THE FUNCTIONAL STATUS AND ITS PREDICTION ONE YEAR AFTER HIP OR KNEE REPLACEMENT

Ulrich Betz, Laura Langanki*, Jürgen Konradi, Ruben Westphal, Philipp Drees, Sebastian Kuhn

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* The data analysis is part of the dissertation of Laura Langanki

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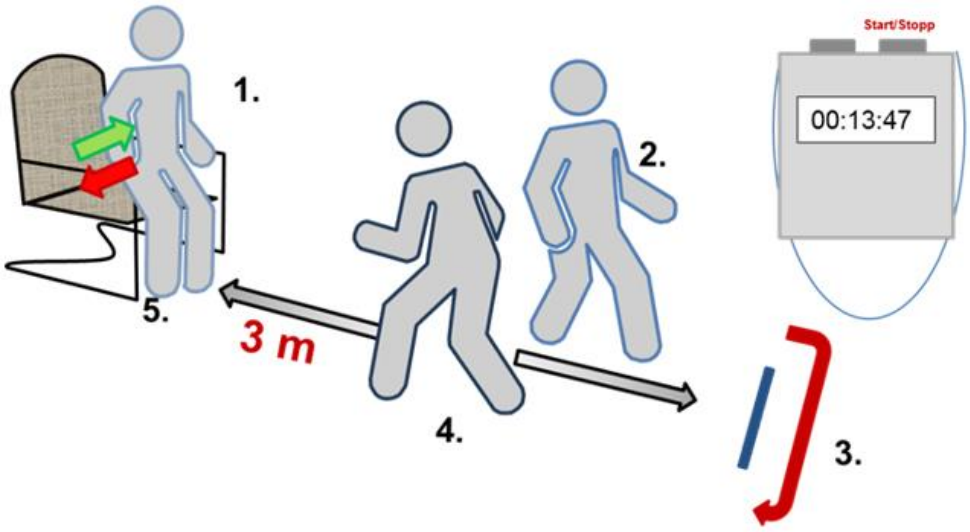
- no conflicts of interest -

PROMISE Trial

- **“Process optimization by interdisciplinary and cross-sectoral care using the example of patients with hip and knee prostheses”**
- Recommendations of the Enhanced Recovery After Surgery (ERAS) Society with some extensions
- 3 German hospitals offering different levels of care
- 5 cooperating rehabilitation centers
- **subanalysis: n=507 participants**: TKA (n=268), TKA both (n=40), THA (n=199)

Variables / Questionnaire	Construct / Expression
Patient characteristics	
Comorbidities	Medical history form: musculoskeletal system, further information
ASA classification	Health status of the patients Expression / Score (1-6)
Body Mass Index (BMI)	Body weight (kg) / height squared
Gender	Female, male
Marital status	Single, married, divorced
Age	Date of birth, date of operation
Psychological barriers / factors	
PHQ4	Anxiety and depression, sum score (0-12)
LOT-R	Optimism and pessimism
Organisational factors / ERAS features	
Patient seminar	Participation (yes/no)
Oslo Social Support Scale (OSSS)	Extent of social support
Mobilisation on the day of surgery	Yes/No No = Reasons why not possible (free text)
Functional factors	
Timed Up and Go Test (TUG)	Physical mobility, time in seconds
Resources	Use of aids in the TUG test Expression: None, walking stick, UAGS, walker, walking frame
Numerical Rating Scale (NRS)	Pain
Staffelsteinscore Range of motion/strength	Subscore range of motion/strength

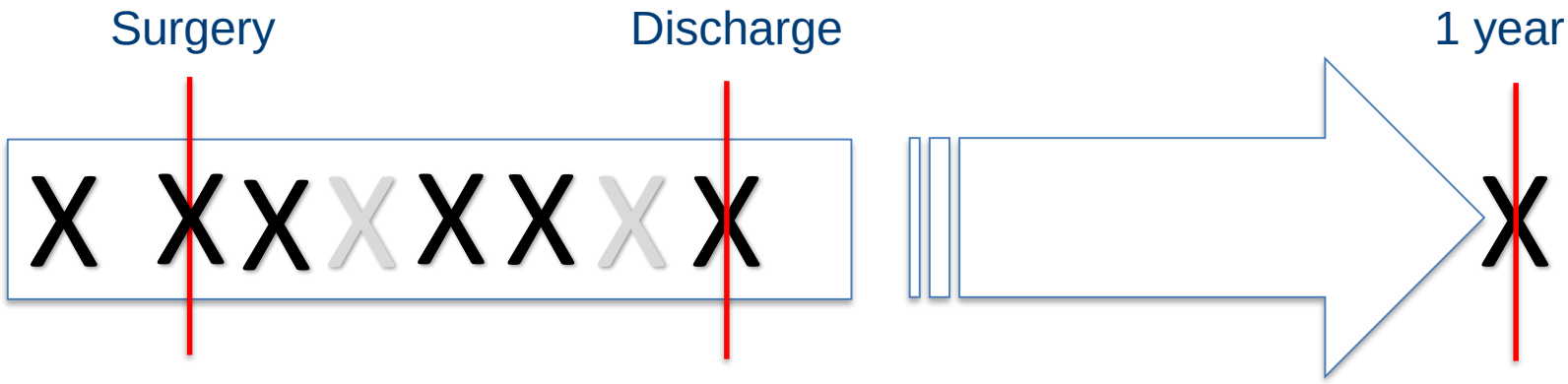
Timed Up and Go – Test (TUG)



