Radek Kučera

Diagnostic algorithm of Prostate Cancer

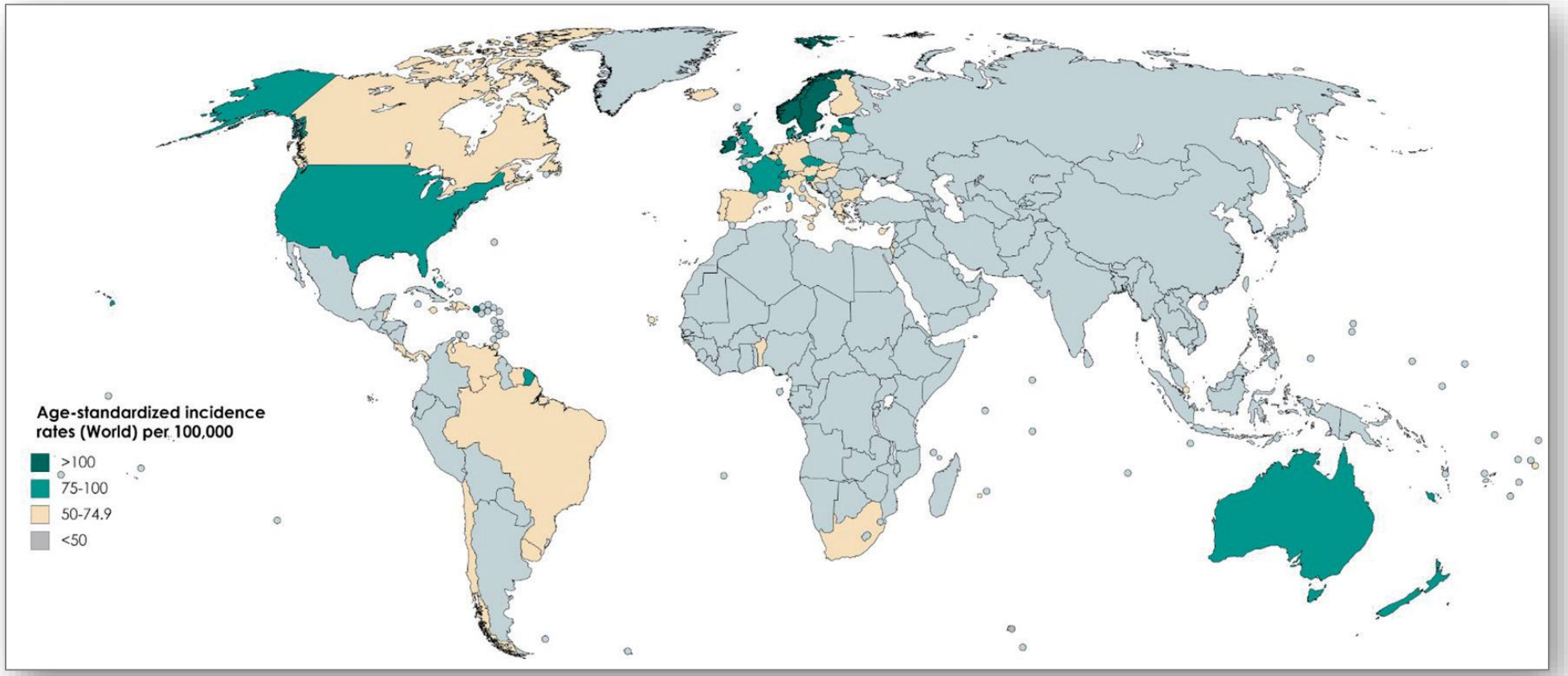
26th May, 2021

Schedule of the presentation

- **Epidemiology of prostate cancer (PCa)**
- **Experience with PCa diagnosis**
- **Diagnostic algorithm in the University Hospital in Pilsen**
- **Conclusions**

