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Impacts of the Covid-19 on the IRPA young generation activities in radiation protection: testimonies and experience feedback

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Abstract – The measures implemented to limit the spread of Covid-19 have brought many challenges on the work organization, the radiation protection being no exception. The IRPA Young Generation Network has investigated through a collection of testimonies the impacts of these measures and how the continuity and consistency of radiation protection was ensured. This article presents the results of the analysis of the testimonies. The impacts of the Covid-19 for each of the radiation protection related sectors covered by the survey are presented from a young generation perspective. The impacts are never negligible and even more important in some sectors and for some type of work. The adaptations made to the radiation protection and how they were implemented are shown, as well as the lessons-learned from these unprecedented circumstances.

Keywords: Young Generation Network / testimonies / IRPA / Covid-19

1 Introduction

The worldwide pandemic of Covid-19 has brought the world to a kind of standstill. Life had to go on and many workers started a new professional life which combined teleworking, visio conferences, paper-based work and indeed some regular work on site whenever necessary or possible.

The new way of life imposed by the Covid-19 pandemic has introduced new challenges, also faced by young professionals and scientists in radiation protection.

This is what we investigated through a collection of testimonies and experience feedback coming from the young scientists and professionals, members of the national radiation protection societies of IRPA. The objective of this paper is to report a synthesis of these testimonies, the evaluation of the impacts of the Covid-19 on radiation protection activities (from a young perspective) and especially how the consistency of radiation protection was ensured in such circumstances.

2 Methods

This study started in mid-March 2020 with the elaboration by the five authors of this paper of a questionnaire to be

circulated among the IRPA Young Generation Network in order to initiate a collection of testimonies.

A questionnaire composed of five open questions (*cf. Appendix A*) was proposed to help the participants write down the impacts they faced due to Covid-19, the initiatives they took to ensure the continuity and the consistency of their radiation protection (RP) activities, and also the remaining difficulties.

The questionnaire was sent by email to the Members of the IRPA YGN Leadership Committee on 26th March 2020 for further dissemination. The same protocol was used for a previous survey (*Andresz et al., 2019*). The testimonies have been shared to the community using the IRPA YGN Blog (the upload was every weekly). The study was closed on May 15th after the reception of the 31st testimony.

3 Results

3.1 Information about the participants

The thirty-one participants came from 8 countries (at least, because the IRPA YGN Leadership Committee Representative from Argentina has forwarded anonymous testimonies coming from all South America):

- Asia: Japan (N=8) and China (2);
- America: Argentina and other south American countries (7), Canada (4);

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- Europe: Austria (4), France (1), Spain (4) and United Kingdom (1).

In the questionnaire, the participants were first invited to describe shortly their area of work and it appeared that the participants are often “multi-tasks”, meaning that their job generally covers several radiation protection-related topics and that they bear several responsibilities in:

- Management and consultancy (N=8);
- Medical field (8) (*e.g.*, medical physicists);
- Dosimetry and instrumentation (8) (*e.g.*, calibration laboratory);
- Education (teaching/studying) (6);
- Regulation and inspection (5) (*e.g.*, regulator, manager of installation);
- Environmental radioactivity (4).

Therefore, the testimonies cover a large panorama of work and interestingly allowed to collect some complementary points of view, *e.g.*, from a Radiation Protection Service in hospital (managing staff dosimeters) and from an external dosimetry laboratory. The same situation occurred when comparing the viewpoints of regulators-licensees and teachers-students.

Despite the large panorama, there are many commonalities and it is proposed to first describe the generic impacts of Covid-19 on the young professionals, and then to develop on the specific elements for some sectors. The discussion will highlight some comparisons between radiation protection and Covid and the lessons-learned from the situation.

3.2 General impacts

The following consequences have affected all organizations:

- The program of activities for the forthcoming year has to be reconsidered totally and several activities were given less priority;
- Domestic and overseas business trips have been cancelled;
- All events gathering radiation protection professionals (meetings, seminar and symposium) have been postponed or cancelled;
- Teleworking has been implemented in routine.

This required huge flexibility in terms of work arrangement and several participants reported that “it was difficult to organize ourselves”.

Paper-based work. For “paper-based research” and office work, the impacts were tiny because most daily tasks could be completed electronically at home: “*The basis has not changed*”, although a high level of flexibility was needed in term of work arrangement and displacement of workload.

