



Non-medical caregivers and the use of intraperitoneal chemotherapy in the operating theatre: A survey on the perception of safety

M. Al Hosni, C. Rouget, C. Cusumano, E. Garcia Lozano, H. Popescu, S. Carrere,
F. Quénet, O. Sgarbura

► To cite this version:

M. Al Hosni, C. Rouget, C. Cusumano, E. Garcia Lozano, H. Popescu, et al.. Non-medical caregivers and the use of intraperitoneal chemotherapy in the operating theatre: A survey on the perception of safety. Journal of Visceral Surgery, 2020, 157, pp.461 - 467. <10.1016/j.jviscsurg.2020.02.005>. <hal-03493621>

HAL Id: hal-03493621

<https://hal.science/hal-03493621v1>

Submitted on 15 Dec 2022

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons CC BY-NC 4.0 - Attribution - Non-commercial use - International License

Original article

Non-medical caregivers and the use of intraperitoneal chemotherapy in the operating theatre: a survey on the perception of safety

Mohammed Al Hosni¹, Christel Rouget², Caterina Cusumano¹, Edgar Garcia Lozano¹, Horatiu Popescu³, Sébastien Carrere¹, François Quénet¹, Olivia Sgarbura¹

¹ Department of Surgical Oncology, Cancer Institute Montpellier (ICM), University of Montpellier, 34298, Cedex 01, Montpellier, France

² Operating Theatre Nurse, Cancer Institute Montpellier (ICM), 34298, Cedex 01, Montpellier, France

³ Department of Anesthesiology, Cancer Institute Montpellier (ICM), University of Montpellier, 34298, Cedex 01, Montpellier France

Running title: Non-medical caregivers and intraperitoneal chemotherapy

Corresponding author:

Olivia Sgarbura, Cancer Institute of Montpellier, Surgical Oncology Department

208, Avenue des Apothicaires, 34298, Cedex 01, Montpellier, France

olivia.sgarbura@icm.unicancer.fr

Acknowledgements:

SIRIC Montpellier Cancer Grant INCa_Inserm_DGOS_12553

Declaration of interest: “The authors declare that they have no competing interest”

Abstract

Background:

In the last two decades, intraperitoneal(IP) chemotherapy during surgery achieved recognition in the management of peritoneal metastases. Occupational hazard became a concern leading to standardized safety measures. The aim of this study is to evaluate the perceived level of information and protection among the non-medical caregivers involved in HIPEC and PIPAC in a high-volume center.

Methods:

All non-medical caregivers in the operating theatre of our institution were asked to answer a questionnaire between April and May 2018. The questionnaire included multiple choice questions and open questions structured in four parts: demographic variables, perceived level of information, perceived level of protection, interest in further education.

Results:

Forty-nine caregivers agreed to answer the questionnaire. All identified IP chemotherapy as an occupational risk. Thirty-eight persons (77,55%) thrust the protective value of safety measures during HIPEC compared to 32(65,3%) during PIPAC. 29 persons (59,18%) used some of the measures while 16(32,65%) used all of them. Main reasons of non-use were slips and lapses(7 persons) and lack of comfort(4 persons). 34 caregivers considered the level of information about safety protocols as good or very good (69%). 46 persons considered the level of protection as satisfying or excellent (93,87%). 36(73,47%) interviewees expressed the need of receiving more information.

Conclusions:

The present study shows that non-medical caregivers in the operating theatres are aware of the occupational hazards related to the use of IP chemotherapy. The use of protective measures is associated with decreased level of perceived risk. However there is a high need of continuous education on this subject for the involved personnel.

Keywords: HIPEC, PIPAC, occupational hazard, occupational risk, chemotherapy exposure

Acknowledgement: SIRIC Montpellier Cancer Grant INCa_Inserm_DGOS_12553

Abbreviations

EPIC – early postoperative intraperitoneal chemotherapy

HIPEC – hyperthermic intraperitoneal chemotherapy

ICU – intensive care unit

IP – intraperitoneal

OR – operating room

PIPAC – pressurized intraperitoneal aerosol chemotherapy

PM – peritoneal metastases

Introduction

During the last two decades, paradigms have continuously changed concerning the loco-regional treatment of peritoneal metastases (PM) of different origins[1,2] . Operating rooms in expert centers witnessed the use of early intraperitoneal chemotherapy (EPIC)[3], hyperthermic intraperitoneal chemotherapy (HIPEC)[4] and, more recently, pressurized intraperitoneal aerosol chemotherapy (PIPAC)[5]. With the arrival of these drug delivery methods incorporated into the surgical treatment of PM, security measures have evolved as the occupational hazard benefitted from a growing awareness.

