



## Ukraine Radiotherapy Needs Assessment Document

26 April 2022

### Aim

To provide the WHO Emergency Committee with a “needs assessment document” for radiotherapy providers and patients in Ukraine, as well as to provide intelligence for current and future support that may be needed in Ukraine and surrounding Eastern European countries.

### Specific Radiotherapy Issues

Radiotherapy is one of the three pillars of cancer treatment and involves highly specialized, technical and multidisciplinary treatment. In the majority of cases, it requires large, fixed equipment with patients attending daily over several weeks, ideally without interruptions. It therefore has its own specific challenges, risks, and solutions during war, particularly for refugees. Radiotherapy is needed in 40% of cancer cures and in around 50% of all cancer patients, including for palliation. Cancer treatment is urgent; international data shows that for every 4 weeks of delay in cancer treatment there can be a 10% reduction in survival. Thus, it is crucial that maximal radiotherapy capacity is maintained and patient access facilitated.

### The Global Coalition for Radiotherapy (GCR)

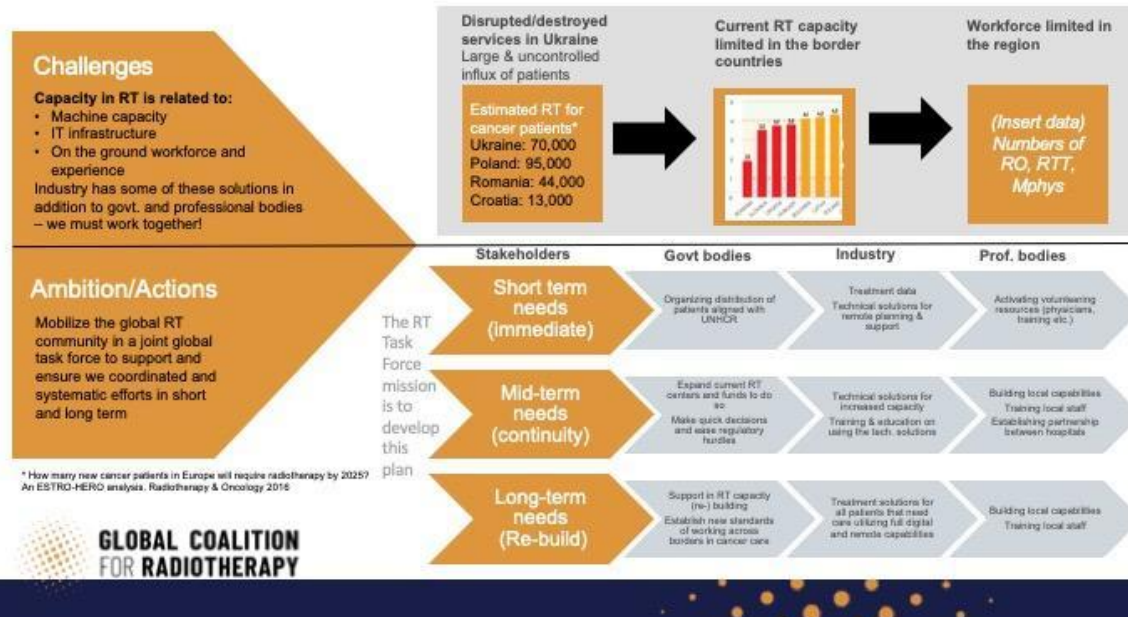
The Global Coalition for Radiotherapy is a virtual organization involving the worldwide radiotherapy community, established to address global radiotherapy challenges collectively, [www.globalradiotherapy.org](http://www.globalradiotherapy.org). The GCR was approached to provide intelligence and a “needs and solutions document” for Ukraine and Eastern European countries to assist the WHO in planning their response to the crisis in Ukraine.

### Methodology

The GCR held an initial Emergency Radiotherapy Task Force meeting via an open webinar on 15 March 2022. Eighty-seven members of the radiotherapy community joined, including individuals, industry, and organisations, as well as Ukrainian and Eastern European physicians receiving refugees.

