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## Patterns of care for brachytherapy in Europe (PC BE) in Spain and Poland: Comparative results

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### Summary

#### Background

Cancer incidence and its mortality depend on a number of factors, including age, socio-economic status and geographic situation, and its incidence is growing around the world [1]. Cancer incidence in Europe is now about 4000 patients per million per year and due to the ageing population a yearly increase of 1–1.5% in cancer cases is estimated in the next two decades [2–4]. Most of the cancer treatments will include external beam radiotherapy or brachytherapy. Brachytherapy has increased its use as a radical or palliative treatment and become more sophisticated with the spread of pulsed dose rate and high dose rate afterloading machines, and the use of new planning systems has additionally improved quality of treatment [5–14]

#### Aim

The aim of the present study was to compare two countries (Poland and Spain) and to report the differences in the use of brachytherapy in these countries. For this reason, several characteristics related to brachytherapy were compared.

#### Materials/Methods

The data used were collected using a website questionnaire for the year 2002 where every centre that participated in the survey could introduce, change or update the information requested. Hospitals included in the study were those that provided data on brachytherapy, because our objective was to compare the brachytherapy facilities between Poland and Spain.

#### Results

Data were available for 22 centres in Poland and 39 centres in Spain that provided brachytherapy in 2002. Spain having more centres that applied brachytherapy (1.0 centre per 1,000,000 inhabitants in Spain vs. 0.6 centre per 1,000,000 inhabitants in Poland), the average number of brachytherapy patients per centre is lower in Spain than in Poland, 137 and 382 respectively. The 5 main tumour sites treated with brachytherapy in Poland were: gynaecological (73.7%), bronchus (13.0%), breast (2.8%), prostate (2.4%) and head and neck (1.6%). In Spain they were: gynaecological (59.7%), breast (15.4%), prostate (12.8%), head and neck (4.2%) and bronchus (1.5%). Statistically significant differences

were found in the number of gynaecological, bronchial and breast brachytherapy patients between the countries.

**Conclusions** Although both countries belong to the European Union, there were observed several differences in the use of brachytherapy. We also found some differences in the brachytherapy techniques used in prostate and head and neck cancers.

**Key words** Poland • Spain • brachytherapy • patterns of care • European Union

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**Figures:** 8

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## BACKGROUND

Cancer incidence and its mortality depend on a number of factors, including age, socio-economic status and geographic situation, and its incidence is growing around the world [1]. Cancer incidence in Europe is now about 4000 patients per million per year and due to the ageing population a yearly increase of 1–1.5% in cancer cases is estimated in the next two decades [2–4]. Most of the cancer treatments will include external beam radiotherapy or brachytherapy. Brachytherapy has increased its use as a radical or palliative treatment and become more sophisticated with the spread of pulsed dose rate and high dose rate afterloading machines, and the use of new planning systems has additionally improved quality of treatment [5–14].

Patterns of Care for Brachytherapy in Europe (PCBE) was launched with the objective of collecting detailed information on the brachytherapy pattern of care throughout the European area, allowing the study of this treatment method and monitoring of changes with time. These data were also considered crucial as a feasibility study in the framework of the ESTRO-QUARTS project (QUAntification of Radiation Therapy Infrastructure and Staffing Needs, contract number GLG4-CT-2002-30583 with the EU).

The data collected from the PCBE project were used to compare two countries, Poland and Spain, in the application of brachytherapy in the year of 2002. It was agreed to compare these countries because they have a similar number of in-

habitants (38,654,164 in Poland and 40,016,081 in Spain, year 2000) and population structure (Figure 1) and comparable area (312,685km<sup>2</sup> in Poland and 505,811km<sup>2</sup> in Spain) [15]. Based on the data collected, a map for the distribution of radiotherapy facilities for Poland and Spain is shown in Figure 2. In both countries cancer incidence is continuously growing except in Spanish women. As an example the changes in incidence in Spain and Poland since 1951 are presented (Figure 3) [16].

