

Status of particle facilities in Europe

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&

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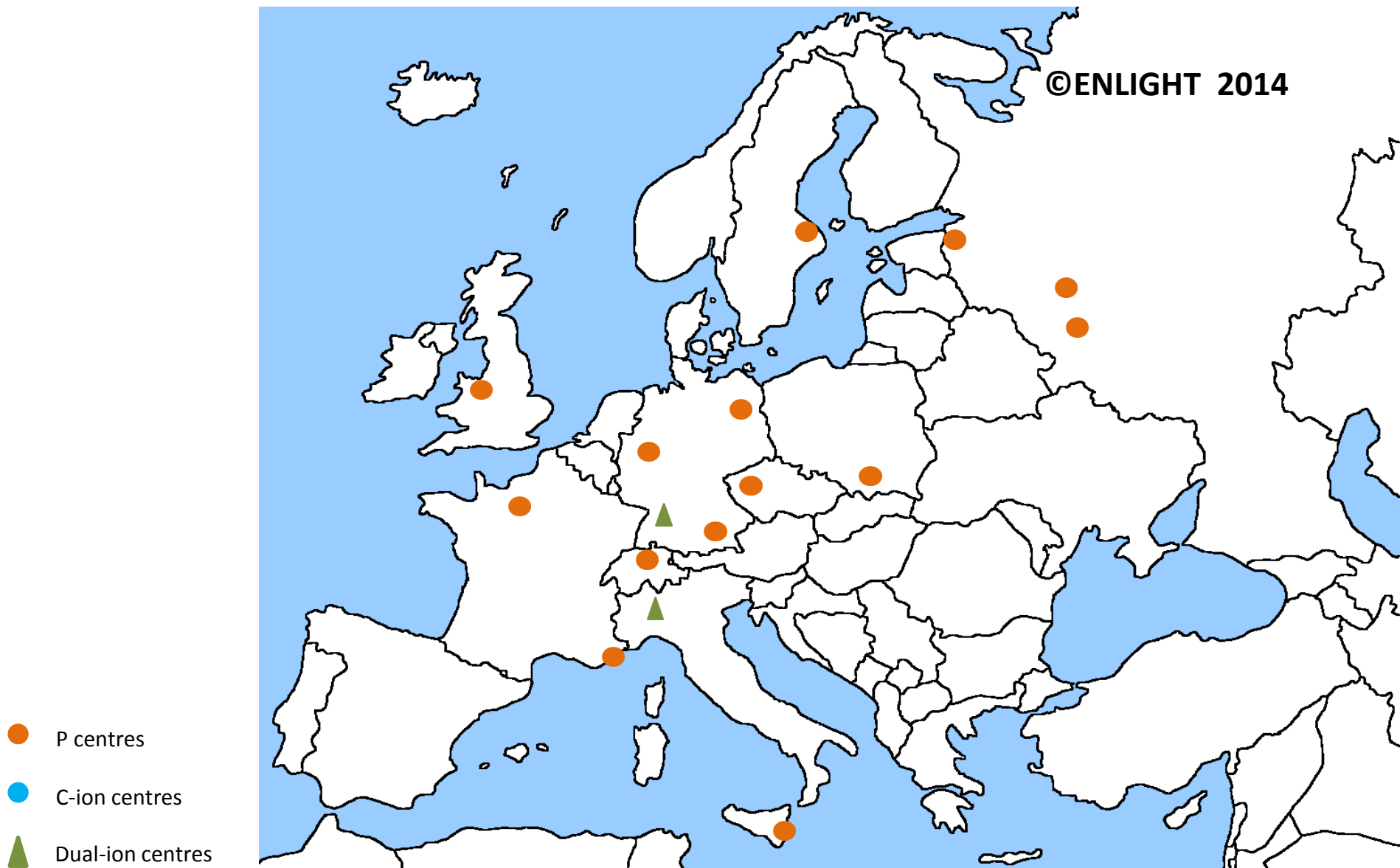
Contents

- General evolution and distribution of PT facilities in Europe (BT)
- Project phase of a new facility / BE (KH)
- Start-up and operation / WPE-DE (BT)

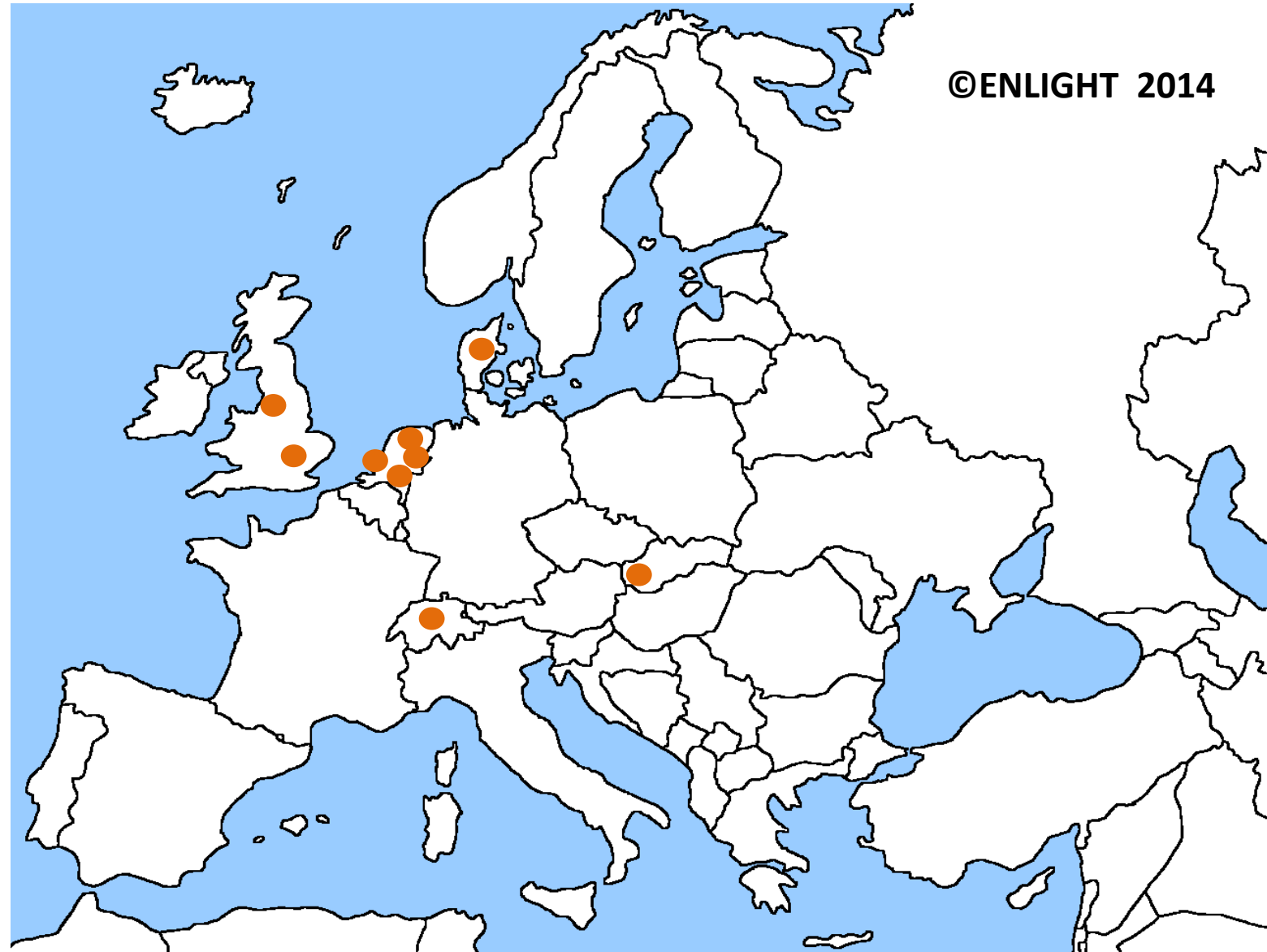
Particle therapy centres in Europe - 2002



