**Supplemental Digital Content**

**Table S1:** Initial disease classification into relapsing and non-relapsing.

| Relapsing kidney disease | Non-relapsing kidney disease |
|---|---|
| Glomerulopathy | Interstitial nephritis / Pyelonephritis |
| | Vascular nephropathy / Hypertension |
| | Unknown kidney disease |
| | Diabetic nephropathy |
| | Others (hereditary nephropathy, drug-induced nephropathy …) |

**Table S2:** Original joint model published in Fournier et al. (2019) used to estimate the DynPG compared to the time-fixed model. The two models were estimated from the original learning sample used in Fournier et al. (2019).

| | Original joint model of Fournier et al. (2019) (1) | | | Time-fixed model (2) | | |
|---|---|---|---|---|---|---|
| | HR | 95%CI | p-value | HR | 95%CI | p-value |
| Current SCr (µmol/L), for an increase of 25% | 1.96 | [1.79; 2.15] | <0.0001 | - | - | - |
| Current SCr increase (µmol/L), for a growth of 25% in 1 year | 1.84 | [1.11; 3.04] | 0.0176 | - | - | - |
| Log(SCr) measurement at 1-year post-transplantation | - | - | - | 7.54 | [5.36; 10.62] | <0.0001 |
| Recipient age at transplantation (years, standardized) | 1.49 | [1.33; 1.66] | <0.0001 | 1.36 | [1.22; 1.51] | <0.0001 |
| History of cardiovascular diseases | 1.41 | [1.16; 1.71] | 0.0007 | 1.49 | [1.24; 1.80] | <0.0001 |
| 3-months SCr (µmol/L, standardized) | 0.83 | [0.74; 0.93] | 0.0011 | 0.95 | [0.85; 1.06] | 0.3370 |
| Acute rejection episode(s) during the first year | 1.46 | [1.16; 1.82] | 0.0011 | 1.31 | [1.06; 1.63] | 0.0137 |
| Anti-class I immunization: positive versus negative | 1.54 | [1.22; 1.94] | 0.0002 | 1.55 | [1.24; 1.92] | 0.0001 |
| Rank of graft: second versus first | 1.31 | [1.01; 1.71] | 0.0433 | 1.32 | [1.02; 1.70] | 0.0326 |

(1) Referential value for log(SCr) at 1-year post-transplantation was 4.860, 95%CI : [4.846; 4.873]. Referential value for the slope of log(SCr) was 0.024 95%CI : [0.021; 0.028]. This model is adjusted on a period effect with a threshold at 2008 (before 2008 versus after): HR=0.74 [0.58 ; 0.95]. Parameters of the Weibull baseline risk function were defined given the 'jointModel' function of the R JM package: intercept : -20.72 ± 0.97; log(shape): 0.33 ± 0.05; $alpha_1$ = 3.0179 ± 0.2049 95%CI[2.62 ; 3.42] and $alpha_2$ = 3.0567 ± 1.2871 95%CI[0.53 ; 5.58]

(2) This model is adjusted on a period effect with a threshold at 2008 (before 2008 versus after): HR=0.73 [0.58 ; 0.93]. Parameters of the Weibull baseline risk function were defined given the 'survreg' function of the R survival package: intercept : 10.10 ± 0.62; log(shape): -0.43± 0.4

**Table S3:** Description of recipient, donor, and transplantation characteristics according to the Lille validation sample (n=1165) and the Leuven validation sample of patients (n=472).

