Physica Medica 55 (2018) 33–39

Contents lists available at ScienceDirect

Physica Medica

journal homepage: www.elsevier.com/locate/ejmp

Original paper

Medical physics workforce: A global perspective

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ARTICLE INFO

Keywords:
Medical Physics
Global workforce
Women

ABSTRACT

Purpose: The International Organization for Medical Physics (IOMP) performed a detailed study following the first survey published in 2015 with the particular objectives: 1) gather data on global medical physicists (MPs) workforce, 2) identify differences between geographical regions and, 3) investigate whether there is a gender dimension in higher hierarchy positions.
Methods: An online questionnaire was send to IOMP members and contact points in countries where no professional MPs society existed. Information requested: total number (N) of MPs (men and women), N of current elected executive board (EB) of societies and women proportion in the board, president gender and number of women presidents for the last 10 years. IOMP archives were also investigated for data on gender composition related to chairs of committees, officers and IOMP awardees.
Results: Ninety three countries reported 29,179 MPs, from which 8702 were women (29.8%) and 20,477 men. The most dense MPs population was in Europe (34%), followed by North America (33%) and Asia/Oceania (24%). Societies EB women members constitute 21–40%, but rarely reach the presidential position. The IOMP archived data show that women MP representation decreases in higher hierarchy positions.
Conclusions: Global MPs production does not meet clinical needs especially in Latin America/Caribbean and Africa (6% of total MPs workforce and small number of MPs/million of population). Rough estimations showed that approximately 58,950 MPs will be required by 2035. Women representation is away from the United Nations and European Commissions goals. Women representation in higher hierarchy position is low.

1. Introduction

The education and training of medical physicists (MPs) is a subject of discussion in the recent literature [1–8], as well as their professional status in various countries or regions of the world [9–29]. However, literature related to global workforce is rather scarce. According to a report published in 2015 in Lancet, estimated future needs of MPs solely in radiotherapy will be 22,100 professionals by 2035 in low-and-middle income (LMI) countries; according to the study training needs until 2025 would approximately be 6000 MPs [30]. The study also concluded that about 1000 newly trained MPs should be trained each year, for the next twenty years, in LMI countries alone to offer efficiently their services in radiotherapy. It is evident that one needs to add to these numbers, the MPs required for nuclear medicine, radiology and other scientific fields.

The first global survey ever on MPs manpower and women representation was conducted by the International Organization for Medical Physics (IOMP) in 2015 [31]. The study included data from 66 countries around the world. The reported number of MPs was 17,024 with women percentage, 28% (4807 MPs). The results of the survey showed a significant MPs workforce difference between countries and immense variation on proportion of women MPs (variation: 0% to 100% women between countries). The study showed that certain developing countries had only women MPs, or very high percentage of women MPs, whereas developed countries reported a much lower women proportion than initially anticipated. The study mainly focused on women representation and did not provide any analysis on workforce in general.

According to the latest "She" report of the European Commission (EC) in 2015, under-representation of women continues to characterize participation in science and technology occupations [32]. Despite significant progress in their level of education relative to men over the last few decades, women are increasingly under-represented as they move up the stages of an academic or professional career, as specifically

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https://doi.org/10.1016/j.ejmp.2018.10.012
Received 9 August 2018; Received in revised form 28 September 2018; Accepted 14 October 2018
1120-1797/

stated in the report. Within the European Union (EU-28), women make up 28% of scientific and administrative board members and only 22% of board leaders. More importantly, The European Commission's Expert Group on Structural Change states that increasing the proportion of women in the research and innovation workforce would lead to many benefits, such as economic growth and increased relevance and quality outputs for society as a whole, by making greater use of the available talent pool [33]. The Expert Group specifically stated that more women among scientific decision makers would enhance the robustness of the decisions made due to an increase in the diversity of viewpoints [33]. The Council of the European Union invited Member States, in December 2015, to set targets for gender balance among full professors and in research decision making bodies [32], but results are yet to be seen. United Nations Educational, Scientific and Cultural Organization (UNESCO) is a specialized agency of the United Nations (UN). According to the latest UNESCO report [34], less than 30% of researchers worldwide are women and only around 30% of all women students select Science, Technology, Engineering, and Mathematics (STEM) related fields in higher education. UNESCO has acknowledged that in order to achieve the above goal urgent changes are needed. The UN General Assembly 2030 Agenda for Sustainable Development, which was adopted in September 2015, calls for a new vision and mission in order to address the environmental, social and economic concerns facing the world today [35]. One of the Sustainable Development Goals (SDGs) calls for gender equality and governments are asked to make national commitments that will close the gender equality gap – from laws and policies to national action plans and adequate investment.