For HIPEC, which remains the most frequently used intraperitoneal drug delivery method, contamination risk came into the spotlight for some research groups [6]. Several authors showed that there is no detectable safety hazard for the surgeon or for the operating room (OR) personnel[7–12]. A survey performed within the French centers explored different protection methods used in France and the importance of standardization of these safety measures[13].

Safety guidelines were recently published and they included measures concerning the following steps of the surgical intervention: preparation of the operating room and the OR personnel, use of personal protective equipment during HIPEC, handling of chemotherapy during HIPEC, spill management and handling of waste after HIPEC[6] .

By contrast, PIPAC is a more recent procedure with theoretically different levels of risk of contamination as the chemotherapy is delivered in the form of aerosols. Available studies confirm the safety of PIPAC on operation room personnel, if safety precautions are applied[14] .

The literature in this field is based on the identification of the procedures and the quantification of their result in terms of exposure[8,11,15–17]. By contrast, the objective of the present study is to look at operating theatre caregivers' perception of security measures related to intra-peritoneal chemotherapy in a single center with high volume use of both HIPEC and PIPAC.

Material and methods

The questionnaire

The questionnaire was created by an operating room nurse specializing in PIPAC and HIPEC (CR) in collaboration with a surgeon **experienced** in both procedures (OS). The items were multiple choice questions and open questions as presented in Appendix 1. They addressed demographic data, the knowledge of the caregivers concerning the use of IP chemotherapy in the operating room as well as their perception on their knowledge and safety resulting from these measures. **The item construction followed available guidelines[18,19] and the first version of the questionnaire was reviewed and corrected by all authors before administration allowing for face and content validity assessment.** The study was approved in the institutional review board in accordance with the ethical standards of the Helsinki Declaration of 1975.

The caregivers

HIPEC has been performed at the Cancer Institute of Montpellier (ICM) since 2004 while PIPAC was introduced in 2016. The institution is a high-volume center with an yearly experience of more than 100 HIPEC procedures and more than 70 PIPAC procedures. **All the categories of non-medical caregivers had a theoretical course on PIPAC, a simulation of the procedure before the first real procedure in the OR, and another course three months later. Some of the caregivers were initially trained in HIPEC before the beginning of the program in 2004. Several updating courses were provided on a regular basis. Newcomers were trained “on the field” by experienced members with procedure debriefing and practice under supervision.** All the non-medical personnel of the OR of ICM were asked to fill in the survey in an anonymous manner. The addressed categories of personnel included cleaning agents, auxiliary agents, circulating nurses, anesthesia nurses and scrub nurses working in the OR or/and in the postoperative care unit that is integrated in the OR structure.

Data management and statistical analysis

All data were analyzed with the SPSS software (SPSS 17.0; SPSS Inc., Chicago, Illinois, USA) for Windows. Categorical variables were expressed as percentages with two decimals while continuous variables were expressed as medians with range. Non-parametrical statistical tests were used for comparison purposes (Chi-square). Pearson correlation and logistic regression were used for testing association between variables. Univariate and multivariate analysis were performed. A p-value of less than 0,05 was considered significant.

Results

Survey participants

The questionnaire was conceived and administered between April and May 2018. Forty-nine participants responded to the questionnaire out of 51 solicited (response rate 96,1%). The demographical characteristics of the study group are presented in Table 1.

Safety measures

The rates of participants that identified the risk of contamination with intra-peritoneal chemotherapy were 100% with HIPEC and 98% with PIPAC. The rates of acknowledgement of three major risks for each procedure are presented in Table 2. 16 (32,65%) caregivers used all the safety measures while 29 (59,18%) used more than five out of seven protective measures. The most commonly used protection were the sterile gloves (86%). The less used protective measure was the absorbing mat (55%).

Safety perception

The results concerning the perception on safety and information are presented in Table 3. 25 participants (51%) believed that there was a moderate risk of exposure to chemotherapy drugs with HIPEC. The safety measures available were sufficient to decrease this risk according to the opinion of 38 (78%) of them. Concerning PIPAC, this risk was estimated as weak for 29 (59,18%) of the respondents with sufficient cautious efforts for 32 (65,3%) of them.