Facilities in operation 2014 - Europe



Facilities being planned - 2014

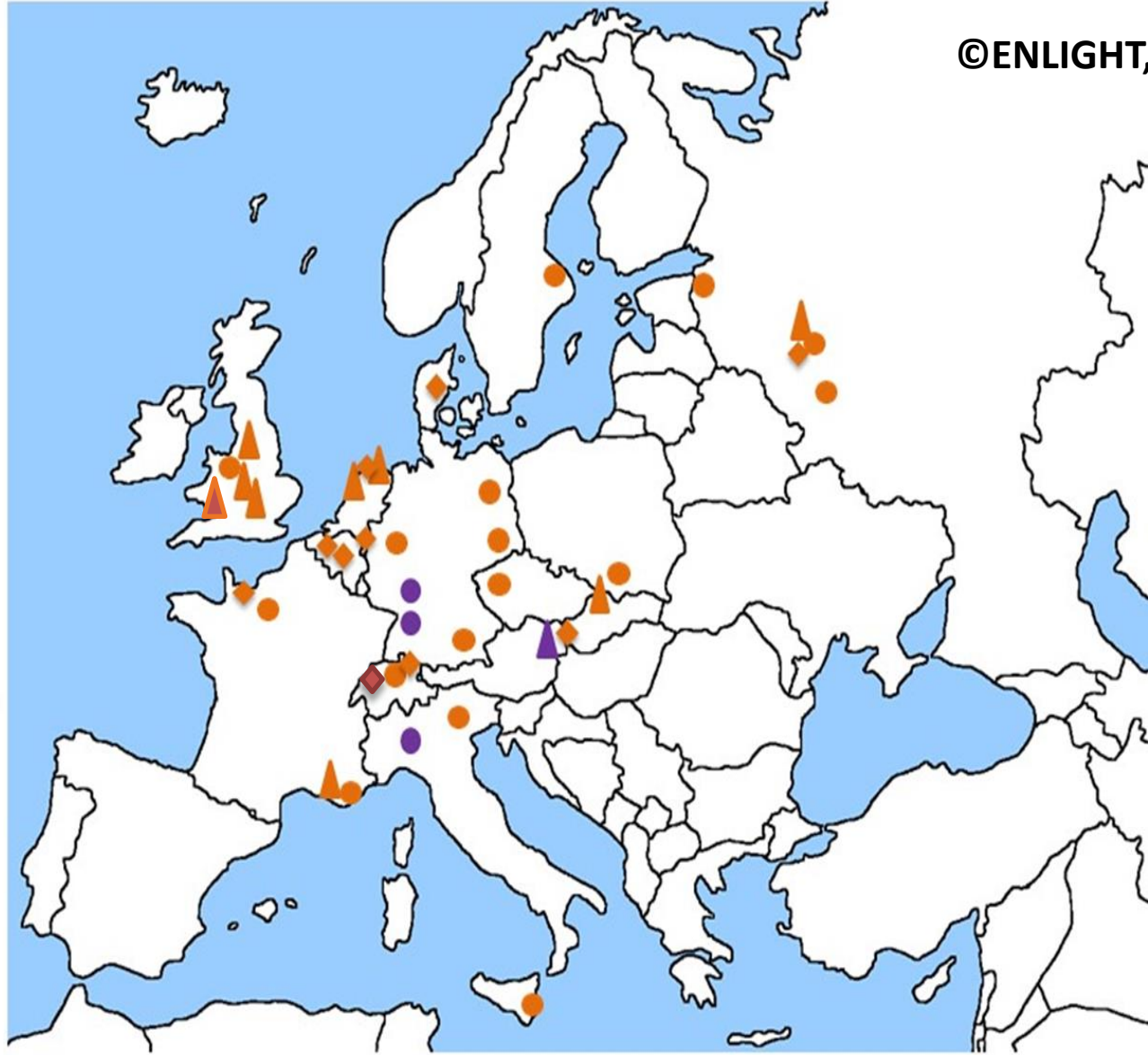


Particle Therapy Centres in Europe

2016

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- In operation:
 - Proton
 - Dual Ion
- Under construction:
 - Proton
 - Dual Ion
- Being planned:
 - Proton
 - Dual Ion