| | Lille validation sample (n=1165) | | Leuven validation sample (n=472) | | p-value |
|---|---|---|---|---|---|
| | NA | estimations | NA | estimations | |
| **Quantitative characteristics : mean ± SD** | | | | | |
| Recipient age (years) | 0 | 50.44 ± 13.66 | 0 | 52.98 ± 13.58 | 0.0007 |
| Recipient BMI (kg/m²) | 3 | 25.04 ± 4.42 | 1 | 25.38 ± 4.78 | 0.1877 |
| Donor age (years) | 0 | 51.25 ± 15.59 | 0 | 47.93 ± 14.38 | <0.0001 |
| Last donor SCr (µmol/L)[1] | 96 | 87.64 ± 60.41 | 135 | 74.83 ± 28.80 | <0.0001 |
| Cold ischemia time (hours) | 63 | 16.93 ± 7.44 | 0 | 13.60 ± 5.84 | <0.0001 |
| Time spent on dialysis (years) | 0 | 3.17 ± 4.44 | 457[2] | - | - |
| 3-months SCr (µmol/L) | 0 | 140.19 ± 50.43 | 0 | 145.82 ± 50.51 | 0.0411 |
| 6-months SCr (µmol/L) | 2 | 133.53 ± 44.30 | 38 | 136.13 ± 57.28 | 0.3932 |
| **Categorical characteristics : N (%)** | | | | | |
| Recipient men | 0 | 734 (63.00) | 0 | 279 (59.11) | 0.1417 |
| Second transplantation | 0 | 184 (15.79) | 0 | 61 (12.92) | 0.1403 |
| Dialysis technique | 32 | | 0 | | <0.0001 |
| Preemptive transplantation | | 130 (11.47) | | 15 (3.18) | |
| Hemodialysis | | 871 (76.88) | | 340 (72.03) | |
| Peritoneal dialysis | | 132 (11.65) | | 117 (24.79) | |
| Relapsing initial disease | 0 | 348 (29.87) | 0 | 142 (30.08) | 0.9319 |
| History of diabetes | 5 | 157 (13.53) | 0 | 84 (17.80) | 0.0278 |
| History of hypertension | 15 | 706 (61.39) | 0 | 302 (63.98) | 0.3283 |
| History of cardiovascular disease | 0 | 289 (24.81) | 0 | 121 (25.64) | 0.7259 |
| History of dyslipidemia | 131 | 268 (25.92) | 0 | 114 (24.15) | 0.4649 |
| More than 4 HLA A-B-DR incompatibilities | 2 | 295 (25.37) | 0 | 25 (5.30) | <0.0001 |
| Daily anti-HLA immunization of class I | 0 | 209 (17.94) | 0 | 92 (19.49) | 0.4629 |
| Daily anti-HLA immunization of class II | 15 | 221 (19.22) | 0 | 73 (15.47) | 0.0748 |
| Donor men | 0 | 674 (57.85) | 0 | 245 (51.91) | 0.0280 |
| Donor vital status | 0 | | 0 | | 0.5664 |
| Living donor | | 96 (8.24) | | 42 (8.90) | |
| Cerebrovascular donor death | | 552 (47.38) | | 234 (49.58) | |
| Non cerebrovascular donor death | | 517 (44.38) | | 196 (41.53) | |
| Acute rejection episode(s) during the first year | 0 | 103 (8.84) | 0 | 107 (22.67) | <0.0001 |
| Transplanted before 2008 | 0 | 1008 (8.33) | 0 | 169 (35.81) | < 0.0001 |

Abbreviations: BMI Body Mass Index; HLA Human Leucocyte Antigen; NA: Not Available (missing data); SCr Serum Creatinine; SD Standard Deviation

[1] Living donor last SCr were all missing in Lille center. In Leuven center, 32 missing data among 135 were living donors.

[2] 15 patients have not a missing data for time spent on dialysis, they correspond to pre-emptive transplantation