Wolf, 2022

- Functional Mobility
- Very good Intrarater-Reliability (ICC = 0.92) and Interrater-Reliability (ICC = 0.91/0.87)
- Independence / Secure Walking TUG ≤ **12 sec** (10 sec)

Timed Up and Go – Test (TUG)



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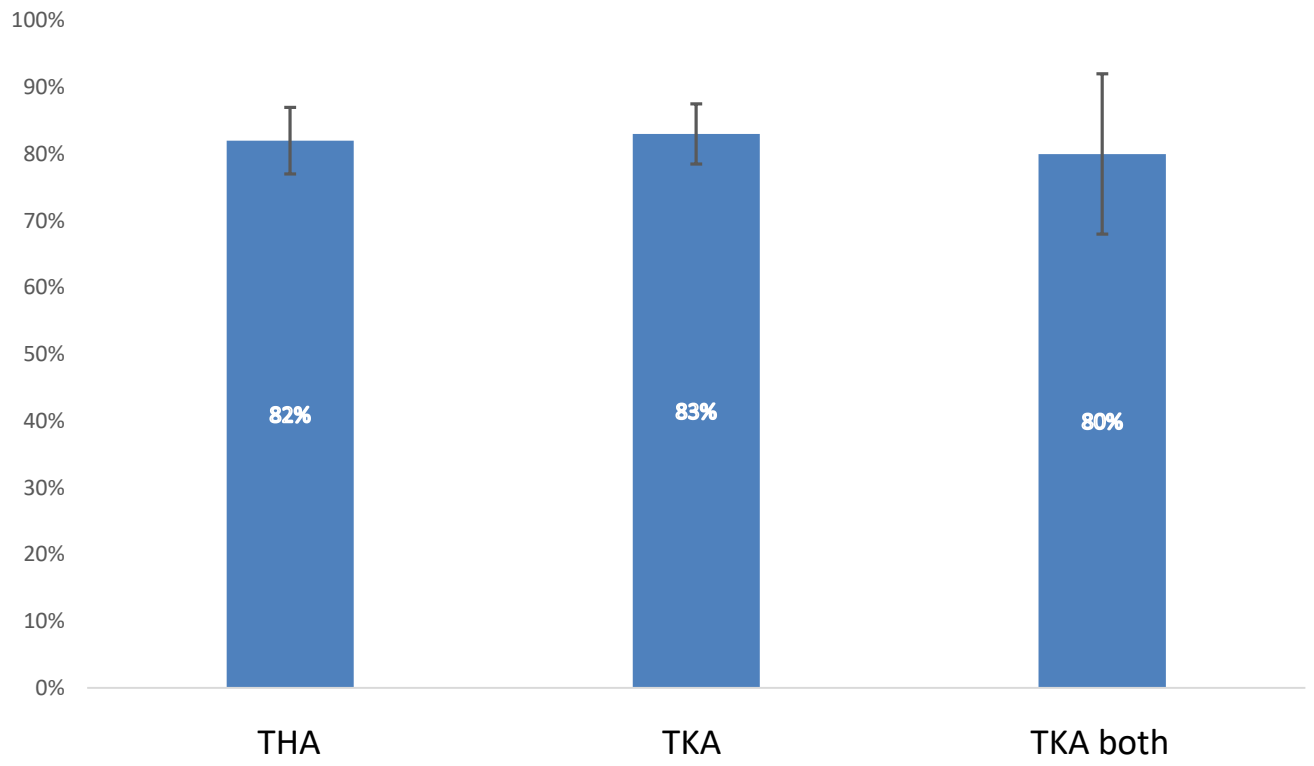
PROMISE Trial - cohort

