[7] Blackstone EH. Comparing apples and oranges. J Thorac Cardiovasc Surg 2002;123:8–15.
[8] Bardell T, Petsikas D. What keeps postpulmonary resection patients in hospital? Can Respir J 2003;10:86–89.
[9] Irshad K, Feldman LS, Chu VF, Dorval JF, Baslaim G, Morin JE. Causes of increased length of hospitalization on a general thoracic surgery service: a prospective observational study. Can J Surg 2002;45: 264–268.
[10] Varela G, Jimenez MF, Novoa N, Aranda JL. Estimating hospital costs attributable to prolonged air leak in pulmonary lobectomy. Eur J Cardiothorac Surg 2005;27:329–333.

Conference discussion

Dr. H. Jessen Hansen (*Copenhagen, Denmark*): Were there any patients in either of the groups where you had to reinsert a tube due to subcutaneous emphysema or pneumothorax after tube removal?

Dr. Pompili: No. In this series we had no cases with pneumothorax or other complications after removal of the chest drain.

Dr. H. Jessen Hansen (*Copenhagen, Denmark*): That's great. I think it is an interesting option, and you are now giving a fixed rate for when the tube can be removed, but is it still the doctor's single decision or is it actually so fixed and so secure that you would even allow the OR medical staff to make the decision on when the tube can be removed?

Dr. Pompili: This is a good point, because in this case, unlike a surgical procedure where you have to learn a technical skill, the learning curve is more like a confidence curve. The staff have to have confidence in the safety of the criteria for removing the chest tube. Chest tube removal criteria were decided a priori based on the consensus opinion of major centers with experience in using these digital devices. We think that it is safe to remove a chest tube when the airflow is >40 ml/min. It should be even safer with Thopaz since it shows the graph of airflow in the last 24 h, allowing the detection of higher spikes of air leak.

Dr. H. Jessen Hansen (*Copenhagen, Denmark*): But it is still the surgeon who looks at the graph and who does the decision-making?

Dr. Pompili: The medical staff are in charge of making this decision in our setting.

Dr. J. Kuzdzal (*Krakow, Poland*): You said that there was a difference in the overall cost of treatment in favor of the Thopaz device. Did you also include in this calculation the price of the Thopaz unit itself, which is quite considerable?

Dr. Pompili: The calculation is based on the entire hospital stay costs. We found no differences between the costs of the devices. Thopaz is a reuseable pump, and the cost of consumables for one patient is the same as with traditional devices. Therefore, our cost differences are due mainly to the differences in hospital stay influenced by the duration of chest tube usage.

Dr. J. Kuzdzal (*Krakow, Poland*): But was the cost of the pump itself, which is very high, included in the calculation?

Dr. Pompili: Yes, but the cost of the pump depends on the type of purchasing model, whether it is a sales model or a consignment model. We chose the consignment model in which the pump is usually given for free and only the consumable costs are charged. The consumable costs for one patient are the same as with a traditional device.

eComment: The Six Sigma approach: from mobile phones to chest tubes

Authors: ***Luca Bertolaccini***, *Thoracic Surgery Unit, S. Croce e Carle Hospital, Cuneo, Italy;* ***Alberto Terzi***

doi:10.1510/icvts.2011.280941A

We read with interest the manuscript of Pompili et al. [1] about the learning curve after introduction into clinical practice of a new electronic chest drainage system. In recent times, several devices able to measure air leaks (AL) continuously and digitally have been introduced into clinical practice. According to the authors, the results of their study may be biased by their familiarity with other electronic devices. Consequently, these results need independent confirmation.

Chest tube management has a limited number of steps and is performed many times per year by thoracic surgeons; it is thus ideal for root-case analysis and evaluation of modifications. In a previous paper [2], we applied the Six Sigma concept to improve the process of AL evaluation; in particular to design and assess a protocol for postoperative AL evaluation, to reduce the time to rate AL at bedside, and to minimize the degree of variability of AL score. This translated into improved efficiency and effectiveness.

The Six Sigma quality improvement methodology is a data-driven approach developed by the Motorola Corporation that seeks to improve outcomes by eliminating the variation within a process [3]. To date, clinical use of Six Sigma methodology has focused on efficiency outcomes, such as reducing the length of hospital stay in stroke patients, but application of the Six Sigma method has been used successfully to improve clinical outcomes and also to reduce surgical complications in repetitive procedures [4].

In conclusion, we agree with the authors that electronic devices are cost-saving. However, we suggest the use of an objective method such as Six Sigma to evaluate the effectiveness of a new device.

References

[1] Pompili C, Brunelli A, Salati M, Refai M, Sabbatini A. Impact of the learning curve in the use of a novel electronic chest drainage system after pulmonary lobectomy: a case-matched analysis on the duration of chest tube usage. Interact CardioVasc Thorac Surg 2011;13:490–493.
[2] Bertolaccini L, Rizzardi G, Filice MJ, Terzi A. 'Six Sigma approach' – an objective strategy in digital assessment of postoperative air leaks: a prospective randomised study. Eur J Cardiothorac Surg 2011;39:e128–e132.
[3] Chassin MR. Is healthcare ready for six sigma quality. Milbank Q 1998;76:565–591.
[4] Isaacson G. Six Sigma tympanostomy tube insertion: achieving the highest safety levels during residency training. Otolaryngol Head Neck Surg 2008;139:353–357.