**Figure S1:** Serum Creatinine distribution from 1 to 6 years post-transplantation.

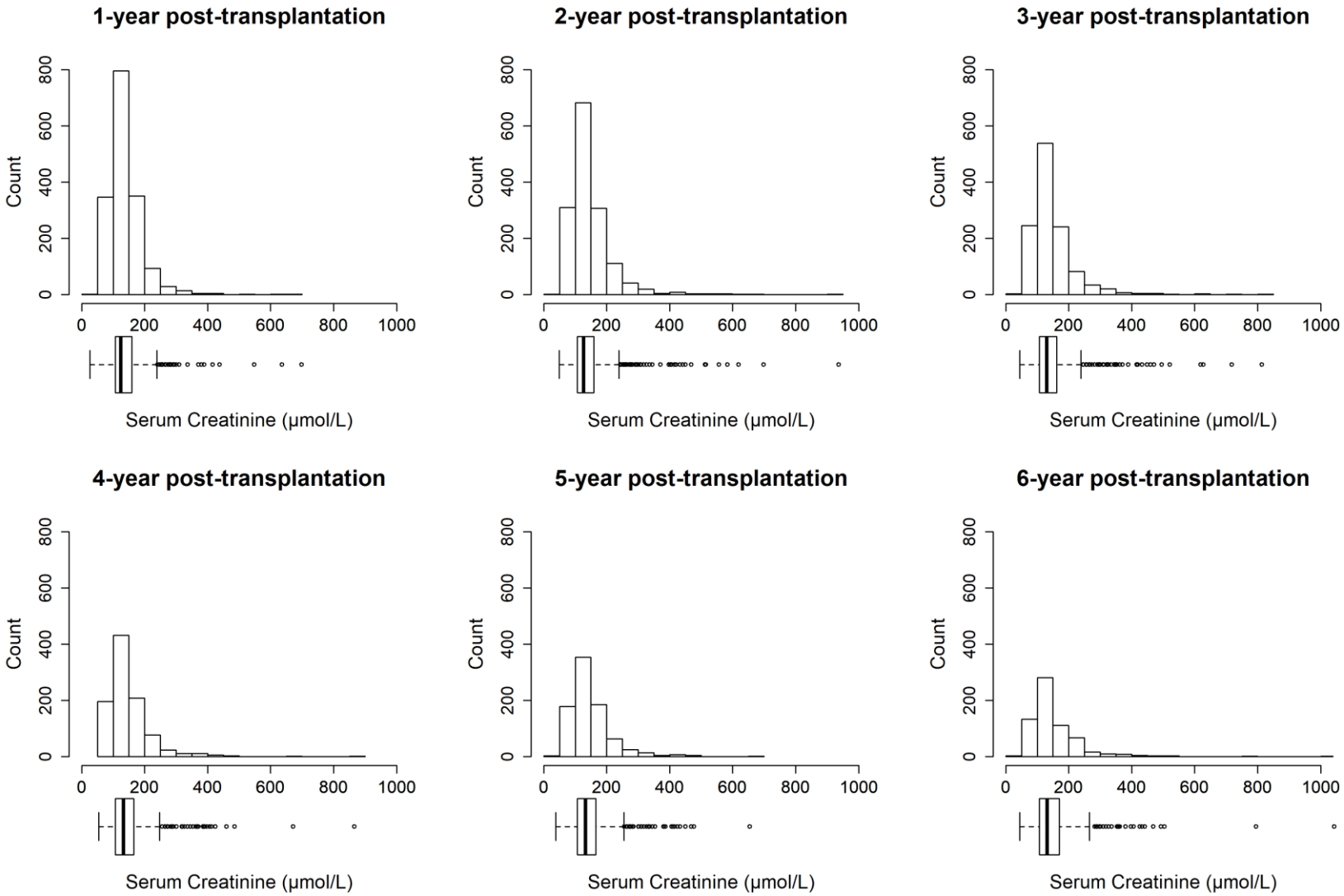

**Figure S2:** Patient and graft survival from Kaplan-Meier estimator and their corresponding 95%CI according to the Lille validation sample (solid line) and the Leuven validation sample of patients (dashed line) (Log-Rank test: p=0.1900).

