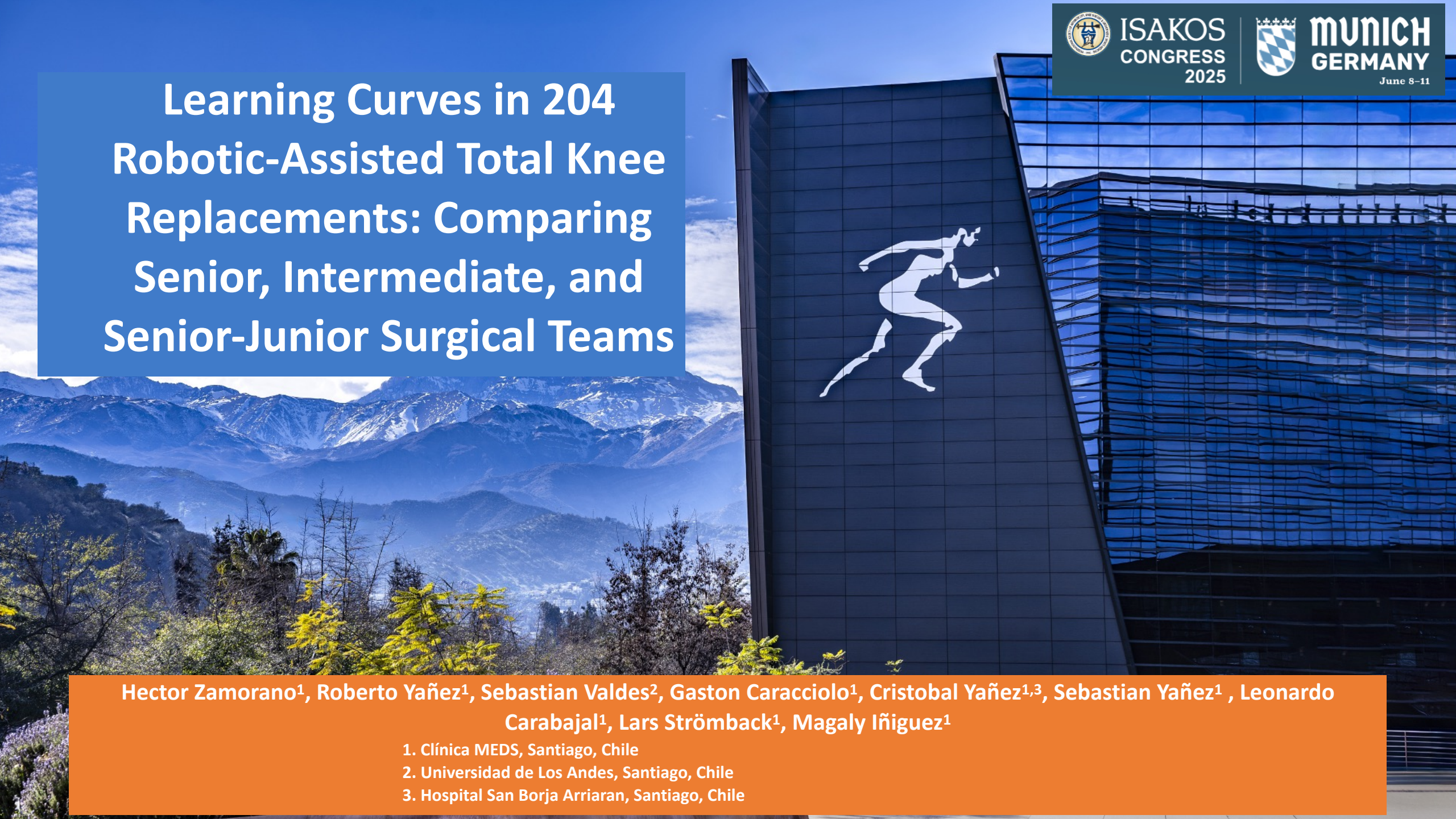

Learning Curves in 204 Robotic-Assisted Total Knee Replacements: Comparing Senior, Intermediate, and Senior-Junior Surgical Teams

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Faculty Disclosure Information

- Nothing to disclosure with this presentation.

Introduction

- Total knee arthroplasty (TKA) is a common procedure in orthopedic surgery.
- Advancements in TKA include the development of robot-assisted systems (rTKA).
- Training in rTKA involves a learning curve to achieve competence comparable to manual TKA (mTKA).
- The positive effect of supervision by a senior surgeon on a less experienced surgeon is well known.
- However, it is unknown whether a senior surgeon experienced in mTKA improves the learning curve when assisting a younger surgeon in rTKA.

