A Map of Healthcare Needs for Mazowieckie Voivodeship– Oncology

Summary

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Background information

1. This document covers cancer diagnoses with the exception of non-melanoma skin cancer and tumours of the hematopoietic and lymphoid tissues (codes: C00-C43, C45-C80, D05 according to the International Statistical Classification of Diseases and Related Health Problems, 10th revision)
2. The number of cancer patients, newly diagnosed in 2010-2012, was established based on the data from the Polish National Cancer Registry (KRN), supplemented by the data from the Polish National Health Fund's (NFZ) reports, however, our actions were not limited to simply merging the two above-mentioned sets of data. As to the KRN, we have excluded those patients who, despite being entered therein for the first time this year, were qualified as patients diagnosed earlier (so-called follow-up patients) based on medical treatment provided to them in the previous years. As to the NFZ records, we have excluded those patients who were entered in the NFZ database under different type of cancer than in the KRN database (precedence of KRN over NFZ database) and who, despite being entered therein for the first time this year, were qualified as patients diagnosed earlier (so-called follow-up patients) based on medical treatment provided to them in the previous years, as well as those whose medical records did not suggest any oncological treatment. Information on the clinical pathway (covering the period of 365 days from the first date of entry in the system, and including the information on reported procedures in compliance with ICD-9, reported chemotherapy and radiotherapy treatment as well as information on patient's death) was also used to estimate the cancer stage for patients for whom it was not specified in the KRN database.
3. Such patient records were used to reclassify some part of the inpatient treatment reported along with D37–D48 diagnosis (relative to conservative or surgical treatment) to appropriate groups of cancer diagnoses.

Part I
Demographic and Epidemiological Aspects

Population Breakdown

In 2014, MazowieckieVoivodeship was inhabited by 5.3 million people, i.e. by 13.9% of all population of Poland (as at 31 December 2014). It was the largest Polish region in terms of population. In demographic sense, the population of MazowieckieVoivodeship was older than the Polish population (the share of people aged 65+ in MazowieckieVoivodeship constituted 15.8%, while the share of people aged 65+ in the entire population of Poland constituted 15.3%).

Demographics of Mazovian Counties (poviats)

1. Among the Mazovian counties (*poviats*), the capital city of Warsaw had the largest number of inhabitants (1.7 million inhabitants, 33% of the entire region's population, as at 31 December 2014). The lowest number of people (32 thousand, 0.6% of the entire region's population) inhabited Łosice County.
2. As to the population ageing, the highest share of people aged 65 and over was observed in the following Mazovian counties: the capital city of Warsaw (18.6%), Lipsko (17.5%), SokołówPodlaski (17.3%) and Łosice (17.1%), while the lowest in: Wołomin (12.2%), Radom (12.5%), Ostrołęka (12.8%), Ostrołęka City (12.9%), Piaseczno (12.9%) and Legionowo (13%).

Cancer Incidence

1. In 2012, 23,605 new cancer cases were diagnosed in MazowieckieVoivodeship. This number was the highest in the entire country. In other words, there were 445 cancer cases per 100,000 inhabitants, which equals to the 5th highest number in Poland.
2. The most frequently diagnosed cancer types were the following: tracheal, bronchial and lung cancer (3,567 cases), breast cancer (3,022 cases), prostate cancer (2,343 cases), colon cancer (1,947 cases), kidney cancer (1,171 cases) and bladder cancer (1,105 cases). They constituted over 56% of diagnosed cancer cases in MazowieckieVoivodeship in 2012. Their share in Mazovian incidence did not differ from the national one.