Particle therapy facilities in Europe in operation

country	who, where	particle	beam directions	no. of treatment rooms	start of treatment
Czech Republic	PTC Czech r.s.o., Prague	p	3 gantries, 1 horiz.	4	2012
England	Clatterbridge	p	1 horiz.	1	1989
France	CAL, Nice	p	1 horiz.	1	1991
France	CPO, Orsay	p	1 gantry, 2 horiz.	3	1991
Germany	HZB, Berlin	p	1 horiz.	1	1998
Germany	RPTC, Munich	p	4 gantries, 1 horiz.	5	2009
Germany	HIT, Heidelberg	p, C-ion	2 horiz., 1 gantry	3	2009, 2012
Germany	WPE, Essen	p	4 gantries, 1 horiz.	4	2013
Germany	PTC, Uniklinikum Dresden	p	1 gantry	1	2014
Germany	MIT, Marburg	p, C-ion	3 horiz., 1 45degraded	3	2015
Italy	INFN-LNS, Catania	p	1 horiz.	1	2002
Italy	CNAO, Pavia	p, C-ion	3 horiz., 1 vertical	4	2011, 2012
Italy	APSS, Trento	p	2 gantries, 1 horiz.	3	2014
Poland	IFJ PAN, Krakow	p	1 horiz.	1	2011
Sweden	The Skandion Clinic, Uppsala	p	2 gantries	2	2015
Switzerland	CPT, PSI, Villigen	p	2 gantries, 1 horiz.	3	1984, 1996, 2013

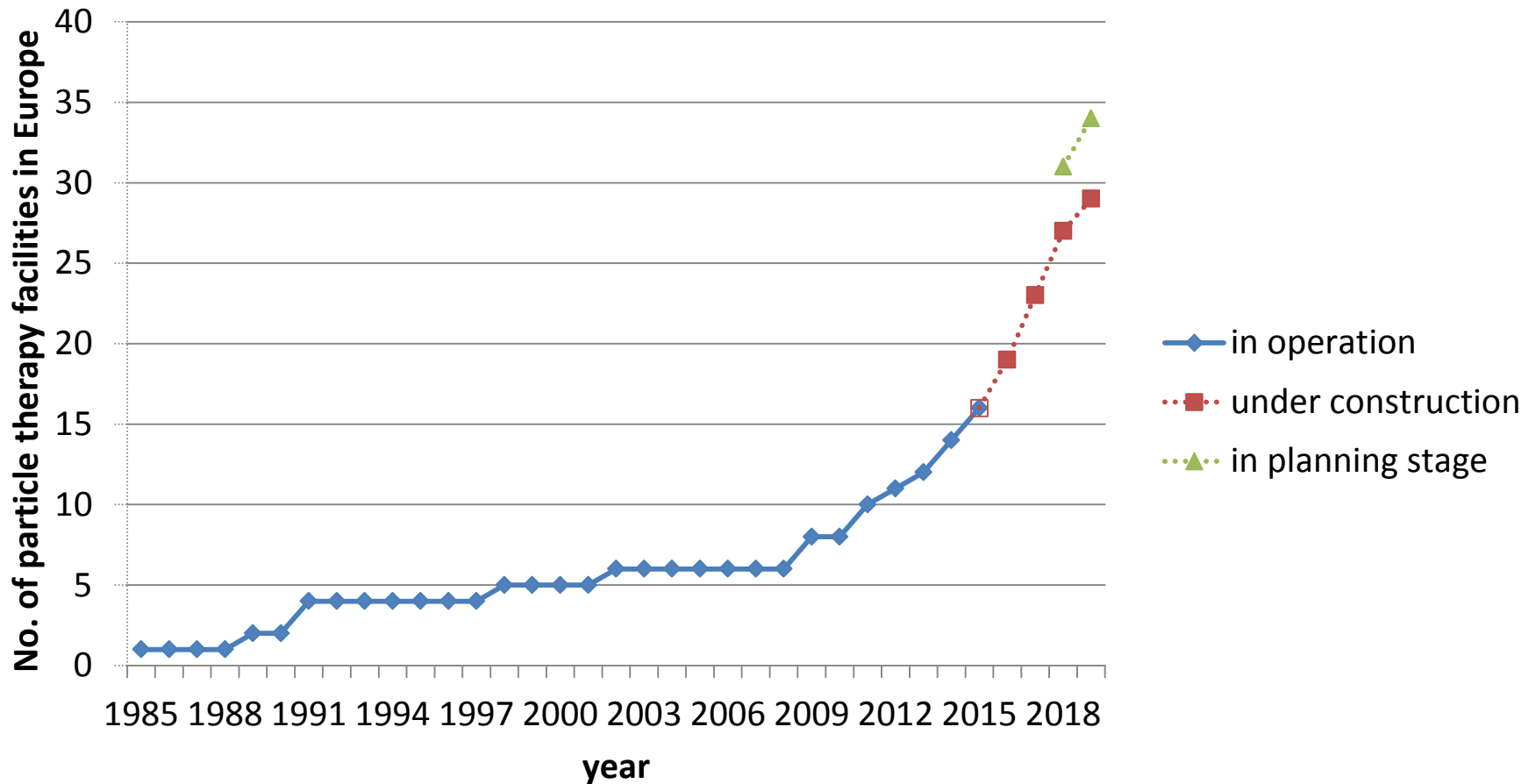
Particle therapy facilities in Europe under construction

country	who, where	particle(s)	beam directions	no. of treatment rooms	start of treatment planned
Austria	Med-AUSTRON	p, C-ion	1 gantry (for protons)	3	2016
Denmark	DCPT, Aarhus	p	3 gantries, 1 horiz. fixed beam	4	2018
France	Centre Antoine Lacassagne, Nice	p	1 gantry	1	2016
Netherland	HollandPTC, Delft	p	2 gantries, 1 horiz. fixed beam	3	2017
Netherland	UMC PTC, Groningen	p	2 gantries	2	2017
Poland	IFJ PAN, Krakow	p	2 gantries, 1 horiz. fixed beam	3	2016
Slovak Rep	CMHPTC, Ruzomberok The Christie Proton Therapy Center,	p	1 horiz. fixed beam	1	2017?
United Kingdom	Manchester	p	3 gantries	3	2018
United Kingdom	PTC UCLH, London	p	3 gantries	3	2019
United Kingdom	Proton Partners Int., Northumbria	p	1 gantry	1	2018
United Kingdom	Proton Partners Int., Newport, Wales	p	1 gantry	1	2017
United Kingdom	Proton Partners Int., Reading	p	1 gantry	1	2018
United Kingdom	Proton Partners Int., Imperial-West, London	p	1 gantry	1	2019