Due to all above reasons, IOMP decided to perform the current global study with the following objectives: 1) gather more data on global MP workforce, 2) identify differences between geographical regions of the world and 3) investigate whether there is a gender dimension in higher hierarchy positions.

2. Materials and methods

An online questionnaire prepared as Google Forms was send to IOMP National Members organizations (NMOs) and to contact points in countries in which no professional MPs society or NMO existed (Annex). The countries approached were one hundred and ten (1 1 0). The questionnaire requested information on total number of MPs, proportion of men and women MPs, total number of current elected executive board (EB) of Societies and women proportion in the EB, president gender and number of women presidents for the last 10 years. Both high income and LMI countries were included in the survey. The study lasted for one year and data collection ended in December 2017. IOMP archives were also investigated in order to provide statistical data on gender composition related to chairs of committees, Executive Committee and IOMP awardees. Data were retrospectively collected for the last 56 years starting from 1962 until 2018.

3. Results

The countries that provided data are shown in Table 1. Ninety three (93) countries provided data, which is more than the number of membership of IOMP and included almost all IOMP member societies. This is approximately 50% of the total countries within the United Nations (193 member states and 2 additional observer countries). The results showed that the total number of MPs were 29,179, from which 8702 (29.8%) were women and 20,477 men. The study published in 2015 reported 17,024 as a total number of MPs with 4807 (28%) being women and 12,217 men [31]. There is a substantial increase of about 42% in the reported numbers of MPs workforce due mainly to the increase in the number of countries submitting data (93 countries submitting data in 2017 compared to 66 countries in 2015; a 30% increase in the number of countries included in the study). One has to note that the IOMP Treasurer's data from the end of 2014 shows an approximate number of 23,500 medical physicists globally.

Table 1
Medical Physicists global workforce (data from 2017). Data are reported by National Member Organizations (NMOs) contact points in countries in which no professional MPs society or NMO existed. (M: Men, W: Women, T: Total). T: 29,179, W: 8702 and M: 20,477.

	Country	T	W	M		Country	T	W	M
1	Algeria	36	13	23	48	Malta	20	6	14
2	Argentina	167	62	105	49	Mauritius	5	1	4
3	Australia-NZ	717	237	480	50	Mexico	140	45	95
4	Austria	210	51	159	51	Mongolia	4	2	2
5	Bahrain	30	26	4	52	Moroccoe	36	10	26
6	Bangladesh	330	34	296	53	Myanmar	30	21	9
7	Belgium	215	98	117	54	Namibia	6	2	4
8	Brasil	732	254	478	55	Nepal	13	0	13
9	Brunei	3	3	0	56	Nicaragua	9	4	5
10	Bulgaria	84	41	43	57	Nigeria	100	40	60
11	Camerron	2	1	1	58	Norway	186	98	88
12	Canada	726	191	535	59	Oman	25	15	10
13	Chile	30	8	22	60	Panama	15	4	11
14	China	1600	235	1365	61	Paraguay	5	1	4
15	Colombia	48	9	39	62	Philippines	110	65	45
16	Costa Rica	32	7	25	63	Poland	210	113	97
17	Croatia	53	23	30	64	Portugal	132	61	71
18	Cuba	49	18	31	65	Qatar	20	4	16
19	Cyprus	60	40	20	66	Republic of Moldova	15	3	12
20	Czech Republic	147	45	102	67	Republic of Yemen	6	1	5
21	Denmark	178	58	120	68	Romania	134	92	42
22	Dominican Republic	10	0	10	69	Russia	600	400	200
23	Ecuador	8	1	7	70	Saudi Arabia	250	50	200
24	Egypt	200	50	150	71	Senegal	2	2	0
25	El Salvador	11	2	9	72	Serbia	48	23	25
26	Ethiopia	4	0	4	73	Singapore	42	17	25
27	Finland	127	42	85	74	Slovakia	30	14	16
28	France	520	260	260	75	South Africa	185	69	116
29	Germany	1589	388	1201	76	Spain	837	260	577
30	Ghana	58	9	49	77	Sri Lanka	26	9	17
31	Greece	459	182	277	78	Sudan	28	11	17
32	Hong Kong	113	30	83	79	Sweden	300	120	180
33	Hungary	96	28	68	80	Switzerland	216	64	152
34	India	1800	250	1550	81	Syria	30	12	18
35	Iran	300	140	160	82	Taipei	317	152	165
36	Iraq	60	25	35	83	Tanzania	4	0	4
37	Ireland	206	103	103	84	Thailand	150	100	50
38	Italy	1016	540	476	85	The Netherlands	419	109	310
39	Japan	958	70	888	86	Tunisia	17	5	12
40	Kenya	4	0	4	87	Turkey	220	120	100
41	Korea	154	30	124	88	UAE	35	30	5
42	Kuwait	20	4	16	89	United Kingdom	1700	700	1000
43	Lebanon	20	8	12	90	USA	8849	1993	6856
44	Lithuania	20	11	9	91	Vietnam	140	30	110
45	Macedonia	15	10	5	92	Zambia	3	2	1
46	Madagascar	2	2	0	93	Zimbabwe	5	0	5
47	Malaysia	286	183	103	93	Zimbabwe	5	0	5