Deaths due to Cancers

1. Cancer was the second most frequent cause of death of the inhabitants of MazowieckieVoivodeship (as it was the case in other regions of Poland). In 2011-2013, it was responsible for 24.2% of deaths in MazowieckieVoivodeship (25.4% in the case of men and 22.8% in the case of women), which closely corresponded to the cancer death rates for Poland in general (24.5%, 26% and 22.8% respectively). The actual death rate of the inhabitants of MazowieckieVoivodeship due to cancer (245.7 per 100,000 people) was slightly higher than the national one (by 1.2%), the difference being greater for women (2.6%) than for men (0.4%). The surplus results partially from the age demographic breakdown for the region, since the age adjustment (SMR) allowed us to establish that the regional rates were lower than the national ones. The difference is 2.5% in general, 0.8% for women and 3.8% for men.
2. The most frequent cancer type causing death in MazowieckieVoivodeship was lung cancer (26.8%). The SMR for lung cancer was higher in MazowieckieVoivodeship than nationwide, and the highest percentage was recorded in the following counties: Sierpc, Płock and Płock City. The lowest SMR was observed in Łosice County, in Ostrołęka City County and in Garwolin County.
3. Breast cancer caused the death of 13.9% of women dying from any type of cancer in MazowieckieVoivodeship. Almost the same share of women (13.5%) died of breast cancer nationwide. The SMR value for the region was very close to the national value, and the SMR values for breast cancer in specific counties showed that the lives of the inhabitants of Żyrardów and Łosice counties were particularly endangered. The lowest SMR values were observed in the following counties: Żuromin, Lipsko and Ostrołęka.
4. In turn, cancers of the lower gastrointestinal tract were responsible for 11.5% of deaths of the people inhabiting MazowieckieVoivodeship and dying from cancer in 2011-2013. Their percentage was very similar to the national one (11.8%). The regional SMR value for cancers of the lower gastrointestinal tract was lower than national. The highest SMR for this type of cancer (higher by approx. 25% than national SMR) was observed in the following counties: Płońsk, Żyrardów and Grodzisk Mazowiecki.
5. Another type of cancer which caused a high number of deaths was prostate cancer (approx. 8.2% of deaths among men). The regional SMR for prostate cancer was close to the national SMR, which amounted to 8%. The highest SMR in MazowieckieVoivodeship was observed in the following counties: Białobrzegi, Zwoleń and Garwolin (higher by over 50% than the national SMR). More positive situation was observed in NowyDwór Mazowiecki County, Piaseczno County and Siedlce City County, where SMR values were lower by approx. 50% than national average SMR.
6. Bladder cancer was responsible for 3.4% of deaths due to any type of cancer in MazowieckieVoivodeship. The SMR value for this type of cancer was slightly lower for the analysed region than for Poland in general. The highest SMR values for bladder cancer (higher by nearly 50% than the national SMR) were recorded in the following counties: Gostynin, Żuromin and Przysucha. In turn, the lowest SMR values for bladder cancer (lower by over 50% than the national SMR) were observed in the following counties: Warsaw West, SokołówPodlaski and Siedlce.