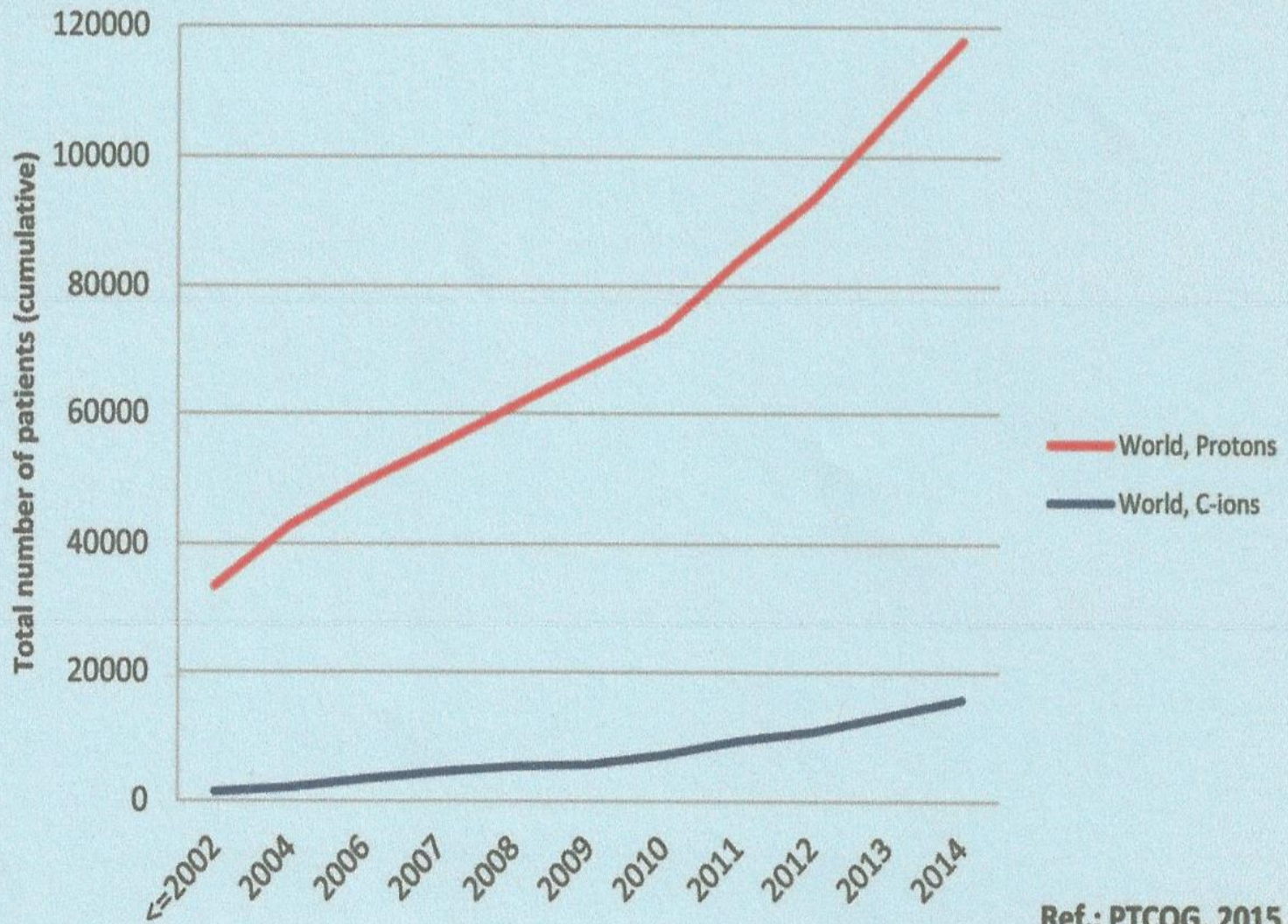
Particle therapy facilities in Europe in planning stage

country	who, where	particle	beam directions	no. of treatment rooms	start of treatment planned
Belgium	University Hospitals Leuven, Leuven	p	1 gantry	1	2018
France	ARCHADE, Caen	p	1 gantry	1	2018
Netherland	APTC Amsterdam	p	2 gantries	2	2018
Netherland	PTC, Maastricht	p	1 gantry	1	?
Slovak Rep.	CCSR, Bratislava	p	1 horiz fixed beam	1	?
Switzerland	PTC Zürichobersee, Galgenen	p	4 gantries	4	2019
Switzerland	CHUV, Lausanne	p	1 gantry	1	2018?

