times, the estimated cost per use is £4.00 or \$6.00 (or less) as calculated in St. Mary's and St. Charles Hospital in London. Using reusable ports can achieve substantial reduction in cost.

Table 1. The key factors influencing the economics and use of disposable and reusable instruments

The maintenance cost of laparoscopic instruments

- The cost of labor to clean the instruments
- The cost of sterilization
- The repair and breakage of reusable instruments
- The cost of disposing the disposable instruments

Medicolegal issues pertaining to complications attributable to instruments

- The fear of sepsis from reusable instruments
- The fear of sepsis from reusing the disposable instruments
- The safety of instruments

The benefits of minimal access surgery not contributing to the cost of operation

- The hospitals not being benefited by the indirect benefits of minimal access surgery such as early return to work
- Insurance companies not paying extra money to the surgeon or the hospital for performing laparoscopic operations
- Some patients do not return to activity though they are fit to go back to work

Health systems and national priorities

- Different health systems, e.g., insurance-based (surgeon less concerned about the cost of instruments) in comparison with national health system (hospitals more concerned about the cost of operation)
- Difference in the priorities of developing countries and developed countries

Other issues

- Increasing research and development cost of instruments to manufacturers
- Some instruments are available only in disposable models, at least initially
- Gradual drop in the price of disposable instruments
- Availability of partially disposable instruments
- Increasing availability of different varieties of reusable instruments of good quality
- The nature and magnitude of the laparoscopic operation

The question often raised is the cost of sterilization. In national health hospitals in the U.K., a large quantity of reusable conventional surgical instruments are sterilized routinely. A few additional reusable laparoscopic instruments will not increase the cost substantially unless they are sterilized separately. Labor cost involved in cleaning the instruments is another debated issue—quite a few are broken by negligence or because of lack of skill in cleaning. This can lead to considerable expense.

In national health hospitals (U.K.), a limited budget is given to the surgeon. The extra money spent for disposable instruments is negligible in comparison with the savings derived from early discharge and early return to activity. Nonetheless, neither the surgeon nor the hospital is rewarded financially. Many times the patient is fit to go back to work but may choose not to do so, as he is entitled to a certain number of days of sick leave. If a private insurance company pays the cost of the operation, then the surgeon may not be concerned with costs, unless there is pressure from the insurer.

The sepsis rate after laparoscopic surgery is very low. There is no evidence that the sepsis rate is higher in either reusable or disposable instruments. In Europe it is not uncommon to reuse disposable tools such as endoshears two to three times. In Southeast Asia these may be reused in even greater frequency. It is argued that such tools cannot be sterilized properly. However, there is no clear evidence that this has led to increased sepsis rate. In countries such as the United States, the practice of medicine is defensive and due to medicolegal fears, one would see the single use of disposable instruments in the U.S. much more than in Europe.

The safety of disposable and reusable instruments in laparoscopic cholecystectomies has been evaluated^{2,3,4} as well as their impact on the cost of each operation at St. Mary's and St. Charles Hospitals in London. The cost per laparoscopic cholecystectomy was calculated, using variable numbers of disposable instruments. The cost was also calculated for open cholecystectomy. Over 600 laparoscopic cholecystectomies were performed using only one

disposable port, and 30 laparoscopic cholecystectomies using no disposable ports. The safety of disposable ports and of obtaining pneumoperitoneum by "open technique" without use of a Hasson cannula was assessed. The material cost of ports and other consumable items per cholecystectomy was as follows: all disposable instruments, £500.00; one disposable port and the remainder reusable, £125.00; all reusable instruments, £60.00; open cholecystectomy, £30.00. Disposable instruments add considerably to the cost of an operation, but not necessarily to the safety. No complications in these series were attributable to disposable or reusable ports. However, disposable instruments were available in OR in case of emergencies.