A GCR core team has continued developing the task force and has compiled a list of individuals from the radiotherapy community volunteering their services. With the help of machine manufacturers, local centres, and the head of medical physics in Ukraine, Ruslan Zelinskyi, intelligence has been gathered on the current state of affairs. A framework of challenges has been presented and an openly available webpage has been developed ([www.globalradiotherapy.org/ukraine](http://www.globalradiotherapy.org/ukraine)) for updating specific radiotherapy information and solutions that would feed into the ECO/ASCO collaboration and WHO emergency committee. The GCR has used social media for rapid communication globally and has used a wide range of global contacts to consider solutions. Machine usage was also considered as a useful, additional metric for radiotherapy (RT) activity.

## GCR: Establish an RT Task Force supporting Ukraine cancer patients



Information comes from (i) remote RT activity monitored by specific industries on their machines (only includes those they service) (ii) direct contact with centres and (iii) contact with the medical physics society of Ukraine. As more information comes in from ECO/ASCO, ESTRO and other Radiotherapy organisations, this will continue to be a working document where data can be shared.

### Estimations and assumptions (updated from WHO 26.4.22):

- Population of Ukraine: 43.7 million
- More than 5 million refugees have left Ukraine
- 57% are in Poland, 15% in Romania
- 7.1 million internally displaced in Ukraine, representing 16% of Ukraine's population
  - Mainly women, children, and elderly
  - This group is likely to have slightly less than the "average" rate of cancer per population given the high proportion of children, but it is suspected that a disproportionate number fleeing already have cancer (assuming diagnostic pathways are available and functional).
- 162,500 new cancer cases in Ukraine in 2020 [Globocan: [804-ukraine-fact-sheets.pdf \(iarc.fr\)](https://www.iarc.fr/publications_new/globocan_2020)]
- Numbers of cancer patients needing RT: Optimal Utilization 50-52%
- Optimal radiotherapy courses 2022 (taken from 2025): 70.8K-73.4K [[How many new cancer patients in Europe will require radiotherapy by 2025? An ESTRO-HERO analysis - PubMed \(nih.gov\)](https://pubmed.ncbi.nlm.nih.gov/36111111/)]

Actual utilization rate is likely lower (as is true in other countries):

- Estimated RT needs as a percentage of cancer patients: 25-50%

### Data analysis

*Capacity and need evaluation in consideration of machines, staff and patient access and numbers*

Some centres in Ukraine are in areas currently occupied by Russian forces, and 10 million people have been displaced. Significant loss of medical and radiotherapy workforce long-term in Ukraine due to:

- Nothing to return to (houses and workplaces destroyed completely)
- Fear of returning
- Little prospect for new generation of RT specialists (education facilities destroyed)

**Estimated extra capacity needed per year for refugees as of April 2022:**

Country	Population	No cases Cancer per year	Patients needing RT per year (?Actual-Optimal)
<b>Pre War Ukraine</b>	43.7 million	162,500	41,000-81,000
<b>Eastern Europe Refugees (total)</b>	3.5 million	13,015	3,253-6,507
<b>Polish Refugees</b>	2 million	7,437	1,859-3,718
<b>Ukraine Refugees</b>	6.5 million	24,170	6,042-12,085

**Current estimated machine capacity**

*Radiotherapy Equipment in Ukraine and Neighbouring Countries:*

Country	RT Centers	MV Therapy	Light Ion Therapy	kV therapy	Brachytherapy	Last update
Ukraine	45	73	0	50	39	2021
Moldova	1	3	0	0	1	2021
Poland	46	168	2	0	25	2021
Hungary	13	42	0	4	14	2022
Romania	38	71	0	0	10	2022

Extra capacity over and above this likely needed due to the geographical distribution of refugees and working RT centres; see below Ukraine Association of Medical Physicists mapping based on DICAC data and [Ukraine | GCR \(globalradiotherapy.org\)](https://www.globalradiotherapy.org/).