Meetings have been implemented on a regular basis (*ex. weekly*) using teleconference systems (Zoom, Skype, Microsoft Teams) and the feedback is good in general. Office phone calls have to be forwarded to cell-phones (Jabber has been used with good feedback).

Numerous very practical difficulties have been encountered: unstable internet connection impairing data transfer and meetings, high phone bills, overwhelmed network, limitation in use and to data access due to security reasons have been reported. All resulted in significant lack in progress and delays. Diminution of interactions with the other co-workers was reported.

Some participants have been placed by management on mandatory leaves. Staying at home for a long period and not interacting for real with the co-workers have been reported as “*tough*” and the overall situation “*stressful*”. Several participants expressed concerns about the long-term psychological consequences of the situation.

The presence of (very) young children (a context specific to young professionals) has raised difficulties, notably in the personal vs. professional balance: “*I cannot do telework to take care of my baby*”, “*it is HARD to juggle both*”.

The problem of accessing database, software and documentation was reported several times (the worst case was when the documentation was not in electronic format). In some cases, the access to database using a VPN (Virtual Private Network) has been reported.

Practical work. The impacts were more important for more “practical-based” radiation protection that cannot be performed remotely. The young generation is particularly represented in these jobs *e.g.*,

- Laboratory experiments and calculation;
- Samples collection and measurements (environmental monitoring);
- Fundamentals research often in connexion with an university researcher/a PhD;
- “*I cannot access my laboratory to perform my research*”.

Most of these works have been considered as “non-priority” and cancelled or postponed.

3.3 Nuclear-cycle related industries (nuclear power plants and other installations)

Work management. These works have been deemed as “essential activities” and operation have been pursued, but with less staff on-site (rotating schedule) and with important modification of activities and workplace station: regular disinfection, minimization of contact, mask wearing, etc.

The RP coverage (for advice and support) could not be performed optimally over distance: “*I cannot adequately do this without seeing the process in person*”. The reduced RP presence on-site caused overwork of the staff and difficulties in getting information from the field. The question of a general “slip” of RP results due to the reduced RP presence was raised (*e.g.*, increase in the number of contaminations?).

As an ultimate contingency plan, it has been decided to identify and train a reserve bank of workers (with initial knowledge in RP) and give them RP function in case the situation worsen (a Shift Monitor Handbook was elaborated for this purpose).

RP practices and equipment. A clarification was rapidly needed for when to apply face shield (for radiological risk) and surgical mask (for infection control). Generic communication

to the staff could do the job, but the importance of personalized communication about the new procedures was highlighted.

Specific procedures for the disinfection of the detectors at the exit of controlled area of plants have been implemented.

The quality control of NPP environmental monitoring system and the circulation of samples to laboratory have been suspended or limited to essential samples. Other activities have been postponed: calibration of instruments, other quality assurance procedures, as well as the acquisition of new equipment. Dosimetric activities and inspections will be analysed in below paragraphs.

3.4 Hospitals

Staffs with responsibilities in RP such as Technicians in Radiology Service or Nuclear Physicians have reported that hospitals have been saturated by Covid-19 patients (or suspected of having it). Non-essential operations have been postponed to manage and treat Covid-19 patients and emergencies. The main priority has been the biological risk and not radiation protection. In some cases, the principle for justification was questioned (*e.g.*, applying oncology procedures for Covid-19 patients).

At the beginning, the difficulties were the lack, scarcity and low-quality of protective personal equipment (PPE) against Covid-19 (respirators, masks, gloves, gown, etc.), and the fact that PPE have complicated operation and work (*e.g.*, discomfort, lack of habit etc.). This resulted in operation taking longer time and delays in procedure.

Drafting protocols and procedures to coordinate and harmonize sanitary and radiation protection was needed. At the beginning, this was empirical and made at the scale of individual/department. Then, interdisciplinary working group have been set up, also fed with the input of national and international institutions and network professional bodies, etc. For example, the working group was composed of hospital representatives and professionals, the regulatory authority and different professional associations (ex. nuclear medicine).

But this was “*slow*” and the implementation of the procedures in the field “*made with difficulties*”: new procedures were not clear and training was needed. Progress was made only with the development of communication (brochure and internal seminar), and best achieved with personalized communication (training on the spot). The young generation has often been put in front line for communication (ex. hotline).

