

CONGRESO LATINOAMERICANO DE CIRUGÍA HEPATOPANCREÁTICA Y BILIAR CHILE 2017



Performance validation of the ALPPS risk Model

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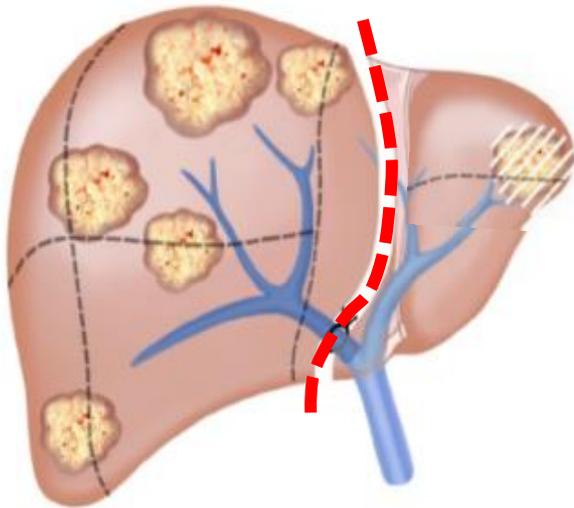
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ALPPS

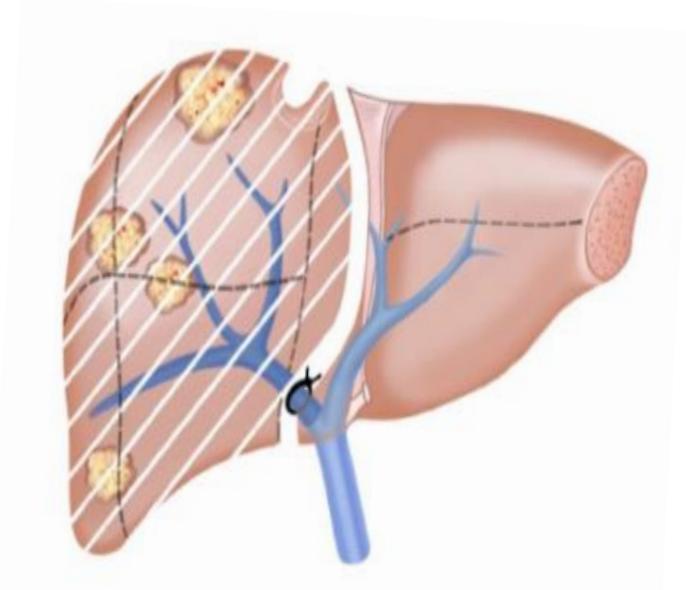
Associating **L**iver **P**artition **P**ortal Vein Occlusion for **S**taged Hepatectomy

Stage 1



→ 1-2 weeks

Stage 2



Portal vein ligation
+ parenchymal transection

Schnitzbauer, Schlitt et al, Ann Surg 2012

De Santibañes, Clavien, Ann Surg 2012

Linecker, Clavien et al, Ann Surg 2016

ALPPS Risk Model

ESA PAPER

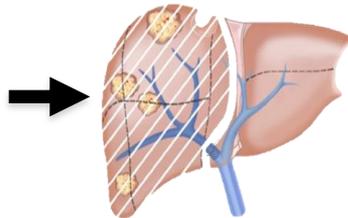
The ALPPS Risk Score

Avoiding Futile Use of ALPPS

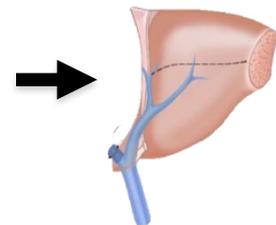
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Burkhardt Seifert, PhD,§ Georg Lurje, MD,¶ Jan Bednarsch, MD,¶ Ulf Neumann, MD,¶
Ivan Capobianco, MD,|| Silvio Nadalin, MD,|| Ricardo Robles-Campos, MD,**
Eduardo de Santibañes, MD, PhD, FACS,†† Massimo Malagó, MD,‡‡ Mickael Lesurtel, MD, PhD,*
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Ann Surg 2016;264:763–771