**Ukraine Information Gathered to Date**

Since February 24<sup>th</sup> 2022: There was an initial decrease in activity as patients and staff stayed away from hospitals at risk of being bombed or attacked. More recently, there has been some recovery and, despite the ongoing war, patients and staff have resumed treatment in areas not directly affected (Western Ukraine).

Need	Solution	Action Needed
<p><b>Increase capacity</b></p> <ul style="list-style-type: none"> <li>• Within Western Ukraine/safe areas</li> </ul>	<ul style="list-style-type: none"> <li>• ? install equipment as needed-vendor support and ? finances</li> <li>• Increase brachytherapy capacity</li> <li>• Remote training and planning</li> <li>• Staff to transfer in</li> </ul>	<p>Financial support</p> <p>Volunteers for abroad</p>
<p><b>Logistics of supply to working RT centres</b></p> <ul style="list-style-type: none"> <li>• Machine parts</li> <li>• Shell material, small equipment and consumables</li> <li>• Chemo drugs (for chemo and chemoRT)</li> <li>• Radioactive iodine</li> </ul>	<ul style="list-style-type: none"> <li>• Vendor hotline?</li> <li>• ? project manager to source</li> <li>• <a href="https://www.gillware.com/">https://www.gillware.com/</a> (specialising in restoring data from badly damaged hardware)</li> <li>• Nataliya Kovalchuk has a list of needed supplies; <b>need donors</b></li> <li>• Telemedicine setup (Viveo, Doctors4UA, MIM + UMANA) - Roman Kowalchuk leading; <b>need MD volunteers</b></li> </ul>	<p>? support from WHO to fund coordination</p> <p>? industry to donate</p> <p>Stanford Hospital donated \$165,000-worth of medical supplies via Nova Ukraine foundation</p> <p>Mayo clinic fundraising</p> <p>Petition more institutions</p>
<p><b>Basic needs</b></p> <ul style="list-style-type: none"> <li>• Electricity and internet use</li> </ul>	<p>To be maintained in non-occupied areas</p>	<p>Authorities to prioritize</p>
<p><b>Centres</b></p> <ul style="list-style-type: none"> <li>• List of centres willing to accept/treat patients</li> </ul>	<ul style="list-style-type: none"> <li>• Assume all will ? ASCO/ECO help</li> <li>• Access to guidelines and standards</li> </ul> <p><i>*See below for an example of Ukrainian charitable foundation efforts</i></p>	<p>Increased coordination between open hospitals and the charitable foundation (Inspiration Family)</p> <p>?Funding for patient treatment</p> <p>Reach out to Professor Skladowski, Polish National Radiotherapy Consultant, for coordination of care nationally and with Eastern European counterparts</p>
<p><b>Volunteers</b></p>	<p>GCR spreadsheet and ASCO/ECO general help list</p>	<p>GCR to develop further</p>

<ul style="list-style-type: none"> <li>List of a wide range of people/organisations willing to help</li> </ul>		
<b>Conduit for information</b> <ul style="list-style-type: none"> <li>RT specific initiatives</li> </ul>	<ul style="list-style-type: none"> <li>GCR Ukraine webpage</li> <li>ECO help page [<a href="https://www.europeanacancer.org/help">https://www.europeanacancer.org/help</a>]</li> <li>ASTRO [<a href="https://www.astro.org/News-and-Publications/News-and-Media-Center/News-Releases/2022/ASTRO-Statement-on-Ukraine">https://www.astro.org/News-and-Publications/News-and-Media-Center/News-Releases/2022/ASTRO-Statement-on-Ukraine</a>]</li> </ul>	<p>Up and running</p> <p><i>*Need to distribute it widely and encourage others to contribute</i></p>
<b>Create FAQs</b> <ul style="list-style-type: none"> <li>The impact of the conflict on RT</li> </ul>	GCR preparing and will put in webpage	<p>Communicate widely</p> <p>Petitioning ASTRO/AAPM for sessions so spread awareness</p>
<b>Staff</b> <ul style="list-style-type: none"> <li>Some amongst refugees</li> <li>Most stay in the hospital (safer)</li> <li>Mostly male oncologists remain (18-60 yo males required to stay in Ukraine by law)</li> </ul>	<ul style="list-style-type: none"> <li>Useful to document what staff have fled and where are and can they help locally (5 known, see below)</li> <li>List of staff willing to mentor displaced RT health care professionals (See below, Nataliya Kovalchuk has list)</li> </ul>	<p>? information collection support from UNHCR re data collected on refugees</p> <p>Short internship for displaced providers at willing centres</p>
<b>Transport and accommodation costs</b> <ul style="list-style-type: none"> <li>Patients needing to travel and return (1-7 weeks)</li> </ul>	<ul style="list-style-type: none"> <li>? RT hotline</li> <li>List of organisations/volunteers willing to translate needs and coordinate transportation for Ukrainian patients to hospitals willing to treat them</li> </ul>	<p>Financial support ? from WHO or UNHCR</p> <p>Inspiration Family charitable foundation</p>
<b>Medical evacuation</b>	Information and funding	? Logistics support from WHO/Red Cross
<b>Translation</b> <ul style="list-style-type: none"> <li>Medical records and previous RT records</li> <li>Patient communication</li> </ul>	<ul style="list-style-type: none"> <li>Consent form for machine manufacturers</li> <li>Translation</li> </ul>	<p>? website for consent form and volunteer list</p> <p>Increased volunteer volume</p>