PCa epidemiology

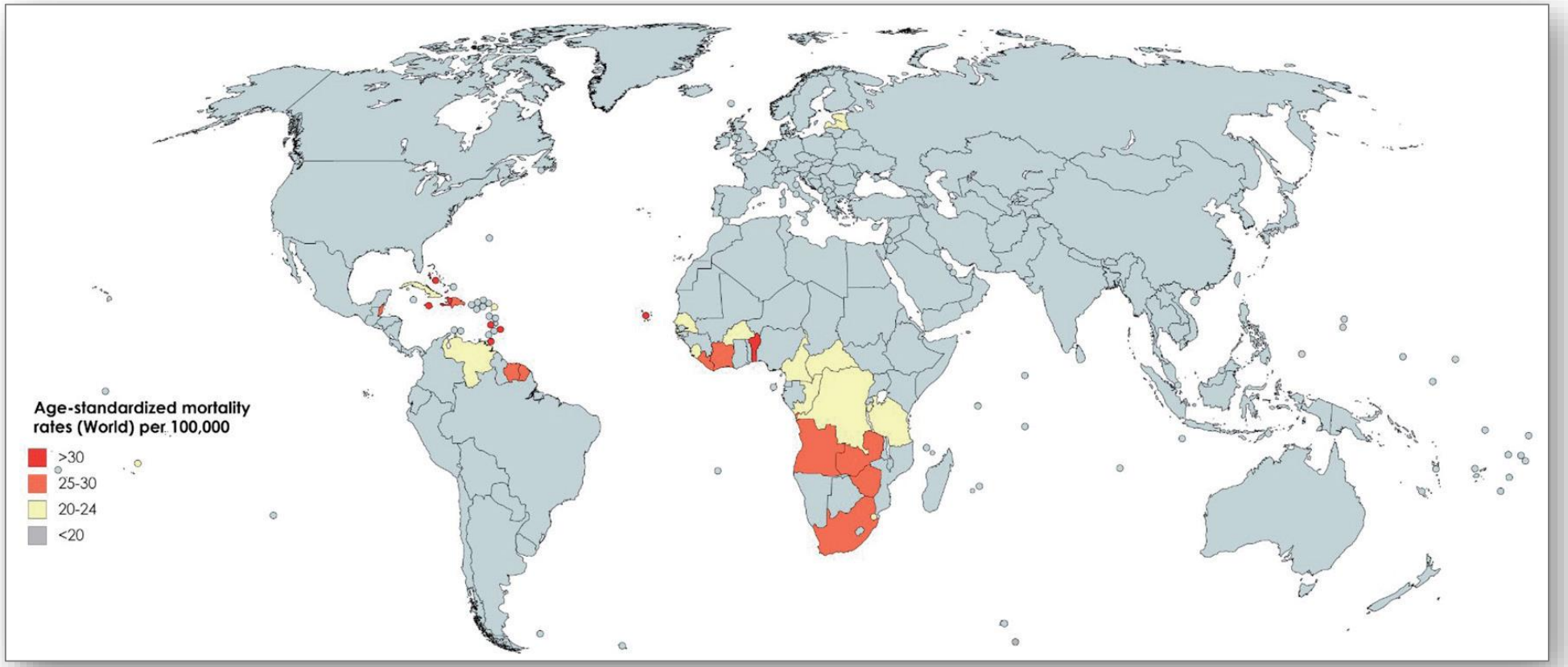
Estimated Prostate Cancer Incidence Worldwide in 2018



Rawla P. Epidemiology of Prostate Cancer. World J Oncol. 2019 Apr;10(2):63-89. doi: 10.14740/wjon1191.

PCa epidemiology

Estimated Prostate Cancer Mortality Worldwide in 2018



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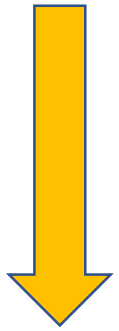
Main current clinical question

What is the aggressiveness of the tumour?



Active surveillance vs. surgery

Active surveillance - benefits for patient

- **Surgery burden**
- **Anesthesia**
- **Incontinence**
- **Erectile dysfunction**

Current diagnostic tools

- **Biopsy**
  - Gleason Score
- **Imaging methods**
  - Ultrasound (US), magnetic resonance (MRI), positron emission tomography (PET)/MRI

- **Prostate specific antigen (PSA) panel**
  - **total PSA** (tPSA)
  - **free PSA** (fPSA)
  - **[-2]proPSA**
  - **%freePSA** %freePSA=(fPSA/tPSA)*100
  - **Prostate Health Index** **PHI**=([-2]proPSA/fPSA)*√tPSA

Biopsy, histology
Gleason Score

- In the 60's a US pathologist **Donald Gleason**.
- **The cells are scored on a scale of 1 to 5.**
- The pathologist looking at the biopsy sample will assign one Gleason grade to the most predominant pattern in the biopsy and a second Gleason grade to the second most predominant pattern.

- The sum of these 2 grades is called the **Gleason Score**.

- **GS=6 vs GS>6 (7-10)**

Current evaluation

- In 2016 International Society of Urological Pathology (ISUP) revised the grading system in PCa.

Gleason Score	ISUP Grade
6	1
7 (3+4)	2
7 (4+3)	3
8	4
9, 10	5

Prostate specific antigen (PSA) in PCa diagnostics

- **PSA**
  - free
  - bound to alpha-1-antichymotrypsin
  - bound to alpha-2-macroglobulin - loss of immunoreactivity

- PSA is specific for prostate tissue but not for PCa

- **Increased levels of PSA**
  - PCa
  - benign prostatic hyperplasia
  - acute and chronic prostatitis
  - after ejaculation, mechanical prostate massage

PSA panel FN Pilsen - reference values

tPSA (µg/l)

till 39 years	0 - 2.0
40-49 years	0 - 2.5
50-59 years	0 - 3.5
60-69 years	0 - 4.5
above 70 years	0 - 6.5