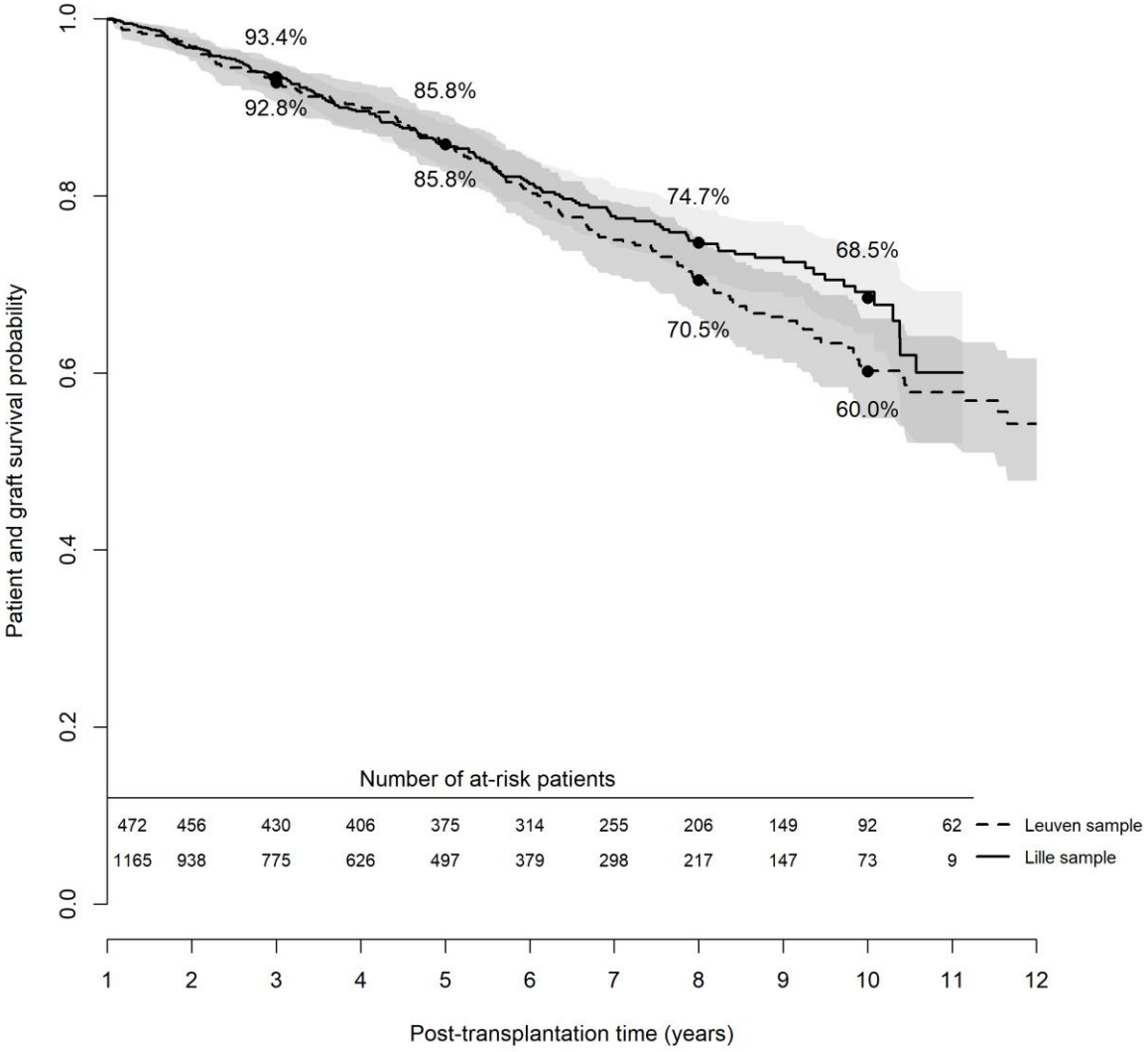

**Figure S3:** Prognostic capacities of the DynPG and the time-fixed score (n=1637) estimated for prediction times from 1 to 6-years post-transplantation for an horizon window at 5 years, $R^2$ describes global performance (Part A) while Area under ROC curve (AUC) represents discrimination accuracy (Part B). The DynPG is represented in black lines, while the time-fixed score is in grey lines.