Table 2 presents the data from the current survey grouped in various geographical regions. The highest number of reporting countries was in the European region (31 countries), followed by Asia/Oceania region (19 countries), Africa (18 countries), Latin America/Caribbean (13 countries) and Middle East region (10 countries). United States of America (USA) reports the highest MPs workforce (8849). The highest number of MPs is found in Europe (10,062) and then in North America (9575). MPs workforce in Europe range from 15 MPs in FYR of Macedonia or Moldova, to 1700 reported by United Kingdom (UK). The countries with highest number of MPs in Europe are UK, Germany and Italy with over 1000 MPs. The range of MPs in Asia is also diverse starting from 3 (Brunei) to 1800 in India. The rest of the regions follow similar less pronounced patterns with Latin America/Caribbean range

Table 2
Global MPs workforce presented in geographical regions (data from 2017).

a) Europe (M: Men, W: Women, T: Total).

A/A	Country	T	W	M
1	Austria	210	51	159
2	Belgium	215	98	117
3	Bulgaria	84	41	43
4	Croatia	53	23	30
5	Cyprus	60	40	20
6	Czech Republic	147	45	102
7	Denmark	178	58	120
8	Finland	127	42	85
9	France	520	260	260
10	Germany	1589	388	1201
11	Greece	459	182	277
12	Hungary	96	28	68
13	Ireland	206	103	103
14	Italy	1016	540	476
15	Lithuania	20	11	9
16	Macedonia	15	10	5
17	Malta	20	6	14
18	Norway	186	98	88
19	Poland	210	113	97
20	Portugal	132	61	71
21	Republic of Moldova	15	3	12
22	Romania	134	92	42
23	Russia	600	400	200
24	Slovakia	30	14	16
25	Serbia	48	23	25
26	Sweden	300	120	180
27	Spain	837	260	577
28	Switzerland	216	64	152
29	The Netherlands	419	109	310
30	Turkey	220	120	100
31	United Kingdom	1700	700	1000
	Total	10,062	4103	5959

b) North America

A/A	Country	T	W	M
1	Canada	726	191	535
2	USA	8849	1993	6856
	Total	9575	2184	7391

c) Asia and Oceania (M: Men W: Women T: Total).

A/A	Country	T	W	M
1	Australia-New Zealand	717	237	480
2	Bangladesh	330	34	296
3	Brunei	3	3	0
4	China	1600	235	1365
5	Hong Kong	113	30	83
6	India	1800	250	1550
7	Iran	300	140	160
8	Japan	958	70	888
9	Korea	154	30	124
10	Malaysia	286	183	103
11	Mongolia	4	2	2
12	Myanmar	30	21	9
13	Nepal	13	0	13
14	Philippines	110	65	45
15	Singapore	42	17	25
16	Sri Lanka	26	9	17
17	Taipei	317	152	165
18	Thailand	150	100	50
19	Vietnam	140	30	110
	Total	7093	1608	5485

d) Middle East (M: Men, W: Women, T: Total).