In the end, specific protocols have been established *e.g.*, for the labelling, preparation and injection of radiopharmaceuticals and in line with infection-control requirement. For radiology imaging, a protocol balancing between radiation protection standards compatible with sanitary precaution have been put in place.

Equipment. Similarly to nuclear installations, many procedures such as calibration and quality control of equipment (X-Rays machine) contracted with the manufacturers or laboratories have been postponed.

But on the opposite, more checks were needed in some cases: hospitals have contacted laboratories to test urgently large amounts of radiological protection clothes which were

used continually (used for CT-imaging of lungs, hence for Covid-19 diagnosis). Specific protocols have been implemented but the potential augmented infection risk has raised high concerns from the laboratories. This might again question the balance (and the transfer) of radiological vs. sanitary risks.

The dosimeters of hospital staff have been managed in two manners:

- 1 The monthly controls of electronic dosimeters have been suspended (during the lockdown). In the first manner, there was the potential to identify too late a dose exceedance.
- 2 In the cases where the dosimeters still circulated from/to hospital to laboratories, specific protocols have been put in place (unpack/read/pack) to prevent infection.

External laboratories have provided support (by distance) to the hospital staff and again the personal communication (mail, telephone) has proven to be more efficient than the initial generic communication (website).

3.5 Regulation

They are mixed impacts and feelings in this sector. Office work has been replaced by home office work without “*influence on the work yet*”. Similarly, on-site inspections have been postponed. For example, inspectors have not been able to perform routine inspection of X-ray equipment (*e.g.*, more than 7000 facilities in a country) so virtual inspections have been put in place by the Regulators to ensure that the users have the knowledge about the legislation and are using the equipment with diligence to the standards, that preventive maintenance is performed, etc. But participants reported that virtual inspection cannot replace the *in-situ* inspections for assessing the extent of radiation protection compliance.

From the licensee side, some participants have sought advice from the Authorities and have reported difficulties to access appropriate people (“*limited working hours*” and “*poor accessibility*”).

3.6 Education and training

Naturally, the young generation is particularly represented in this sector. Globally all face-to-face courses and training have all been cancelled or replaced by remote teaching. This is an unprecedented switch.

Early difficulties have been encountered by teachers because of the lack of knowledge and use of new tools such as educational platforms. Reactive meetings and video conferences were scheduled for knowledge building, coordination and harmonization of procedures (*e.g.*, to evaluate the progress of the students).

Nonetheless, teachers have reported that the switch from face-to-face to online courses was a big challenge and required a huge work to reshape the courses for adaptation, but the efficiency of education and training in virtual setting remain difficult to evaluate (as epitomized by “*are the message still passed?*” from a trainer). Advanced on-line teaching systems (RainClassroom and TenCent Conference have been quoted) have been used with good feedback and have allowed the students to interact live with the trainer and the other students

(e.g., tools can lead students to illustrate slide on-line). New modalities for the evaluation and the graduation of students were decided and practical activities postponed.

The diminution of interaction has raised concern from students: “*I cannot have discussion with my senior*”, “*I am only reading books at home*” when others have seen the bright side: “*Students who are shy could actively speak through the typing*”, “*this is a very good opportunity to introduce the remote teaching*”.

3.7 Putting Covid-19 and radiation protection in comparison

With the situation, the participants have naturally developed on similarities in the management of the Covid-19 and radiation protection and these reflections are collected in this paragraph.

- The knowledge about radiation protection has been reported as very useful in the Covid situation because the radiation protection principles are pretty much applicable against virus infection and are comparable: time, distance and shielding/PPE. This has facilitated the communication of new procedures to the workers accustomed to radiation protection;
- The Japanese participants highlighted that the experience from the Fukushima accident has been re-used at hospitals: the triage at the entrance and the delimitation of contaminated vs. non-contaminated areas;
- The topics of communication in emergency have also been judged very similar. Hoax can spread rapidly and experts/scientists need to communicate clearly and above all in a harmonized and coordinated manner;
- Concerns about the initiative to use ionizing radiation for disinfection of instruments and even individuals against the Covid-19 have been raised. These initiatives have been judged not ALARA.