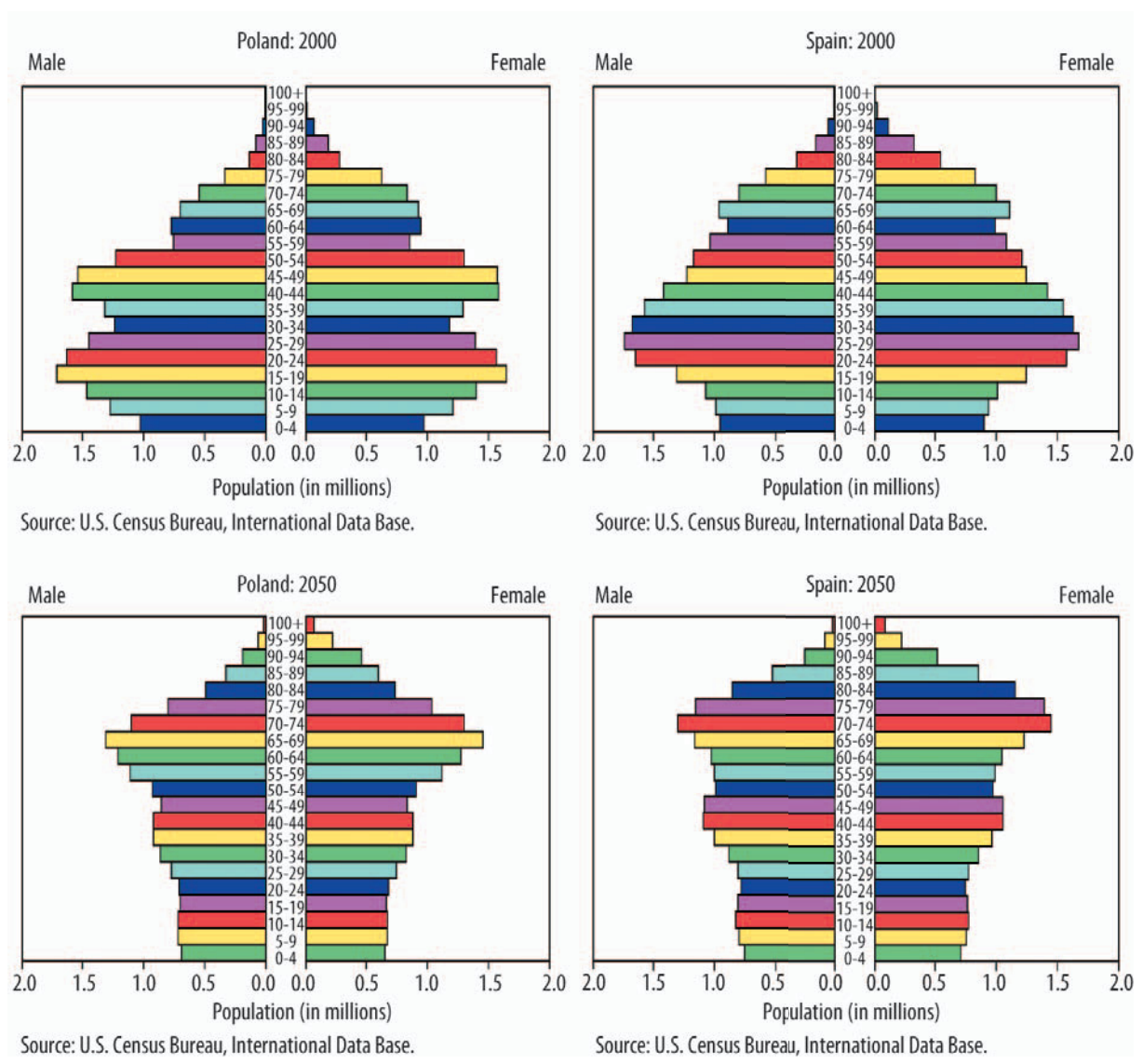
## AIM

For these reasons, this paper reports the differences in the use of brachytherapy in these countries and several characteristics related to brachytherapy are compared.

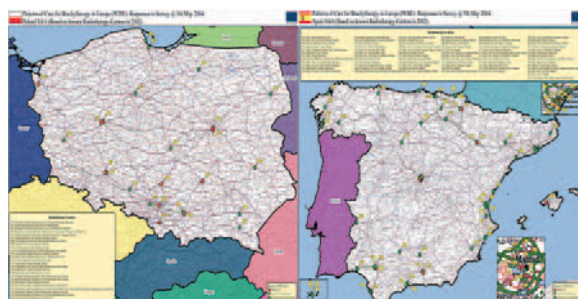
## MATERIALS AND METHODS

The data used to compare Poland and Spain were based on the results obtained in the questionnaire completed for the PCBE project in 2002. The questionnaire was web-based because there were several reasons for thinking that it would be an easy way to achieve a large number of responses from the centres collaborating in the survey. The main reason was that the Internet allows easy access to the questionnaire and the manipulation of the data. This was supported by the National Cancer Services Analysis Team, NHS, in the United Kingdom.