A/A	Country	T	W	M
1	Bahrain	30	26	4
2	Iraq	60	25	35
3	Kuwait	20	4	16
4	Lebanon	20	8	12
5	Oman	25	15	10
6	Qatar	20	4	16
7	Republic of Yemen	6	1	5
8	Saudi Arabia	250	50	200
9	Syria	30	12	18
10	UAE	35	30	5
	Total	496	175	321

e) Africa (M: Men, W: Women, T: Total).

A/A	Country	T	W	M
1	Algeria	36	13	23
2	Camerron	2	1	1
3	Egypt	200	50	150
4	Ethiopia	4	0	4
5	Ghana	58	9	49
6	Kenya	4	0	4
7	Madagascar	2	2	0
8	Mauritius	5	1	4
9	Morocco	36	10	26
10	Namibia	6	2	4
11	Nigeria	100	40	60
12	Senegal	2	2	0
13	South Africa	185	69	116
14	Sudan	28	11	17
15	Tanzania	4	0	4
16	Tunisia	17	5	12
17	Zambia	3	2	1
18	Zimbabwe	5	0	5
	Total	697	217	480

f) Latin America and Caribbean (M: Men, W: Women, T: Total).

A/A	Country	T	W	M
1	Argentina	167	62	105
2	Brasil	732	254	478
3	Chile	30	8	22
4	Colombia	48	9	39
5	Costa Rica	32	7	25
6	Cuba	49	18	31
7	Dominican Republic	10	0	10
8	Ecuador	8	1	7
9	El Salvador	11	2	9
10	Mexico	140	45	95
11	Nicaragua	9	4	5
12	Panama	15	4	11
13	Paraguay	5	1	4
	Total	1256	415	841

Table 3
Global workforce as reported in the previous IOMP survey in 2015 [31] and the current 2017 survey (N: number of countries).

Geographical region	N		T		W		M	
	2015	2017	2015	2017	2015	2017	2015	2017
Africa	19	18	561	697	220	217	341	480
Asia/Oceania	9	19	3141	7093	743	1608	2398	5485
Europe	16	31	5384	10,062	1948	4103	3436	5959
Latin America/Caribbean	12	13	1159	1256	414	415	745	841
North America	1	2	6330	9575	1316	2184	5014	7391
Middle East	9	10	449	496	166	175	283	321
Total	66	93	17,024	29,179	4807	8,702	12,217	20,477