**Pre-stage 1
Model**



**Pre-stage 2
Model**



Study Aim

Validation of the ALPPS Risk Model

(90d mortality) using a

temporal and an external ALPPS cohort

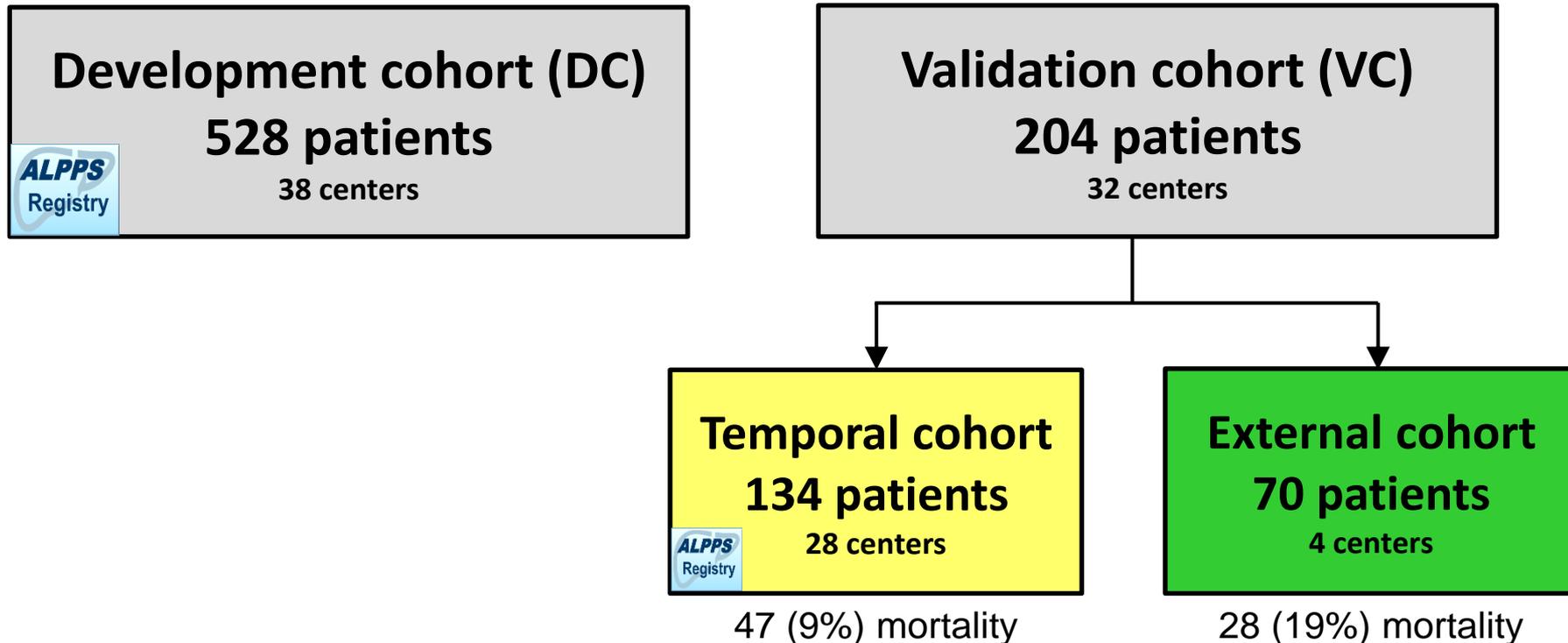
Study Population

Inclusion criteria:

- ALPPS centers ≥ 5 cases

Exclusion criteria:

- Other transection variants than ALPPS and partial ALPPS
- Not proceeding to stage-2 surgery (invalid risk prediction for both stages)