For every country that collaborated in the survey, a national coordinator was designated. He/she



**Figure 1.** Population pyramid summary for Poland and Spain (2000 and 2050).



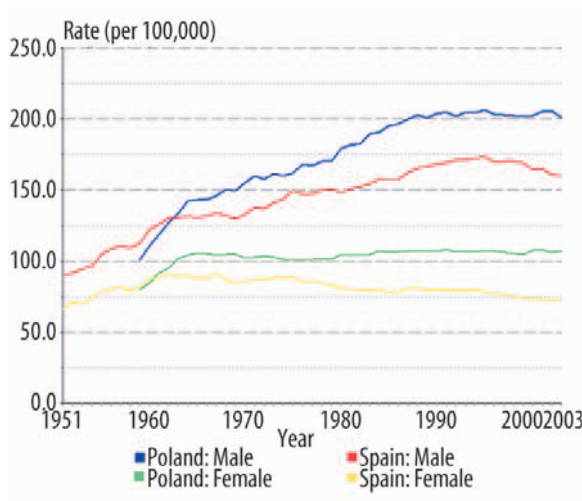
**Figure 2.** Distribution of radiotherapy facilities in Poland and Spain (2002).

took several responsibilities: to coordinate the distribution of the questionnaires and to encourage compliance. Centres in each country were asked

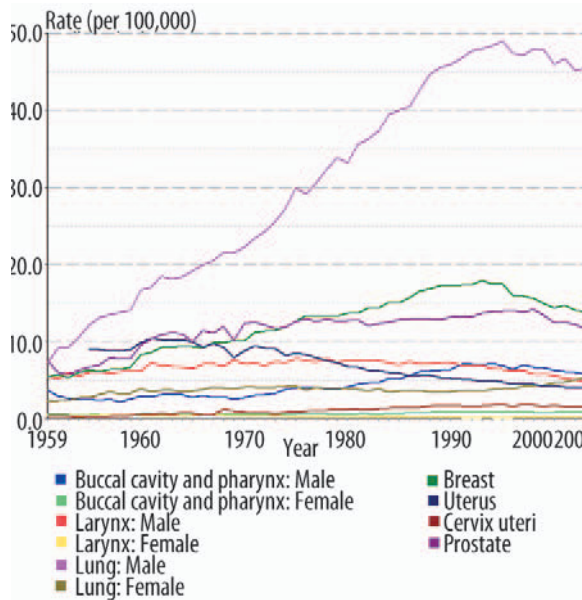
to submit data regarding brachytherapy services and activity during 1997 and 2002. There was also named a general coordinator who was responsible for ensuring the correct development of the process and to solve any issues that might arise.

We chose two similar countries (Spain and Poland) for the following reasons: similar number of inhabitants, population structure and pattern of cancer incidence. We compared these countries to report differences in the use of brachytherapy and several characteristics related to brachytherapy.

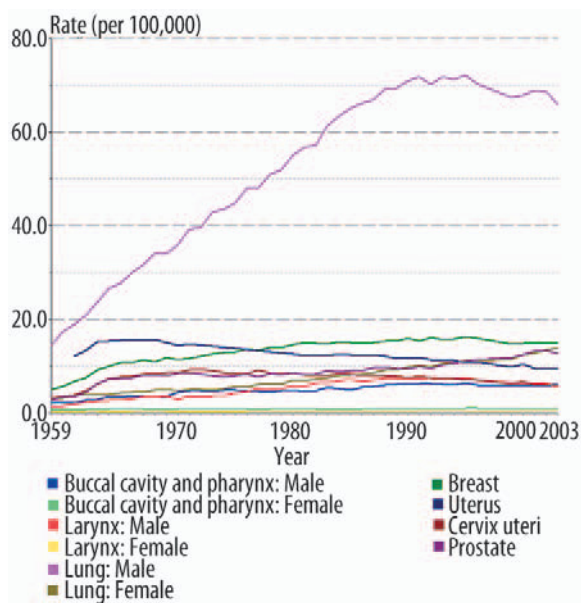
The statistical analysis was performed using the t-test or Mann-Whitney test, depending on the distribution of the variables, in order to assess