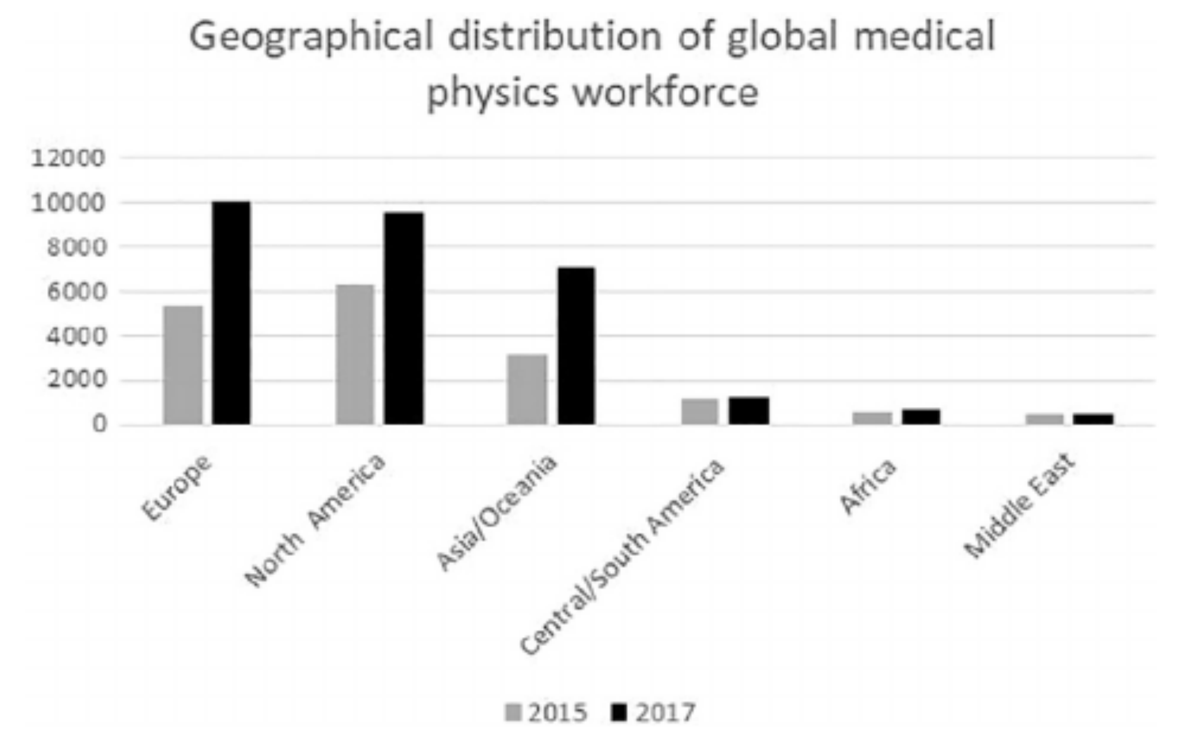

Fig. 1. Geographical distribution of total number of MPs. Europe and North America represent approximately 67% of global workforce. The increase from year 2015 to year 2017 was mainly due to the increase in the number of countries reporting data (93 countries submitting data in 2017 compared to 66 countries in 2015).