Pre-stage 1 Variables

Univariate analysis

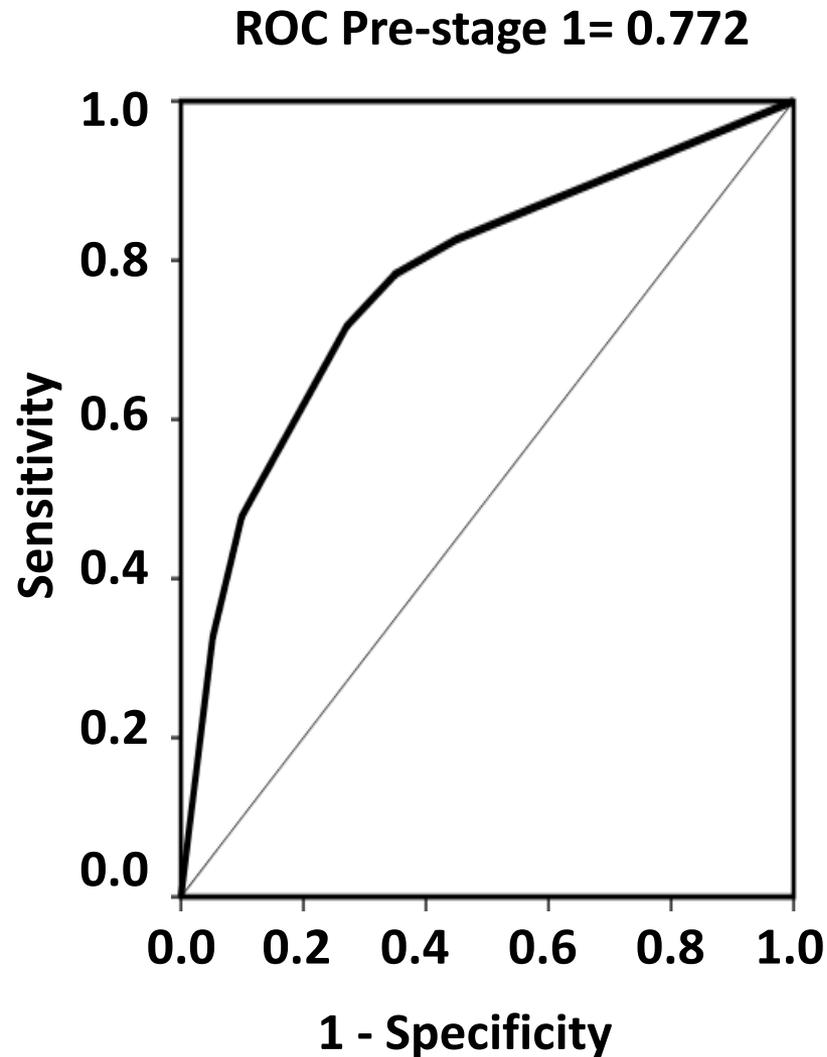
Characteristics	Development cohort (n = 528)	Validation cohort (n = 204)	<i>P</i>
Age, years	62 (53-69)	60 (51-67)	0.019
CRLM	69%	54%	0.001
Biliary tumors	15%	24%	0.015
Non-CRLM/non-biliary	16%	11%	0.134

Pre-stage 1 Variables

Univariate analysis

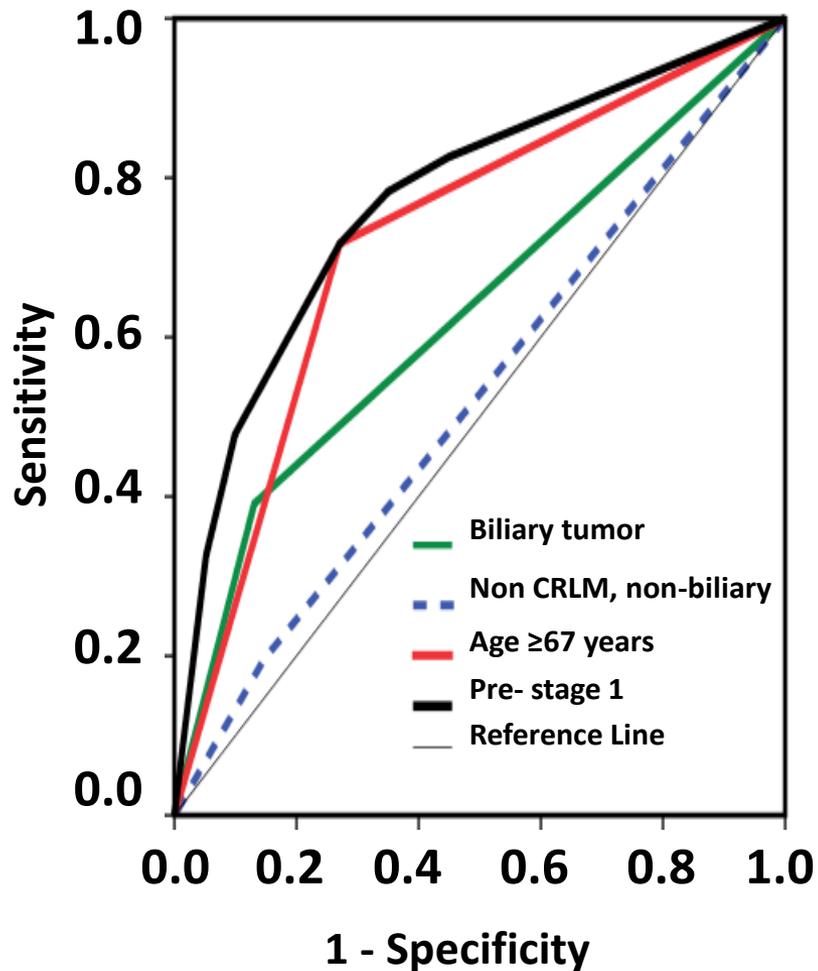
Liver performance	Development cohort (n = 528)	Validation cohort (n = 204)	<i>P</i>
sFLR pre-stage 1	0.21 (0.16-0.27)	0.22 (0.16-0.27)	0.732
Bilirubin (mg/dl)	0.59 (0.40-0.90)	0.63 (0.44-1.06)	0.014
INR	1.0 (1.0-1.1)	1.0 (1.0-1.1)	0.004
Creatinine (mg/dl)	0.81 (0.70-0.96)	0.80 (0.67-0.94)	0.272

