European Society of Thoracic Surgeons Risk Scores

Alessandro Brunelli, MD

KEYWORDS

• Quality of care • Risk models • Mortality • Lung cancer surgery • Professional accreditation

KEY POINTS

- Risk-adjusted outcome analysis is one of the main elements for monitoring and improving quality of care.
- The European Society Objective Score in-hospital mortality risk model was the first risk model developed from the European Society of Thoracic Surgeons database and applied for quality initiatives.
- The Composite Performance Score incorporates 2 risk-adjusted outcome indicators (morbidity and mortality) and 3 process indicators covering all domains of the lung cancer resection pathway of care, and it is used to verify eligibility for the European Institutional Accreditation program.
- The most recent European morbidity and mortality risk models have been developed from a population of nearly 50,000 lung resection patients registered in the European Society of Thoracic Surgeons database and are named Eurolung1 and Eurolung2.

INTRODUCTION: HISTORY AND PRINCIPLES OF THE EUROPEAN SOCIETY OF THORACIC SURGEONS DATABASE

The first version of the European Society of Thoracic Surgeons (ESTS) Database was created in 2001 as a standalone computer database (Filemaker Pro [Filemaker Inc, Santa Clara, CA]) developed by Richard Berrisford. Several units across Europe joined the project by applying via a Web page linked to the ESTS Web site and received a code enabling them to download and install the database.

Encrypted data were then exported from each unit, automatically attached to an email, and submitted to a central database. There was no fixed harvesting period, and units could submit their data any time they wished, providing more than 95% of fields were complete and valid.

At that time, more than 100 units requested the access to the database but only 27 of them from 14 different countries contributed valid data. Approximately 3500 lung resection cases were collected from 2001 through 2003, leading to the publication of the first European model of in-hospital mortality (European Society Objective Score [ESOS]).[1] The project resumed 4 years later with the creation of the first version of the online database in July 2007.

Since its inception, the online ESTS database continues to be a completely free database for all ESTS members. It was designed to include fields related to all general thoracic surgery procedures. However, lung surgery being the most representative procedure of our specialty and for the purpose of developing outcomes and process measures of quality of care, the section dedicated

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Department of Thoracic Surgery, St. James's University Hospital, Beckett Street, Leeds, LS9 7TF, UK
E-mail address: brunellialex@gmail.com

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to lung cancer surgery has always been particularly detailed.

Since the launch of the first version, the online database has gone through a series of periodic (usually on a yearly basis) revisions and changes of systems with the aim to improve its quality, accessibility, user friendliness, and security according to the most recent international legislation on data protection.

In 2009, a contract was signed with Dendrite Clinical Systems LTD, Rome, Italy and most recently with Kdata, Rome, Italy to help the ESTS in professionalizing the database. This collaboration created a platform, allowing the import of data from individual units and from existing national databases. The first country to join the project was France in 2010 followed by Hungary in 2015. Following these examples, an increasing number of countries expressed their interest to join the ESTS database by exporting data from their respective national registries.

In addition to the core database, several other satellite sections have been expanded thanks to the hard work of different ESTS working groups and leading surgeons and the Database Committee (http://www.ests.org/council_committee/16/ests_database_committee).

These sections include specific fields of interest for those surgical procedures. In particular, the sections devoted to thymic tumors, mesothelioma surgery, neuroendocrine tumors, and chest wall surgery have been recently implemented.

The database is accessible online (https://ests.kdataclinical.it). A username and password are requested to login and they can be obtained by using the appropriate registration form (http://www.ests.org/collaboration/database_registration_form.aspx).

Since 2009, the Database Committee has edited database annual reports (the so-called Silver Book) from the ESTS Database to provide the membership an informative tool about thoracic surgery practice in Europe on which to benchmark their practices. The Silver Books are accessible online and free to all members (http://www.ests.org/collaboration/database_reports.aspx).

The latest version of the report included data about more than 70,000 lung resections from more than 230 units (of which, 144 contributed more than 100 cases) (http://www.ests.org/collaboration/database_contributors_list.aspx).

Data can be imputed online in the ESTS database or in case the unit has their own existing institutional database, data can be exported and submitted as an excel spreadsheet to the ESTS Database without duplicating their imputing work. Units without an internal database can use the free online ESTS Database as an institutional registry for their own purposes at the same time contributing to the European data collection. Ownership of data remains that of the contributing units that can download their own data for internal analyses.

The main objective of the ESTS database is monitoring quality of care with the ultimate purpose of standardizing and improving the outcome of general thoracic surgery across Europe. To this purpose, several risk-adjusted models and composite performance scores have been produced to be used as instruments of clinical audit.

EUROPEAN SOCIETY OBJECTIVE SCORE

The first risk model developed from the ESTS database was published in 2005.[1] The entire sample was split in a derivation (60%) and validation (40%) set. The model was first derived from a population of 1753 patients undergoing any type of lung resections (from wedges to extended pneumonectomy) for lung tumors. The in-hospital mortality rate in this derivation set was 1.9% (34 cases). Subsequently the model was validated in a set of 1166 patients (23 deaths).

The predictive model for in-hospital mortality was named the European Society Objective Score (ESOS) and included only 2 variables: age and predicted postoperative forced expiratory volume in 1 second (ppoFEV$_1$). The resulting logit equation was the following: $-5.8858 + 0.0501 \times \text{age} - 0.0218 \times \text{ppoFEV}_1\%$. When tested in the validation set, the model showed a satisfactory concordance between predicted and observed mortality, although slightly overestimating death in patients with the highest expected risk.

ESOS was subsequently applied to evaluate the performance of 3 different European units.[2] Although the units showed different unadjusted mortality rates (2.3% for unit A, 2.6% for unit B, and 4.1% for unit C) the ESOS-predicted risk-adjusted mortality rates were similar. This study emphasized the importance of using a risk-adjusting instrument when comparing outcomes between different centers or surgeons, as they may be affected by different case mixes. This report represented the first external application of the European risk model for audit purposes.

ESOS was subsequently applied by independent investigators to evaluate its predictive ability in their populations compared with other existing risk scores.[3,4] They found that in general ESOS had a better discrimination compared with Thoracoscore (the in-hospital mortality risk index based on the data collected within the French Society of Thoracic and Cardiovascular Surgery database),