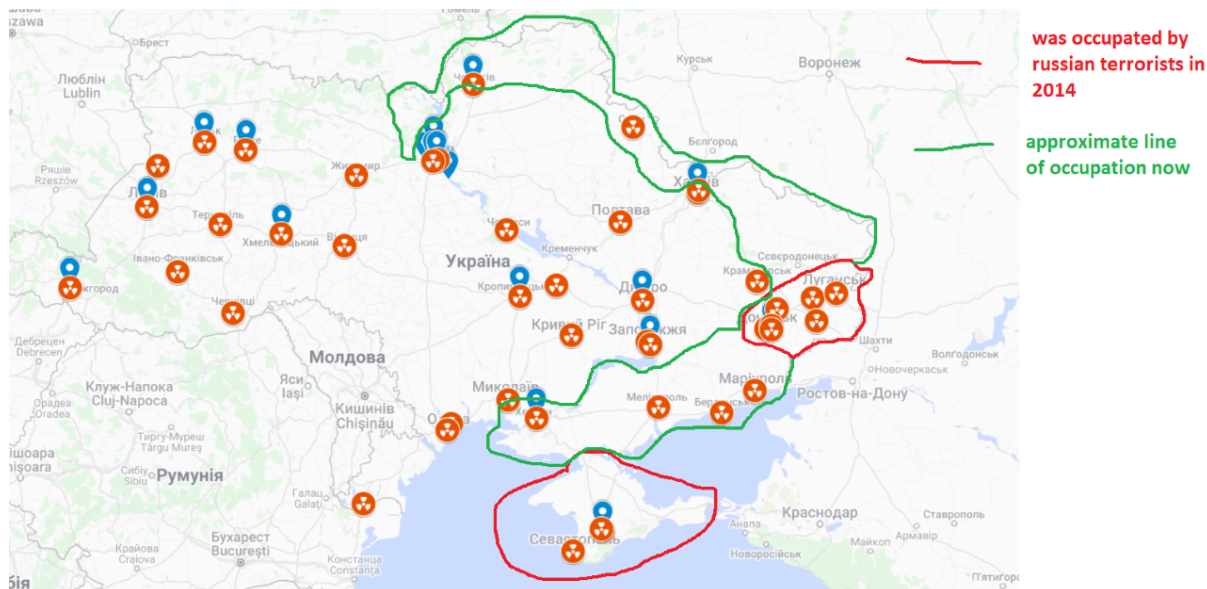
<p><b>Rebuilding plan</b></p> <ul style="list-style-type: none"> <li>Once occupying forces leave centres</li> <li>Destroyed homes of staff and patients</li> </ul>	Humanitarian and volunteer work	? WHO/Red Cross
<p><b>Security</b></p> <ul style="list-style-type: none"> <li>Cybersecurity for IT needed for RT planning and delivery</li> <li>Radiation security for cobalt and active source</li> </ul>	?	<p>Cybersecurity agencies</p> <p>IAEA monitoring</p>
<p><b>Ongoing intelligence gathering</b></p>	<ul style="list-style-type: none"> <li>Regular 2 week updates and reassessments</li> <li>Information globally of activity (eg, Ireland/Canada)</li> </ul>	Kyra working with Nataliya for direct Ukrainian intel
<p><b>Longer term plan for assistance</b></p> <ul style="list-style-type: none"> <li>Significant loss of long-term medical/radiotherapy workforce (as above)</li> </ul>	<ul style="list-style-type: none"> <li>Rebuilding patient and provider homes</li> <li>Safety</li> <li>Psychological assistance</li> <li>Training in other countries (including UK) and return for fellowship in Ukraine</li> <li>Some hospitals in Poland currently offering permanent positions to professional refugees</li> </ul>	<p>Radiotherapy Task force to work with organisations</p> <p>Nataliya Kovalchuk petitioning ASTRO/ASCO/vendors for training opportunities for Ukrainian female refugee doctors - has a list of doctors who can train</p>