		N	Minimum	Maximum	Mean value	Std. deviation
Hip joint (n=199 / 39%)	Age	199	27	92	**67.14**	11.82
	BMI	197	15.95	54.03	**28.22**	6.14
	Length of stay_days	199	3	30	**6.19**	2,90
	ASA	198	1	4	**2.51**	.62
	Valid values	196				
Knee joint (n=268 / 53%)	Age	268	22	90	**66.75**	10.97
	BMI	268	18.94	52.88	**29.93**	6.34
	Length of stay_days	268	3	84	**6.26**	5.39
	ASA	265	1	4	**2.43**	.59
	Valid values	265				
Knee joint on both sides (n=40 / 8%)	Age	40	54	81	**68.15**	7.954
	BMI	40	21.45	48.44	**29.54**	6.06
	Length of stay_days	40	1	14	**6.95**	2.54
	ASA	40	1	3	**2.42**	.59
	Valid values	40				

Mobilization on day of surgery

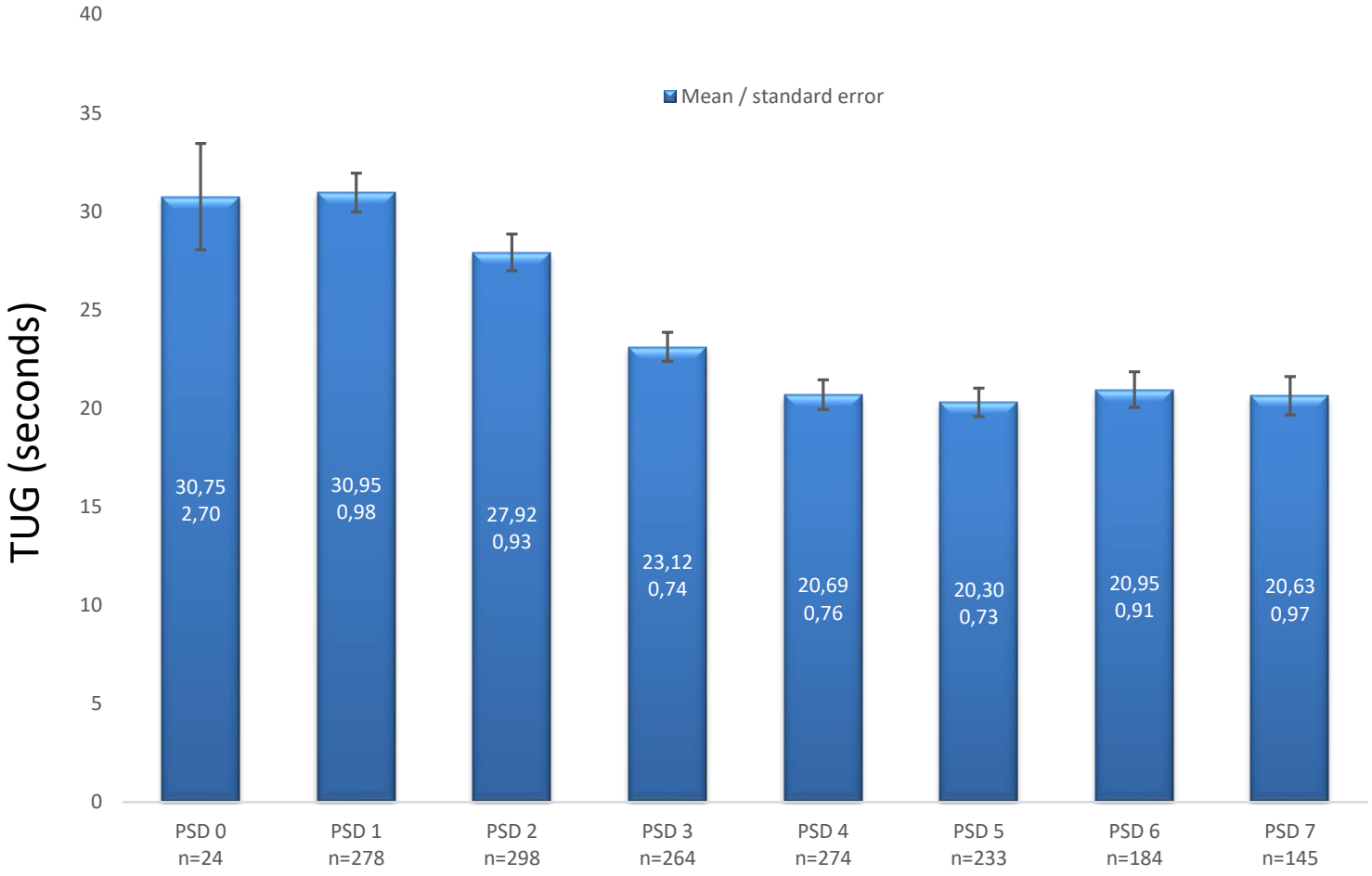
- 417 (82%) of patients could be mobilized on the day of surgery