All participants admitted that all the safety measures were available, and 43 (87,75%) of them used these tools. Four (8,16%) attributed the omission of protective procedures to the lack of comfort in using the specific tools, while seven (14,28%) considered this was due to forgetting (slips and lapses). Protective gloves were never omitted. All scrub nurses declared the use of all protected measures. Five of the seven slips and lapses were identified among cleaning and auxiliary personnel. Lack of comfort was equally incriminated by circulating nurses and anesthesia nurses.

34 (69,38%) of the caregivers considered the level of information about safety protocols as good (53%) or very good (16%), while 15 persons (31%) considered it weak (27%) or null (4%). Except for age category, demographic factors do not have an impact on the perceived level of protection. When nurses are considered separately, circulating and scrub nurses are perceiving a statistically higher level of protection when compared to anesthesia nurses

($p=0,05$). Concerning the perceived level of information, no demographic factor was identified to have a statistically significant impact. For this subset of questions, in the nurses category, circulating and scrub nurses perceived a higher level of information when compared to anesthesia nurses ($p=0,04$). In univariate and multivariate analysis, there was no significant impact on either the “protected” or the “informed” perceived status of age, gender, experience or profession.

36 (73,47%) of interviewees expressed the need of receiving more information about safety measures. Age had a significant impact on this item with 93,75% of caregivers aged less than 35 expressing their need for training ($p=0,03$). No other demographic variable proved to have a significant impact in univariate and multivariate analysis.

Discussions

Since the diffusion of intra-peritoneal (IP) chemotherapy for peritoneal carcinomatosis in the operating theatres, caregivers and regulators have expressed concerns related to occupational safety. Several papers explored this issue and succeeded to prove that these procedures are safe when the equipment and protocol are respected[10,12,14,16,17,20–22]. Safety measures such as gloves, shoe covers, reinforced surgical gowns, FFP2/3 masks, protection goggles, double pair of gloves and absorbing mats were identified to be effective in minimizing the risk of personnel contamination by IP cytotoxic agents while laminar flow can be an option for a rapid turnover of contaminated air in the room. The OR personnel is regularly trained concerning these practices either at a national level (participation in targeted national courses), regional level (nurse association driven) or local level (institution driven). However, the turnover rate of the different type of caregivers in the OR is irregular and, sometimes, unpredictable[23] imposing a training “on the field” under the supervision of another experienced member for many of the newcomers before theoretical courses can be provided.

To our knowledge, this is the first study to evaluate the awareness of the non-medical operating theatre staff concerning the risk of contamination and to test their perception of the applied measures as well as their need for continuous education. No validated survey was available for that intent therefore we created an original questionnaire based on available questionnaire design guidelines[18,19]. A similar method was used in other surveys concerning protective measures in HIPEC centers[13]. Although a validated tool would have

been optimal, it is acknowledged that a new questionnaire can be conceived in order to address untested issues if the rules of conception are respected[18]. The new questionnaires need to comply with specific construction and validation criteria[24]. Construct and face validity were assessed together with the local team of experts but the number of items was restricted to a minimum in order to maintain high response rates. The study is unicentric and therefore the total number of subjects was low not allowing a pilot testing. The present administration can be considered as a pilot testing on a matter that is rapidly evolving in current practice in order to develop an international survey.

We handed the survey to all the non-medical caregivers involved in HIPEC and PIPAC procedures in our high-volume center. Although they were aware of the importance of security measures, two main reasons were incriminated in the occasional lack of respect for the safety protocols: lack of comfort and slips and lapses. **Lack of comfort in general and specifically thermal comfort were** already cited in the literature as a difficulty for caring on with surgical procedures[25]. The identification of the lack of comfort as a factor involved in root causes of caregivers' exposure could stimulate the administration and industry to look for more pertinent solutions concerning the equipment. **However national and international data is needed to confirm that the lack of comfort with the current equipment is real and impacts the safety of caregivers.**

Slips and lapses were often identified as major factors in the non-medical caregivers actions leading to errors[26,27]. Together with mistakes they were incriminated in medication administration errors such as choice of drug dose, intravenous pump set up but also in monitoring errors in the intensive care unit (ICU). In the present study we identified slips and lapses as a risk factor concerning the application of all safety measures in a minority of the participants (14,28%), **more frequently among cleaning and auxiliary personnel**. Although they usually concerned only one item of the seven-item list, this situation should become a priority in the management of the OR together with other measures imagined to preserve the human factor[28]. Possible solutions are related to increasing awareness to the occupational hazard through continuous education.