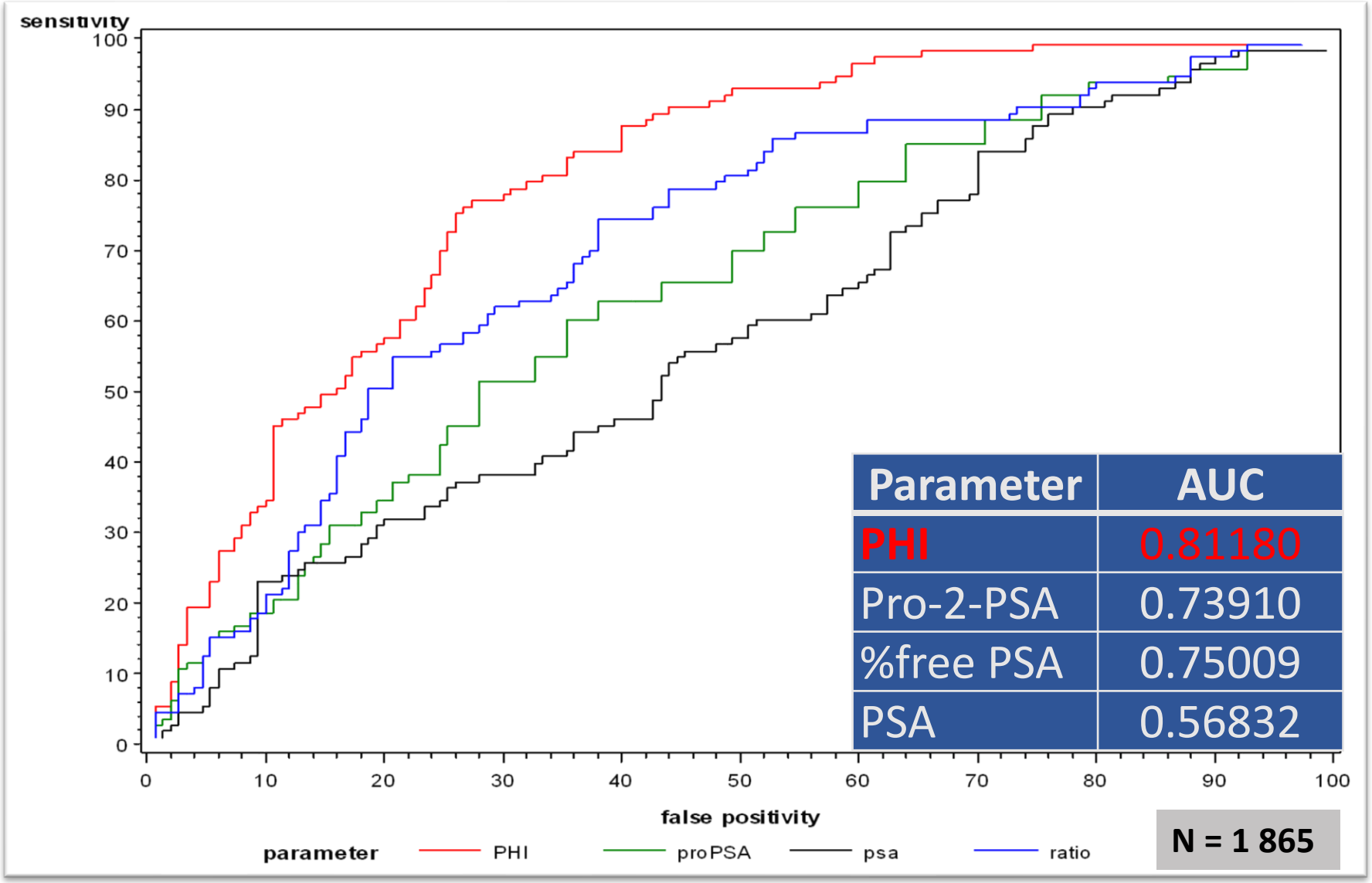
%fPSA

above 25 %	benign disease
15-25 %	gray zone
0-15 %	malignant tumour

PHI

0-30	benign disease
30-40	gray zone
above 40	malignant tumour

ROC curves - PSA markers vs. Gleason Score



Parameter	AUC
PHI	0.81180
Pro-2-PSA	0.73910
%free PSA	0.75009
PSA	0.56832

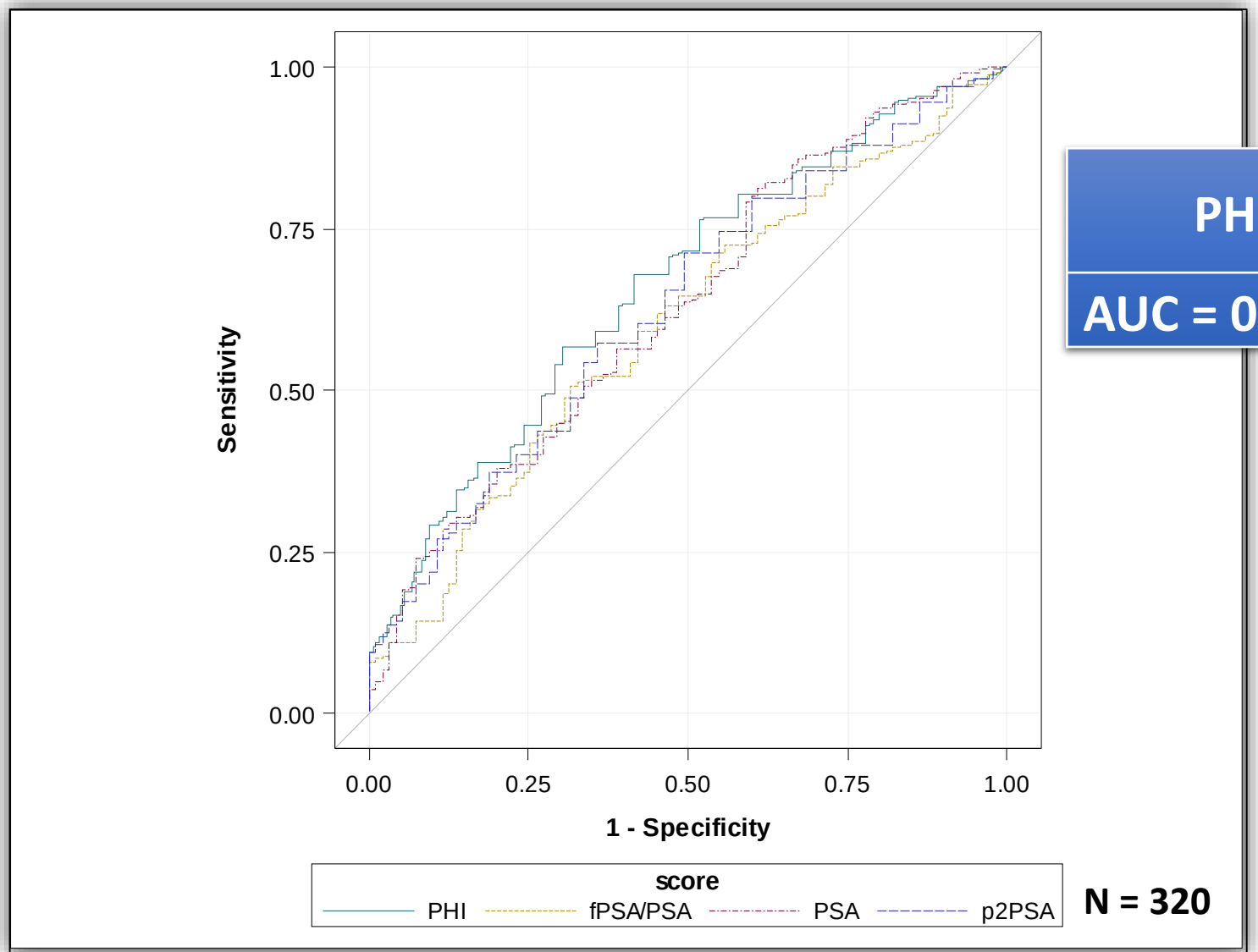
PHI in clinical practice

Dolejsova O, Kucera R, Fuchsova R, Topolcan O, Svobodova H, Hes O, Eret V, Pecen L, Hora M. The Ability of Prostate Health Index (PHI) to Predict Gleason Score in Patients With Prostate Cancer and Discriminate Patients Between Gleason Score 6 and Gleason Score Higher Than 6-A Study on 320 Patients After Radical Prostatectomy. **Technol Cancer Res Treat. 2018** Jan 1;17:1533033818787377.

Kucera R, Pecen L, Topolcan O, Dahal AR, Costigliola V, Giordano FA, Golubnitschaja O. Prostate cancer management: long-term beliefs, epidemic developments in the early twenty-first century and 3PM dimensional solutions. **EPMA J. 2020** Jun 26;11(3):399-418.

Novak V, Vesely S, Luksanová H, Prusa R, Capoun O, Fiala V, Dolejsová O, Sedlacková H, Kucera R, Stejskal J, Zalesky M, Babjuk M. Preoperative prostate health index predicts adverse pathology and Gleason score upgrading after radical prostatectomy for prostate cancer. **BMC Urol. 2020** Sep 7;20(1):144.