Reasons for „Mobilization on day of surgery“ not possible

Reasons	Frequencies (n=90 / 100%)
Organizational reasons	38 / 42%
Late-effects of anesthesia (sensomotoric deficits)	21 / 23%
Circulatory problems	11 / 12%
Other (pain, complications)	8 / 9%
Nausea / vomiting	7 / 8%
Not specified	5 / 6%

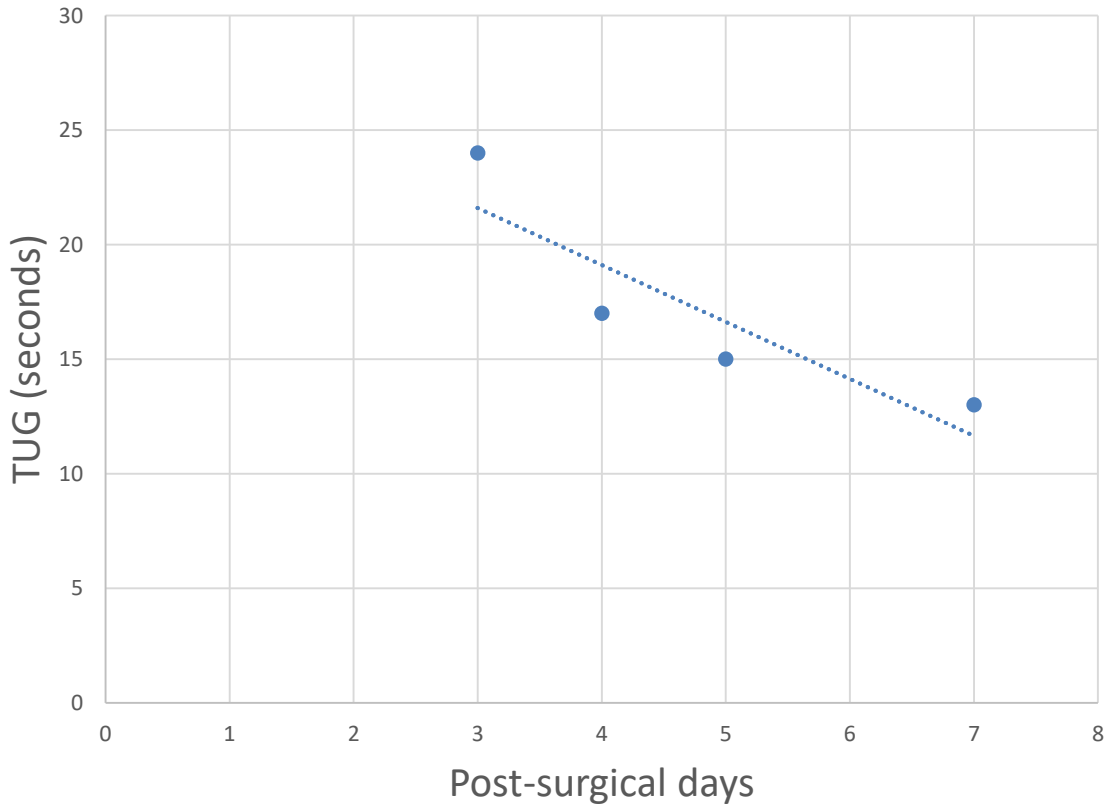
TUG in the course of the postsurgical days