The cost of the materials used for laparoscopic and conventional hernia repairs in national health hospitals has also been evaluated.⁵ The materials used for 100 laparoscopic hernia repairs and 100 conventional hernia repairs by the same team were detailed. For laparoscopic unilateral hernia repair using a preperitoneal prolene mesh, two disposable ports (10 mm and

Table 2. Laparoscopic operations and cost

1st Authors	Comments
<u>Cholecystectomy</u>	
Savalgi RS et al. ^{1,2,3}	The cost of materials used for the operation was \$750.00 if all instruments were disposable and \$200.00 if the first port was disposable and the other ports were reusable.
Traverso LW et al. ⁸	60% of the equipment cost in the OR could be attributed to disposable instruments.
<u>Appendectomy</u>	
Vallina VL et al. ⁶	The surgical supplies comprise 35% of the total cost for laparoscopic appendectomy (total cost: \$6748.00) in comparison with 9% for the open procedure (total cost: \$5010.00).
<u>Hernia Repairs</u>	
Schultz LS ⁹	Laparoscopic hernia repair with mesh and disposable instruments adds to the cost of the surgical procedure. However this is offset by the indirect savings.
Schurz JW et al. ¹⁰	Disposable equipment utilization resulted in charges of \$4563.00 compared to \$3766.00 (21.2% difference) for reusable equipment.
Savalgi RS et al. ⁴	The cost of materials used for preperitoneal mesh repair was approximately \$515.00 with disposable instruments and that for conventional hernia repair was \$40.00. If all the materials used for laparoscopic hernia repair were reusable, the cost of materials can be reduced to \$115.00.
<u>Colon Resections</u>	
Coller JA ¹¹	The mean charge for all laparoscopic colonic resections was \$13,357 vs. \$12,922 for open cases. The high markup on disposable equipment (up to 250%) and the high cost of operating room time contribute appreciably to offsetting the economic advantages of shorter hospital stay and fewer complications.
Pfeifer J et al. ¹²	No difference in the cost of conventional and laparoscopic colonic resections.
<u>Nissen Fundoplication</u>	
Low DE ¹³	The cost of open procedure was \$5564.00 in comparison with \$5006.00 for laparoscopic operations. The laparoscopic operations made up for the expected savings in room charges with somewhat higher expenses for the surgical procedure itself.
Hinder RA et al. ¹⁴	The annual cost of medical therapy is \$2100.00. The total real cost for surgery varies between \$5000.00 to \$15,000.00.
<u>Vaginal Hysterectomy</u>	
Johns DA et al. ⁵	It is a cost-effective procedure when reusable instruments are used. Disposable instruments, trocars and staplers are unnecessary and expensive.

Some of the studies pertaining to the cost of laparoscopic operations are listed here. Some of them have not focused on the effect of disposable and reusable instruments on the total cost.

12 mm) and one reusable 5-mm port were used. The instruments used were all reusable except the scissors. For laparoscopic herniotomy, we used one disposable 10-mm port, two reusable 5-mm ports and endoloops for ligation of the sac. For conventional hernia repair, plication of transversalis fascia using 3-0 PDS followed by a nylon darn was performed. The cost of materials used for the different operations was as follows: laparoscopic preperitoneal mesh repair, £275.00; laparoscopic herniotomy, £100.00; conventional hernia repair, £25.00. The cost of the materials used for laparoscopic mesh repair for hernia was more than those used for conven-

tional hernia repair by approximately a factor of 10. However, if bilateral laparoscopic hernia repair is performed, the only additional need would be a mesh, and laparoscopic mesh repair is a less expensive procedure. The quality of reusable scissors is improving and reusable 12-mm ports are easily available. If a pneumoperitoneum is obtained by open technique, all ports and shaft instruments are reusable, and the mesh is sutured instead of stapled, the cost of laparoscopic mesh repair can be reduced to £75.00. In summary the cost of the materials used for laparoscopic mesh repair for hernia is more than that for conventional hernia repair by £250.00.

Johns et al.⁶ evaluated the cost of vaginal hysterectomy and concluded that laparoscopically assisted vaginal hysterectomy is cost-effective when reusable instruments are used. The primary cost savings resulted from shortened duration of stay in the hospital. Vallina et al.¹ studied the cost of laparoscopic appendectomy and concluded that disposable instruments add considerably to the cost of operation. DiGiacomo et al.⁷ studied disposable and reusable operating gowns and scrub suits and showed that it costs substantially more to use the disposable.

Developing new instruments requires a great deal of funds for research and

development. Therefore, manufacturers of disposable instruments initially sell them at high prices. Gradually the cost of disposable instruments falls and the reusable instruments also start claiming their share in the market. Less developed countries not able to afford the disposable instruments will wait until reusable instruments are available in the market. This historical tradition is an economic reality. The future of disposable and reusable instruments in laparoscopic surgery will likely follow this path. **STI**

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