Pre-stage 1 Model



Pre-stage 1 Model

ROC Pre-stage 1: c-statistic= 0.772



Risk point allocation

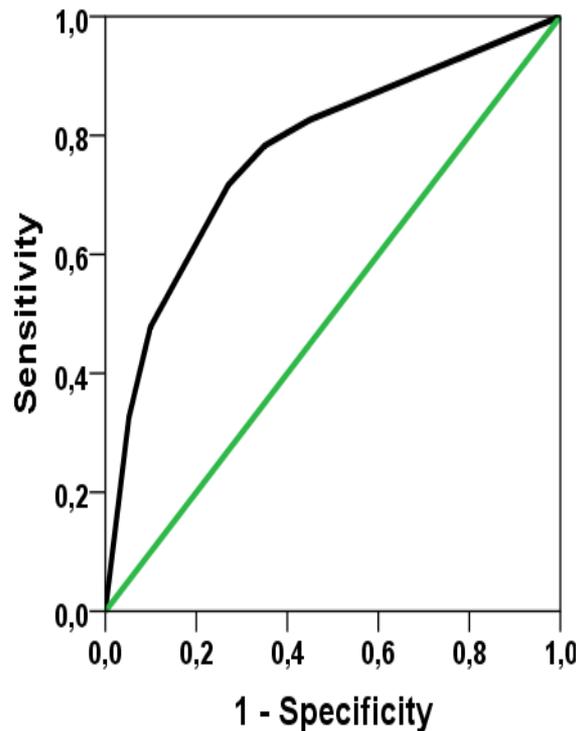
CRLM	0
Non-colorectal/non-biliary	1
Biliary tumor	2
Age ≥67 years	3