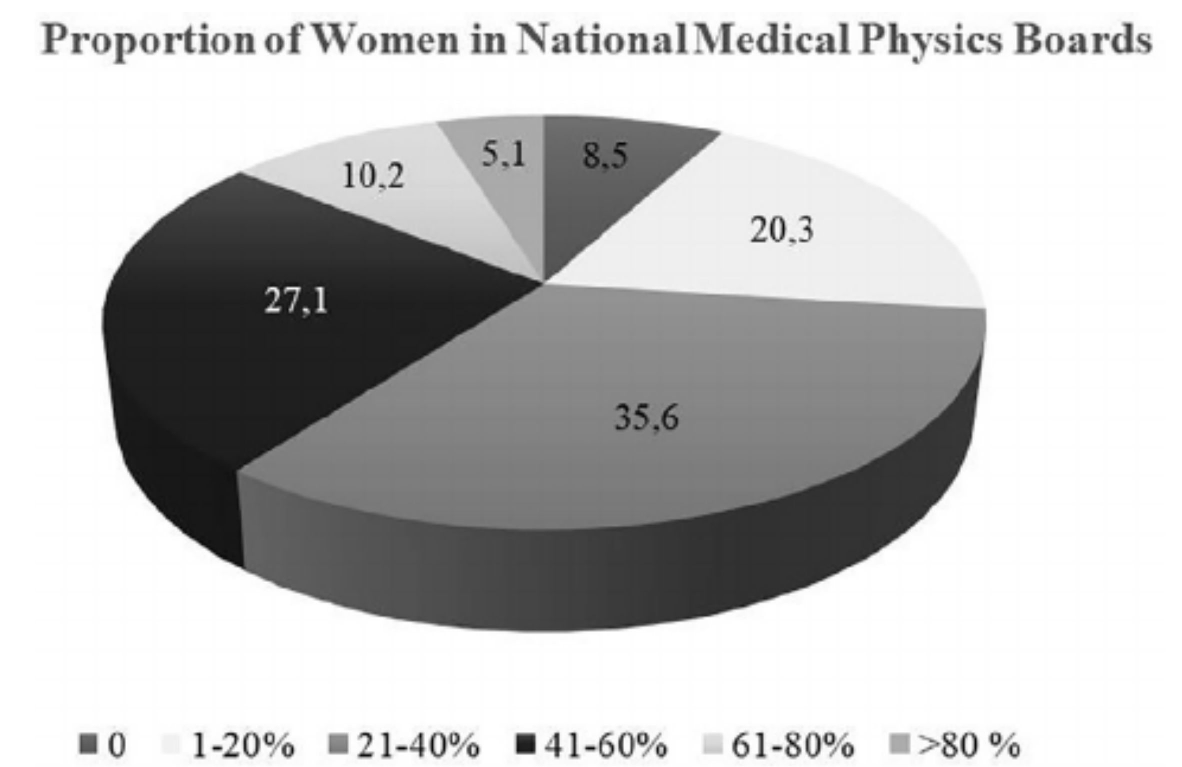

Fig. 2. Proportion of women (%) in national medical physics executive boards (EB). Highest percentage is 21–40% followed by 41–60 %. Annex The google form that was sent to National Member Organizations and can be found at the following link: https://goo.gl/forms/sdqPfHWoTcebKjlw1.

being from 5 to 732 in a country; Middle East from 6 to 250 and Africa from 2 to 200 MPs.

Table 3 and Fig. 1 compare the IOMP 2015 survey with the current 2017 survey for different geographical regions and Table 4 presents total MPs workforce per geographical region coupled to their population as this is reported by Worldometers, a free reference website that produces world statistics of various types [36]. The 2017 percentage distribution of global MPs workforce is 34% in Europe, 33% in North America (USA and Canada), followed by Asia/Oceania (24%) (Table 3). Latin America and Caribbean (4%), Africa (2%) and Middle East (2%) together do not account for even 10% of global MP workforce.

As far as synthesis of the EB of societies is concerned, not all countries responded. Data was provided by 65 countries. Fig. 2 shows the proportion of women in EB of societies. The most frequent proportion is 21–40%, followed by 41–60 %. From the 65 current Presidents only 19 are women (29%). More than half of societies (52%) did not have a woman president in the last 10 years and 33% had only once.

Table 5 shows the gender composition of IOMP Executive Committee based on the archives of the organization. Table 5a presents the gender composition within the Executive Committee. Results show that from the year 1963 (the year of IOMP formation) until the year 1994 (32 years) there was no woman MP in the IOMP Executive Committee. From the year 1994 until today, women representation range from 20% to the maximum of 40%. Table 5b presents gender composition of the IOMP Presidents together with the Chairs of Education and Training Committee (ETC), Science Committee (SC), Professional Relations Committee (PRC), Awards and Honors Committee (AHC) and editors of the IOMP Medical Physics World Newsletter. Results show that from 1963 until today there was only one woman IOMP President. The PRC have never had a woman chair, the ETC had a woman chair 3 out of 12 terms, SC had 4 out of 9 times and the MPW Newsletter 5 out of 12 terms. Finally, Table 6 presents the winners of various IOMP awards during the years. As data show there was only one time that this was offered to a woman in all 3 IOMP award types.

Table 4
Global MPs workforce is shown below for various geographical regions compared to population [36], (accessed 10th August 2018).

	Total MPs	Population	MPs/million population
Geographical Region	2017	[29]	2017
Europe	10,062	742,264,8010	13.5
North America	9575	363,844,490	26.3
Asia (with Middle East) /Oceania	7589	4,586,394,306	1.7
Latin America/Caribbean	1256	652,012,001	1.9
Africa	697	1,287,920,518	0.5

Table 5a
Gender distribution of IOMP Executive Committee is shown below.

Period	Men	Women	Total	% women
1962–1965	3	0	3	0
1965–1969	4	0	4	0
1969–1972	4	0	4	0
1972–1976	4	0	4	0
1976–1979	4	0	4	0
1979–1982	4	0	4	0
1982–1985	4	0	4	0
1985–1988	6	0	6	0
1988–1991	6	0	6	0
1991–1994	7	0	7	0
1994–1997	6	2	8	25
1997–2000	3	2	5	40
2000–2003	8	2	10	20
2003–2006	8	2	10	20
2006–2009	8	2	10	20
2009–2012	9	1	10	10
2012–2015	8	2	10	20
2015–2018	6	4	10	40
2018–2021	7	3	10	30