PSD = post-surgical day

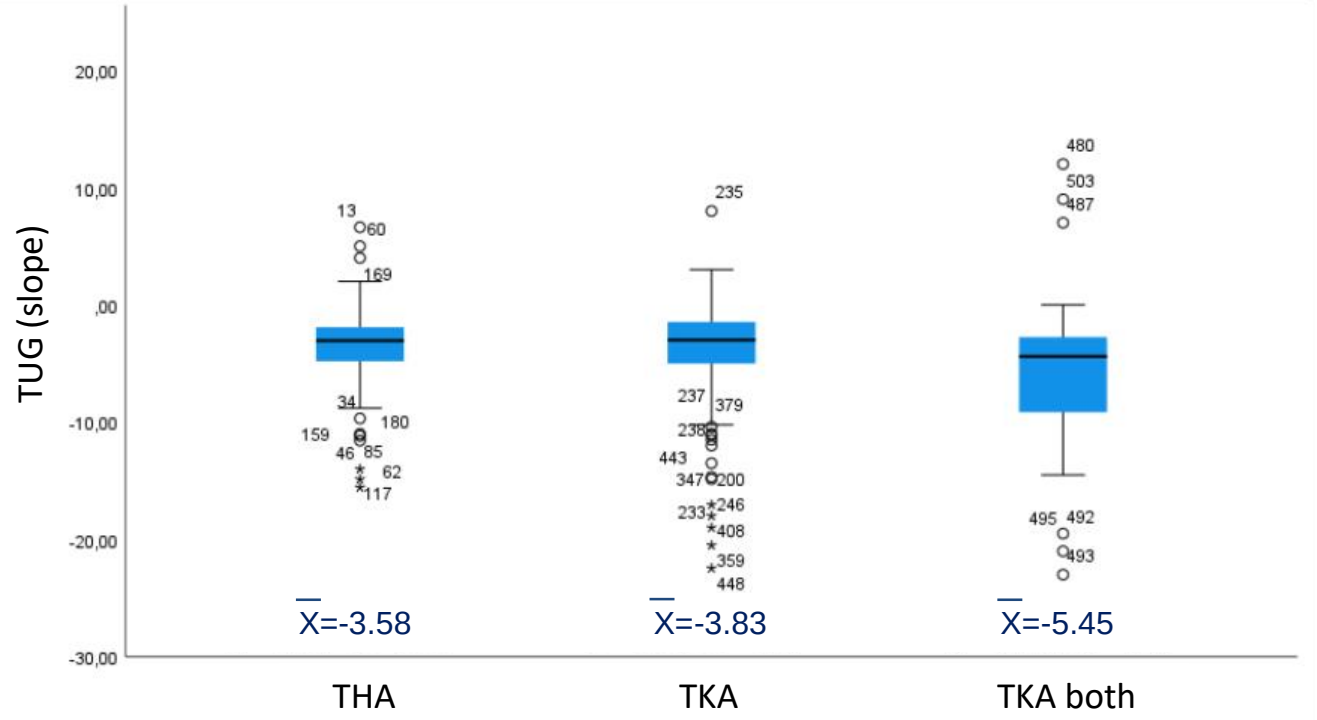
TUG in the course of the postsurgical days

- The slope of the regression line: Mean value $\overline{X}$=-3.85 (SD=3.9)



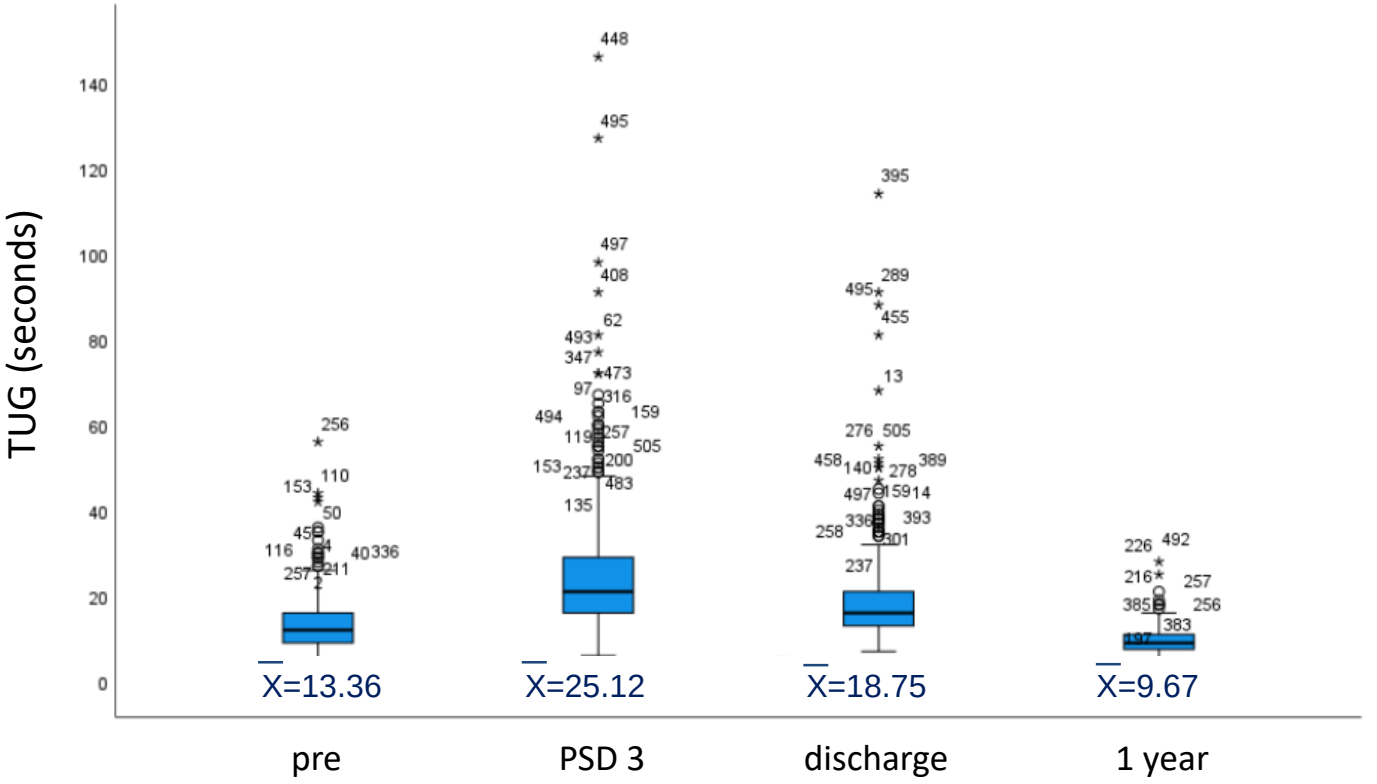
TUG in the course of the postsurgical days