**Figure 3.** Age Standardised Rate (World) age [0–85+] (all cancers).



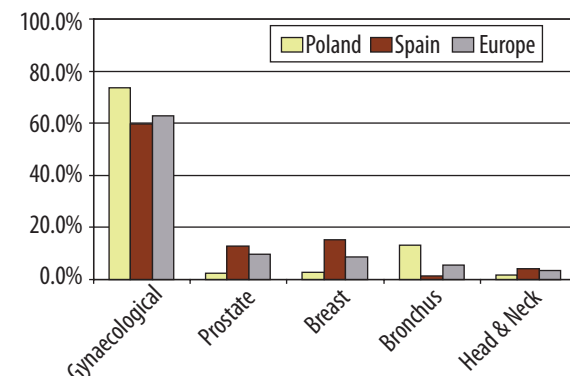
**Figure 5.** Age Standardised Rate (World) age [0–85+] in Spain.



**Figure 4.** Age Standardised Rate (World) age [0–85+] in Poland.

whether the means of the two countries were statistically different from each other. The

Kolmogorav-Smirnov test was applied to test for a normal distribution. A  $p$  value  $< 0.05$  was considered statistically significant for all procedures used. Also, the 95% confidence interval for each average was estimated, in order to have an accurate idea of the variable. The SPSS (Statistical Package for the Social Sciences) package was used for the analysis.



**Figure 6.** Distribution of patients according to site implanted for the most common tumour sites.

**RESULTS**

The final results of PCBE [17] showed that 737 of 1064 European radiotherapy centres (69.3%) responded to the questionnaire. Of these centres, 450 (42%) confirmed that they provide brachytherapy treatments.

In the present study, there were 25 centres in Poland and 74 centres in Spain that applied radiotherapy in 2002. The inclusion criteria were achieved for 25 centres in Poland (100%) and 22 had brachytherapy (88%), whereas 72 centres in Spain achieved the inclusion criteria (97.3%) and only 39 centres provided brachytherapy (52.7%).

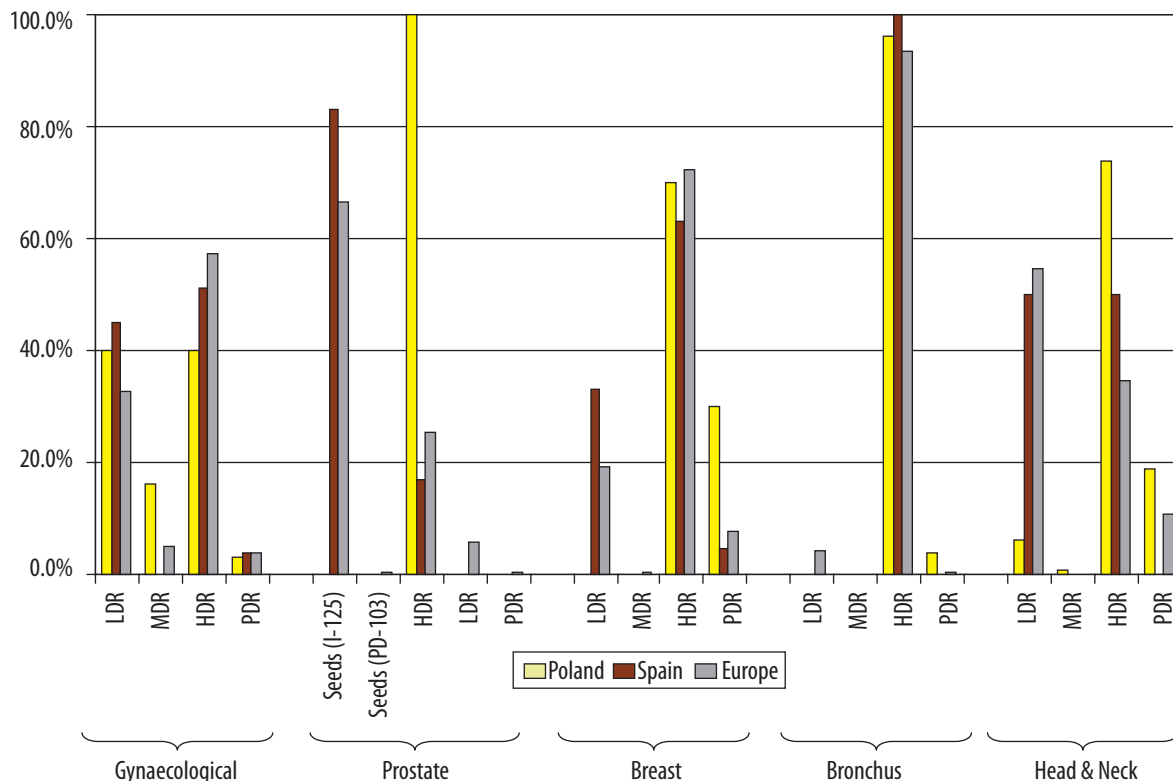


Figure 7. Brachytherapy used in the most common sites treated (%).