4. Discussion

During the first years of IOMP formation close to the year 1963, global MPs workforce was approximately 6000 scientists [22]. At that time, it was not easy to have accurate statistics as there were countries in which there were no professional societies, exchange of data and information was difficult as there were no easy means of communication and collection of data compared to today (internet, social media, email communication, etc). Data show that 54 years later (end of 2017) MPs workforce has grown five (5) times (almost 30,000 MPs today as reported in the current study). It took about 30 years for this number to double (from 6000 in 1963 to 12,000 MPs in 1995) [22]. The constantly increasing use of technology and medical devices drove an increasing need for medical physicists. Since 1995 and for the last 20 years, a rapid growth of the profession was observed (from 12,000 to almost 30,000 MPs globally) due to increase in the number of educational courses in medical physics, introduction of e-learning and a large number of training activities around the world. Our recently collected data (current and previous study [31]) show that about 900 MPs are

Table 5b
IOMP Presidents (P), Chairs of Education and Training Committee (ETC), Science Committee (SC), Professional Matters Committee (PRC), Awards and Honors Committee (AHC) and editors of the Medical Physics World Newsletter of IOMP are shown below. Data are shown starting from the year that IOMP and each Committee were formed. M: male, W: Woman.

Period	P	ETC	SC	PRC	AHC	eMPW
1962–1965	M					
1965–1969	M					
1969–1972	M					
1972–1976	M					
1976–1979	M					
1979–1982	M					
1982–1985	M					
1985–1988	M	M				M
1988–1991	M	M				M
1991–1994	M	M				M
1994–1997	W	M	M			W
1997–2000	M	W	M	M	M	W
2000–2003	M	M	W	M	M	M
2003–2006	M	M	W	M	M	M
2006–2009	M	W	W	M	M	M
2009–2012	M	W	M	M	M	M
2012–2015	M	M	M	M	M	W
2015–2018	M	M	M	M	W	W
2018–2021	M	M	M	M	W	W

Table 6
Gender distribution of IOMP awards is shown below.

Maria Sklodowska-Curie Award	Women
2003	0
2006	0
2009	1
2012	0
2015	0
2018	0
Harold Elford Johns Award	Women
2003	0
2006	0
2009	0
2012	0
2015	0
2018	1
IUPESM Award of Merit:	Women
1988	0
1991	0
1994	0
1997	0
2000	0
2003	0
2006	0
2009	0
2012	1
2015	0
2018	0

produced per year around the world for all disciplines (radiotherapy, nuclear medicine, radiology, etc). Taking into consideration the latest study of Atun and co-authors [30], and the rough estimation that about 1000 newly trained MPs should be trained each year, for the next twenty (20) years, in LMI countries alone to offer efficiently their services solely in radiotherapy, the current production is certainly not meeting global needs. This is particularly true for Latin America/Caribbean and Africa, which report 6% of total MPs workforce. Focused actions are urgently needed to change situation in these regions of the world. It should be noted that Africa ranks number 2 among geographical regions of the world (roughly equivalent to "continents"), on the basis of population, whereas Latin America/ Caribbean ranks number 4 [36].

The new International Basic Safety Standards provides requirements for medical physicists [37]. Further, guidelines have been developed for the medical physics staffing levels in medical imaging (diagnostic and interventional radiology and nuclear medicine), radionuclide therapy and radiation oncology [38–39]. Similar publications have been developed at a European level [40–42] and at national level [43–45]. Global estimation on MP needs in all fields however is still missing. Despite challenges on very accurate estimation of future MPs needs, the authors are certain that a worldwide approximate estimation of future MPs workforce (at least within the clinical environment), would be very beneficial for health policy makers, radiation protection authorities, governmental officials and international organizations. These numbers could serve as a starting point for discussion and further actions. A rough estimate of global needs could be based on the assumption that 1/3 of global workforce is working in imaging and 2/3 in radiation oncology. This assumption can be applied on Atun et al calculations related to MP workforce requirements in the field of oncology by 2035: a) for LMI countries – 22,100 medical physicists and b) for high income countries – 17,200 medical physicists [30]. Adding up these numbers, then 39,300 MPs will be needed in radiation oncology by 2035. Using the 1/3 assumption mentioned above, then approximately 19,650 MPs will be needed in imaging and thus 58,950 MPs will be required by 2035. Our IOMP current survey shows that global future needs cannot be met with current production levels (approximately 900 MPs per year globally). Special focus should also be given to the African region (there is an almost-complete absence of radiotherapy facilities in most countries in sub-Saharan Africa [30]) and Latin American/Caribbean region. Main reason is because both regions currently possess only 6% of total MPs workforce (current study) in contrast with their highly dense populations (Africa ranks number 2 and South America number 4).