Development of the no. of particle therapy facilities in Europe over time



Patients Treated with Protons and C-ions Worldwide



Essen Facility – WPE

- start-up
- ramp-up
- operation



To do`s: Start-up

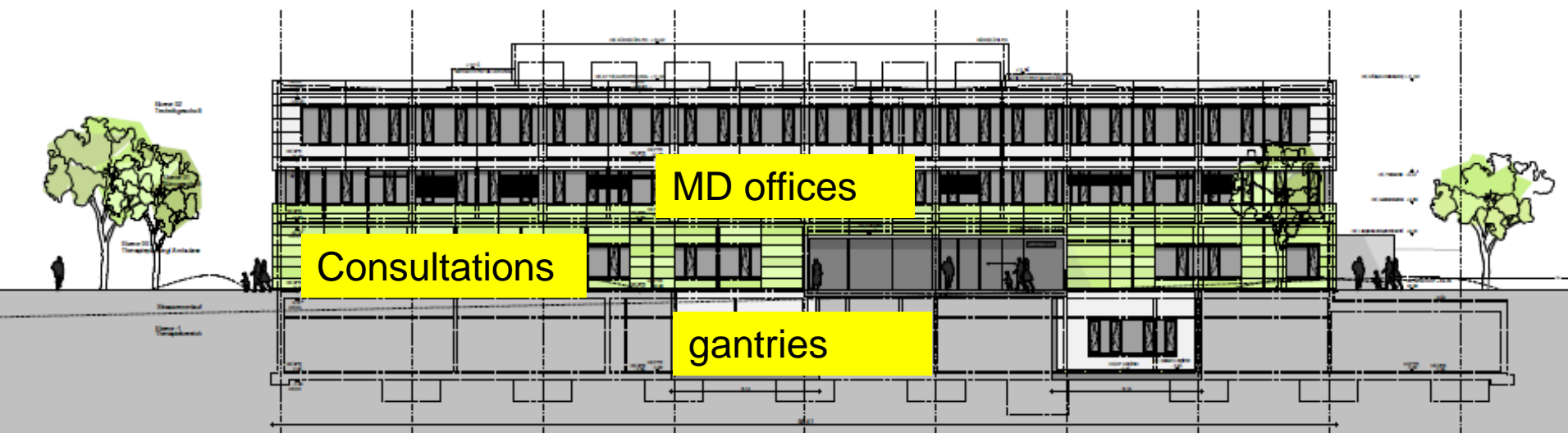
- **Commissioning** (room by room, modality by modality)
- Define **radiation safety and QA** procedures
- **Approval from authorities** (room by room, modality by modality)
- **Define processes/workflow/structures**
- Writing **treatment protocols**
- Set up **documentation strategies/software**
- **Build the team**
- Link to **partners for medical care**
- Find **cooperators for referral**
- Close contracts with **insurances**



To do's: Ramp-up

- **Recruitment of team** - continuously
- **Education and training** of the team
- Expand treatment workflow
- **Tumor board participation and patient selection**
- **Evaluate and refine processes**
- **Research**
- **Technical development, new installations, approvals** - continuously(!)
- Referrals – **network to grow** continuously
- **Marketing** activities
- **Generate SOPs, protocols...**





Authorities, 2015:

- 2 „fachkundige“ seniors in house
- 1 „fachkundiger“ senior at the gantries (level -01)
- WPE: 4 „Fachkundige“ in total -> holidays, tumor boards?

Surprise, surprise

Ergo:

- Increase number of „fachkundige“ seniors
- Move consultations & offices to level -01



Meetings at WPE - transfer of knowledge

- MD meeting (MDs)
- Physics meeting (MPs)
- Planning meeting (MDs, MPs, RTT)
- MD educational meeting (MDs and study office)
- Study meeting (MD, study office)
- Tumor boards (MDs internal and external); n=7 + 2 webconf.
- M&M conference (MDs external and internal)
- RTT educational meeting (presented by MDs and MPs)
- **Positioning meeting** (MD, MP, RTT)
- **Scheduling meeting** (MD, MP, CM)
- **Quality circle** (1 on treatment, 1 on patient intake, 1 with team leaders)
- „**Bug**“ meeting (iba, MD, MP)
- **Joint steering committee meeting** (iba, MP, MD, admin)



Quality assurance

- Successfully undergoing Ärztliche Stelle audit (2014 + 2016)
- Successfully undergoing Onkozert audits (2015 + 2016)
- Successfully achieved Din En ISO certification (2016)

Prerequisites:

SOPs, trainings concepts, quality circles, critical incidence report system ...



Insurances

- Contracts with public insurances renewed/modified
- Structures WPE modified according to contract
- Trustful communication, annual meetings
„Kassenbeirat“ (n=2)

Challenges:

- agreement on hyperfractionation
- agreement on accomodation
- contracts with privat insurances



Agreements on Indications

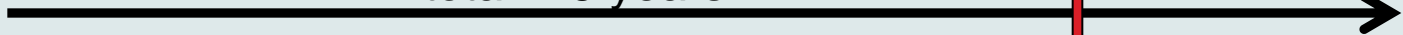
- **Choroidal tumors**
- **Chordomas & Chondrosarcomas**
- **Pediatric Tumors** (*accepted without evaluation*)
- *Gliomas*
- *Recurrent Gliomas*
- *Meningiomas*
- *AVM's*
- *H&N-Tumors*
- *Oesophageal Cancer*
- *Lung Cancer*
- *Pleuramesotheliomas*
- *Prostate Carcinomas*
- *Gynaecological Cancer*
- *Hodgkin's disease*
- *Liver- and Gallbladder/Bile Duct Cancer*
- *Soft Tissue and Bone Sarcomas*

Standard indications for PT

The mission: Obtain evidence, collect data !



Technical Status WPE

Raum	MS* I	MS II	MS III	MS IV	MS V	MS VI
	total 4-5 years 					
GTR3	CC: US	Patients				
GTR4		CC: PBS	Patients			
GTR2			CC: PBS	Patients		
FBTR				CC: PBS	Patients	
Additional Modi					CC / Patients: GTR3 DS/PBS/(SS), FBTR US/Eye	
Indications		Peds./ CNS, BoS	+ spine, pelvis	+ H&N	+ Liver + Lung	

*MS = Milestones

Continuous technical developments after start

- „Through table“ fields (straight and oblique)
- Very small and shallow targets
- „Matched fields“
- Transporter & out-room CT for dose verification and adaptive (Re-) Planning
- Pencil beam scanning in addition to US
- Align RT
- 2. Range Shifter (5.1 cm)
- Stand-off holder (PBS, reducing air gap)
- Raysearch (basic functionality, PBS)
- Craniospinal PT, IMPT and SiB



Inquiries (June 2013 – October 2014)

Diagnoses	Adults	Peds.	Age?	total
CNS	105	159	1	265
Sarcoma	85	107	1	184
H&N	9	1		10
Prostate				
Lung				
Lymphoma				
Breast	22			22
Pancreatic	52			52
Choroid. melanoma	6			6
others	209	32	11	252
total	776	301	14	1,091

10% treated only



Coordination of technical activities (MD/MP and third parties)

- Agree on to do`s and priorities
- Coordination: Medical needs versus technical feasibility / maturity
- Scheduling & sharing beam time
- Distributing appropriate staff from all parties
- Keep within contractual frame & ramp-up plan
- React coordinated and in a fast manner in case of unexpected technical events !