Pre-stage 1 Model Validation

ROC curve analysis

Development cohort

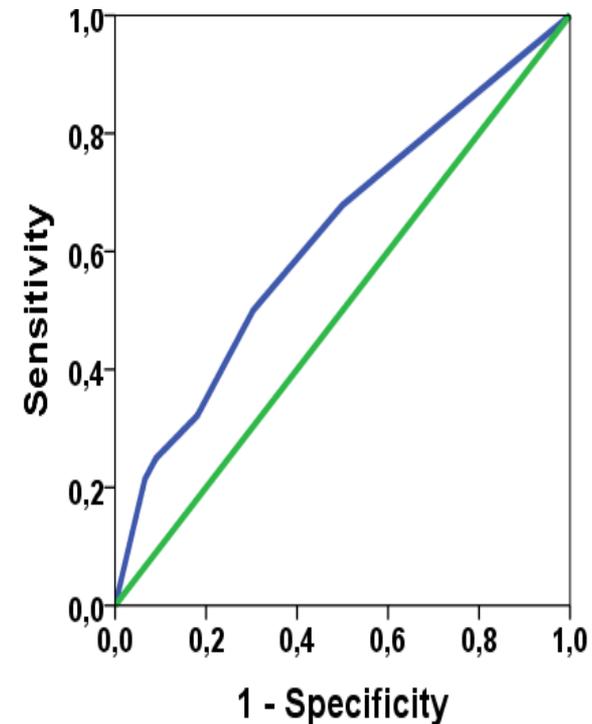
n=528



***c*-statistic: 0.772; $P < 0.000$**

Validation cohort

n=204



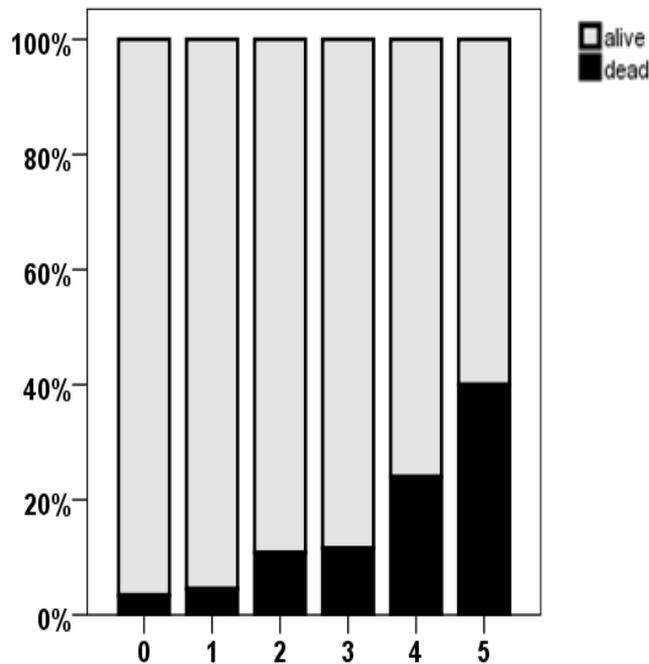
***c*-statistic: 0.625; $P = 0.040$**

Pre-stage 1 Model Validation

Outcome per risk category

Development cohort

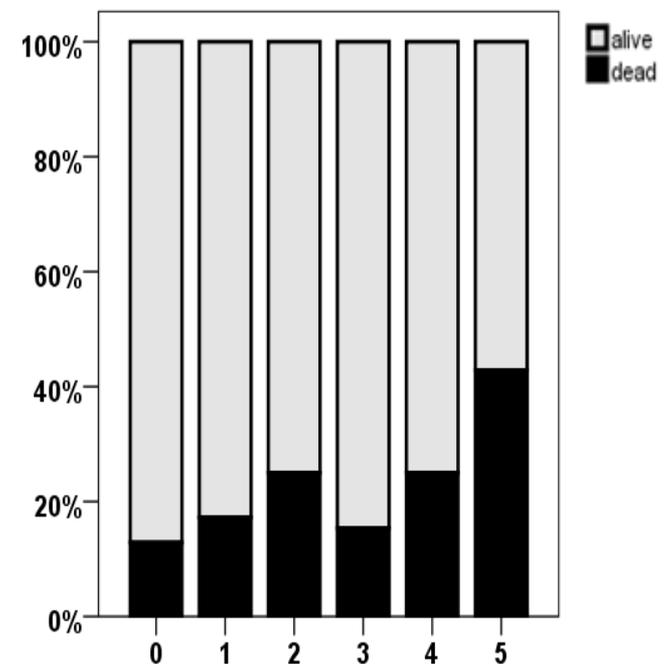
n=528



Pre-stage 1 Risk score

Validation cohort

n=204



Pre-stage 1 Risk score

Pre-stage 2 Variables

Univariate analysis

Inter-stage course	Development cohort (n = 528)	Validation cohort (n = 204)	<i>P</i>
Major complications (grade \geq 3b)	10%	7%	0.239
ISGLS criteria	9%	14%	0.136