- The slope of the regression line:
  Mean values THA $\bar{X}$=-3.58, TKA $\bar{X}$=-3.85; TKA both $\bar{X}$=-5.45



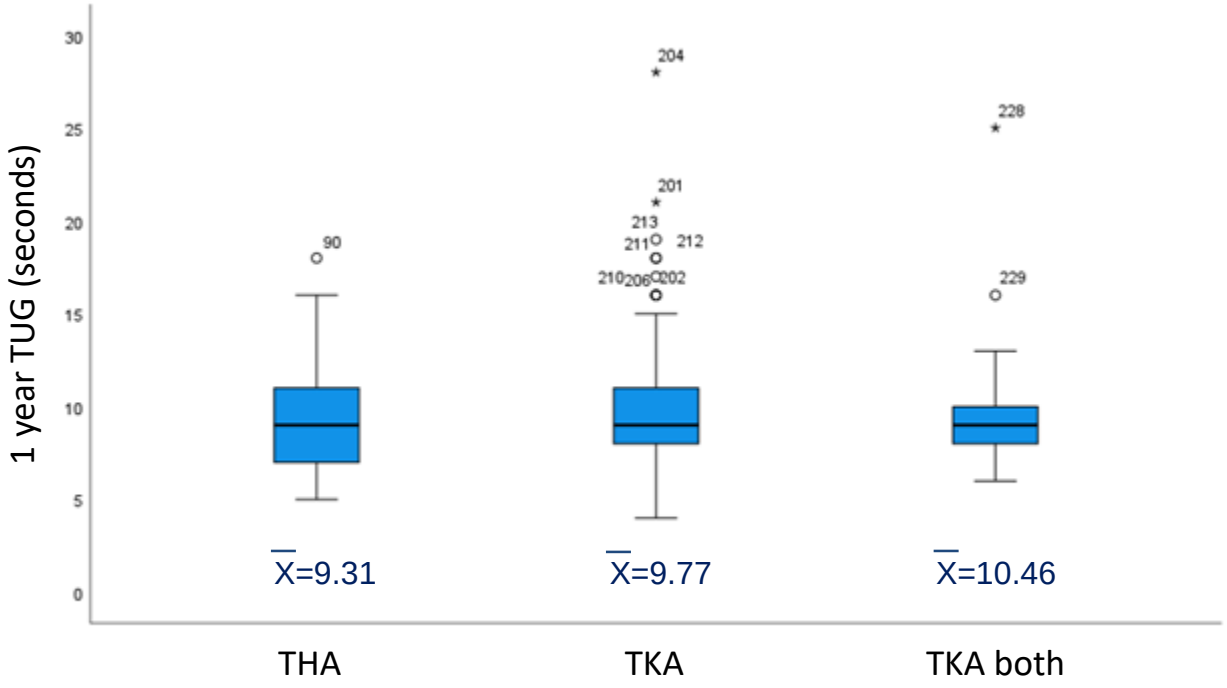
TUG at different time-points

- All joint groups show significant mobility improvements after one year



TUG at 1 year FU

- 1 year TUG: outliers (from 18 sec.) and 2 extreme values (from 25 sec.)
  All patients had at least 4-9 comorbidities and/or complications.