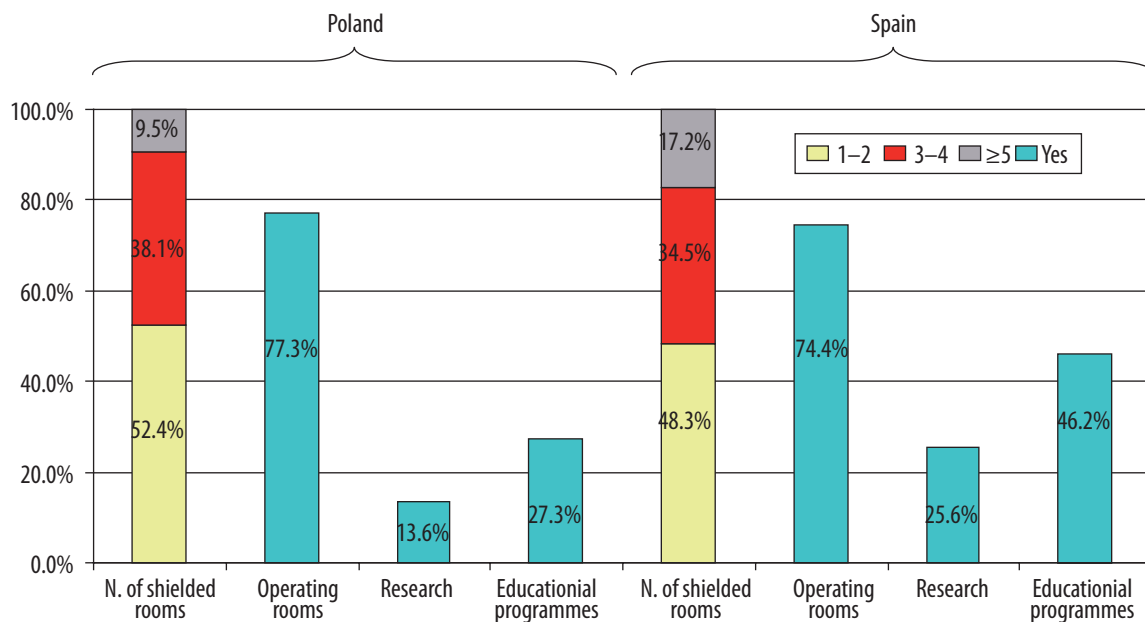


Figure 8. Number of shielded rooms, operating rooms, ongoing brachytherapy trials and educational programmes.

The average number of patients per centre treated with radiotherapy during the year 2002 was 1802 (CI 95% 872-2733) in Poland and 1203 (CI 95% 1013-1393) in Spain, but these differ-

ences were not statistically significant (p=0.986, Mann-Whitney). There were observed significant differences in the average number of patients per centre treated with brachytherapy: it was 382 (CI

**Table 1.** Frequency of the least frequent tumour sites treated with brachytherapy ( $\leq 3\%$ ) in Europe.

	Poland		Spain		Europe	
	N (%)					
Oesophagus	183 (2.6)	23 (0.5)	767 (2.3)			
Rectum	61 (0.9)	27 (0.5)	660 (2.0)			
Intracoronary	29 (0.4)	117 (2.3)	565 (1.7)			
Eye	2 (0.0)	70 (1.4)	500 (1.5)			
Skin	66 (0.9)	62 (1.2)	446 (1.4)			
Other	26 (0.4)	15 (0.3)	149 (0.5)			
Large vessels	9 (0.1)	–	86 (0.3)			
Brain	81 (1.1)	1 (0.0)	83 (0.3)			
Bladder	–	–	52 (0.2)			
Soft tissue	3 (0.0)	–	43 (0.1)			
<b>Total</b>	<b>460 (6.5)</b>	<b>315 (6.3)</b>	<b>3351 (10.2)</b>			

\*  $N_{\text{Poland}}=7064$ ,  $N_{\text{Spain}}=4987$ ,  $N_{\text{Europe}}=32779$ .