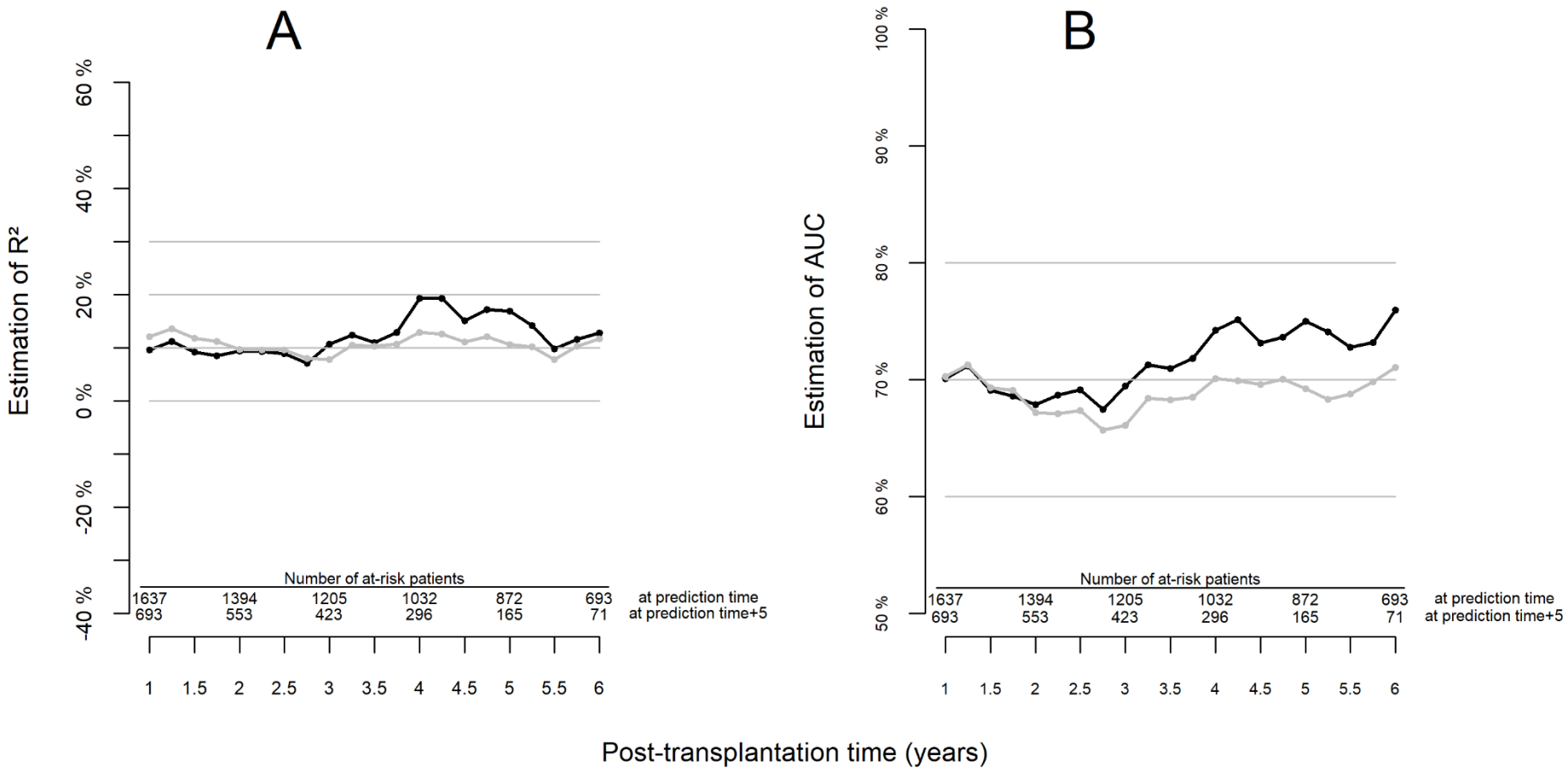

**Figure S4:** Prognostic capacities of the dynamic predictions of Lille transplantation center (n=1165) estimated for prediction times from 1 to 5-years post-transplantation for a given horizon window of 5 years, $R^2$ supplied global performance (Part A) while Area under ROC curve (AUC) appraised discrimination accuracy (Part B). Estimations are drawn in solid lines and the corresponding 95% confidence interval is drawn in dashed lines.

