



Particle Therapy Statistics in 2014

Martin Jermann, MSc

Secretary of the Particle Therapy Cooperative Group
Paul Scherrer Institute, Villigen, Switzerland

More than 137 000 patients were treated with particle therapy worldwide from 1954 to 2014, including 15 000 in 2014, 86% of which were treated with protons and 14% with carbon ions and with other particles (**Table 1**). In 2014, about 10% of patients were pediatric and another 10% were treated for ocular melanomas. Forty-eight particle therapy facilities were in clinical operation at the end of 2014 (**Figure 1**). Two facilities in Asia (one in Lanzhou and the other in Wanjie) were temporarily shut down for technical upgrades and extensions in 2014. One facility in the United States (Indiana University Health Particle Therapy Center, Bloomington, IN) was closed down at the end of 2014 after 10 years of clinical operation. Five new particle therapy centers started patient treatments in 2014. These include two facilities in Asia (Shanghai Proton and Heavy Ion Center in Shanghai, China, and Aizawa Hospital Proton Therapy Center in Nagano, Japan) and three facilities in the United States (the Provision Center for Proton Therapy in Knoxville, TN, the Scripps Proton Therapy Center in San Diego, CA, and the Willis Knighton Proton Therapy Center in Shreveport, LA). **Figure 2**, **Figure 3**, and **Figure 4** depict the number of patients treated with proton and carbon ions and their location.

At the beginning of 2015, more than 30 particle therapy centers, with a total of about 80 treatment rooms, were under construction worldwide. Half of these centers are in the United States and one-third in Asia. About 15 centers expect to start technical and/or clinical commissioning in 2015 and about half of them should be ready for patient treatment before the end of 2015.

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Table 1. Particle therapy patient statistics (per end of 2014).

| Location | | | Particle | First (last) patient, y | Patient total, no. | Date of total, y |
|----------------|------------------|---|----------|----------------------------|-----------------------|---------------------|
| Country | City | Institution | | | | |
| Belgium | Louvain-la-Neuve | - | p | 1991 (1993) | 21 | 1993 |
| Canada | Vancouver | TRIUMF, Canada's national laboratory for particle and nuclear physics | π^- | 1979 (1994) | 367 | 1994 |
| Canada | Vancouver | TRIUMF, Canada's national laboratory for particle and nuclear physics | p | 1995 | 182 | Dec 2014 |
| Czech Republic | Prague | Proton Therapy Centre | p | 2012 | 357 | Dec 2014 |
| China | Zibo | Wanjie Proton Therapy Center | p | 2004 | 1078 | Dec 2014 |
| China | Lanzhou | Institute of Modern Physics, Chinese Academy of Sciences | C ion | 2006 | 213 | Dec 2014 |
| China | Shanghai | Shanghai Proton and Heavy Ion Center | C ion | 2014 | 22 | Dec 2014 |
| China | Shanghai | Shanghai Proton and Heavy Ion Center | p | 2014 | 13 | Dec 2014 |
| England | Clatterbridge | - | p | 1989 | 2626 | Dec 2014 |
| France | Nice | Centre Antoine-Lacassagne | p | 1991 | 5205 | Dec 2014 |
| France | Orsay | Center of Prótontherapy of Orsay | p | 1991 | 7004 | Dec 2014 |