As far as gender distribution is concerned, current data show that women representation is constant (29.8% in 2017 compared to 28% in 2015). It is far from the 50% UN Sustainable Development Goal and the 40% European Commission target. Women representation in EB of Societies or in presidential position follows a similar track at national level (21–40% for EB and 29% for presidential position). The IOMP archived data show that women MP representation decreases in higher hierarchy positions. There is scarce literature on the subject. The first one is a publication from Australia by Crowe SB and Kairn T [46]. Their study showed that women representation (28% of MPs workforce in Australia and New Zealand) is distributed disproportionally in junior roles with a decrease in numbers as the level of seniority is increased. Comparison of their study with older data suggests that this situation has changed little since 2008. The second publication is that of Platoni et al. [47]. The authors investigated the percentages of women MPs that have participated in European Scientific MPs events (European Federation of Organizations for Medical Physics (EFOMP) and European Society for Radiotherapy and Oncology (ESTRO) conferences and schools). The study showed that women are rarely invited as speakers or teachers though they are willing to have a continuing training [47]. According to the authors of the paper, invited speakers are usually selected according to their reputation, which is often measured by citation metrics, but women may interrupt their career to start a family and produce fewer publications during the first decade of their career. Data agree with the latest EC 2015 "She" report both on proportion of women in total workforce but also on the scarce representation in higher hierarchy or leadership positions [32]. The reasons are still not clear to the authors, as no study actually proves if this disproportionateness is because of women losing interest during the years of work or because of unfavorable social or/and professional environment.

For all these reasons, IOMP formed a Women Sub-committee in 2015 in order to develop, implement and coordinate tasks related to the role of women MPs in scientific, educational and practical aspects, to popularize the role of the women and to encourage women MPs to advance in the profession. Also during the latest executive board meeting, IOMP Executive Committee decided to encourage a 30%

women representation in all its committees. As changes in culture and attitude takes years to develop, results of these actions remain to be seen in coming years. Last but not least, considering the overall increased need of medical physicists by 2035, IOMP informed the World Health Organization (WHO) [48] and the global community of the profession [49] advising special measures to be taken for increasing the global production of medical physicists in the coming years.

5. Conclusions

The current IOMP study aimed to gather detailed data on global MP workforce, to identify differences between geographical regions of the world and to investigate whether there is a gender dimension in higher hierarchy positions. Ninety three (93) countries provided data reporting a total number of MP 29,179 (8702 women and 20,477 men). The highest percentage of global MP workforce was found in Europe (34%), followed closely by North America (33%) and Asia/Oceania (24%). Latin America/Caribbean (4%), Africa (2%) and Middle East (2%) do not account for more than 10% of global MPs workforce. Results show that in the Regions of Africa and Latin America/Caribbean the MPs per million are very low (see Table 4); this will inevitably reflect on the provision of healthcare in these regions, especially in the fields of radiotherapy, medical imaging, and related radiation safety. Rough estimations showed that approximately 58,950 MPs would be required by 2035 with a special focus Africa and Latin American/Caribbean region

As far as gender distribution is concerned, women representation is still far fromthe 50% UN Sustainable Development Goal and 40% European Commission target. Women representation in higher hierarchy position is low. More studies are needed to identify the reasons for the disproportionality at senior level positions. Whether this is the result of a loss of interest or a less positive environment remains to be seen. Whatever the reason is actions towards a more inclusive environment and culture for women medical physicists would certainly facilitate their involvement for the best benefit of our profession.

Acknowledgments

The authors of the paper would like to heartily thank all respondents from national medical physics societies, contact points and IOMP Executive Committees that contributed data, which proved to be valuable for global analysis related to the medical physics workforce.

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