Events, promotion

- PTCOG 2013
- Course on pediatric RT (annual)
- **ESTRO Particle Course 2017**
- Courses for practitioners & Oncologists
- Tours for external colleagues, hospitals and departments
- Courses & tours for patient advocacy groups
- Training of colleagues from other projects (MDs, MPs, RTTs)
- Webpage, Flyers, Newspaper, video clips, TV...
- Articles, posters, presentations...



Status WPE

1. Patient at 20.5.13



1. Ch



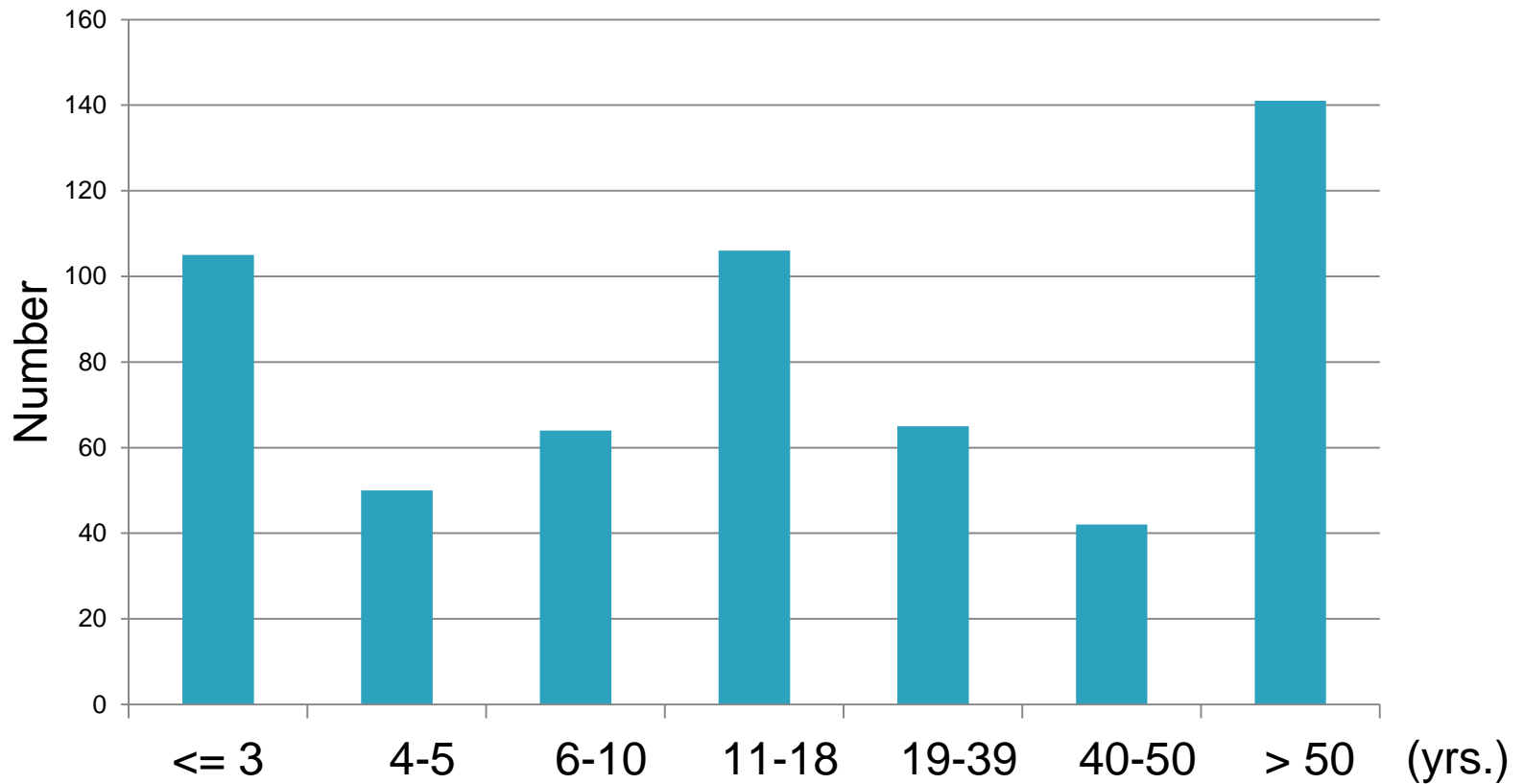
All patients treated so far at WPE

	N / years
Patients	573
Age, median (range)	15.3 (0.9 – 95.1)
adults (\geq 18 yrs.)	253 (44%)
peds. (< 18 yrs.)	320 (56%)
under sedation	179 (31%)