Part II
Status and Use of Resources: the Analysis

Inpatient Healthcare

1 Hospitals Providing Oncological Treatment

1. In 2012, 806 hospitals provided oncological treatment, 103 of which were located in MazowieckieVoivodeship: 42 were situated in Warsaw, 6 in Radom and another 6 in Otwock County.
2. Oncology treatment in Poland is quite centralised: 98 healthcare providers provided oncological treatment to 80% of patients. 18 of them were seated in MazowieckieVoivodeship.
3. The highest number of patients was admitted to Maria Skłodowska-Curie Institute of Oncology in Warsaw (11.3 thousand, 28.4% of patients treated in the entire region). Another facility, Military Institute of Medicine, hospitalised 2.9 thousand patients (7.4% of overall number of patients treated in the region), and "Zdrowie" Medical Centre / Oncology Hospital in Wieliszew admitted 2.7 thousand patients (6.7% of all patients treated in the region). The group of healthcare providers who treated over 2 thousand cancer patients included also the Central Clinical Hospital of the MSWiA and the National Institute of Tuberculosis and Lung Diseases in Warsaw (2.15 thousand, i.e. 5.4% and 2.1 thousand, i.e. 5.3% respectively). Over a half of healthcare providers treating over 2% of patients regionwide (11 out of 19) were located in Warsaw.
4. 86% of patients hospitalised in MazowieckieVoivodeship originated from this region. Among patients inhabiting other regions and receiving treatment in MazowieckieVoivodeship, 1.1 thousand originated from Lublin Voivodeship, one thousand from PodlaskieVoivodeship and one thousand from ŁódzkieVoivodeship. The highest number of patients coming from outside MazowieckieVoivodeship was treated in Maria Skłodowska-Curie Institute of Oncology in Warsaw (22% of all treated patients). The analysis of the internal flow of patients within MazowieckieVoivodeship shows that most patients seek treatment in Warsaw. Many patients move also to other city counties as well as to Ciechanów County and Otwock County where the hospitals treating a significant number of cancer patients are situated.
5. On average, the number of hospitalisations per patient in MazowieckieVoivodeship amounted to 2.11. The above-mentioned rate was the highest for "Magodent" Mon-Public Healthcare Facility (2.6), MazovianCenter for Treatment of Lung Diseases and Tuberculosis in Otwock (2.53), Mazovian Specialist Hospital in Radom (2.39), Military Institute of Medicine (2.29) and Specialist Hospital in Siedlce (2.28). In Maria Skłodowska-Curie Institute of Oncology in Warsaw, i.e. the facility treating the greatest number of cancer patients, the number of hospitalisations per patient oscillated at 1.86.
6. In MazowieckieVoivodeship, cancer patients were most frequently hospitalised at oncology wards (6.8 thousand patients), urology wards (6.5 thousand patients) and surgical oncology wards (5.7 thousand patients). Moreover, two hospitals (the National Institute of Tuberculosis and Lung Diseases in Warsaw and the MazovianCenter for Treatment of Lung Diseases and Tuberculosis in Otwock) admitted almost all of their patients to thoracic surgery ward, pulmonary diseases ward, or tuberculosis and lung diseases ward.
7. The greatest number of in-patients received treatment relative to urology (6.61 thousand), surgical oncology (6.20 thousand), chemotherapy (5.79 thousand) and clinical oncology (4.78 thousand). Additionally, a significant number of in-patients received treatment relative to general surgery (2.88 thousand) and lung diseases (2.66 thousand).
8. Healthcare within the scope of urology was highly concentrated: 77% of patients at Infant Jesus Clinical Hospital in Warsaw and 68% of cancer patients at WitoldOrłowski Independent Public Clinical Hospital in Warsaw were treated for urological disorders. In MazovianCenter for Treatment of Lung Diseases and Tuberculosis in Otwock,

57% of patients were treated for lung diseases, and in the National Institute of Tuberculosis and Lung Diseases in Warsaw 45% of patients received treatment relative to thoracic surgery.

9. 3 out of 4 cancer patients in MazowieckieVoivodeship were admitted electively based on a referral (the greatest share of elective admissions, i.e. 100% was observed in "Zdrowie" Medical Centre / Oncology Hospital in Wieliszew). Statistically speaking, every fifth patient was admitted on an emergency basis, but was not transported to the facility by the paramedics. The greatest share of emergency admissions was reported in the Polyclinic of Bródno Clinical Centre and Międzylesie Specialist Hospital in Warsaw (taking into account the patients transported to the facilities by the paramedics).