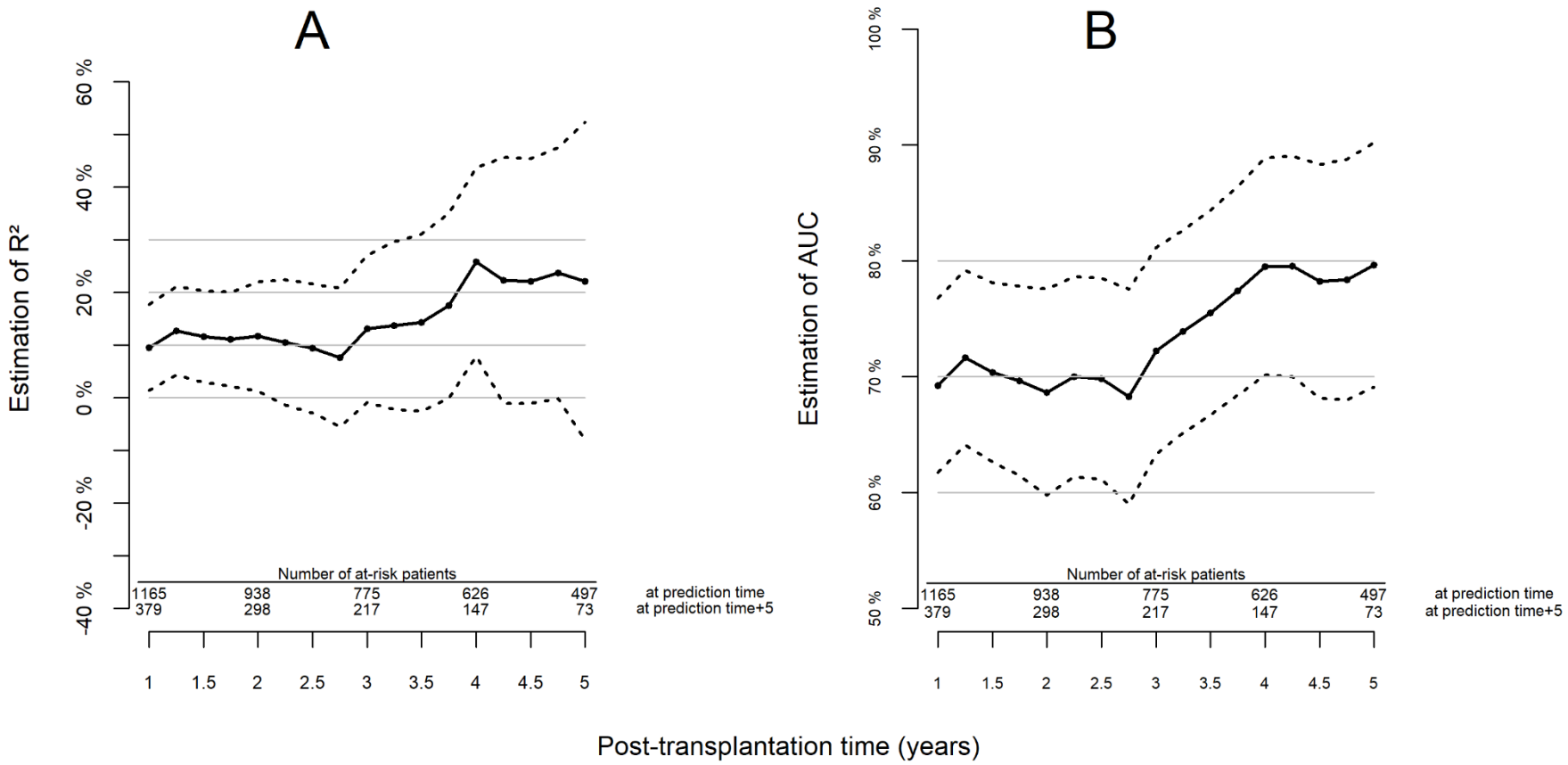

**Figure S5:** Calibration plot of dynamic predictions on the Lille transplantation center (n=1165) for prediction times from 1 to 5-years post-transplantation. Mean predicted risks and observed risks (Kaplan-Meier) of being graft failure-free over a 5-year window are displayed for each subgroup, defined from prediction quantiles.