## Contact Information and Latest Data on Ukraine Hospitals/RT Machines

*Updated on a bimonthly basis*

- [Ukraine Oncological Centres - Last updated 31.3.22](#)
- [Ukraine Machine Uptimes - Last updated 25.3.22](#)
- [Ukraine Installed Base - Last updated 25.3.22](#)





\*Previously occupied territory (2014) included 2 linacs and 8 Co-60 machines

	Number	City	Reason	Machines	Evacuation
Hospitals closed	6	Chernihiv Kharkiv Mariupol Berdyansk Near Kyiv (2)	<ul style="list-style-type: none"> <li>Proximity to Russian border and lines of fighting</li> <li>Danger to both staff and patients</li> </ul>	6 linacs 6 Co-60 machines  <i>*Undamaged as far as is known</i>	To central and eastern Ukraine, or remained in their cities in long term bomb shelters
Occupied hospitals open	2	Kherson Melitopol	<ul style="list-style-type: none"> <li>Fully operational</li> </ul>	1 linac 2 Co-60 machines	
Hospitals open	~34	Kyiv (9) Other (25)			

In conclusion, only 6 hospitals do not provide radiotherapy currently; all others are working now.

- Brachytherapy continues at open centres (mainly with Co-60 machines)
- New linac installed just prior to the war is commissioned and treating patients (licensing became a top priority and was expedited once the war started)
- Lack of radioactive iodine therapy
- Significant lack of access to chemotherapies (eg, pembrolizumab)

Machines currently functioning:

Institution	Status	Machines
National Cancer Institute	Public	Linear Accelerator Clinac-2100 CD VARIAN, Gamma- therapy devices "Gyne Source HDR",

		"GammaMedplus IX" 60 Co, 192 Ir brachytherapy, and AGAT-VU (MDR), Philips CT module system.
Feofania medical centre	Public	Distant radiation therapy Linear Accelerators Clinac iXY and Novalis Tx, brachytherapy GammaMed iX
Oberig	Private	Linear Accelerator - TrueBeam STx
Lissod	Private	Linear Accelerator - Halcyon(VARIAN), brachytherapy

### **About patients:**

Unfortunately we do not have any clear statistics where Ukrainian patients are. Ruslan Zelinskyi tried to find out this information directly from doctors at non-operational hospitals or centres not far from the fighting line through a survey, the response rate was low. The following conclusions were drawn:

- On average < 5% of patients disappeared (no contact with doctors)
- < 5% went abroad
  - Unknown mechanism of transportation, particularly between accommodations and treatment centre
- All others continue treatment at their hospitals or at other hospitals in Ukraine which are far from the fighting line
- *Men age 18-60 are required to stay in Ukraine for conscription*

