Review Article

Occupational safety measures in the intraoperative period of hyperthermic intraperitoneal chemotherapy: scoping review

Medidas de segurança ocupacional no transoperatório de quimioterapia hipertérmica intraperitoneal: *scoping review*

Medidas de seguridad ocupacional en el transoperatorio de quimioterapia hipertérmica intraperitoneal: scoping review

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Abstract

Objective: To map the occupational safety measures recommended to professionals involved in the intraoperative care of patients undergoing Hyperthermic Intraperitoneal Chemotherapy.

Methods: Qualitative scoping review based on the Joanna Briggs Institute. Searches were performed in Pubmed, VHL, SciELO, Scopus, Web of Science, Google Scholar, The Chocrane Library databases and gray literature. The PCC acronym was used in the research question: what occupational safety measures are necessary in the operating room for professionals working directly or indirectly in the intraoperative period of HIPEC? A search for articles published between 2015 and 2019 was performed.

Results: Literature on the subject was scarce. Ten articles were selected: a systematic review; two control cases; two descriptive studies; four literature review studies; an experience report. In the analysis of articles, the recommended safety measures for professionals who work directly or indirectly in this surgical procedure was evidenced, namely: education and training of the staff involved; use of individual and collective protective equipment; provision of infrastructure and general guidelines.

Conclusion: Recommended safety measures for professionals involved in the intraoperative care of patients undergoing Hyperthermic Intraperitoneal Chemotherapy are: team training; use of specific individual and collective protection equipment; necessary infrastructure, such as adjusting the air conditioning to higher pressure inside the operating room; and general guidelines regarding the organization of the operating room, waste disposal, cleaning of the room/materials used, and monitoring of the occupational health of the team involved in the surgical procedure.

Resumo

Objetivo: Mapear as medidas de segurança ocupacional recomendadas aos profissionais envolvidos no atendimento transoperatório de pacientes submetidos à Quimioterapia Intraperitoneal Hipertérmica.

Métodos: Estudo qualitativo com ênfase em *scoping review*, fundamentado no Instituto Joanna Briggs. Realizou-se buscas nas bases de dados Pubmed, BVS, SciELO, Scopus, Web of Science, Google Scholar, The Chocrane Library e literatura cinzenta. Pergunta de pesquisa utilizou o acrônimo PCC: quais medidas de segurança ocupacional são necessárias no Centro Cirúrgico para profissionais que atuam, direta ou indiretamente, no transoperatório da HIPEC? A Busca de artigos ocorreu entre 2015 a 2019.

Resultados: Evidenciou-se escassa literatura sobre a temática. Selecionados dez artigos: uma revisão sistemática; dois casos-controle; dois estudos descritivos; quatro estudos de revisão bibliográfica; um relato de experiência. Análise dos artigos evidenciou as medidas de segurança recomendadas para profissionais que

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atuam direta ou indiretamente nesse procedimento cirúrgico, a saber: educação e capacitação da equipe envolvida; utilização de equipamentos de proteção individual e coletiva; oferecer infraestrutura e orientações gerais.

Conclusão: Medidas de segurança recomendadas para os profissionais envolvidos no atendimento transoperatório do paciente submetido à Quimioterapia Intraperitoneal Hipertérmica são: capacitação da equipe; utilização de equipamentos específicos de proteção individual e coletiva; infraestrutura necessária como ajuste do ar condicionado com pressão maior dentro da sala cirúrgica; e orientações gerais em relação à organização da sala cirúrgica, descarte dos resíduos, limpeza da sala/materiais utilizados e acompanhamento da saúde ocupacional da equipe envolvida em procedimento cirúrgico.

Resumen

Objetivo: Mapear las medidas de seguridad ocupacional recomendadas a los profesionales involucrados en la atención transoperatoria de pacientes sometidos a Quimioterapia Intraperitoneal Hipertérmica.

Métodos: Estudio cualitativo con énfasis en el *scoping review*, fundamentado en el Instituto Joanna Briggs. Se realizaron búsquedas en las bases de datos Pubmed, BVS, SciELO, Scopus, Web of Science, Google Scholar, The Chocrane Library y literatura gris. Pregunta de encuesta utilizó el acrónimo PCC: ¿qué medidas de seguridad ocupacional se hacen necesarias en el Quirófano para profesionales que actúan, directa o indirectamente, en el transoperatorio de la HIPEC? La búsqueda de los artículos ocurrió entre el 2015 y el 2019.