10. In MazowieckieVoivodeship, the largest group of in-patients was formed by patients suffering from lung cancer (6.4 thousand) and breast cancer (4.2 thousand). As far as the analysed types of cancer are concerned, the lowest number of in-patients suffered from testicular cancer (less than 0.4 thousand). The vast majority of in-patients admitted to the MazovianCenter for Treatment of Lung Diseases and Tuberculosis in Otwock and to the National Institute of Tuberculosis and Lung Diseases in Warsaw suffered from lung cancer (90% and 81% respectively). The in-patients of the WitoldOrłowski Independent Public Clinical Hospital and the Infant Jesus Clinical Hospital in Warsaw suffered mainly from bladder cancer (56% and 49% respectively). Almost 1 out of 3 of the WitoldOrłowski Independent Public Clinical Hospital patients suffered from the upper gastrointestinal tract cancer.

11. The biggest group of cancer patients in MazowieckieVoivodeship was formed by patients suffering from lung cancer. Over a half of those patients were hospitalised in Warsaw. The patients were hospitalised mainly in the National Institute of Tuberculosis and Lung Diseases in Warsaw (1733), Maria Skłodowska-Curie Institute of Oncology in Warsaw (1233) and in the MazovianCenter for Treatment of Lung Diseases and Tuberculosis in Otwock (996). In 20 hospitals with the biggest number of in-patients, the predominant lung cancer stage was stage IV. In the majority of hospitals, patients diagnosed with stage I or stage II cancer constituted less than 20% of new cases.

12. As for the breast cancer, lower gastrointestinal tract cancer and prostate cancer, the vast majority of patients were treated in Maria Skłodowska-Curie Institute of Oncology in Warsaw.

2 Inpatient Treatment Analysis

1. In 2012, healthcare providers in MazowieckieVoivodeship reported over 24.1 thousand surgical treatment DRGs and over 17 thousand conservative treatment DRGs. MazowieckieVoivodeship accounted for the biggest number of healthcare providers who reported up to 600 oncology-related admissions (excluding cases of hospitalisation for the purpose of chemo and radiotherapy, as well as those related to the 1b index). Only five healthcare providers reported 1500 or more oncology-related admissions to the hospital. Only one of them reported over twice as many surgical treatment DRGs than conservative treatment DRGs. Such fact was also disclosed by four other healthcare providers who reported from 600 to 1500 DRGs. Based on the assumption that the patient breakdown by cancer type and stage is consistent with the regional breakdown, only two out of five largest healthcare providers would report surgical and conservative treatment in a ratio higher than the average regional ratio.

2. Large facilities (i.e. those reporting over one thousand surgical treatment DRGs) with positive ratio of surgical treatment DRGs to conservative treatment DRGs (i.e. higher or equal to the regional ratio) were located in Warsaw. The majority of the remaining facilities reported a relatively low number of surgical treatment DRGs or presented a negative ratio of surgical treatment DRGs to conservative treatment DRGs (i.e. lower to the regional ratio). Moreover, many of them were relatively small (less than 250 DRGs a year) and were located not far away from other facilities.

3. In 2012, MazowieckieVoivodeship accounted for approx. 12.2 thousand radical surgical treatment DRGs. 85% of all healthcare providers reporting surgical treatment DRGs

reported less than 200 radical surgeries in 2012. It means that they reported on average less than one surgical procedure a day. This leads us to a conclusion that the performance of radical surgical procedures is largely dispersed in MazowieckieVoivodeship.

4. In 2012, 105 Mazowieckie healthcare providers reported surgical and conservative treatment DRGs as part of oncological treatment. They reported over 24.1 thousand surgical and over 17 thousand conservative treatment DRGs. A large decentralisation of surgical treatment (whether radical or not) was observed: 85% of healthcare providers reported less than 200 surgeries a year for all analysed types of cancer. Moreover, it was evidenced that many small facilities (under 250 radical DRGs a year) and those presenting a negative ratio of surgical treatment DRGs to conservative treatment DRGs are located not far away from other facilities (the potential impact of cancer type and stage on the analysis results was excluded). The research shows that the number of performed surgeries may affect negatively the quality and safety of provided treatment. As to the cancer of the lower gastrointestinal tract, 56 healthcare providers reported less than 60 radical procedures in the analysed period. As to the breast cancer, the number of healthcare providers reporting radical surgical procedures amounted to 43, and as to the prostate cancer - to 4 out of 27. Thus, the quality and safety of treatment may be increased by means of centralisation.