| Germany | Darmstadt | GSI Helmholtz Centre for Heavy Ion Research | C ion | 1997 (2009) | 440 | 2009 |
| Germany | Berlin | Hahn Meitner Institut | p | 1998 | 2525 | Dec 2014 |
| Germany | Munich | Rinecker Proton Therapy Center | p | 2009 | 2307 | Dec 2014 |
| Germany | Heidelberg | Heidelberg Ion-Beam Therapy Center | C ion | 2009 | 1723 | Dec 2014 |
| Germany | Heidelberg | Heidelberg Ion-Beam Therapy Center | p | 2009 | 824 | Dec 2014 |
| Germany | Essen | West German Proton Therapy Centre Essen | p | 2013 | 139 | Dec 2014 |
| Italy | Catania | Istituto Nazionale di Fisica Nuclear (Laboratori Nazionali del Sud) | p | 2002 | 350 | Dec 2014 |
| Italy | Pavia | National Centre of Oncological Hadrontherapy | p | 2011 | 111 | Dec 2014 |
| Italy | Pavia | National Centre of Oncological Hadrontherapy | C ion | 2012 | 318 | Dec 2014 |
| Japan | Chiba | Heavy Ion Medical Accelerator in Chiba | p | 1979 (2002) | 145 | 2002 |
| Japan | Tsukuba | Proton Medical Research Center, 1 | p | 1983 (2000) | 700 | 2000 |
| Japan | Chiba | Heavy Ion Medical Accelerator in Chiba | C ion | 1994 | 8841 | Dec 2014 |
| Japan | Kashiwa | National Cancer Center | p | 1998 | 1560 | Dec 2014 |
| Japan | Hyogo | Hyogo Ion Beam Medical Center | p | 2001 | 4652 | Dec 2014 |
| Japan | Hyogo | Hyogo Ion Beam Medical Center | C ion | 2002 | 2146 | Dec 2014 |
| Japan | Tsuruga | Wakasa Wan Energy Research Center | p | 2002 (2009) | 62 | 2009 |
| Japan | Tsukuba | Proton Medical Research Center, 2 | p | 2001 | 3416 | Dec 2014 |
| Japan | Shizuoka | Shizuoka Cancer Center | p | 2003 | 1757 | Dec 2014 |
| Japan | Koriyama City | Southern TOHOKU Proton Therapy Center | p | 2008 | 2797 | Dec 2014 |
| Japan | Gunma | Gunma University Heavy Ion Medical Center | C ion | 2010 | 1486 | Dec 2014 |
| Japan | Ibusuki | Medipolis Proton Therapy and Research Center | p | 2011 | 1317 | Dec 2014 |
| Japan | Fukui City | Fukui Prefectural Hospital Proton Therapy Center | p | 2011 | 428 | Dec 2013 |
| Japan | Nagoya | Nagoya Proton Therapy Center | p | 2013 | 627 | Dec 2014 |
| Japan | Tosu | SAGA HIMAT – Heavy Ion Cancer Treatment Center | C ion | 2013 | 547 | Dec 2014 |
| Japan | Nagano | Aizawa Hospital Proton Therapy Center | p | 2014 | 1 | Oct 2014 |
| Poland | Krakow | Institute of Nuclear Physics PAN | p | 2011 | 85 | Dec 14 |
| Russia | Dubna | Joint Institute for Nuclear Research, 1 | p | 1967 (1996) | 124 | 1996 |
| Russia | Moscow | Institute for Theoretical and Experimental Physics | p | 1969 | 4368 | Dec 2014 |
| Russia | St. Petersburg | Petersburg Nuclear Physics Institute | p | 1975 | 1386 | Dec 2012 |
| Russia | Dubna | Joint Institute for Nuclear Research, 2 | p | 1999 | 1069 | Dec 2014 |
| South Africa | Cape Town | iThemba LABS | p | 1993 | 524 | Dec 2014 |
| South Korea | Seoul | National Centers of Competence in Research | p | 2007 | 1496 | Dec 2014 |
| Sweden | Uppsala | Swedberg Lab, 1 | p | 1957 (1976) | 73 | 1976 |
| Sweden | Uppsala | Swedberg Lab, 2 | p | 1989 | 1431 | Dec 2014 |
| Switzerland | Villigen | Swiss Institute for Nuclear Research/Paul Scherrer Institute, Piotron | π^- | 1980 (1993) | 503 | 1993 |