Our results demonstrate that responders are globally well prepared as they succeeded to correctly identify the risks associated with each type of procedure as well as the associated available equipment. The estimation can be considered well-grounded as the response rate was high (96,10%). However the complete assessment of their procedure-related knowledge

is difficult as the turnover of the personnel can be high, leaving no time for proper, repeated training before integration[23].

Previous papers showed that there was an important contamination by cytotoxic agents in the samples of operating room surfaces (floor, trocars and gloves). Despite that, no significant levels were detected in personal urine samples or in the operating room air[17,21]. All the studies emphasized the importance of safety measures, but the demonstrated absence of health caregivers' contamination is also a consequence of individual education. In our survey, more than the half of caregivers expressed fear of IP chemotherapy but the vast majority of them perceived the protective value of the safety equipment.

The majority of the respondents rated the level of information as good or higher (69%) but 73,47% considered that further education was needed. Age is the only demographic factor impacting the need for education. Although not tested, personnel of younger age is more frequently less trained and confronted with fertility projects. However, the large interest for further education should also be interpreted as a signal that continuous training is mandatory for non-medical personnel in the operating theatres and should be organized on a regular basis. It should include not only formal education often proposed by the respective professional organizations but also local training concerning specific procedures.

Communication with the team is of uttermost importance. Previous reports underlined the role of communication in assuring surgical safety[29]. In our study, it has been shown that surgical nurses, both circulating and scrubbed, have a higher degree of perceived safety and information when compared to anesthesia nurses. As the IP administration is performed during a surgical procedure, this perceptive difference can be attributed to enhanced communication in the core of the same specialty. A systematic review showed that interventions that improve surgical culture including teamwork and communication may lead to a higher healthcare efficiency and better patient outcomes[30]. It can be inferred that an extension of the communication surgeon -nurse at the level of the entire team can lead to a higher compliance to safety measures and an improved perceived safety level. These hypotheses remain to be demonstrated by future interventional studies.

The present study is a single-center study performed in a high-volume unit for both HIPEC and PIPAC. Safety measures, equipment and educational culture are representative for this unique site. A multicenter international survey should follow in order to consolidate the present results and to sustain future initiative in this field. Progress in the use of IP

chemotherapy in the operating theatre should be accompanied by equal progress in safety protocols and training programs that will eventually lead to a homogenous standard of care.

In conclusion, the present study shows that the non-medical caregivers in the operating theatres are aware of the occupational hazards related to the use of IP chemotherapy and that the use of protective measures is associated with decreased level of perceived risk. The lack of comfort and slips and lapses are the two major factors that threaten the application of safety protocols. There is a high need of continuous education on this subject for the involved personnel. More studies are needed in experience centers in order to assess the future standards of protection and education.

References

-
- [1] Koumpa FS, Xylas D, Konopka M, Galea D, Veselkov K, Antoniou A, et al. Colorectal peritoneal metastases: A systematic review of current and emerging trends in clinical and translational research. *Gastroenterol Res Pract* 2019. doi:10.1155/2019/5180895.
- [2] Dahdaleh FS, Turaga KK. Evolving Treatment Strategies and Outcomes in Advanced Gastric Cancer with Peritoneal Metastasis. *Surg Oncol Clin N Am* 2018;27:519–37. doi:10.1016/j.soc.2018.02.006.
- [3] Sugarbaker PH, Graves T, DeBruijn EA, Cunliffe WJ, Mullins RE, Hull WE, et al. Early Postoperative Intraperitoneal Chemotherapy as an Adjuvant Therapy to Surgery for Peritoneal Carcinomatosis from Gastrointestinal Cancer: Pharmacological Studies. *Cancer Res* 1990;18:5790–4.
- [4] Sugarbaker PH. Peritoneal Metastases, a Frontier for Progress. *Surg Oncol Clin N Am* 2018;27:413–24. doi:10.1016/j.soc.2018.02.001.
- [5] Alyami M, Hübner M, Grass F, Bakrin N, Villeneuve L, Laplace N, et al. Pressurised intraperitoneal aerosol chemotherapy: rationale, evidence, and potential indications. *Lancet Oncol* 2019;20:e368–77. doi:10.1016/S1470-2045(19)30318-3.
- [6] Kyriazanos I, Kalles V, Stefanopoulos A, Spiliotis J, Mohamed F. Operating personnel safety during the administration of Hyperthermic Intraperitoneal Chemotherapy (HIPEC). *Surg Oncol* 2016;25:308–14. doi:10.1016/j.suronc.2016.06.001.
- [7] Schmid K, Boettcher MI, Pelz JOW, Meyer T, Korinth G, Angerer J, et al. Investigations on safety of hyperthermic intraoperative intraperitoneal chemotherapy (HIPEC) with Mitomycin C. *Eur J Surg Oncol* 2006;32:1222–5. doi:10.1016/j.ejso.2006.05.011.
- [8] Stuart OA, Stephens AD, Welch L, Sugarbaker PH. Safety monitoring of the coliseum technique for heated intraoperative intraperitoneal chemotherapy with mitomycin C. *Ann Surg Oncol* 2002;9:186–91. doi:10.1007/bf02557372.