5. The correlation between the number of surgical procedures performed annually in a hospital and their efficiency was discussed in multiple medical and statistical papers published in the last 20 years. A general conclusion that can be drawn therefrom is the positive correlation between the number of patients that have undergone a specific surgical treatment in the given facility and the quality of treatment. Assuming that the minimum number of radical surgical procedures oscillates at approx. 60 surgeries per year[1], only 9 healthcare providers met the above criterion in terms of the treatment of lower gastrointestinal tract cancer. The remaining 56 healthcare providers reported in total 881 surgical procedures of such type, which would allow the existence of 15 additional healthcare providers at most, who on average would be able to meet the above criterion (reduction by 41 entities). As to breast surgery, only 7 out of 50 healthcare providers (14%) met this criterion. Centralisation of the remaining dispersed surgical procedures (0.44 thousand in total) would allow 7 additional healthcare providers to meet the analysed criterion (reduction by 36 entities). In the case of prostate cancer, 4 out of 27 healthcare providers reported over 60 radical procedures. Centralising the rest would allow the existence of 4 additional healthcare providers (reduction by 19 entities).

6. The conservative treatment DRGs reported by healthcare providers were analysed according to the average length of stay (ALOS). The ALOS in the case of four healthcare providers reporting at least 400 DRGs oscillated at the level of 4-6 days. This means that the patients hospitalised by those healthcare providers have been undergoing conservative treatment within a DRG during 4-6 days on average. The ALOS for the biggest healthcare provider oscillated at the level of 8 days.

3 Chemotherapy Treatment Analysis

1. In 2012, 28 facilities in MazowieckieVoivodeship provided chemotherapy treatment and were parties to contracts for the provision of the aforesaid treatment with the third-party public payer. Sixteen of them were located in Warsaw.

2. The number of out-patients undergoing chemotherapy is almost twice as high as the number of in-patients undergoing chemotherapy within the region.

3. As far as person-days are concerned, the outpatient treatment was dominated by the inpatient treatment. For each person-day of the outpatient or day treatment, there was approx. one and a half person-day of the inpatient treatment.

[1] Scenarios including at least 150 and 250 surgical procedures were also taken into consideration while working on the full content of the Map for MazowieckieVoivodeship.

4. The adjustment of chemotherapy treatment per 1,000 out-patients, day patients and in-patients indicates that the cancer type and stage were not the only factors affecting the chemotherapy treatment in all three variations per 1,000 patients. The highest share of in-patients undergoing chemotherapy was observed in Szydłowiec County (45%) and Białobrzegi County (43%).