TUG prediction models

- TUG prediction 1 year by **multiple linear regression analysis**
- **stepwise variable selection** excluded the following variables: BMI, gender, ASA (physical health status), SSS (ROM/strength) OSSS (social support), LOT-R (optimism/pessimism), aid use, exertional pain and the remaining comorbidities

TUG prediction models

- **Model A** statistically significant $p < .001$
- **Predictors: Pre-TUG, age, comorbidity: rheumatism**
- Coefficient of determination: $R^2=.54$ (corrected $R^2=.53$): 53% of the variance of the 1 year TUG value can be predicted by the predictors

Model A	Non-standardized coefficients Coefficient of regression B	Standardized coefficients Beta	Significance
(Constant)	2.092		
Pre TUG	0.305	0.59	0.00
Rheumatism	3.509	0.27	0.00
Age	0.055	0.18	0.02

TUG prediction models

- **Predictors: Pre-TUG, age, comorbidity: rheumatism**

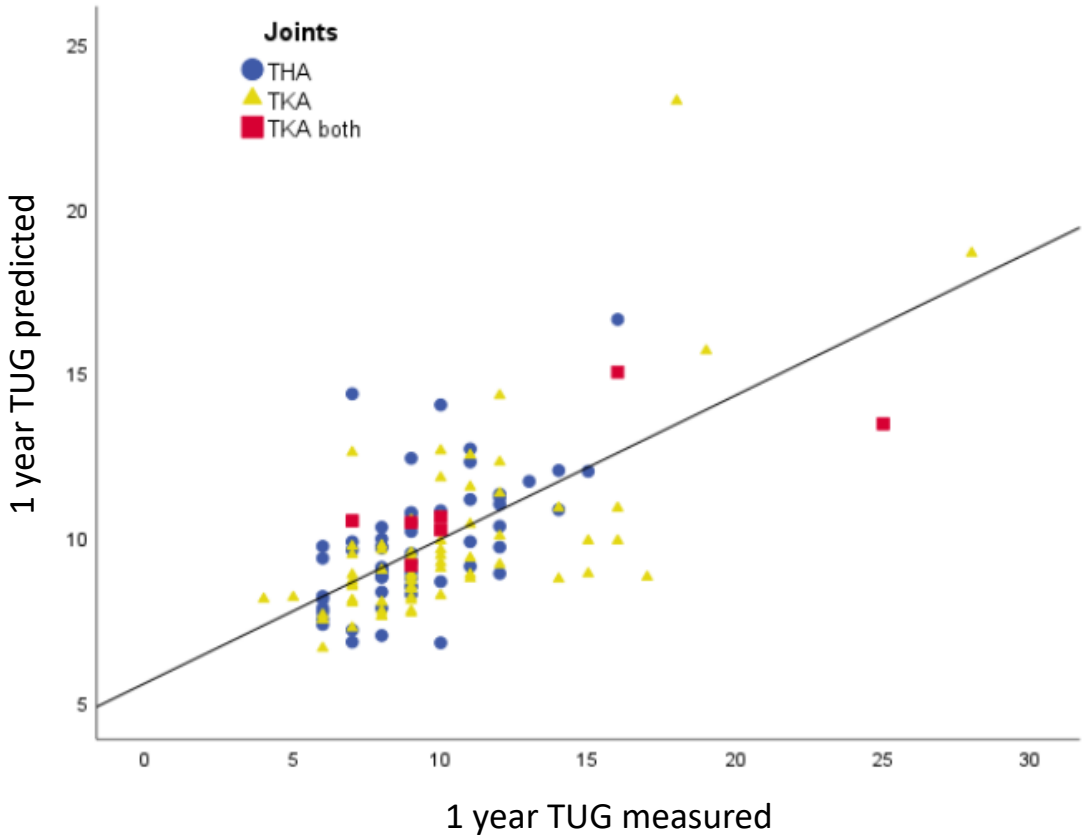
- **For example:**
  Pre-TUG = 35 seconds; age = 70 years ; rheumatism = no

- **Prediction for TUG 1 year by Model A** =
  $2.092 + [0.305\ x\ (35)] + [0.055\ x\ (70)] + [3.509\ x\ (0)\ ]$ = 16.61 sec