Table 1. Continued.

| Country | Location | | Particle | First (last) patient, y | Patient total, no. | Date of total, y |
|--|-------------------------------|---|-------------|-------------------------|--------------------|------------------|
| | City | Institution | | | | |
| Switzerland | Villigen | Swiss Institute for Nuclear Research/Paul Scherrer Institute, OPTIS1 gantry | p | 1984 (2010) | 5458 | 2010 |
| Switzerland | Villigen | Paul Scherrer Institute, Center for Proton Therapy, including the OPTIS2 gantry | p | 1996 | 1906 | Dec 2014 |
| USA | Berkeley, CA | Lawrence Berkeley National Laboratory (184 inch cyclotron) | p | 1954 (1957) | 30 | 1957 |
| USA | Berkeley, CA | | He | 1957 (1992) | 2054 | 1992 |
| USA | Los Alamos, NM | Los Alamos Meson Physics Facility | π^- | 1974 (1982) | 230 | 1982 |
| USA | Berkeley, CA | | ions | 1975 (1992) | 433 | 1992 |
| USA | Boston, MA | Harvard Cyclotron Laboratory | p | 1961 (2002) | 9116 | 2002 |
| USA | Loma Linda, CA | Loma Linda University Medical Center | p | 1990 | 18362 | Dec 2014 |
| USA | Bloomington, IN | Midwest Proton Radiotherapy Institute, 1 | p | 1993 (1999) | 34 | 1999 |
| USA | San Francisco, CA | University of California, San Francisco - Cracker Nuclear Laboratory | p | 1994 | 1729 | Dec 2014 |
| USA | Boston, MA | Massachusetts General Hospital Francis H. Burr Proton Therapy Center | p | 2001 | 8107 | Sep 14 |
| USA | Bloomington, IN | Indiana University Health Proton Therapy Center | p | 2004 (2014) | 2200 | 2014 |
| USA | Houston, TX | MD Anderson Cancer Center | p | 2006 | 5838 | Dec 2014 |
| USA | Jacksonville, FL | University of Florida Health Proton Therapy Center | p | 2006 | 5376 | Dec 2014 |
| USA | Oklahoma City, OK | ProCure Proton Therapy Center | p | 2009 | 1690 | Dec 2014 |
| USA | Philadelphia, PA | Penn Medicine's Roberts Proton Therapy Center | p | 2010 | 2522 | Dec 2014 |
| USA | Warrenville, IL | Chicago Proton Center | p | 2010 | 1782 | Dec 2014 |
| USA | Hampton, VA | Hampton University Proton Therapy Institute | p | 2010 | 1200 | Dec 2014 |
| USA | New Jersey/ Metro New York | ProCure Proton Therapy Center | p | 2012 | 1168 | Dec 2014 |
| USA | Seattle, WA | Seattle Cancer Care Alliance ProCure Proton Therapy Center | p | 2013 | 420 | Dec 2014 |
| USA | St. Louis, MO | S. Lee Kling Proton Therapy Center | p | 2013 | 149 | Dec 2014 |
| USA | Knoxville, TN | Provision Center for Proton Therapy | p | 2014 | 100 | Aug 2014 |
| USA | San Diego, CA | Scripps Proton Therapy Center | p | 2014 | 220 | Dec 2014 |
| USA | Shreveport, LA | Willis-Knighton Cancer Center | p | 2014 | 28 | Dec 2014 |
| Total of all facilities (in and out of operation): | | | | | | |
| | | | He | 2054 | 1957-1992 | |
| | | | Pions | 1100 | 1974-1994 | |
| | | | C-ions | 15736 | 1994-present | |
| | | | Other ions | 433 | 1975-1992 | |
| | | | Protons | 118195 | 1954-present | |
| | | | Grand Total | 137179 | | |

Abbreviations: P, protons, C ion, carbon ions; π^- , pion.

^aData collected by the Particle Therapy Cooperative Group.

Figure 1. Facilities in clinical operation and the number of patients treated from 1955 to 2014.

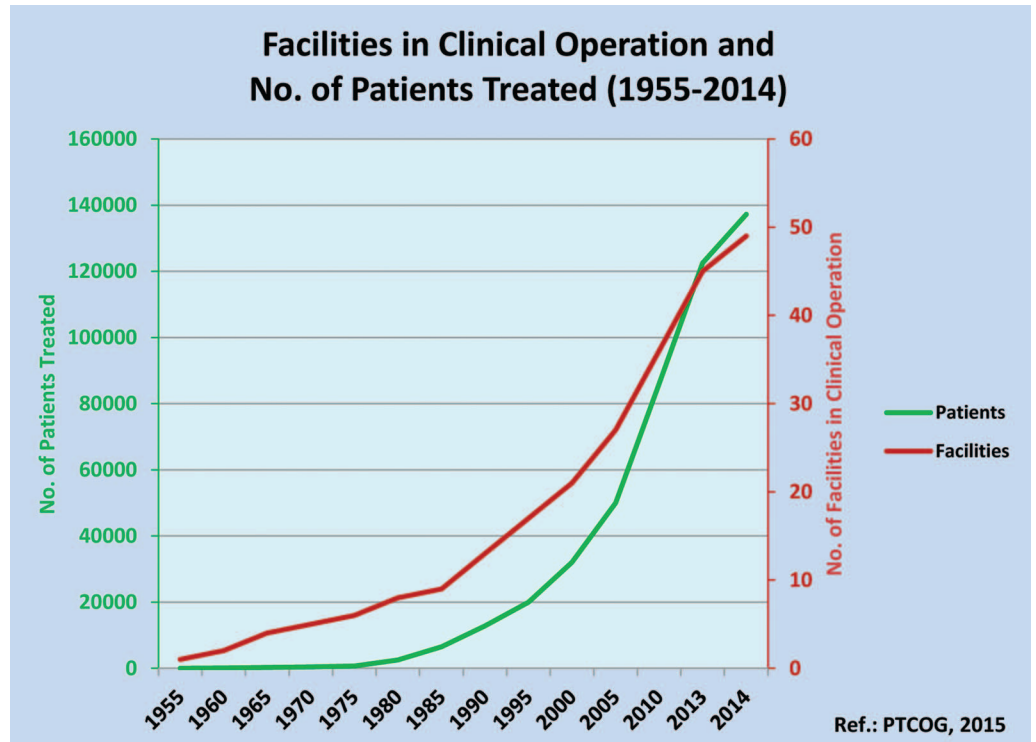


Figure 2. Patients treated with protons and carbon ions in North America, Asia, and Europe.