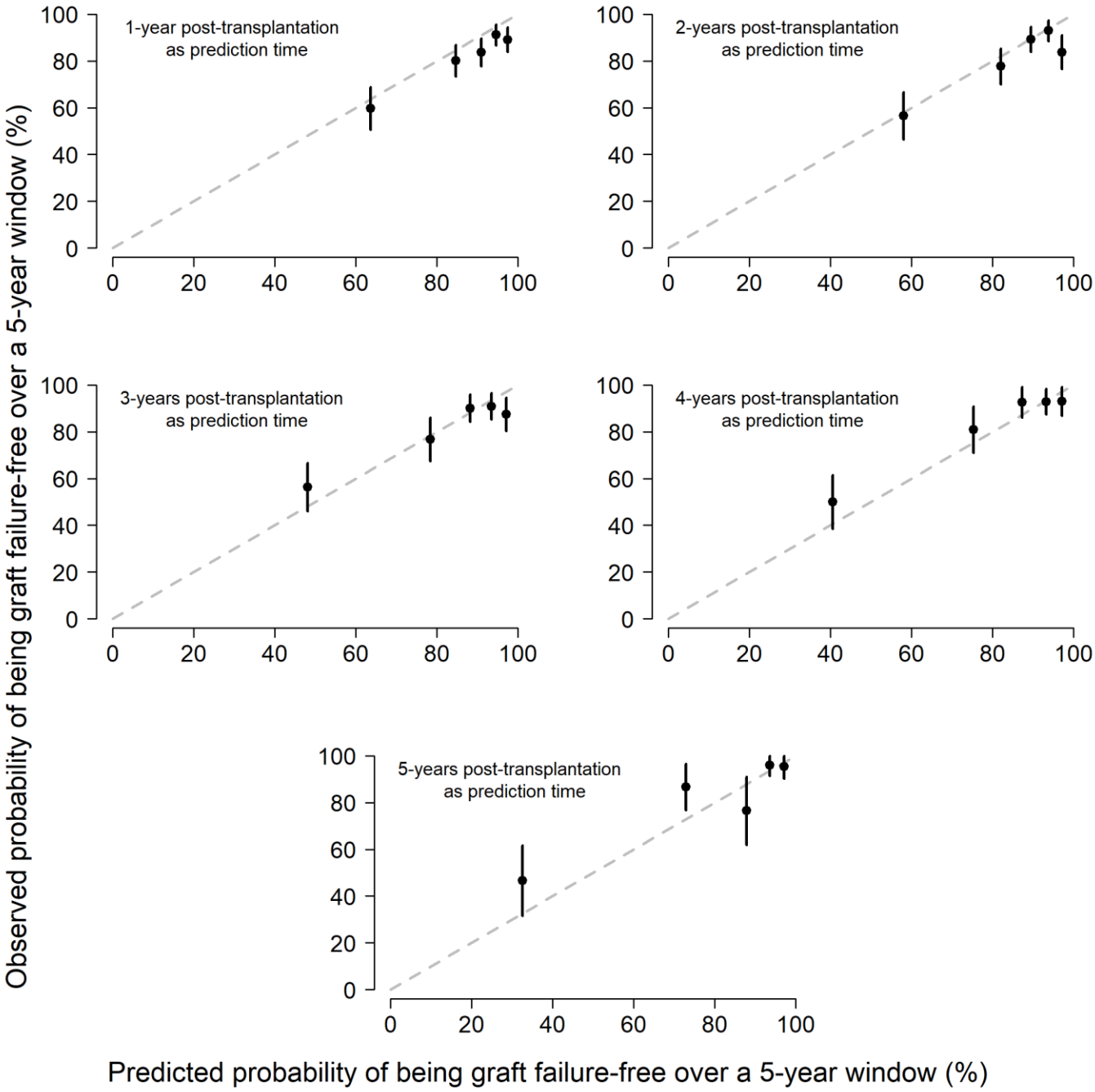

**Figure S6:** Prognostic capacities of the dynamic predictions of Leuven transplantation center (n=472) estimated for prediction times from 1 to 6-years post-transplantation for a given horizon window of 5 years, $R^2$ supplied global performance (Part A) while Area under ROC curve (AUC) appraised discrimination accuracy (Part B). Estimations are drawn in solid lines and the corresponding 95% confidence interval is drawn in dashed lines.