Objective

- To evaluate learning curves among senior, intermediate, and senior+junior surgical teams performing robot-assisted total knee arthroplasty (rTKA) with the ROSA® system (Zimmer Biomet), considering surgical ischemia times and complication rates (overall and during the first 25 rTKAs).

<u>Surgeon experience:</u>

- Senior: 25 years of experience in mTKA
- Intermediate: 15 years of experience in mTKA
- Junior: 5 years of experience in mTKA

Methods

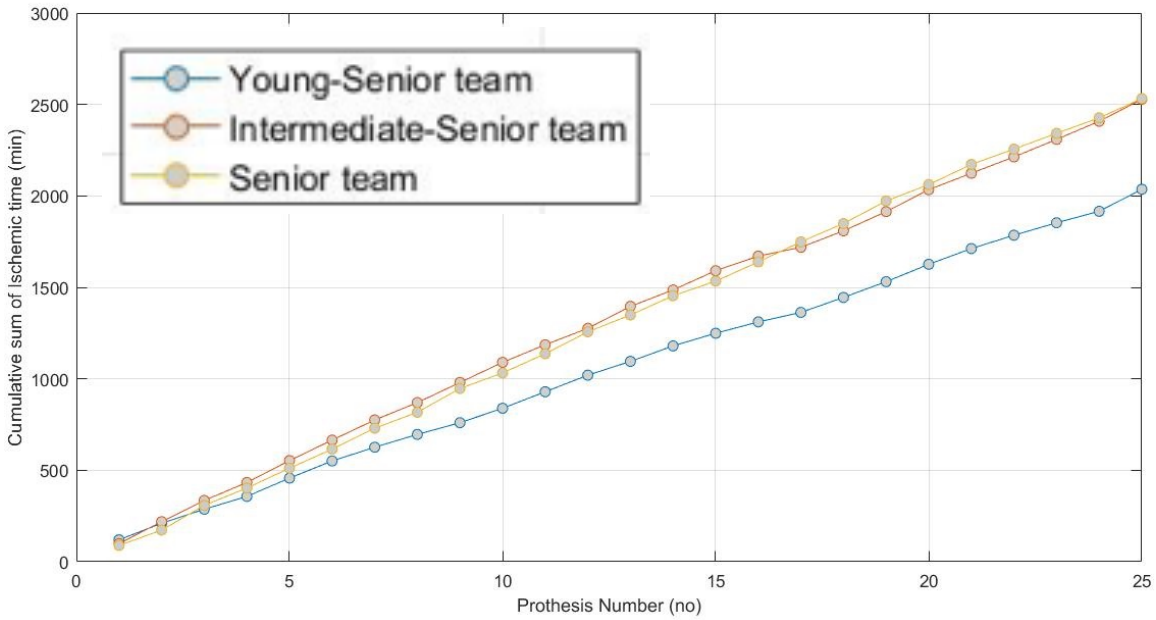
- A total of 204 patients indicated for TKA were prospectively enrolled between 2021 and 2024.
- All patients underwent robot-assisted TKA (rTKA) using the ROSA® system (Zimmer Biomet).
- Ischemia time was recorded, defined from just before the incision to after cementation.
- Stability was assessed by adjusting slopes to minimize cumulative error.
- Ischemia time and complication rates were compared among the senior, intermediate, and senior+junior surgical teams.
- The first 25 rTKAs for each group were compared in terms of ischemia time and cumulative error difference, using ANOVA and multiple comparisons ($\alpha = 5\%$).