4 Radiotherapy Treatment Analysis

1. In 2012, 4 facilities in MazowieckieVoivodeship provided radiotherapy treatment to patients. Maria Skłodowska-Curie Institute of Oncology in Warsaw reported 6.8 thousand teleradiotherapy treatments, 834 brachytherapy treatments and 1.6 thousand isotope treatments. The patients admitted to the Military Institute of Medicine and the Central Clinical Hospital of the MSWiAhave only undergone isotope treatment (165 and 99 patients respectively). In turn, Maria Skłodowska-Curie Non-Public Oncology Hospital in Wieliszew admitted 1540 individual patients for teletherapy and 220 for brachytherapy. In 2012, the inhabitants of MazowieckieVoivodeship were cleared for over 5 thousand radical teletherapy treatments and almost 3.9 thousand palliative teletherapy treatments.
2. The patients from particular counties benefited from these treatments to various degrees (such result is also confirmed by the data excluding the potential impact of the cancer type and stage). Regionwide, 12.5 radical teletherapy treatments per 100 patients were provided. The greatest benefactors were the inhabitants of north-western counties: Sierpc, Płońsk, Ciechanów, Pułtusk, NowyDwór Mazowiecki, Legionowo and Wołomin County. The radical teletherapy utilisation rate for MazowieckieVoivodeship was relatively high also in southern counties. The median value for Mazovian counties amounted to 12.9 radical teletherapy treatments per 100 cancer patients. The analysed rate values were the lowest in the north-eastern part of the region (Ostrołęka City, as well as the following counties: Ostrołęka, Przasnysz and Maków Mazowiecki).
3. The radical teletherapy utilisation rate in MazowieckieVoivodeship is strongly influenced by the development of infrastructure. The cancer patients inhabiting the counties crossed by main state roads (expressways at many sections) are able to reach a teletherapy provider (located in Warsaw, Wieliszew or Kielce) faster; thus, they benefit from teletherapy more often. The correlation coefficient between the distance and the teletherapy utilisation rate amounted to -0.45 in MazowieckieVoivodeship and -0.38 nationwide. In turn, the correlation coefficient between the distance and the inpatient teletherapy treatment rate amounted to 0,62 for Poland, and 0,79 for Mazovian counties.

Specialist Outpatient Care

1. In 2012, in Poland there were 4,603 Specialist Outpatient Care (AOS) facilities providing treatment for cancer patients, of which 468 were located in MazowieckieVoivodeship. The greatest number of AOS facilities was situated in Warsaw (138), which accounted for 29.5% of all oncology facilities in the region. A relatively high number of facilities were located in the central part of the region.
2. The largest group of cancer patients were admitted to Maria Skłodowska-Curie Institute of Oncology in Warsaw. Their number - 53.7 thousand - constituted 49.63% of all individual patients for whom specialist outpatient care was provided in MazowieckieVoivodeship.

Primary Care

In May 2015, MazowieckieVoivodeship maintained 678 registered primary care centres. There are 7.9 thousand inhabitants per each primary care centre. The highest number of patients per one primary care centre inhabited the Gostynin County (15.4 thousand), whereas the lowest – Ostrołęka City County (3.3 thousand). An average number of treatments per one inhabitant of MazowieckieVoivodeship amounted to 4.3. Women benefited from them more often than men (5.3 and 3.4 respectively). The distribution of healthcare services per one inhabitant varied strongly among counties. The highest number of primary healthcare services was provided in Gostynin County (58 thousand), whereas the lowest in Lipsko County (16.1 thousand).

Part III

Healthcare Needs Forecasts

Demographic Forecast

1 Projected Population Breakdown

In 2014-2029, the number of MazowieckieVoivodeship inhabitants will increase by 84 thousand, i.e. by 1.6%. During the same period, the population of Poland will decrease by 1.17 million. MazowieckieVoivodeship population breakdown according to age and gender will be changing along with the Polish population breakdown according to the same factors.

2 Projected Demographics of Mazovian Counties

It is expected that by 2029 the population of individual Mazovian counties will have changed to different extent. The highest decrease is expected in Lipsko County (by 12%) and the highest increase is expected in the following counties: Piaseczno (by 20%), Wołomin (by 18%), Legionowo (by 16%) and Grodzisk Mazowiecki (by 15%).

Projected Number of Patients

1 Incidence Forecast

Taking into account demographic processes only, it is estimated that in 2016–2029 the number of new cancer cases will increase from 25.1 thousand to 30 thousand (+4.9 thousand; +19.7%). In the analysed perspective, new cases of lung cancer (+0.78 thousand; +19%), breast cancer (+0.45 thousand; +16%), colon cancer (+0.5 thousand; +24%) and prostate cancer (+0.66 thousand, +29%) will still be predominant among all types of cancer.