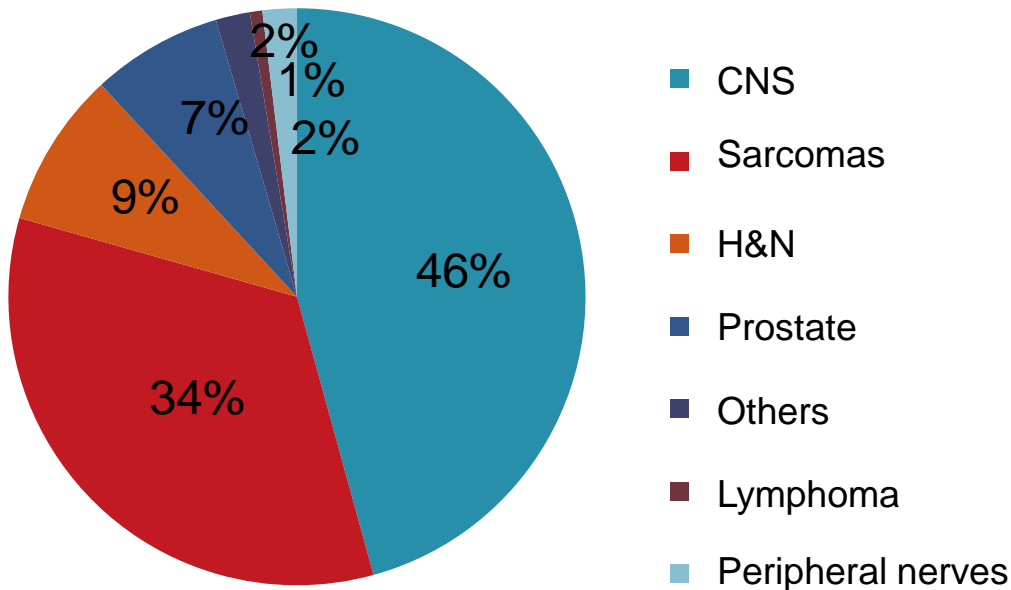
Status 31.08.2016



Age distribution



Diagnoses



Site	%
CNS/BoS/H&N	75%
Pelvis	14%
Spinal/paraspinal	11%

Timing of PT	%
Primary TX	80%
Salvage TX	20 %

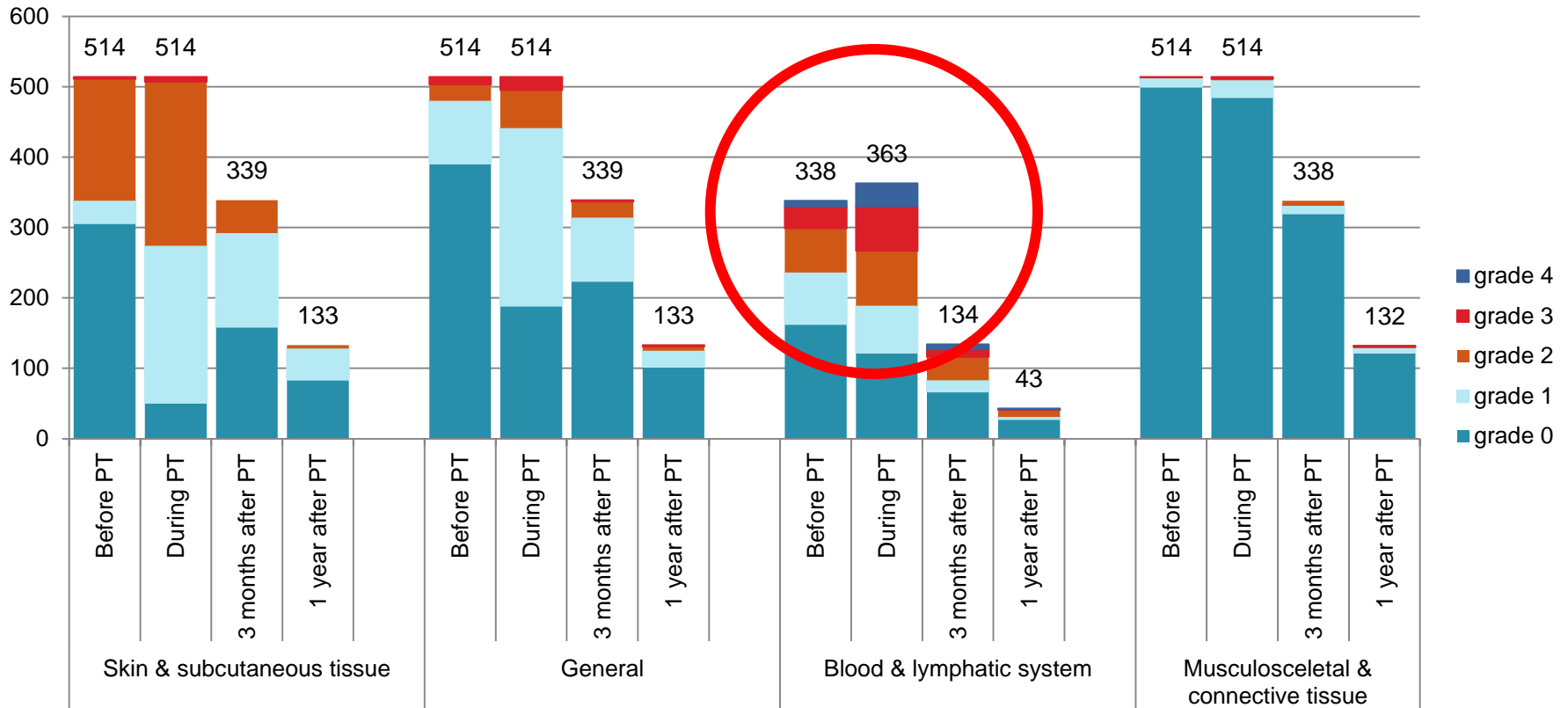


Registry studies

Register	N
KiProReg	311
ProReg	231
ProRegPros	21
none	10



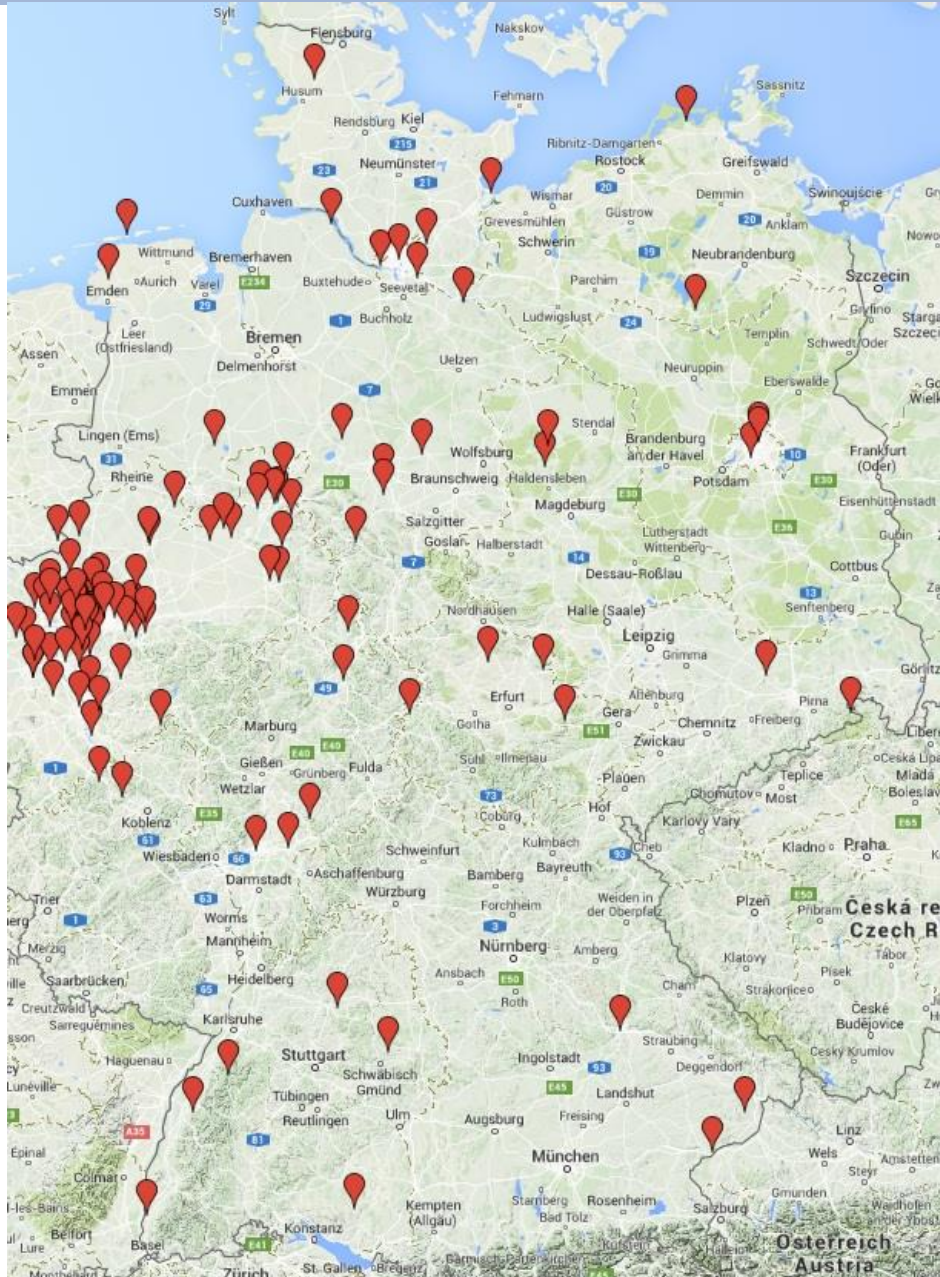
(early!) Toxicity (1)



(early!) Tumor control

	N
Tumor control	437 (84%)
Failure	82 (16%)
Local	48
dissemination	28
Local & dissemination	5
SMN	1
deceased	30 (5.8%)
DOD	29
other	1





Inquiries national/international

international:

Argentina

China

Greece

GB

Irland

NL

Pakistan

Russia

Spain

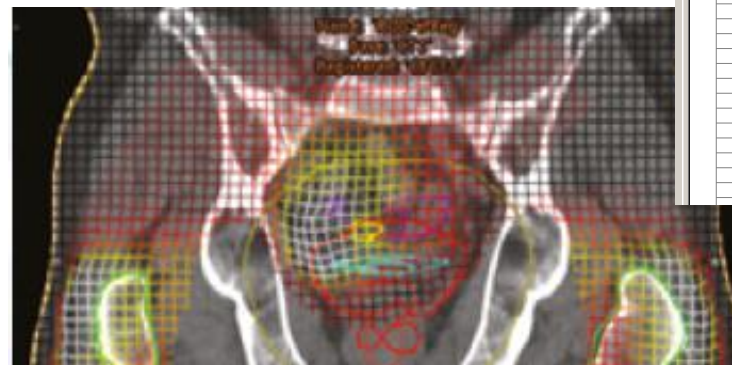
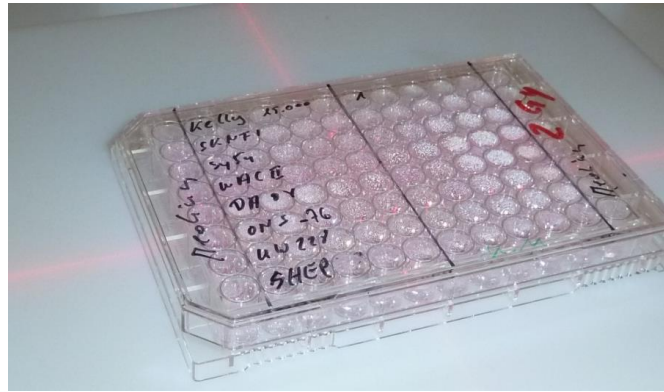
Ukraine

Hungary

Emirates



Establishing R & D Programme



Diagnosis: Bösartige Neubildung: Bindegewebe und andere Weichteilgewebe des Beckens [C49.5]
 Histology: Spindle cell sarcoma [88013.00] MD

Flowsheet | Clinician Worksheet | Laboratory | Vital Signs | Untersuchungen | Graphs | CM | Anfragen | Studien | F