  (measured TUG 1 year = 16 seconds)

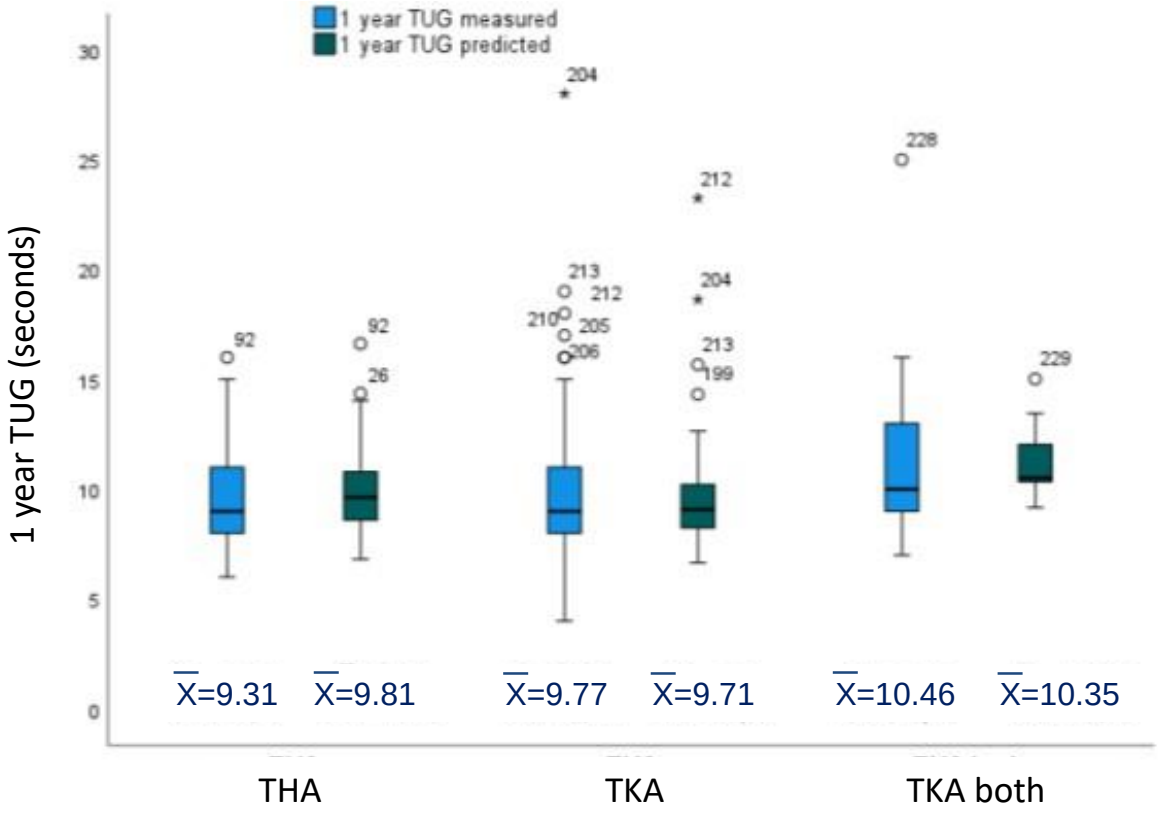
TUG prediction models - Model A

- **Model A: Pre-TUG, age, rheumatism**



TUG prediction models - Model A

- **Model A: Pre-TUG, age, rheumatism**



TUG prediction models

- **Model B** without comorbidities (n=117) statistically significant $p < .001$
- **Predictors: Pre-TUG, age, PHQ-4 (anxiety/depression)**
- Coefficient of determination: $R^2=.48$ (corrected $R^2=.47$): 47% of the variance of the TUG 1 year value can be predicted by the predictors

Model B	Non-standardized coefficients Coefficient of regression B	Standardized coefficients Beta	Significance
(Constant)	0.84		
Pre TUG	0.31	0.59	0.00
Age	0.06	0.21	0.01
PHQ4	0.24	0.18	0.01

Take Home

- in an ERAS setting, most patients can be mobilized on the day of surgery
- the most important reason for non-mobilization are organizational ones
- functional mobility improves rapidly and continuously up to 4 days after surgery
- after one year, the functional mobility for TKA, TKA both and THA is significantly improved compared to the preoperative status and is on average above the cut off for unsafe walking
- functional mobility for TKA, TKA both and THA can be predicted on the basis of preoperative parameters with a medium power

Thank you for your interest

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