Generally, children have fared better. Groups of children have gone abroad in an organized way and then local volunteers take them to various hospitals. If hospitals are willing to treat patients for free or at steeply discounted rates, Ruslan Zelinskyi is willing to help organise volunteer groups to help in three primary areas:

1. Translating patient documents and send to accepting hospitals
2. Transport patients who are unable to transport themselves (at least to national borders)
3. Transport patients directly to accepting hospitals

### **About staff:**

Regarding radiation oncologists and medical physicists who left Ukraine, it has been only women, some with children:

<b>Radiation Oncologists</b>	<b>Medical Physicists</b>
Milan, Italy (1)	Koln, Germany (1)
Leipzig, Germany (1)	Dresden, Germany (1)
	Berlin, Germany (1)



Unknown living conditions, English proficiency, and whether they need help or not.

If it is possible for them to do a short internship or similar, it would greatly benefit their circumstances. According to Zelinskyi, some professional activity often allows them to forget the problems and tragedy they face. Willing hospitals (especially in Germany) should contact Zelinskyi.

## **Ukraine Charitable Foundation Initiative**

The Inspiration Family is a charitable foundation (non-profit organisation) in Ukraine that has connected with two medical centres who are willing to accept and treat Ukrainian refugee patients for free (or at a discounted rate). The process is as follows:

1. The charitable foundation distributes a registration form to patients in Ukraine.
2. Patients who want to be treated in this clinic fill out a form with the following information:
  - Name and surname
  - Sex
  - Birthday
  - Full diagnosis
  - General condition
  - What type of treatment is needed (specify which chemotherapy, surgery, and radiotherapy)?
  - In what city of Ukraine are you now?
  - Do you have the opportunity to get to the Ukrainian-Poland border on your own?
  - Phone number
  - E-mail
  - Level of English proficiency
  - Will you be accompanied by an escort?
3. Completed questionnaires are sent to the hospital.
4. The hospital decides which patients they can treat, and replies to each patient by email with confirmation.
5. If a patient is ready to go to the clinic for treatment, they translate their Ukrainian doctor's report (details of the last treatment and examination results) and send it to the hospital. (The charitable foundation helps to translate if needed.)
6. The hospital reviews the documents and makes a final decision about the possibility to help. They also inform whether the treatment will be free or discounted.
7. When the charitable foundation gathers a certain number of patients who have been confirmed for treatment and are ready to go, a bus to the border is organized.
8. A group of volunteers meet patients in Poland and take them to the appropriate clinic. Patients are also looking for housing for the duration of treatment.

There are already two groups of patients waiting for answers from the clinics. The two clinics currently involved in this are Amsterdam UMC and the Netherlands Cancer Institute.

If more clinics are ready to treat Ukrainian patients, they can join this model. Please send all contact information of interested clinics to Ruslan Zelinskyi, Ukrainian Head of Medical Physics Department in Spizhenko Clinic and Co-founder and President of the Ukrainian Association of Medical Physics, [zelinskyi.ruslan@gmail.com](mailto:zelinskyi.ruslan@gmail.com). A representative of the Inspiration Family will contact the clinic to agree on the details.

---

Document credits:

- Information source:
  - Ruslan Zelinskyi, Ukrainian Head of Medical Physics Department in Spizhenko Clinic and Co-founder and President of the Ukrainian Association of Medical Physics
  - Dr. Oleksandr Sakharenko, Varian Consultant, Kesarev
  - Teresa Gmur, Varian Sr. Manager Government Affairs & Market Development
  - Therese Lindé, Elekta Global Public Affairs Director
  - Frédérique Moureau, Accuray Director Health Economics & Public Affairs, EIMEA
  - Insight from Agata Rembrielak, Polish Radiation Oncologist working in UK
  - Dr. Nataliya Kovalchuk, Stanford School of Medicine
- Compilation:
  - Professor Pat Price, Co-founder, Global Coalition for Radiotherapy and Chair Radiotherapy UK
  - Kyra McComas, resident radiation oncologist, Association of Residents in Radiation Oncology (ARRO), Global Health
- Communications:
  - Darien Laird, Director of Communications, Global Coalition for Radiotherapy