Date	21.11.13	06.1.14
Time	16:50	12:50
☞ Visit	T0	T0001
☞ Körperlicher Allgemeinzustand		
Größe	186.00 cm	186
Gewicht	105.00 kg	99.40
HF		82.00
systolischer Blutdruck		115
diastolischer Blutdruck		72
WHO Performance Scale	1	0
Lansky Scale <16y (KIPr)		
Karnofsky Ind >=16y (KIF)		
☞ Behandlungsziel		
Behandlungsziel	1	1
☞ Bestrahlungskonzept		
neoadjuvant	Y	Y
adjuvant		
definitiv		
kombiniert mit CTx		
Bemerkung		
☞ Vortherapie - tumorspezifisch		
Chemotherapie	Y	
Operative Tumorresektion		
Bestrahlung		
Hormontherapie		
☞ Relevante Komorbiditäten		
DM	0	
Bemerkung DM		
Art. Hypertonie	0	
Bemerkung art. Hyperton		
KHK	0	
Erläuterung KHK		
Vaskuläre Erkrankungen	0	
Erläuterung vask. Erkrank		
cerebrovask. Erkrankung	0	
Erläuterung cerebrovask		
Chron. entzündl. Erkrankun	1	1
Erläuterung chron. entz. E		
Atemwegserkrankungen	Sarkoidose Lunge und Magen	Sarkoidose
Erläuterung Atemwegserk		
Allergien		
Erläuterung Allergien		
Vor-OP in bestrahlter Reg	0	
Erläuterung Vor-OP		



Thank you & Team WPE