- [9] Guerbet M, Goullé JP, Lubrano J. Evaluation of the risk of contamination of surgical personnel by vaporization of oxaliplatin during the intraoperative hyperthermic intraperitoneal chemotherapy (HIPEC). *Eur J Surg Oncol* 2007;33:623–6. doi:10.1016/j.ejso.2007.02.027.
- [10] Schierl R, Novotna J, Piso P, Böhländt A, Nowak D. Low surface contamination by cis/oxaliplatin during hyperthermic intraperitoneal chemotherapy (HIPEC). *Eur J Surg Oncol* 2012;38:88–94. doi:10.1016/j.ejso.2011.10.009.
- [11] Näslund Andréasson S, Anundi H, Thorén S-B, Ehrsson H, Mahteme H. Is Platinum Present in Blood and Urine from Treatment Givers during Hyperthermic Intraperitoneal Chemotherapy? *J Oncol* 2010;2010:1–4. doi:10.1155/2010/649719.
- [12] Konate A, Poupon J, Villa A, Garnier R, Hasni-Pichard H, Mezzaroba D, et al. Evaluation of environmental contamination by platinum and exposure risks for healthcare workers during a heated intraperitoneal perioperative chemotherapy (HIPEC) procedure. *J Surg Oncol* 2011;103:6–9. doi:10.1002/jso.21740.
- [13] Ferron G, Simon L, Guyon F, Glehen O, Goere D, Elias D, et al. Professional risks when carrying out cytoreductive surgery for peritoneal malignancy with hyperthermic intraperitoneal chemotherapy (HIPEC): A French multicentric survey. *Eur J Surg Oncol* 2015;41:1361–7. doi:10.1016/j.ejso.2015.07.012.
- [14] Solaß W, Giger-Pabst U, Zieren JJ, Reymond MA, Solass W, Giger-Pabst U, et al. 21st International Congress of the European Association for Endoscopic Surgery (EAES), Vienna, Austria, 19–22 June 2013. *Surg Endosc* 2014;28:54–191. doi:10.1007/s00464-014-3484-z.
- [15] Korinth G, Schmid K, Midasch O, Boettcher MI, Angerer J, Drexler H. Investigations on Permeation of Mitomycin C Through Double Layers of Natural Rubber Gloves. *Ann Occup Hyg* 2007;51:593–600. doi:10.1093/annhyg/mem039.
- [16] Ametsbichler P, Böhländt A, Nowak D, Schierl R. Occupational exposure to cisplatin/oxaliplatin during Pressurized Intraperitoneal Aerosol Chemotherapy (PIPAC)? *Eur J Surg Oncol* 2018;44:1793–9. doi:10.1016/j.ejso.2018.05.020.
- [17] Ndaw S, Hanser O, Kenepekian V, Vidal M, Melczer M, Remy A, et al. Occupational exposure to platinum drugs during intraperitoneal chemotherapy. Biomonitoring and surface contamination. *Toxicol Lett* 2018;298:171–6. doi:10.1016/j.toxlet.2018.05.031.
- [18] Boynton PM, Greenhalgh T. Selecting, designing, and developing your questionnaire. *BMJ* 2004;328:1312–5. doi:10.1136/bmj.328.7451.1312.
- [19] Rattray J, Jones MC. Essential elements of questionnaire design and development. *J Clin Nurs* 2007;16:234–43. doi:10.1111/j.1365-2702.2006.01573.x.
- [20] Willaert W, Van de Sande L, Van Daele E, Van De Putte D, Van Nieuwenhove Y, Pattyn P, et al. Safety and preliminary efficacy of electrostatic precipitation during pressurized intraperitoneal aerosol chemotherapy (PIPAC) for unresectable carcinomatosis. *Eur J Surg Oncol* 2019. doi:10.1016/j.ejso.2019.06.018.
- [21] VILLA AF, EL BALKHI S, ABOURA R, SAGEOT H, HASNI-PICHARD H, POCARD M, et al. Evaluation of oxaliplatin exposure of healthcare workers during heated intraperitoneal perioperative chemotherapy (HIPEC). *Ind Health* 2015;53:28–