Resultados: Se puso en evidencia una escasa literatura sobre la temática. Seleccionados diez artículos: una revisión sistemática; dos casos-control; dos estudios descriptivos; cuatro estudios de revisión bibliográfica; un relato de experiencia. Análisis de los artículos evidenció las medidas de seguridad recomendadas para profesionales que actúan directa o indirectamente en ese procedimiento quirúrgico, a saber: educación y capacitación del equipo involucrado; utilización de equipos de protección individual y colectiva; brindar infraestructura y orientaciones generales.

Conclusión: Representan medidas de seguridad recomendadas para los profesionales involucrados en la atención transoperatoria del paciente sometido a Quimioterapia Intraperitoneal Hipertérmica: capacitación del equipo; utilización de equipos específicos de protección individual y colectiva; infraestructura necesaria como ajuste del aire acondicionado con una presión más alta dentro del quirófano; y orientaciones generales con relación a la organización del quirófano, descarte de los deshechos, limpieza de la sala/materiales utilizados y acompañamiento de la salud ocupacional por el equipo involucrado en el procedimiento quirúrgico.

Introduction

Hyperthermic Intraperitoneal Chemotherapy (HIPEC) was described in 1986 for the treatment of patients with peritoneal pseudomyxoma and mesothelioma, having better disease-free survival as the outcome.[1] It is indicated for the treatment of peritoneal carcinomatosis due to neoplasms restricted to the peritoneum without invasion of lymphatic or blood tissue of primary cancers of the stomach, ovaries, and mainly colorectal.[2,3] Associated with cytoreductive surgery, it improves the quality of life and is contraindicated for patients over 65 years of age and those with associated diseases.[4]

In March 2020, the National Commission for the Incorporation of Technologies in the National Health Service (Portuguese acronym: CONITEC) published a decision to include cytoreductive surgery with HIPEC in the treatment of peritoneal pseudomyxoma and mesothelioma within the scope of the National Health Service (Brazilian SUS).[5,6]

Complete cytoreductive surgery is performed in the Operating Room (OR) preceding HIPEC, and consists in removal of all visible tumor burden from the peritoneal cavity.[4,7,8] In order to determine tumor extension and volume and if the patient is eligible for HIPEC, the surgeon performs the Peritoneal Cancer Index (PCI) and at the end of cytoreduction, applies The Completeness of Cytoreduction score to classify the extent of tumors not removed.[9] The score varies between 0 and 3cm, and the complete cytoreductive surgery is considered when the value is equal to or less than 0.25cm. If the tumor volume is larger, HIPEC is contraindicated.[9]

At the end of cytoreductive surgery, the patient undergoes HIPEC with administration of cytotoxic agents at high temperature (44°C) in the intraperitoneal cavity [4] for 60 to 120 minutes.[8] The intraperitoneal administration exposes tumor cells to direct contact with the drug at high temperature, which favors the penetration of the chemotherapeutic agent into the intracellular environment, increasing absorption and presenting less effects compared to conventional intravenous therapy.[9,10] The drugs used vary according to the origin of the tumor, and may be Methotexate, Irinotecan, Doxorubicin, Oxaliplatin, among others.[4] Techniques at the surgeon's discretion; open and closed techniques are common.[4,11,12]

Drugs indicated for the treatment of neoplasms are on the "list of dangerous drugs", and during HIPEC, through direct or indirect contact, they can contaminate the skin and eyes and inhalation of the chemotherapy (high temperature vapor).[3,13–15]

Studies dating back to 1970 document the exposure of professionals to the toxic effects of handling chemotherapy drugs and describing the presence of this type of drug in the urine of professionals who administered the therapies.[15,16] Chemotherapy drugs can have carcinogenic effects in professionals exposed daily for a long period of time.[15,16] The greatest possibility of contamination is by the inappropriate handling[17] of professionals participating in the procedure.

In view of the potential risks of professionals exposed to work with antineoplastic drugs and the scarce literature on the occupational safety of professionals working in this type of surgical procedure, this study aimed to map the occupational safety measures recommended for professionals involved in intraoperative care of patients undergoing HIPEC.