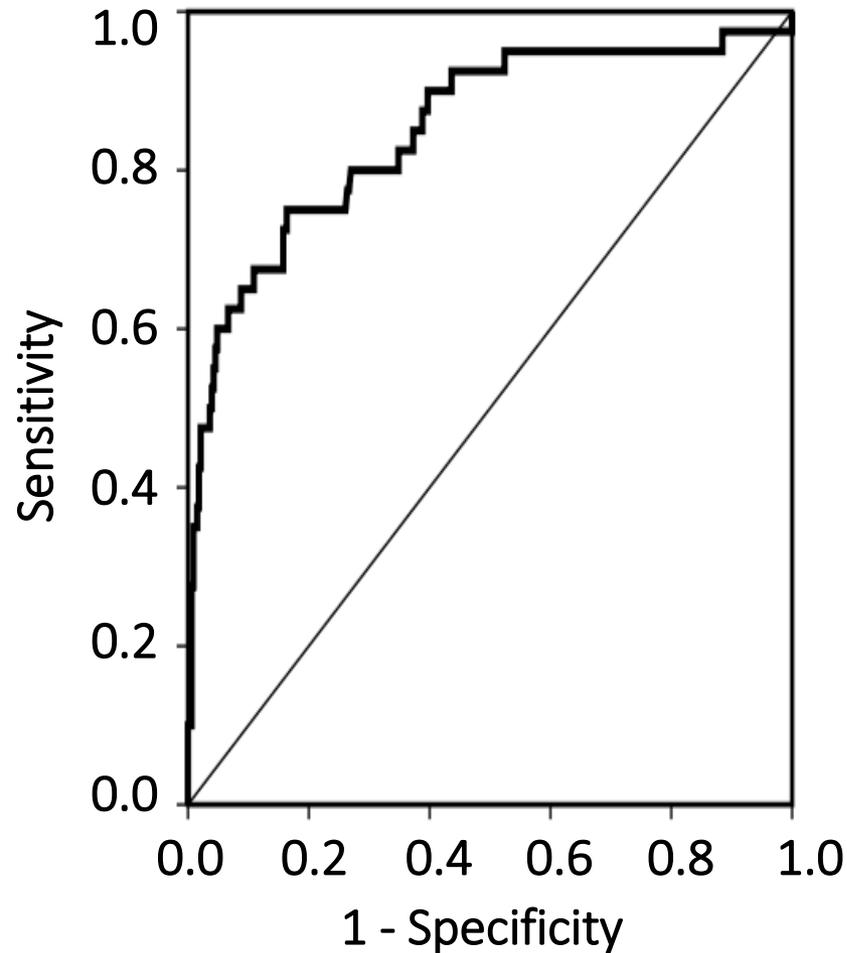
Pre-stage 2 Variables

Univariate analysis

Liver performance	Development cohort (n = 528)	Validation cohort (n = 204)	<i>P</i>
sFLR pre-stage 2	0.37 (0.30-0.45)	0.39 (0.32-0.47)	0.179
Bilirubin (mg/dl)	0.76 (0.47-1.29)	0.69 (0.40-1.25)	0.637
INR	1.1 (1.0-1.2)	1.1 (1.0-1.2)	0.610
Creatinine (mg/dl)	0.71 (0.60-0.91)	0.71 (0.59-0.90)	0.318

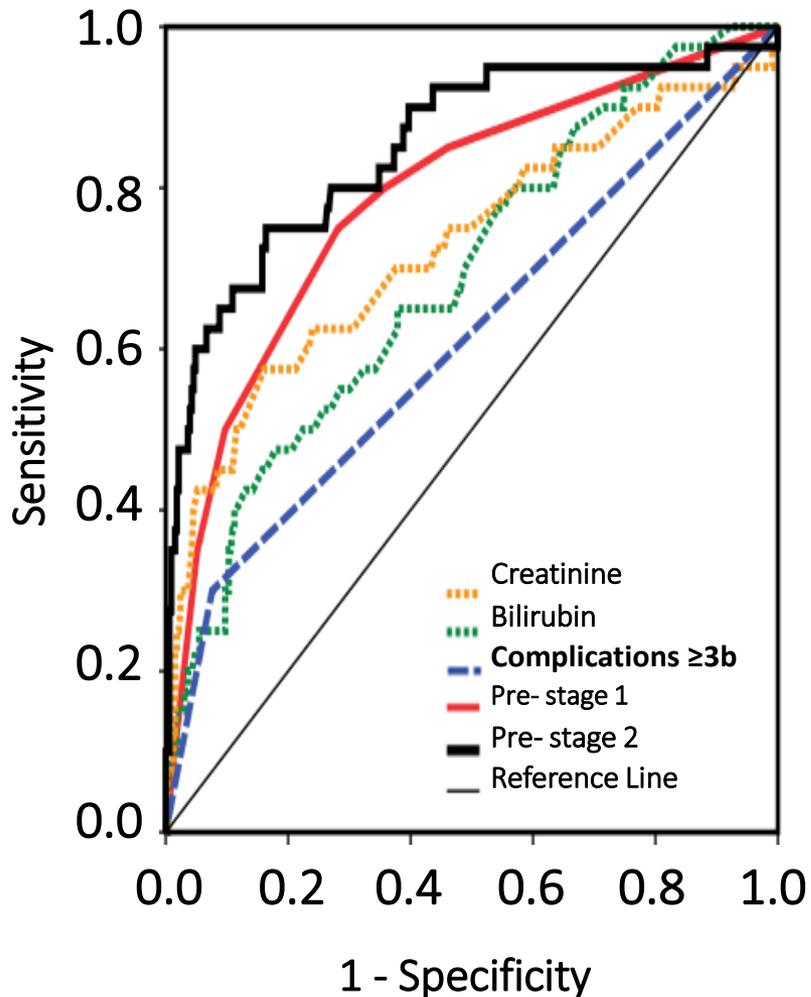
Pre-stage 2 Model

ROC Pre-Stage 2: c-statistic= 0.850



Pre-stage 2 Model

ROC Pre-Stage 2: c-statistic= 0.850



Risk point allocation (range: 0-12)