37. doi:10.2486/indhealth.2014-0025.
- [22] Graversen M, Pedersen PB, Mortensen MB. Environmental safety during the administration of Pressurized IntraPeritoneal Aerosol Chemotherapy (PIPAC). *Pleura and Peritoneum* 2016;1. doi:10.1515/pp-2016-0019.
 - [23] Coomber B, Louise Barriball K. Impact of job satisfaction components on intent to leave and turnover for hospital-based nurses: A review of the research literature. *Int J Nurs Stud* 2007;44:297–314. doi:10.1016/j.ijnurstu.2006.02.004.
 - [24] Trakman GL, Forsyth A, Hoyer R, Belski R. Developing and validating a nutrition knowledge questionnaire: key methods and considerations. *Public Health Nutr* 2017;20:2670–9. doi:10.1017/S1368980017001471.
 - [25] Zwolińska M, Bogdan A. Thermal Sensations of Surgeons During Work in Surgical Gowns. *Int J Occup Saf Ergon* 2013;19:443–53. doi:10.1080/10803548.2013.11077000.
 - [26] Ribeiro G da SR, Silva RC da, Ferreira M de A, Silva GR da. Slips, lapses and mistakes in the use of equipment by nurses in an intensive care unit. *Rev Da Esc Enferm Da USP* 2016;50:419–26. doi:10.1590/S0080-623420160000400007.
 - [27] Keers RN, Williams SD, Cooke J, Ashcroft DM. Causes of Medication Administration Errors in Hospitals: a Systematic Review of Quantitative and Qualitative Evidence. *Drug Saf* 2013;36:1045–67. doi:10.1007/s40264-013-0090-2.
 - [28] Brennan PA, Oeppen R, Knighton J, Davidson M. Looking after ourselves at work: the importance of being hydrated and fed. *BMJ* 2019;1528. doi:10.1136/bmj.1528.
 - [29] Davidson M, Brennan PA. Leading article: What has an Airbus A380 Captain got to do with OMFS? Lessons from aviation to improve patient safety. *Br J Oral Maxillofac Surg* 2019;57:407–11. doi:10.1016/j.bjoms.2019.02.012.
 - [30] Sacks GD, Shannon EM, Dawes AJ, Rollo JC, Nguyen DK, Russell MM, et al. Teamwork, communication and safety climate: a systematic review of interventions to improve surgical culture. *BMJ Qual Saf* 2015;24:458–67. doi:10.1136/bmjqs-2014-003764.

Table 1 Demographic characteristics of the study group

Characteristic		Number (%)
Sex	Male	11 (22,40)
	Female	38 (77,6)
Age	25-35	16 (32,7)
	35-45	18 (36,7)
	>45	15 (30,6)
Type of function	Cleaning agent	9 (18,4)
	Auxiliary caregiver	3 (6,1)
	Circulating nurse or Postoperative room nurse	17 (34,7)
	Anesthesia nurse	13(26,5)
	Scrub nurse	7 (14,3)
Experience	<1 year	6 (12,2)
	1 to 5 years	15 (30,6)
	5 to 10 years	5 (10,2)
	>10 years	23 (46,9)