3.8 Other lessons-learned

Some participants reported that their organisation was prepared in advance for “non-routine situation” and have contingency plans. When the organisation was prepared, the switch to the new organization and the “work-from-home” model was reported as “smooth” and “timely implemented”.

In South-East Asia, the SARS and MERV epidemics provided lessons-learned that were of use in 2020 for the continuity of the activities. The continuity plan should consider having many alternatives to continue activities, even “worst-case scenario”.

The management of documentation (access to important documents) should also be better anticipated. In other cases (Europe), the participants questioned the readiness of their organisation to face the pandemic and also any other emergencies even nuclear emergency.

Working remotely, teleconference and other digital tools have proven to be possible and can be helpful. The use of such systems is not always easy, they come with a certain cost and it

is better for individuals to get comfortable with using these tools and for the organisation to plan for assistance and support (this was needed in all sectors). Non-work technologies (WhatsApp) have also been used to remain connected. But a general technological agility is needed, maybe impairing communication between the young generation and other generations with these tools.

4 Conclusion

The Covid-19 pandemic has affected all the radiation protection related sectors covered by the survey and the collection of IRPA YGN testimonies allowed to get the viewpoint of the young generation. The impacts on radiation protection have never been negligible, and even more important in some sectors and for some type of work.

Most office and paper-based work have been performed remotely: the impacts are organisational “only” and it is conceivable that the continuity and the consistency of radiation protection have been ensured, although this point was not investigated in depth in this survey. But this does not mean that their consequences on RP can be totally disregarded: difficulties with online system, with the new working management, delays, lack of interaction with co-workers and the rest of the communities, not to mention the psychological aspects (stress) have been reported repeatedly. Indeed, previous studies have shown that health crises can cause anxiety in the acute phase (Kawashima *et al.*, 2020) and specifically that confinement measures and stay-at-home orders implemented in Japan after the Fukushima nuclear accident have been associated with higher levels of changes in mental health (Sawano *et al.*, 2020), which can last for years (Hori, 2020). The evolution of the situation might be worthwhile to investigate by the IRPA Young Generation Network and national networks.

The impacts are more important with job requiring practical manipulation: young scientists performing research with experiments, PhD work and young professionals in laboratories. Research work has been generally deemed non-priority and cancelled or postponed. The situation is the same for most “non-essential” radiation protection procedures such as quality assurance, calibration, renewal of instruments, etc. The monthly control of dosimeters and regulatory inspection has also been postponed or has been adapted (virtual inspection). Overall, it seems the RP procedures were not the main priority. The collection of testimonies was superficial on this topic and the timing did not give the opportunity to collect data to document the topic. However, similar survey implemented later in 2020 (after 2nd lockdown) were able to collect quantitative and qualitative data on about the extension of use of dosimeters, report of inspections and other quality-insurance related activities (García-Baonza *et al.*, 2021). A deep analysis of these data could be presented in further studies.

The presence of radiation protection workers on-site was needed in hospitals and most nuclear installations, but the RP-oversight was reduced due to staff limitation. Ensuring a high level of RP with limited presence was judged not possible on

the long term. In these sectors, the main challenges were for the coordination of the protection against infection and radiation. This touched overriding issues such as the justification principle, the transfer of risks and the holistic approach that may be worthwhile to investigate in future.

The most efficient way to sort out the issue was an interdisciplinary working group, using experience from other bodies and countries, to elaborate the procedure, followed then by a personalized communication and training about the new procedures.

An area where the young generation is highly represented is education and training. The entire sector has moved from the usual face-to-face to a new way of remote interactions (if not cancelled). Practical difficulties have been encountered by teachers and students at the beginning and concerns about the quality of RP education with the new scheme have been expressed and remain current. The long-term impacts of the pandemic for this sector are an area of concern for the IRPA Young Generation Network.

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Appendix A . The questionnaire.

Table 1. This layout was used to collect the testimonies and send to the IRPA Young Generation Network.

Name and organisation

(or leave it blank if you want anonymity)

What is your job in radiation protection?

What are the difficulties encountered in your daily-job of radiation protection's professional because of the Covid outbreak?

(personal level, organisation level, etc)

How do you ensure the continuity and consistency of a high level of radiation protection given the circumstances? What are the initiatives taken? Any practical lessons-learned to share?

What difficulties remain?

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