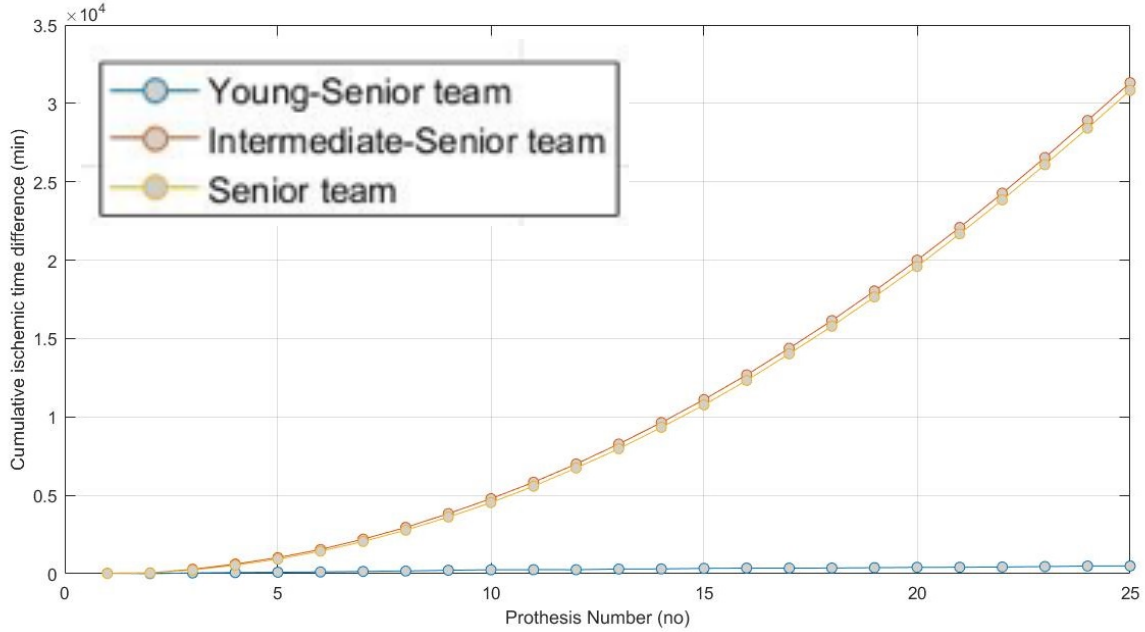
Results

	rTKAs performed	Ischemia time
SENIOR Team	25	105 [95%IC: 95.0–107.6]
INTERMEDIATE Team	29	98 [95%IC: 91.1–104.6]
SENIOR+JUNIOR Team	159	65 [95%IC: 62.1–67.9]