2 5-Year Prevalence Forecast

The projected 5-year cancer prevalence will increase in 2016–2029 by 10 thousand cases (i.e. from 68 thousand to 78 thousand; +14%). The highest 5-year prevalence in 2016 in MazowieckieVoivodeship will concern breast cancer and will amount to 11.9 thousand. Another type of cancer with the second highest 5-year prevalence will be prostate cancer (9.4 thousand). The same two types of cancer will have the highest prevalence in 2029: 12.8 thousand for the breast cancer and 10.9 thousand for the prostate cancer.

Treatment Forecast

1 Hospitalisation

The performed analysis (based on the demographic changes only, *ceteris paribus*) indicates that the demand for hospitalisation for the purpose of performing radical surgical procedures will increase from 11.4 thousand in 2016 to 13.3 thousand in 2029 (+17%). In 2016, the maximum number of contracts for the provision of "oncology package" combined treatment should somewhat decrease as compared to the year 2015 and should not exceed: 36 - in general surgery, 17 - in obstetrics and gynaecology, 7 - in otolaryngology, 4 - in neurosurgery, 1 - in maxillo-facial surgery. The above numbers result from the need to centralise the radical surgical treatment, which is vital to ensure the proper level of patient's safety.

2 Positron Emission Tomography Treatment Forecast (PET)

The projected demand for PET scans in 2029 for MazowieckieVoivodeship (based on the current performance, taking into account the scope of treatment provided in other regions) fits into the current (2014) reported number of PET scans carried out in the region (6,875). Moreover, the number lies well within the limits of current potential calculated based on the report on the status of radiotherapy in Poland (as at 31/12/2014; number of devices: 2).

3 Chemotherapy

1. As the maximum, within the analysed time horizon, a slight increase in the demand for chemotherapy (inpatient treatment, day care treatment, outpatient treatment), from 241.7 thousand person-days in 2016 to 267.6 thousand person-days in 2029 (+10.8%), is estimated.
2. As the minimum, within the analysed time horizon, a slight increase in the demand for chemotherapy (inpatient treatment, day treatment, outpatient treatment), from 104.7 thousand person-days in 2016 to 118.4 thousand person-days in 2029 (+13.1%), is estimated.
3. The optimal number of facilities providing chemotherapy treatment in the region was calculated based on the number of chemotherapy person-days. The national average number of person-days for 2012 served as the current minimum profitable number of person-days. As the maximum, the increase in the number of person-days in chemotherapy will have enabled the establishment of 21 new facilities providing such treatment by 2029. One should not forget that the establishment of new facilities is a means to tackle the projected increase in demand for chemotherapy services. Another method is to modernise the existing facilities and to support the shift towards the increased share of day treatment and outpatient chemotherapy in provided treatments. The appropriate approach should take advantage of both described actions. As the minimum, there will have been no demand for new facilities by 2029.

4 Radiotherapy

1. In 2014, the number of patients receiving teletherapy treatment amounted to 8.7 thousand, which means that on average there was 1 accelerator per 583 patients (IAEA recommendations of 2010 regarding 450 patients per 1 accelerator have not been met).
2. The average age of an accelerator in MazowieckieVoivodeship was 5.2 yrs. In 2014, the analysed region held the 5th position in terms of the lowest average age of an accelerator in Poland. Three accelerators in MazowieckieVoivodeship did not meet the age criterion (they were over 10 years old, which was the limit).
3. The projected demand for teletherapy in 2025 amounts in MazowieckieVoivodeship to 12.5 thousand.
4. In 2015, MazowieckieVoivodeship was equipped with 16 linear accelerators: 13 in Warsaw and 3 in Wieliszew (the model excluded the CyberKnife system). Additionally, there were two other accelerators in Otwock owned by a private entity who was not a party to the contract with the Polish National Health Fund. According to the 2016-2025 optimisation model for the purchase and location of linear accelerators, by 2025 MazowieckieVoivodeship should have been equipped with 26 linear accelerators (13 in Warsaw, 4 in Wieliszew, 3 in Radom, and 2 in each of the following: Siedlce, Płock and Otwock).