# Validation in a single-center cohort of existing predictive models for delayed graft function after kidney transplantation

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## INTRODUCTION AND AIMS

- **Kidney transplantation is the preferred treatment for patients with ESRD, improving survival, cardiovascular comorbidity, QoL and costs.**
- **Delayed graft function (DGF):**
  - **Early postoperative graft dysfunction due to ischemia/reperfusion injury**
  - **Usually defined as the need for dialysis within the first week after transplantation**
  - **Deleterious short-term and long-term consequences:**
    - **Prolonged hospitalization and higher transplantation costs**
    - **Increased rate of acute rejection**
    - **Reduced long-term graft function**
    - **Long-term graft loss**
    - **Reduced recipient survival**
  - **4 predictive models have been developed [1-4].**
- **Aim: we want to assess the predictive accuracy of the existing models and identify risk factors that are not included.**

## METHODS

- **Retrospective cohort study of 497 adult kidney transplantations from deceased donors between 2005-2011**
- **Association between 47 risk factors and DGF: multivariate logistic regression**
- **Aggregation of existing models into meta-model: stacked regressions**
- **Predictive accuracy:**
  - **Discrimination: area under the receiver operating characteristic curve (AUROC)**
  - **Calibration: Hosmer-Lemeshow test**
- **Baseline characteristics are presented in Table 1.**

**Table 1: Baseline characteristics**

| | | |
|---|---|---|
| **Donor** | Age (year) | 42.6 ± 14.8 |
| | Male (%) | 60.4 |
| | BMI (kg/m$^2$) | 24.9 ± 4.2 |
| | DBD (%) | 90.3 |
| **Recipient** | Age (year) | 52.8 ± 11.7 |
| | Male (%) | 66.6 |
| | BMI (kg/m$^2$) | 25.9 ± 4.7 |
| | Duration of dialysis (year) | 2.7 ± 1.7 |
| **Preservation** | Cold ischemia time (hour) | 14.2 ± 4.3 |
| | Warm ischemia time (min) | 22.3 ± 7.1 |

Abbreviations: BMI, body-mass index; DBD, donation after brain death.

## RESULTS

- **Observed incidence of DGF is 12.5%.**
- **The meta-model only includes predictions of Irish et al. and Zaza et al.: stacked regressions coefficient of 1.495 and 0.229 respectively**
- **Results of the cohort fitted model are presented in Table 2.**
- **Discrimination and calibration of the different models are presented in Figure 1.**

**Table 2: The cohort fitted model using multivariate logistic regression**

| | β (SE) | OR (95% CI) | P-value |
|---|---|---|---|
| Intercept | -3.47 (1.74) | | |
| **Donor** | | | |
| Age (per 10 years) | 0.032 (0.01) | 1.37 (1.10-1.73) | 0.006 ** |
| BMI (per 1 kg/m$^2$) | -0.10 (0.05) | 0.91 (0.82-0.99) | 0.041 * |
| Serum creatinine (per 1 mg/dL) | 1.12 (0.30) | 3.05 (1.78-5.67) | <0.001 *** |
| DCD: yes vs. no | 2.16 (0.38) | 8.67 (4.09-18.51) | <0.001 *** |
| **Recipient** | | | |
| BMI (per 1 kg/m$^2$) | 0.09 (0.03) | 1.09 (1.02-1.16) | 0.008 ** |
| Duration of dialysis (per 1 year) | 0.22 (0.09) | 1.24 (1.04-1.49) | 0.020 * |
| Preoperative DBP (per 10 mmHg) | -0.25 (0.13) | 0.78 (0.61-0.99) | 0.049 * |
| EF < 40%: yes vs. no | 1.36 (0.40) | 3.88 (1.73-8.51) | <0.001 *** |

Abbreviations: BMI, body-mass index; CI, confidence interval; DBP, diastolic blood pressure; DCD, donation after cardiac death; EF, ejection fraction; OR, odds ratio; SE, standard error.
* significant (P<0.05); ** very significant (P<0.01); *** extremely significant (P<0.001).