$0.66 \times [\text{pre-stage 1 score}]$

$+ 1.2 \times [\text{complications} \geq 3b; \text{no}=0; \text{yes}=1]$

$+ 1.5 \times \log_{10} [10 \times \text{bilirubin pre-stage 2 in mg/dL}]$

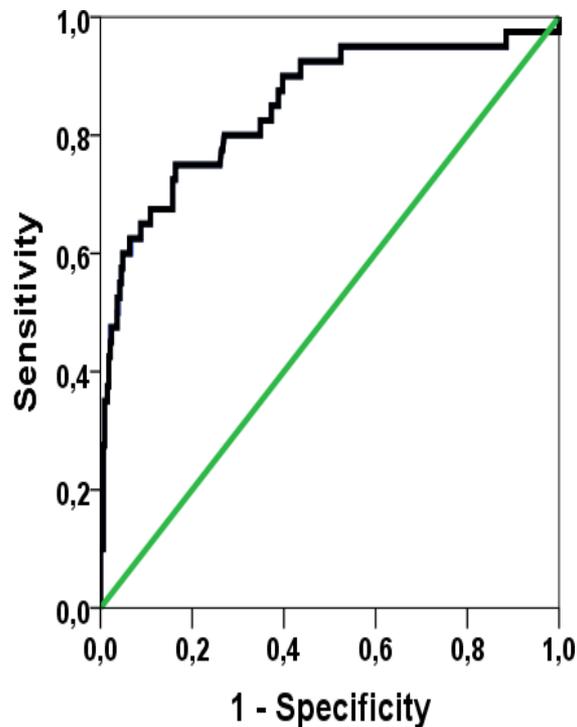
$+ 1.7 \times \log_{10} [10 \times \text{creatinine pre-stage 2 in mg/dL}]$