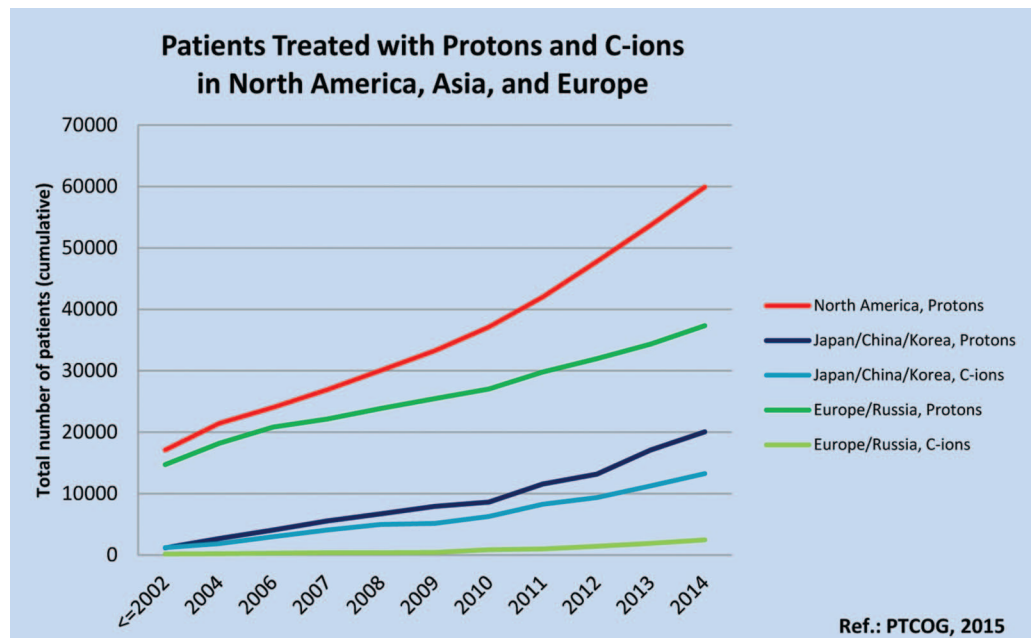


Figure 3. Patients treated with proton and carbon ions worldwide.

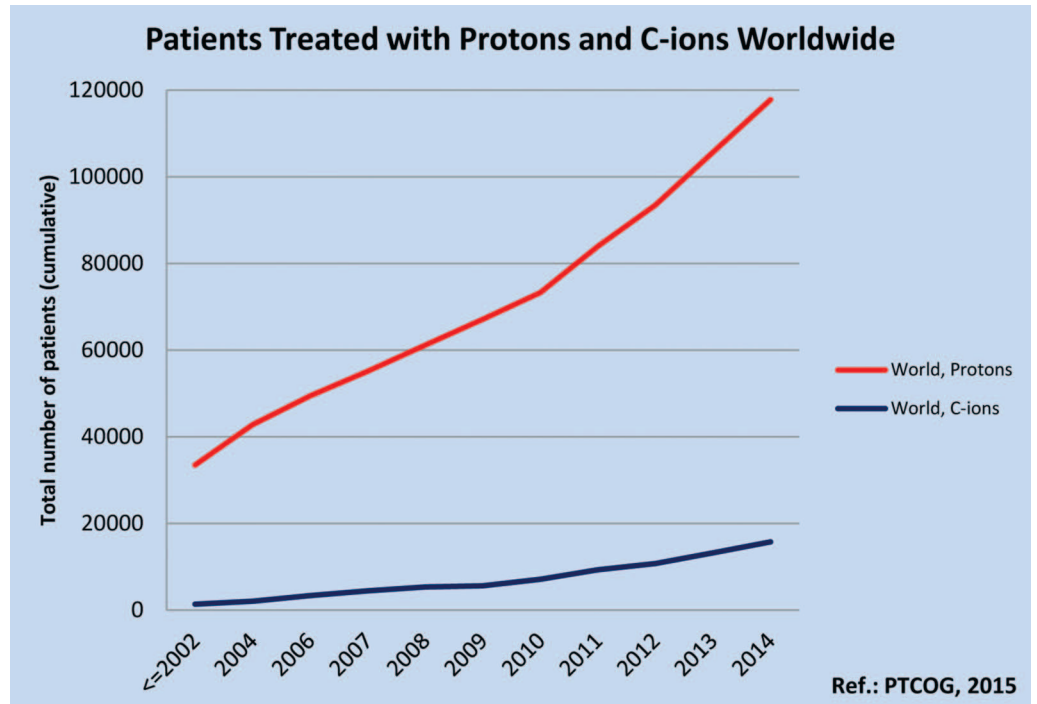


Figure 4. Pie charts depicting (A) patients treated with particle from 1954 to 2014 and (B) patients treated in 2014 with protons and carbon ions (total = 15 000).