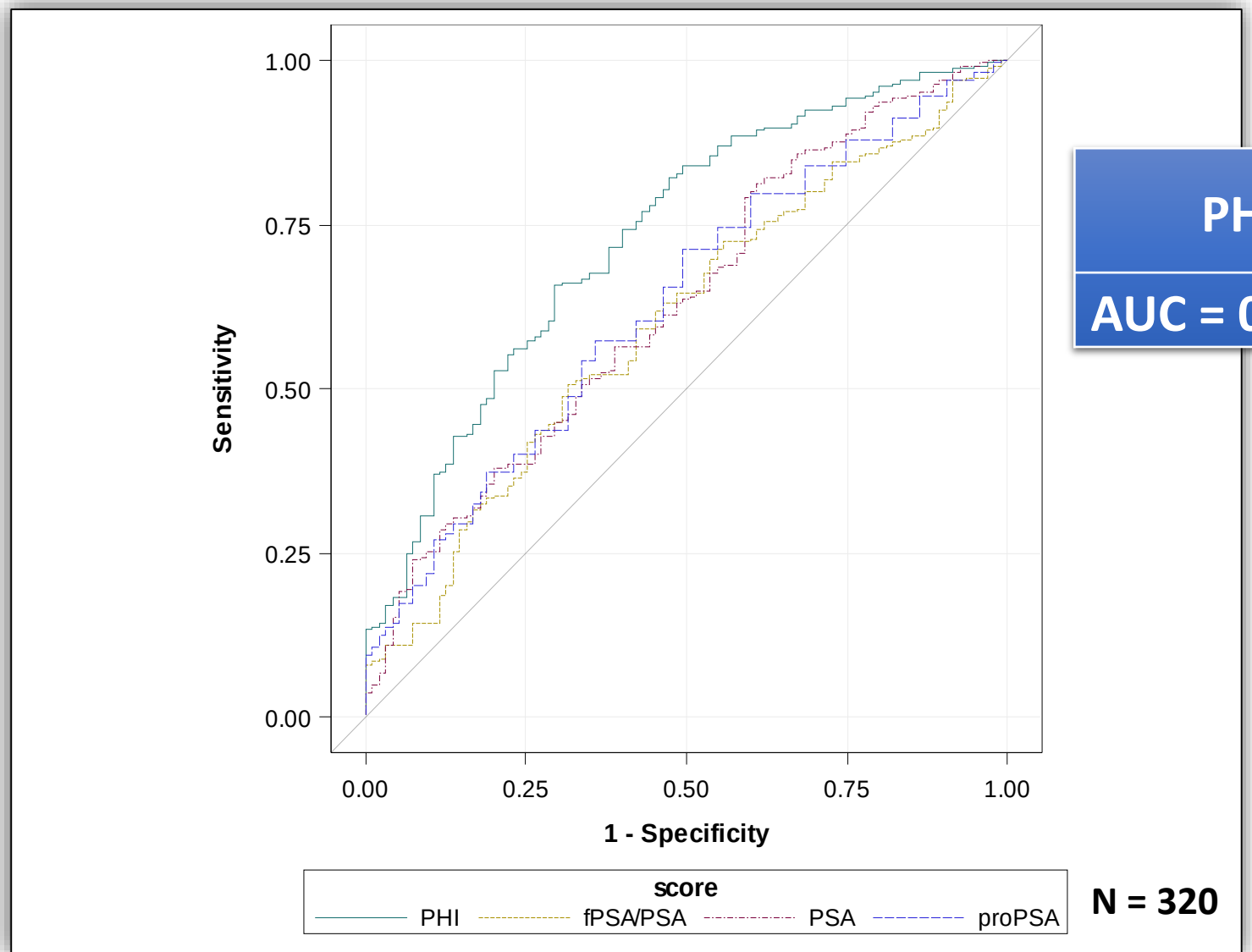
ROC - biopsy Gleason Score (GS6 vs GS>6)



PHI

AUC = 0.6230

ROC - histology after radical prostatectomy (RAPE)
Gleason Score (GS6 vs GS>6)