Pre-stage 2 Model Validation

ROC curve analysis

Development cohort

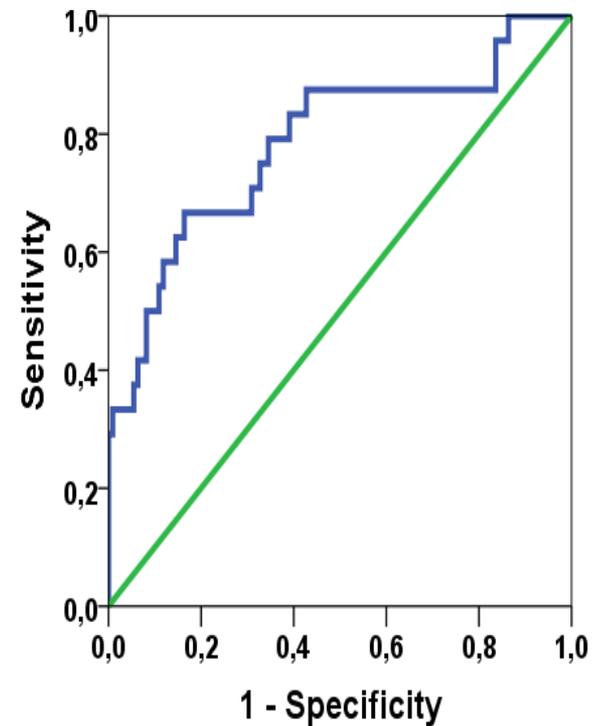
n=528



c-statistic: 0.850; P<0.000

Validation cohort

n=204



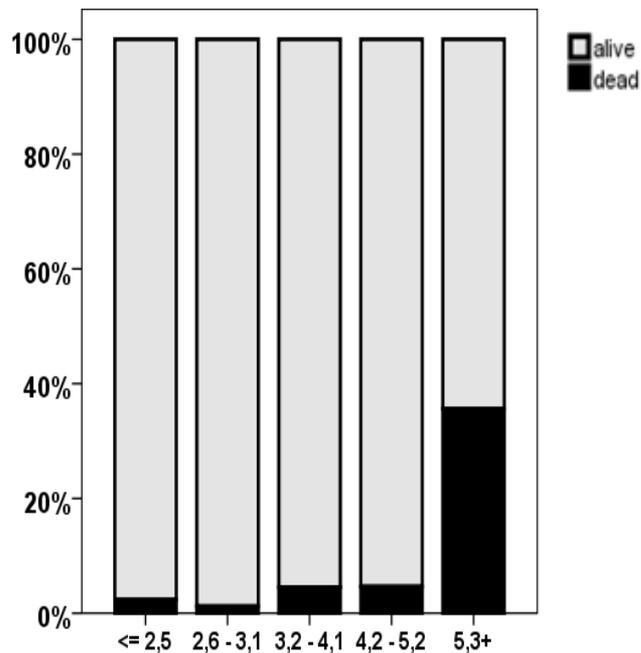
c-statistic: 0.785; P=0.058

Pre-stage 2 Model Validation

Outcome per risk category

Development cohort

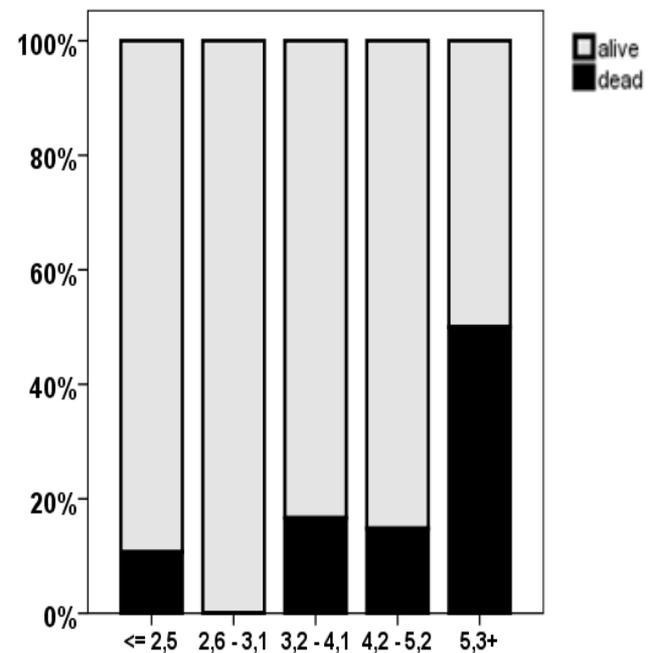
n=528



Pre-stage 2 Risk score

Validation cohort

n=204



Pre-stage 2 Risk score

Clinical Sample Vignette

77y female, gallbladder cancer

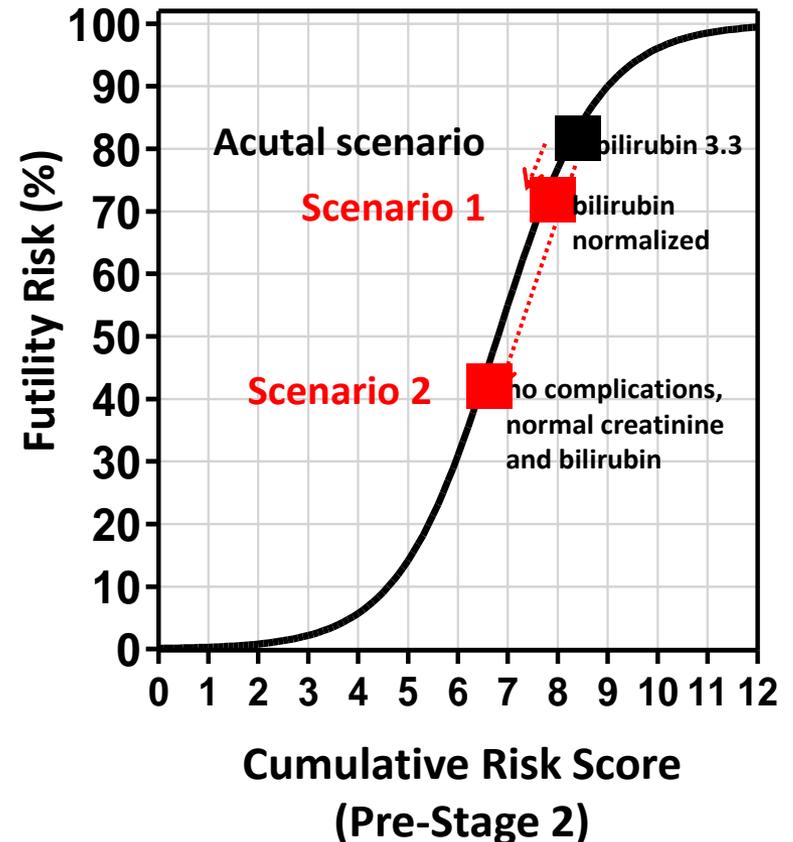
Pre-stage 1 futility risk 37%

Complication $\geq 3b$

Bilirubin 3.33mg/dl

Creatinine 0.69mg/dl

Pre-stage 2 futility risk 79%

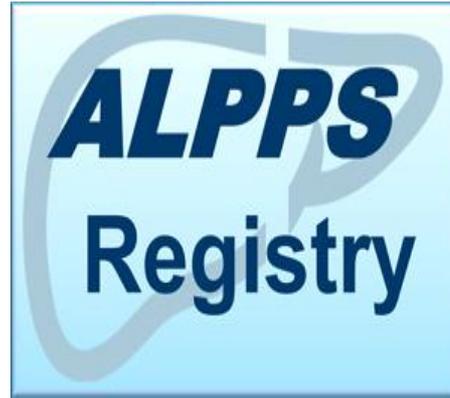


Summary

1. ALPPS Risk Score: Prospective validated decision guide to avoid 90-day mortality
1. Easy applicable risk calculation for individual patients before stage-1 and stage-2 surgery
2. Proper patient selection
3. Determination to proceed safely with stage 2 surgery

Patient Registration

Please register your ALPPS patients



www.alpps.net

ALPPS@usz.ch

São Luís



Gracias!