Methods

Qualitative study with emphasis on scoping review based on the Joanna Briggs Institute. This allows for a synthesis of knowledge by mapping the key concepts on the subject and enables the inclusion of original and non-original studies and articles, in addition to those available in the gray literature, as well as the inclusion of studies based on searches in databases/platforms.[18,19] Its development occurred in nine steps:[20] definition of the research question and objectives; definition of eligibility criteria; description of the planned approach, search for studies, selection, data extraction and presentation of evidence; denomination of the search for evidence; selection of evidence; extraction of the evidence; analysis of the evidence found; presentation of results; and summary of evidence regarding the purpose of the review.[20]

The research question was based on the PCC acronym; "P" of population (professionals working in the OR involved in the HIPEC procedure), "C" concept (occupational safety) and "C" context (necessary care for occupational safety during the intraoperative period).[18] Therefore, the research question was: what occupational safety measures are necessary in the OR for professionals working directly or indirectly in the intraoperative period of HIPEC?

Searches were carried out between September 2019 and January 2020 in Pubmed, Virtual Health Library (VHL), Scientific Electronic Library Online (SciELO), Scopus, Web of Science, Google Scholar and The Chocrane Library.

Selection of controlled terms in the Health Science Descriptors (DeCS) and Medical Subject Headings (MeSH) plus uncontrolled terms. Selected in DeCS: induced hyperthermia, operating room, pharmacological treatment, occupational health and peritoneal neoplasms. In MeSH: induced hyperthermia, surgicenters, drug therapy, occupational health and peritoneal neoplasms. The search strategy was defined with Boolean operators AND and OR combined with uncontrolled terms related to HIPEC and occupational safety. Table one presents databases with their respective search strategies (Table 1).

Table 1. Strategies used in databases

Database	Strategy used
PUBMED	(Occupational Risks OR Occupational Health OR Occupational Exposure) AND (Therapy, Fever OR Fever Therapy OR Hyperthermia, Therapeutic OR Therapeutic Hyperthermia OR Thermotherapy OR Induced Hyperthermia OR Hyperthermic Intraperitoneal Chemotherapy OR Chemotherapy, Hyperthermic Intraperitoneal OR Hyperthermic Intraperitoneal Chemotherapies OR Intraperitoneal Chemotherapy, Hyperthermic OR Hyperthermia, Local OR Local Hyperthermia)
VHL	("Occupational Risks" OR "Occupational Health" OR "Occupational Exposure") AND ("Therapy, Fever" OR "Fever Therapy" OR "Hyperthermia, Therapeutic" OR "Therapeutic Hyperthermia" OR "Thermotherapy" OR "Induced Hyperthermia" OR "Hyperthermic Intraperitoneal Chemotherapy" OR "Chemotherapy, Hyperthermic Intraperitoneal" OR "Hyperthermic Intraperitoneal Chemotherapies" OR "Intraperitoneal Chemotherapy, Hyperthermic" OR "Hyperthermia, Local OR Local Hyperthermia")
SCIELO	(Occupational Risks) OR (Occupational Health) OR (Occupational Exposure) AND (Therapy, Fever) OR (Fever Therapy) OR (Hyperthermia, Therapeutic) OR (Therapeutic Hyperthermia) OR (Thermotherapy) OR (Induced Hyperthermia) OR (Hyperthermic Intraperitoneal Chemotherapy) OR (Chemotherapy, Hyperthermic Intraperitoneal) OR (Hyperthermic Intraperitoneal Chemotherapies) OR (Intraperitoneal Chemotherapy, Hyperthermic) OR (Hyperthermia, Local) OR (Local Hyperthermia)
Scopus	(Occupational Risks) OR (Occupational Health) OR (Occupational Exposure) AND Therapy, Fever OR Fever Therapy OR Hyperthermia, Therapeutic OR Therapeutic Hyperthermia OR Thermotherapy OR Induced Hyperthermia OR Hyperthermic Intraperitoneal Chemotherapy OR Chemotherapy, Hyperthermic Intraperitoneal OR Hyperthermic Intraperitoneal Chemotherapies OR Intraperitoneal Chemotherapy, Hyperthermic OR Hyperthermia, Local OR Local Hyperthermia)
Web of Science	(Occupational Risks OR Occupational Health OR Occupational Exposure) AND (Therapy, Fever OR Fever Therapy OR Hyperthermia, Therapeutic OR Therapeutic Hyperthermia OR Thermotherapy OR Induced Hyperthermia OR Hyperthermic Intraperitoneal Chemotherapy OR Chemotherapy, Hyperthermic Intraperitoneal OR Hyperthermic Intraperitoneal Chemotherapies OR Intraperitoneal Chemotherapy, Hyperthermic OR Hyperthermia, Local OR Local Hyperthermia)
Google Scholar	(Occupational Risks OR Occupational Health OR Occupational Exposure) AND (Therapy, Fever OR Fever Therapy OR Hyperthermia, Therapeutic OR Therapeutic Hyperthermia OR Thermotherapy OR Induced Hyperthermia OR Hyperthermic Intraperitoneal Chemotherapy OR Chemotherapy, Hyperthermic Intraperitoneal OR Hyperthermic Intraperitoneal Chemotherapies OR Intraperitoneal Chemotherapy, Hyperthermic OR Hyperthermia, Local OR Local Hyperthermia)
The Cochrane Library	"Occupational Risks" OR "Occupational Health" OR "Occupational Exposure" AND "Therapy, Fever" OR "Fever Therapy" OR "Hyperthermia, Therapeutic" OR "Therapeutic Hyperthermia" OR "Thermotherapy" OR "Induced Hyperthermia" OR "Hyperthermic Intraperitoneal Chemotherapy" OR "Chemotherapy, Hyperthermic Intraperitoneal" OR "Hyperthermic Intraperitoneal Chemotherapies" OR "Intraperitoneal Chemotherapy, Hyperthermic" OR "Hyperthermia, Local OR Local Hyperthermia"