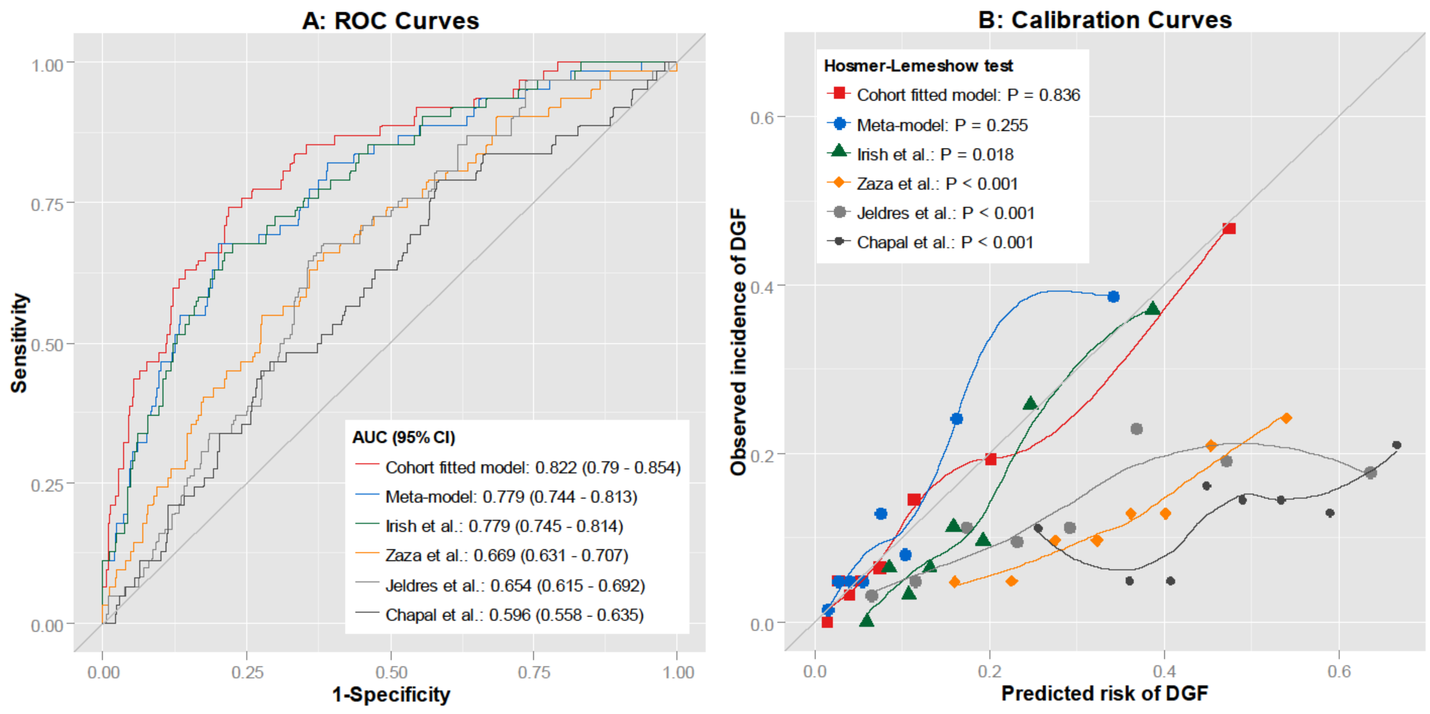


**Figure 1. ROC curves and calibration curves to assess the discrimination and calibration of the different models.** **(A)** Only the model of Irish et al., the meta-model and the cohort fitted model have a good discriminative capacity. Abbreviations: AUC, area under the curve; CI, confidence interval; ROC, receiver operating characteristic. **(B)** All existing models overestimate the risk. The meta-model and the cohort fitted model are well calibrated. Abbreviations: DGF, delayed graft function.

## CONCLUSIONS

- **4 existing predictive models for DGF overestimate the risk in a cohort with a low incidence of DGF.**
- **We have identified 2 recipient parameters that are not included in the existing models: cardiac function and preoperative diastolic blood pressure.**

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