PHI

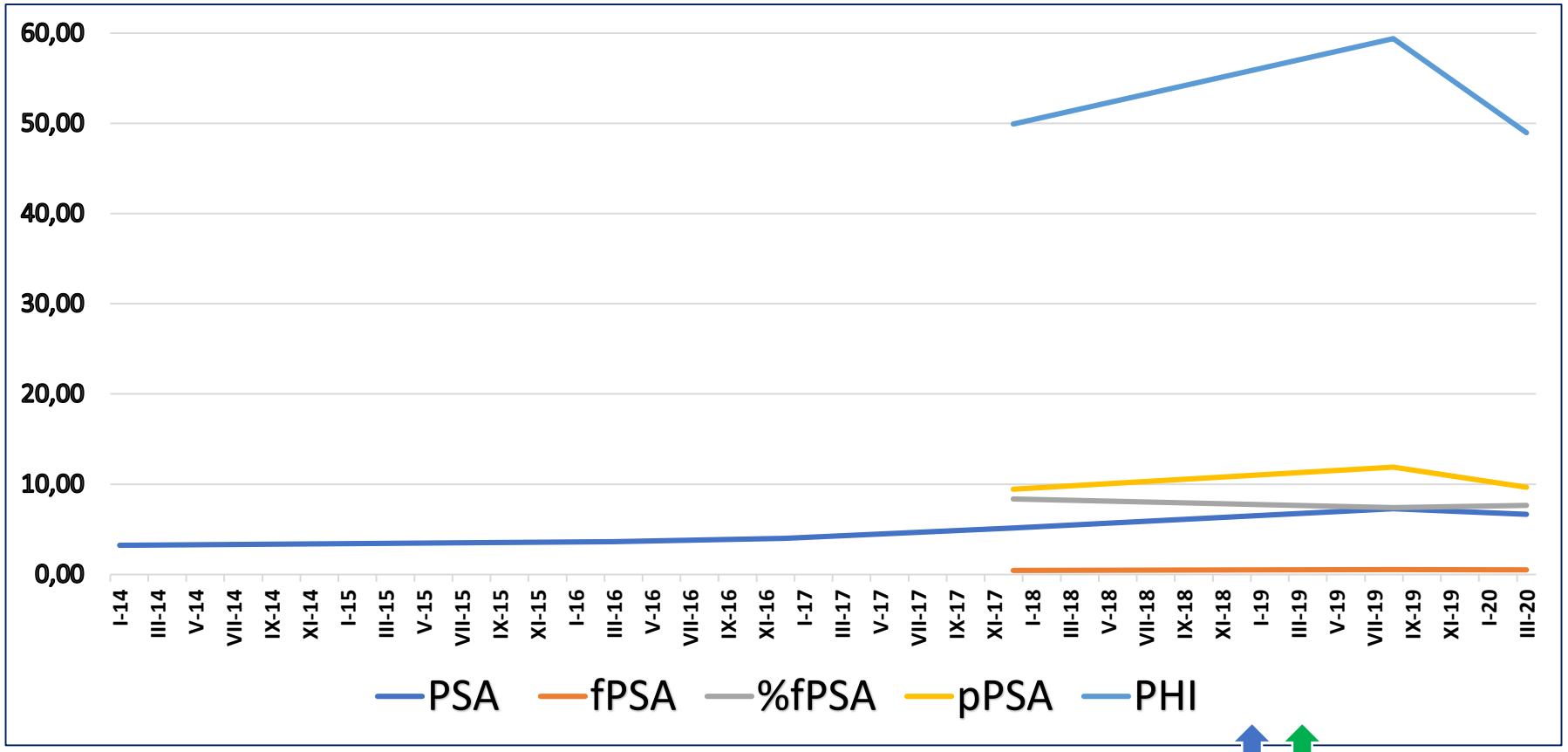
AUC = 0.7496

3 casuistics

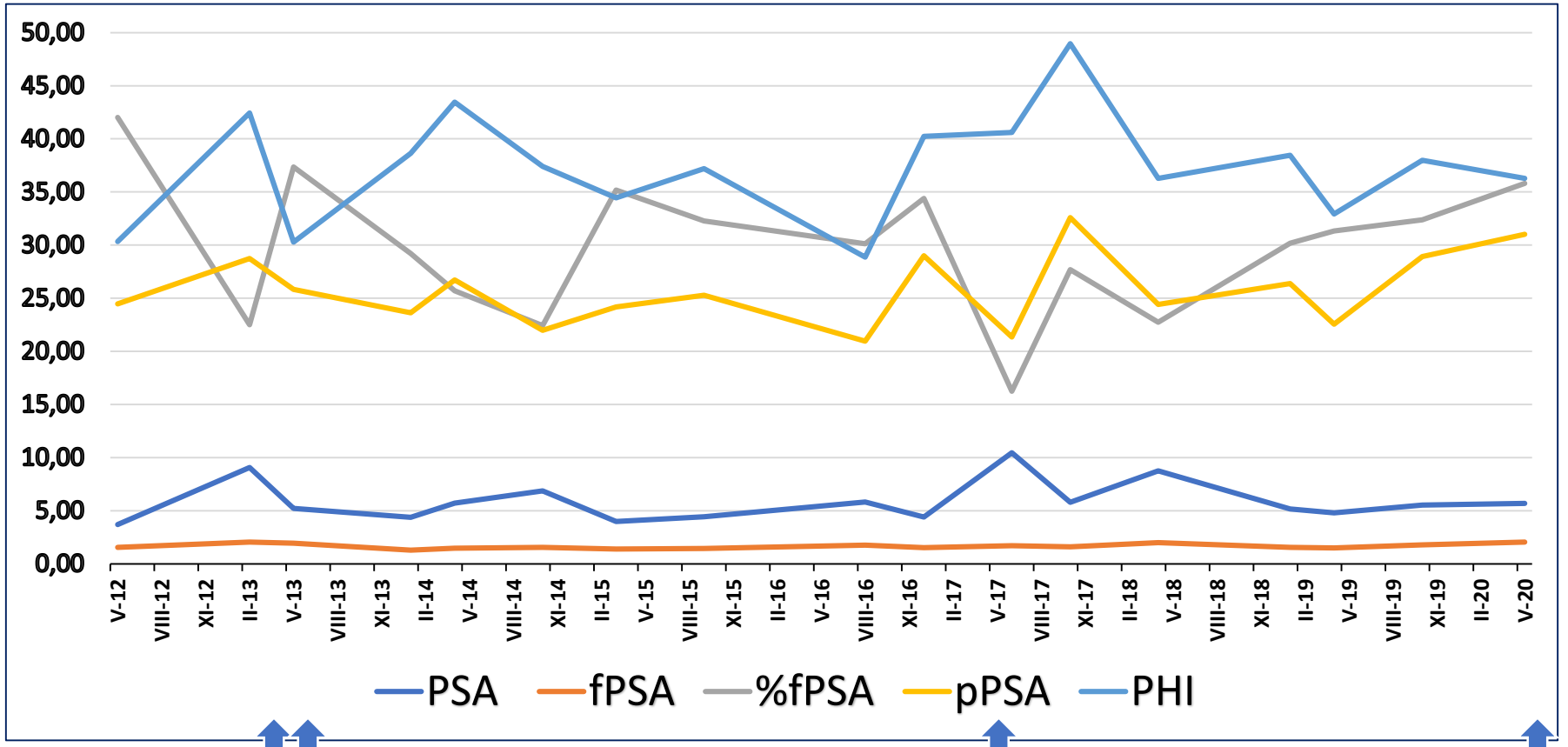
University Hospital in Pilsen

2012 – 2020

Patient 1 (age 77) 01/2014 – 03/2020



Patient 2 (age 77) 05/2012 – 05/2020



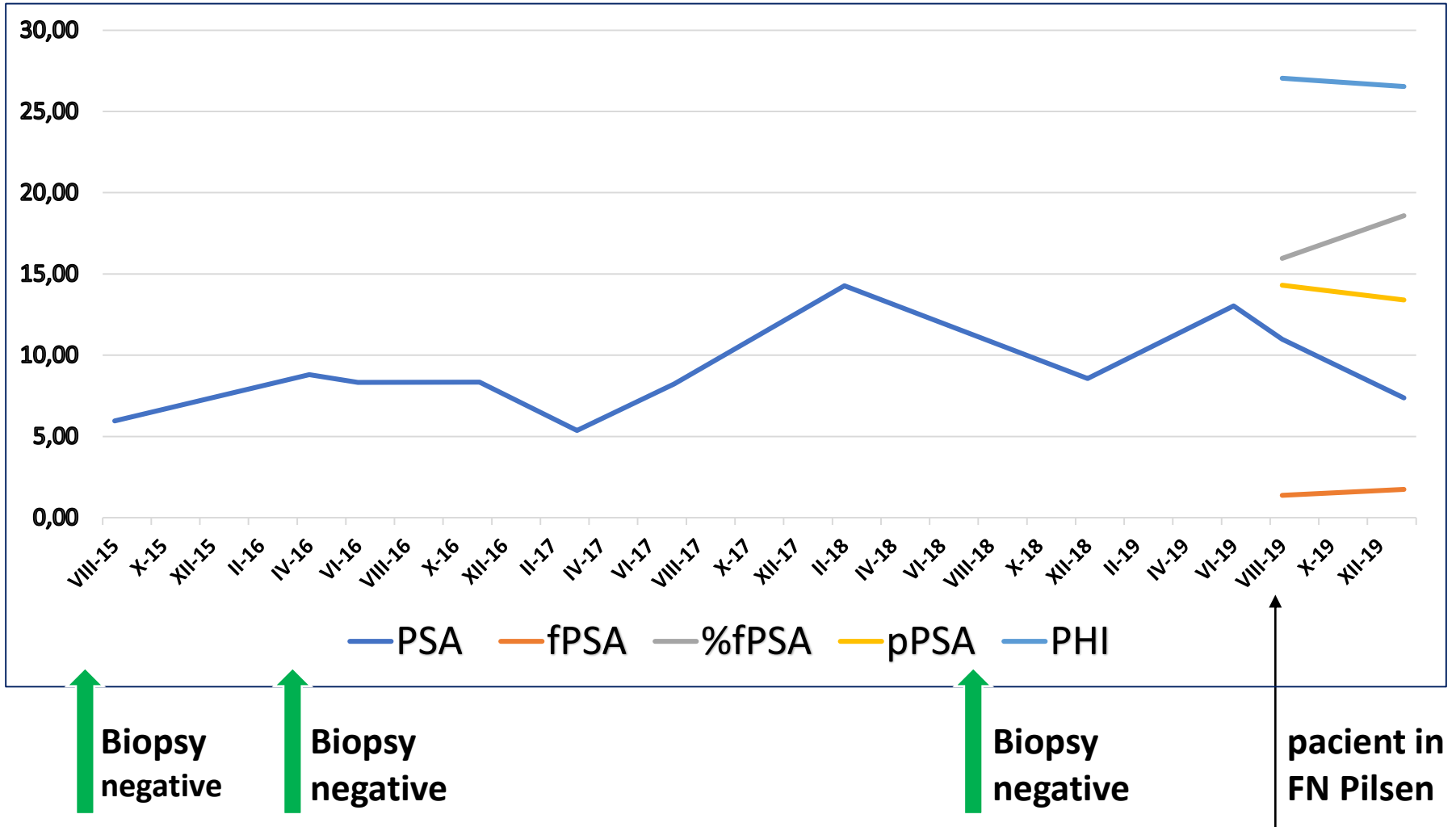
MRI
adenomyomatous hyperplasia

PET/CT ^{18}FCH
adenomyomatous hyperplasia

MRI
benign hyperplasia PIRADS 2

MRI
adenomyomatous hyperplasia PIRADS 2

Patient 3 (age 71) 08/2012 – 01/2020

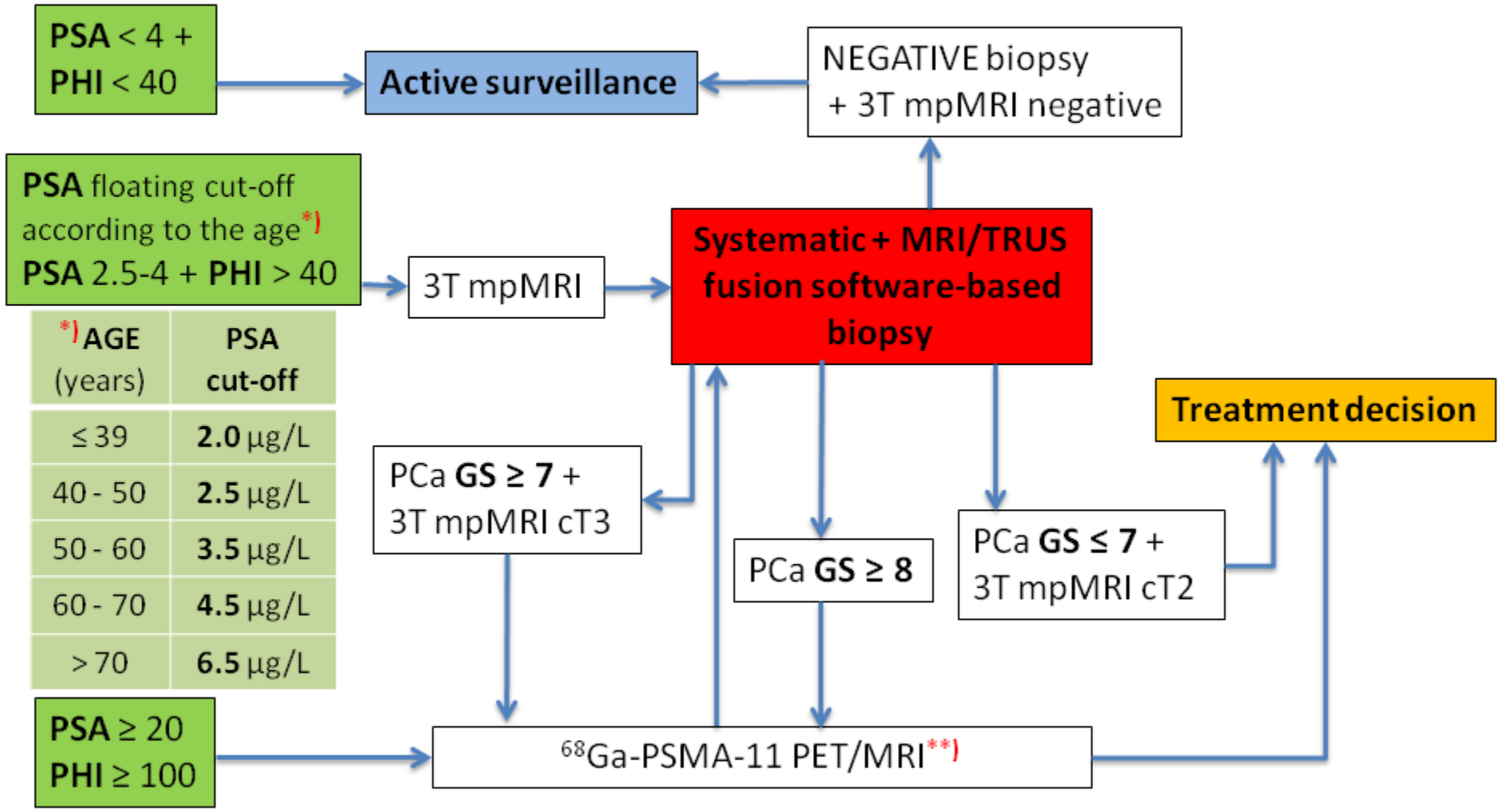


Diagnostic algorithm of Prostate Cancer

- patient stratification
- comprehensive staging
- aggressiveness assessment

Sedláčková H, Dolejšová O, Hora M, Ferda J, Hes O, Topolčan O, Fuchsová R, Kučera R. Prostate Cancer Diagnostic Algorithm as a "Road Map" from the First Stratification of the Patient to the Final Treatment Decision. **Life** (Basel). **2021** Apr 7;11(4):324.

The diagnostic algorithm for suspected prostate cancer at University Hospital in Pilsen



*) AGE (years)	PSA cut-off
≤ 39	**2.0** µg/L
40 - 50	**2.5** µg/L
50 - 60	**3.5** µg/L
60 - 70	**4.5** µg/L
> 70	**6.5** µg/L

**) ^{68}Ga-PSMA-11 PET/MRI is currently prefered in the Hospital, when PSMA PET is not available ^{18}F-choline PET/MRI is recommended

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Conclusions

- **1) Tumour aggressiveness and choice of the appropriate treatment**
- **2) Active surveillance**
- **3) The Diagnostic Algorithm reflects addvances in**
  - ✓PSA markers
  - ✓Biopsy techniques
  - ✓Imaging methods

Thank my Colleagues and Institutions

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- Medical Faculty in Pilsen, Charles University

- Hana Sedlackova
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Thank you for your attention