Short-term mortality in patients undergoing colorectal cancer surgery.

A prediction study.

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INTRO

Short-term mortality after colorectal cancer surgery has decreased greatly in the last 20 years, however some patient courses unfortunately and often unexpectedly end suddenly in a possible surgery-related fatality.

Short-term mortality is often defined as death within 30 and 90 days after the start event of an observation period.

It is well known, that palliative surgery and emergency surgery lead to a significantly increased risk of death after surgery, though not modifiable per sé. However, factors that we can affect before surgery include prehabilitation, optimization and more planned follow-up, and this may reduce the short-term mortality further.

METHODS

We created a CDM from the Danish Colorectal Cancer Group (DCCG) database covering near all Danish colorectal cancer patients since 2001 with **346 clinical variables**.

Using the ATLAS patient-level prediction package we created a **30-** and **90-day post-operative mortality** PLP models using preoperative variables. We ran the package with custom covariates using R.

RESULTS

- From 2001-2019 **65.612 patients** (**85,3 %**) had colorectal cancer surgery in Denmark.
- Incidence of **30-day mortality was 5,42 %.**
- Incidence of **90-day mortality was 8,53 %.**
- Using preoperative covariates, we predicted with great calibration with a Brier Score of 0.06 for 30-day and 90-day mortality using Lasso Logisitc Regression.
- Using preoperative covariates, we predicted the risk of **30-day mortality with an AUC of 0,868 (0,857-0,88**) and **90-day mortality with an AUC of 8,869 (0,859-0,878).**

The DCCG short term mortality cohort

	30-day mortality	90-day mortality
Target cohort	Patients operated for colorectal cancer	Patients operated for colorectal cancer
Outcome cohort	Patients who died	Patients who died
Time at risk	0 to 30 days after colorectal cancer surgery	0 to 90 days after colorectal cancer surgery

Preoperative clinical patient parameters can be used to **predict the risk of short-term mortality** for colorectal cancer **patient after surgical treatment.**

The predicted risk can assist the **multidisciplinary team conference** deciding on slightly **different approaches** to the patient course to prevent mortality.

CLINICAL USE OF PREDICTION MODELS

The MDT conference is where the decision regarding the treatment plan is made. The short-term mortality model along with out other models could be a valuable addition to the current patient information.

Patients with a high risk of short-term mortality should be reviewed in detail by their responsible doctor to identify, why the risk is higher:

- Do they have a bad performance status?
- Do they have severe anemia?
- Are they fragile, elderly citizens?
- Do they have severe comorbidity?

When the patient's risk factors are identified, the best treatment plan should be planned accordingly.

The threshold for a "high" risk of short-term mortality is based on the predicted risk, the remaining CSS prediction models and an individual assessment of, however if a patient's risk significantly exceeds the average risk of mortality for patients operated for colorectal cancer, it should be reviewed why.

POSITIVE VALUE COVARIATES IN LASSO REGRESSION (30 DAYS) – Top 7

American Society of Anaesthesiology Score 4 (custom)
Exploratory surgery as primary procedure
Age group 100-104
Age group 90-94
Endoscopic insertion of permanent colonic stent
Age group 85-89
Emergency surgery

See full list of positive covariates →

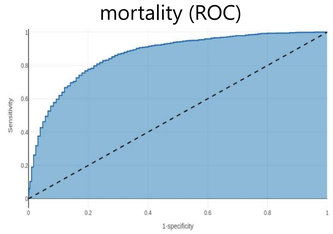
NEGATIVE VALUE COVARIATES IN LASSO REGRESSION (30 DAYS) – Top 7

Age group 40-44
Age group 50-54
Age group 45-49
Endoscopic procedure before final surgery
Age group 55-59
American Society of Anaesthesiology Score 1 (custom)
Age Group 35-39

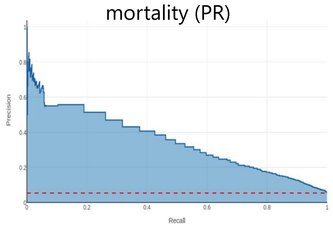
See full list of negative covariates →

AUROC or Precision-recall curve for both predictions

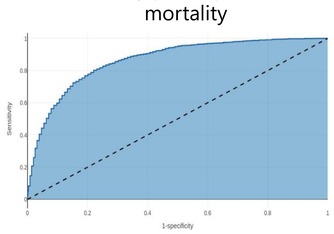
30-day post-operative mortality (ROC)



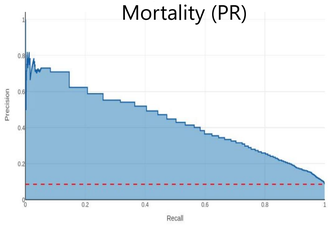
30-day post-operative mortality (PR)



90-day post-operative mortality



90-day post-operative Mortality (PR)



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