**Supplementary 1. Study algorithm**Abbreviations: PET: positron Emission Tomography, CT: computed Tomography, EMD: electronical medical data system, PM: primary malignancies.

**Retrospective study: data was extracted from the electronical medical system**

**Cohort = 217 patients**

With pathologically proven all stages

oropharyngeal and hypopharyngeal cancer

diagnosed between 01/01/2005 – 31/12/2017

**Exclusion:** Histology other than squamous cell carcinoma

**198 patients**

**Exclusion:**

* Simultaneous, synchronous, metachronous head & neck malignancies
* Recurrences of pharyngeal cancer
* Metastases from other sites
* Patients monitored at other hospitals
* Patients who refused surveillance
* Patients who did not receive curative treatment
* Residual disease after primary therapy

**132 patients patient**

**Analysis 2**

**Analysis 1**

**-**

**-**

**Analysis 1**

*Statistical Analysis*

*Data extraction*

**Data extracted from the electronical medical data system (EMD) for each patient (N=132):**

Patient and tumor characteristics

* Age at diagnosis of primary tumor
* Sex
* Primary site
* Grade of differentiation
* Tumor Stage
* Curative Treatment

Outcome

* Start & End of Treatment
* Recurrence: YES / NO
* Date of recurrence
* Alive or dead at 31/07/2017: 0 / 1
* Date of death or date of last follow-up consultation in the EMD

If recurrence

* Local/Regional/Distant
* Symptoms at time of recurrence: YES/NO
* Detection of metastases: NO / YES  
  + date if YES
* Treatment of recurrence

Detection of recurrence

* PET or PET-CT positive for recurrence: YES / NO   
  + date if YES
* Physical or ENT examination positive for recurrence: YES / NO  
  + date is YES
* Other imaging positive for second event: YES / NO   
  + date if YES

Other primary malignancies (PMs)

* Secondary PM: YES / NO
* Third PM: YES / NO
* Fourth PM: YES / NO

+ Date of detection

+ Location

**Kaplan-Meier estimation** of the cumulative incidence of SPMs discovered after completion of primary therapy. (Fig 5)

**Descriptive Statistics for** detection method

* Firs detection by: PET/CT or Physical Examination or Other

The influence of detection by PET/CT vs. clinical examination on overall survival after recurrence was examined using **Kaplan-Meier analysis and the Log-Rank (mantel-cox) tests.** (Fig. 4)

**Descriptive Statistics** for patient and tumor characteristics (Table 1)

**Time of follow-up** after end of treatment until 31/07/2017 ranged from 22 days – 12 years. Median time of follow-up was 2.67 years.

Taking into account the different time periods of follow-up, the **Kaplan-Meier curve** was used to visualize the incidence of recurrence in relation to time after treatment.

* **‘Relapse-free survival’**: (Fig. 1)

the time between completion of treatment and diagnosis of recurrence, with patients who died from other causes being censored.

* **Incidence of recurrence:** (Fig. 2)
* **‘Overall survival after recurrence’:** The time between diagnosis of recurrence and death from any cause was termed (Fig. 3)

**Analysis 2**

***Data extraction:*** *For each included patient (N = 132), All PET/CT-scans performed as routine follow-up were collected from the EMD. If recurrence was confirmed or an SPM was detected, subsequent scans were not included in the evaluation.*

**396 PET/CT scans performed as routine follow-up**

**370 PET/CT scans included for analysis 2**

**Exclusion**:

If the follow-up period after the scan was less than 6 months, except for death due to recurrence.

**First step:** Each PET/CT scan was categorized according to the time interval after finishing primary treatment  
🡺 Table 2

**Second step:** Each PET/CT scan was scored: Negative (0) / Equivocal (1) / Positive (1)  
🡺 Fig. 6a

**Third step:** The Outcome for each PET/CT scan was scored after 6 months based on information found in the EMD during this time-interval: Recurrence (1) / No recurrence (0)

**Fourth Step:** Each PET/CT scan was scored True/False Negative/Positive based on the results of the second and third step  
🡺 Fig. 6b

**Fifth Step**: The accuracy was evaluated with descriptive statistics using crosstabs to calculate sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for each time interval.  
🡺 Fig. 7

**39** **PET/CT** scans

**34  
PET/CT** scans