95% 231–533) in Poland and 137 (CI 95% 96-177) in Spain ( $p=0.001$ , Mann-Whitney). The centres with the largest number of patients in 2002 were, in Poland: Centrum Onkologii – Instytut im. Marii Skłodowskiej-Curie in Warsaw (1100), Centrum Onkologii – Instytut im. Marii Skłodowskiej-Curie in Gliwice (1003), Wielkopolskie Centrum Onkologii im. Marii Skłodowskiej-Curie in Poznań (774), Regionalne Centrum Onkologii Szpital prof. F. Łukaszczyka in Bydgoszcz (724) and Wojewódzki Szpital Specjalistyczny im. M. Kopernika (623) in Łódź. In Spain they were: Institut Catala d'Oncologia (704), Instituto Oncológico de Guipuzcoa (318), Clinica Ruber Internacional (279), Centro Oncológico de Galicia (270) and Instituto Valenciano de Oncologia (257).

There has been observed an increase in the number of brachytherapy patients between 1997 and 2002: 21.4% in Spain and 23.2% in Poland. A difference in the average increase of treated patients per centre with brachytherapy in comparison with the European area was also noted, where the average increase between 1997 and 2002 was 10.2% [17]. On the other hand, Spain had 96.9% of brachytherapy procedures with curative intention and Poland 81.3%.

There were 252 radiation oncologists in Spain, 57.1% involved in brachytherapy. In contrast, Poland had 219 radiation oncologists, 30.6%

**Table 2.** Average number of patients per centre and country for the most common tumour sites treated with brachytherapy.

	Poland		Spain		p*
	Mean (CI 95%)				
Gynaecological	236.6 (138.2,335.0)	76.3 (54.0,98.6)			$p<0.001$
Prostate	7.6 (0.0,17.0)	16.3 (5.3,27.3)			$p=0.09$ (ns)
Breast	9.0 (0.5,17.5)	19.7 (8.8,30.7)			$p=0.031$
Bronchus	41.9 (12.5,71.2)	1.9 (0.5,3.4)			$p=0.016$
Head and neck	5.1 (0.0,10.4)	5.3 (2.4,8.3)			$P=0.149$ (ns)

\*  $p<0.05$ , significant; ns-not significant; (Mann-Whitney).

countries. Finally it was observed than in Poland there were other rare sites treated, such as large vessels (endovascular brachytherapy), soft tissue sarcomas or brain tumours. In contrast Spain treated more patients with uveal melanoma by means of episcleral brachytherapy.

A higher use of HOR in Poland for prostate and head and neck cancers and less LOR than in Spain was observed. This can be explained by the fact that HOR equipment allows a significantly larger number of patients treated for the same costs compared to the traditional use of LOR in Spain.

Another variable that showed important variation between these two countries is access to research programmes and educational programmes, with a much higher percentage in Spain.

This study has some limitations. First of all, data were based on the individual reports from both countries and each centre, and although every possible effort was made to make all the reports consistent, variability in data quality may exist. Finally, this initial survey only allows for a descriptive analysis of activity. Interesting differences between the countries and regions have been identified

and future surveys to identify certain trends will be important. As patterns of disease change and health services across Europe develop it is to be expected that for example the high incidence of gynaecological cancers in Poland will fall and that incidence of prostate cancer and demand for its treatment with brachytherapy will increase this indication, bringing the practice closer to harmonisation between the two countries.

## CONCLUSIONS

Although both countries belong to the European Union (EU), several differences in the use of brachytherapy were observed. Poland had fewer centres that provided radiotherapy or brachytherapy, but the average number of patients per centre treated with brachytherapy was higher than in Spain. In both countries an increase in the number of patients treated with this technique per centre was observed, and in both countries that increase was higher than 10.2%, observed in Europe in 2002 [17].

The workload of all the specialists who regularly perform brachytherapy was estimated. There were no significant differences in radiation oncologists and technologists, but the workload for physicists was significantly higher in Poland than in Spain.

As far as the main tumour site is concerned, the countries had minor differences in the distribution in comparison with the European results. There were observed significant differences considering the average number of patients per centre for the most common tumour sites treated with brachytherapy. Poland had a larger average number of patients in gynaecological and bronchial tumour sites, whereas Spain had more patients treated with brachytherapy for breast cancer. For the less common tumour sites, Poland applied brachytherapy in a wide range of tumour sites and there were more patients treated in comparison with Spain.

The brachytherapy technique depends on the site to be treated, but depends also on the country. As an example, all prostate cancer patients in Poland were treated with HDR brachytherapy, whereas in Spain permanent seeds (1-125) were mostly used.

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