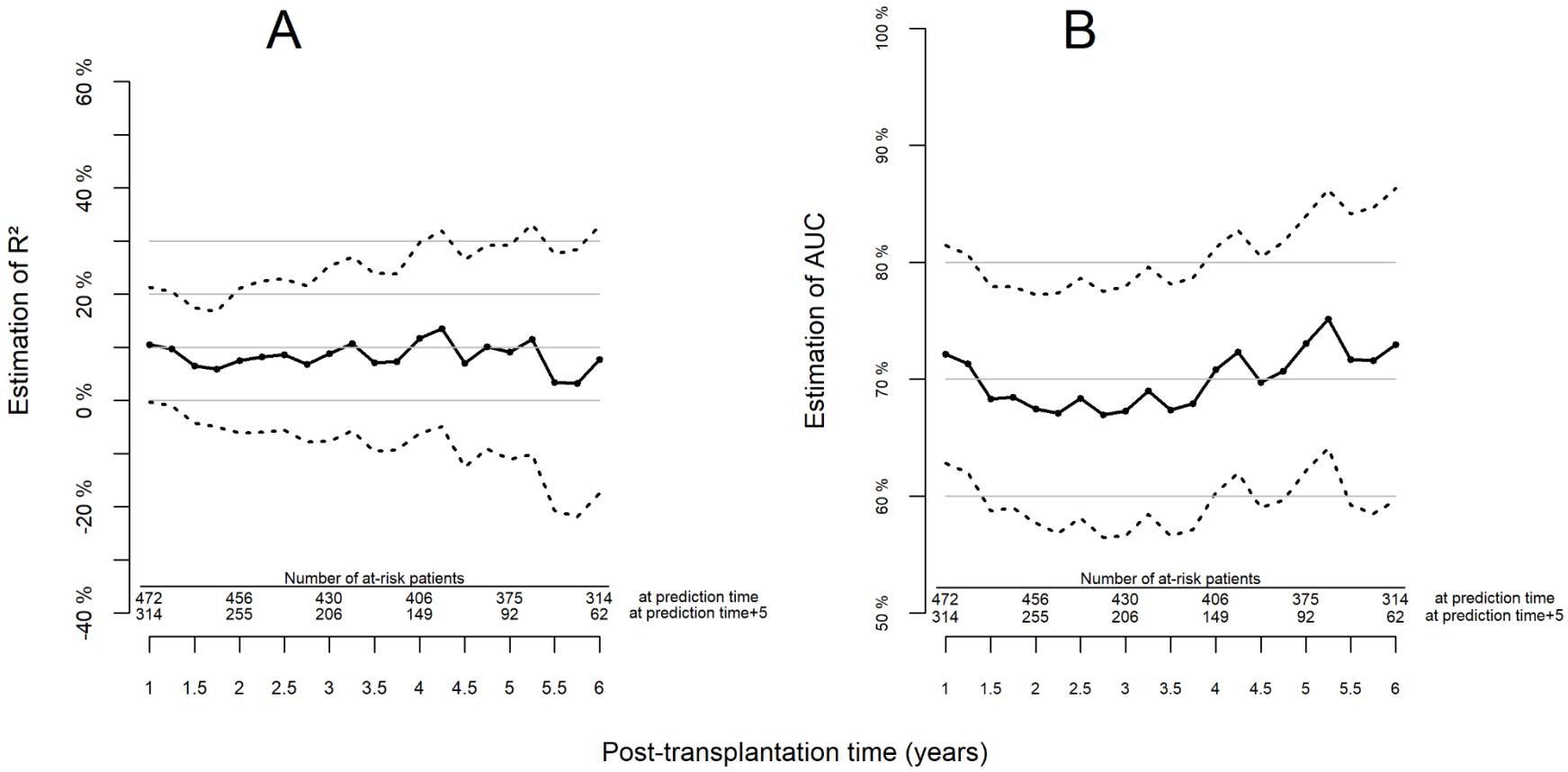

**Figure S7:** Calibration plot of dynamic predictions on the Leuven transplantation center (n=472) for prediction times from 1 to 6-years post-transplantation. Mean predicted risks and observed risks (Kaplan-Meier) of being graft failure-free over a 5-year window are displayed for each subgroup, defined from prediction quantiles.