Table 2 Identification and use of security measures

Item		Number (%)
Identification of three main exposure risks in HIPEC	Direct contamination	43 (87,75)
	Surgical waste manipulation	33 (67,35)
	Environmental projections	24 (48,9)
Identification of three main exposure risk in PIPAC	Airways contamination	34 (69,38)
	Surgical waste manipulation	24 (48,9)
	Direct contamination	19 (38,77)
Use of protective measures	Yes	43 (87,75)
	No	6 (12,25)
Reasons for not using protective measure	Forgetting	28 (57,14)
	Unavailability	8 (16,32)
	Discomfort	17 (34, 69)
	Absence of exposure risk	8 (16,32)

Table 3 Variation of perception of protection and information depending on demographic variables (*-statistically significant value)

Perceived level of protection						
Variable	Categories	Responses				P value
		Insufficient (%)	Average (%)	Satisfying (%)	Excellent (%)	
Age	25-35	0	0	13 (81,25)	3 (18,75)	P=0,02*
	35-45	0	1 (5,55)	6 (33,33)	11 (61,12)	
	>45	0	2 (13,33)	7 (46,67)	6 (40,00)	
Gender	Male	0	1 (9,1)	7 (63,63)	3 (27,27)	P=0,5
	Female	0	2 (5,27)	19 (50)	17 (44,73)	
Function	Cleaning (ASH)	0	2 (22,22)	5 (55,56)	2 (22,22)	P=0,15
	Auxiliary Nurse (AS)	0	0	2 (66,67)	1 (33,33)	
	(IDE)	0	0	8 (47,05)	9 (52,95)	
	Anesthesia nurse (IADE)	0	1 (7,7)	9 (69,23)	3 (23,07)	
	Scrub nurse (IBODE)	0	0	2 (28,57)	5 (71,43)	
Experience	<1	0	0	3 (50,00)	3 (50,00)	P=0,9
	1 to 5	0	2 (13,33)	8 (53,34)	5 (33,33)	
	5 to 10	0	0	3 (60,00)	2 (40,00)	
	More than 10	0	1 (4,34)	12 (52,18)	10 (43,48)	

Perceived level of information						
Variable	Categories	Responses				p-value
		Insufficient(%)	Average (%)	Satisfying (%)	Excellent (%)	
Age	25-35	1 (6,25)	6 (37,50)	7 (43,75)	2 (12,50)	P=0,11
	35-45	1 (5,56)	3 (16,67)	13 (72,21)	1 (5,56)	
	>45	0	4 (26,66)	6 (40,00)	5 (33,34)	
Gender	Male	0	5 (45,45)	5 (45,45)	1 (9,1)	P=0,53
	Female	2 (5, 26)	9 (23, 68)	20 (52,64)	7 (18,42)	
Function	Cleaning (ASH)	0	1 (11,11)	6 (66,67)	2(22,22)	P=0,09
	Auxiliary Nurse (AS)	0	2 (66,67)	1 (33,33)	0	
	(IDE)	0	4 (23,53)	11 (64,70)	2 (11,77)	
	Anesthesia nurse (IADE)	2 (15,38)	5 (38, 47)	6 (46,15)	0	
	Scrub nurse (IBODE)	0	1 (14,28)	2 (28,57)	4 (57.15)	
Experience	<1	1 (16, 67)	2 (33,33)	3 (50,00)	0	P=0,54
	1 to 5	1 (6,66)	4 (26,67)	7 (46,67)	3 (20,00)	
	5 to 10	0	2 (40,00)	2 (40,00)	1 (20,00)	
	More than 10	0	5 (21,74)	14 (60,87)	4 (17,39)	
Interest for continuous education						
Variable	Categories	Responses		p-value		

		Yes	No	
Age	25-35	15 (93,75)	1 (6,25)	P=0,03*
	35-45	13 (72,22)	5 (27,78)	
	>45	8 (53,33)	7 (46,67)	
Gender	Male	11 (100)	0	P=0,1
	Female	25 (65,79)	13 (34, 21)	
Function	Cleaning (ASH)	6 (66,67)	3(33,33)	P=0,27
	Auxiliary Nurse (AS)	2 (66,67)	1 (33,33)	
	(IDE)	14 (82,35)	3 (17,65)	
	Anesthesia nurse (IADE)	11 (84,61)	2 (15,38)	
	Scrub nurse (IBODE)	3 (42,85)	4 (57,15)	
Experience	<1	5 (83,34)	1 (16,66)	P=0,67
	1 to 5	12 (80,00)	3 (20,00)	
	5 to 10	4 (80,00)	1 (20,00)	
	More than 10	15 (65,22)	8 (34, 78)	