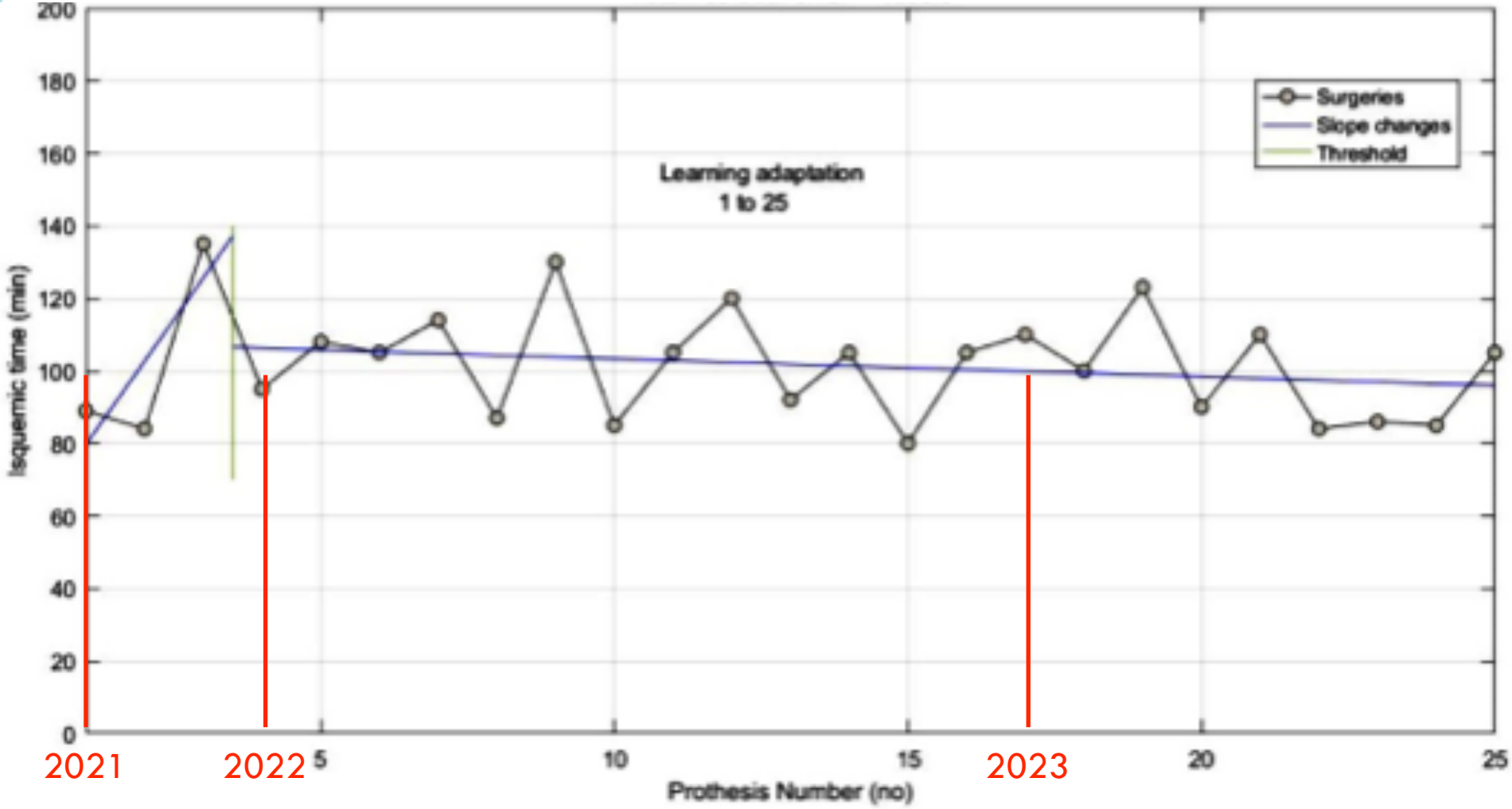
Ischemia time

- First 25 rTKAs:

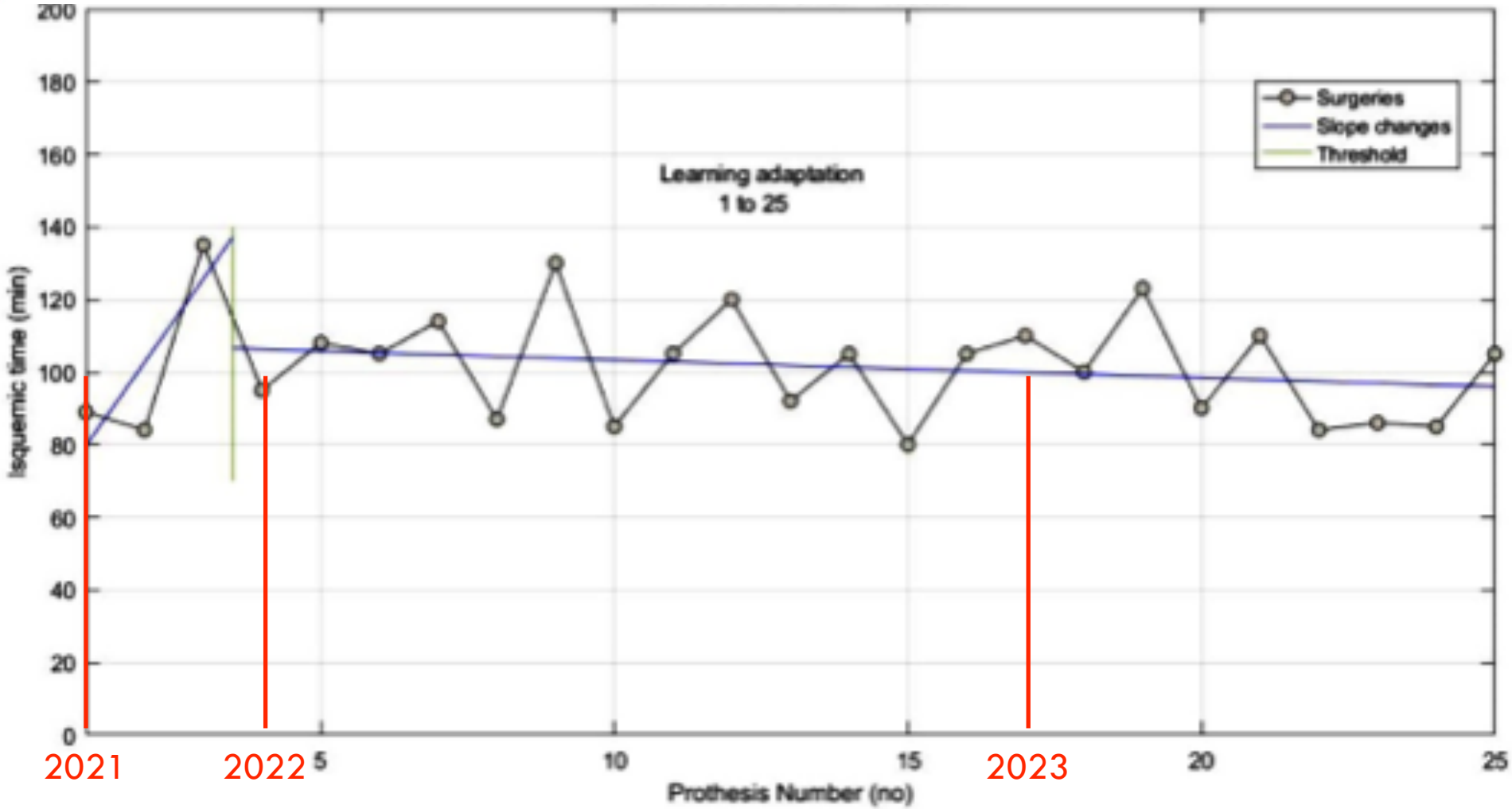




- SENIOR Team:


Learning adaptation
1 to 25
Surgeries
Slope changes
Threshold
Isquemic time (min)
Prothesis Number (no)
2021
2022
2023
0
20
40
60
80
100
120
140
160
180
200
5
10
15
20
25

- INTERMEDIATE Team:



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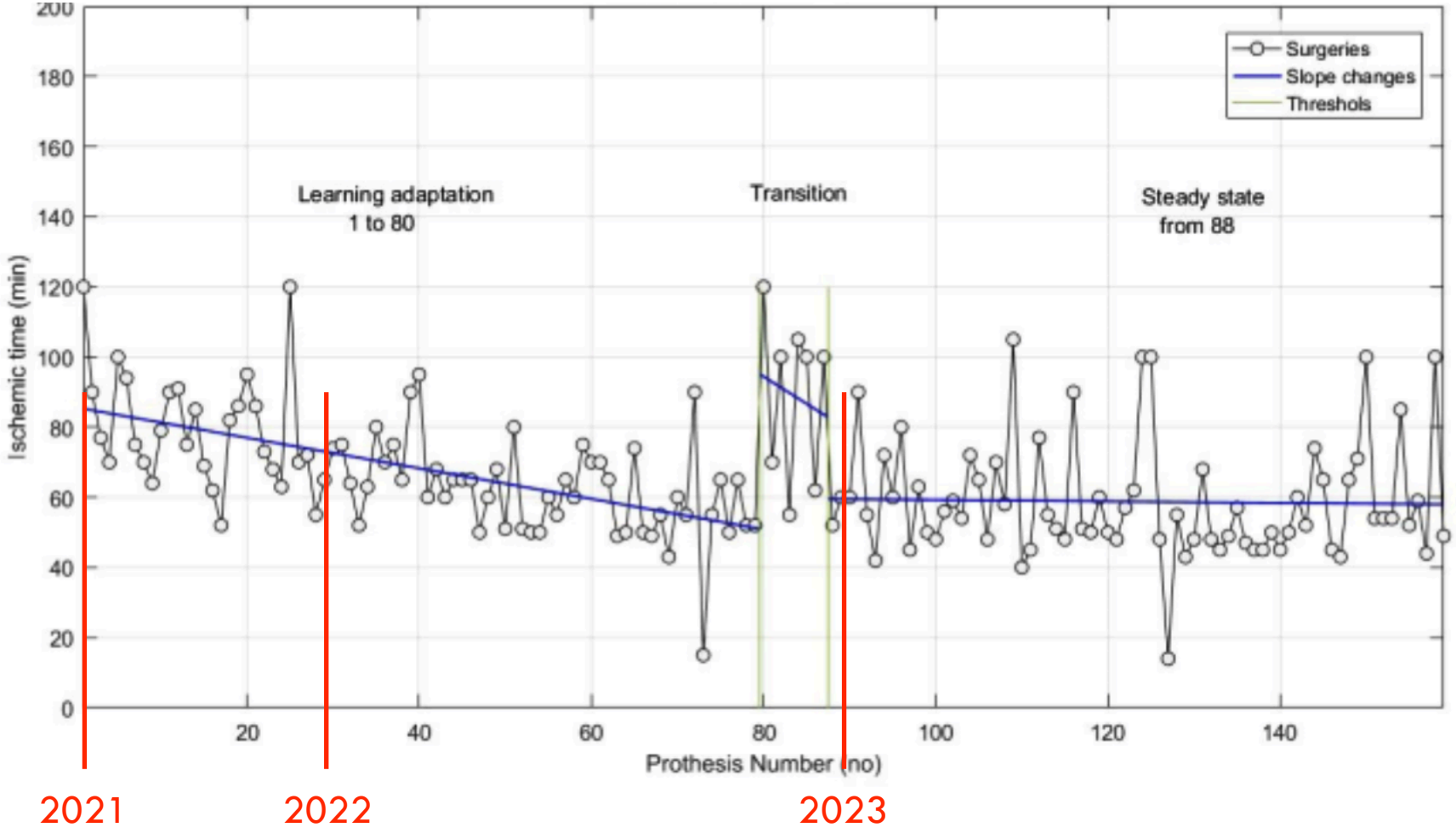
- SENIOR+JUNIOR Team:



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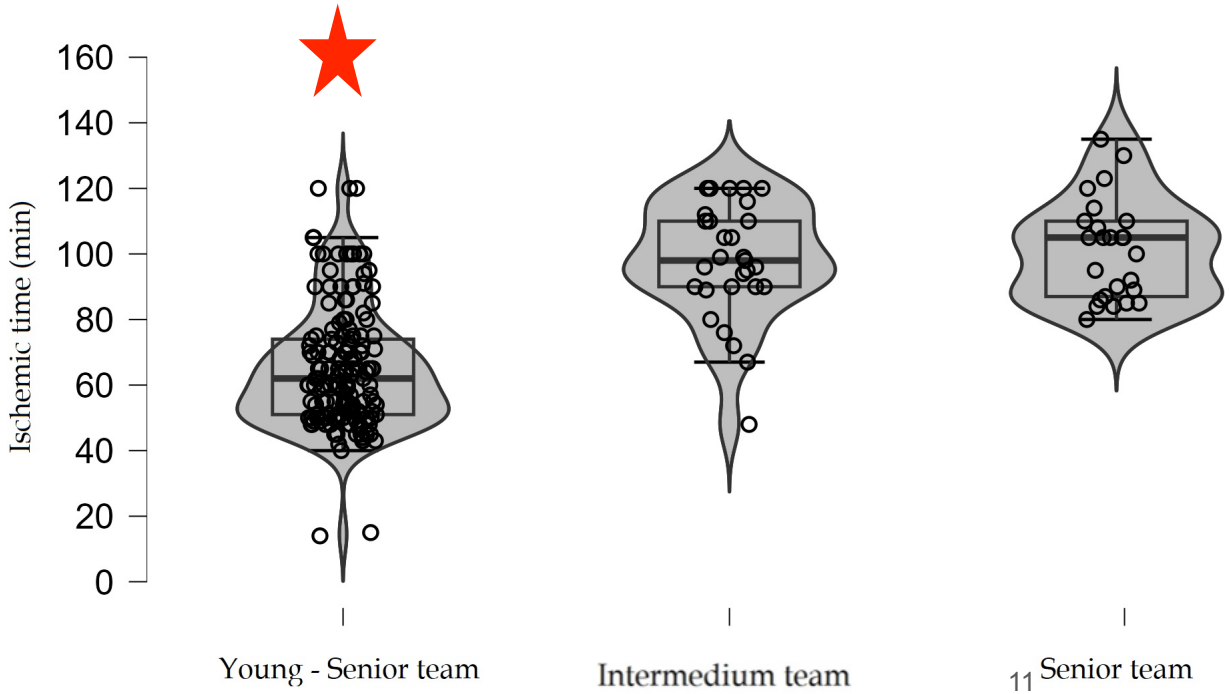
- Only the senior+junior team achieved a stable slope (rTKA = 88).
- In the first 25 rTKAs, the senior+junior team had significantly lower ischemia times and cumulative error differences compared to the intermediate team ($p < 0.001$, Cohen's $d = 1.2$) and the senior team ($p < 0.001$, Cohen's $d = 1.2$).
- Complication rates showed no significant differences.



Conclusions & Discussion

- A benefit was observed in the collaboration between senior and junior surgeons.
- A low complication rate was observed when incorporating robotic assistance into TKA across all groups.
- Other studies have shown that the learning curve in rTKA depends on the surgeon's prior experience in mTKA, with better results observed as experience increases.
- It is interesting to note the symbiotic effect between an experienced mTKA surgeon and a “younger” surgeon when utilizing new technological support (robotic assistance).
- This is consistent with other studies that show no increased complications with the use of rTKA.

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