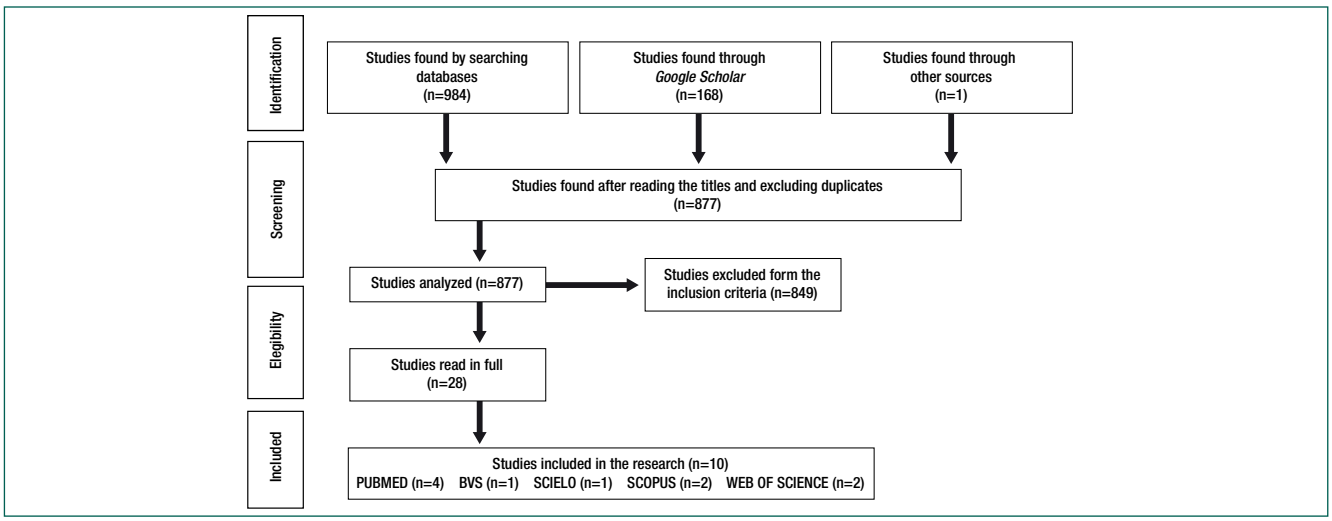

Figure 1. Study selection flowchart

The inclusion criteria for the selection of studies were publications between 2015 and 2019; in English, Spanish and Portuguese; regardless of design; available in full, free of charge in electronic media. Exclusion criteria were studies addressing HIPEC in animals or children.

Searches were carried out with the mapping of data from the sources of evidence included, recording them in an Excel table (Microsoft Office). Independent peer-reviewed studies. Selection based on the reading of the title, abstract and later, the full text.

In scoping reviews, the assessment of the methodological quality of studies included is not necessary. The treatment method and data summary were mapped according to the theme and determinations of the Preferred reporting items for systematic reviews and meta-analyses - extension for scoping reviews (PRISMA-ScR) were followed.[21]

Results

Based on searches in databases and gray literature, 1,153 studies were initially found. Of these, 849 did not meet the eligibility criteria. At the end of the selection, a total of ten articles were included in the sample as shown in figure 1.

The methodology of selected articles was: a systematic review; two case-controls; two descriptive studies; four literature review studies and an experience report. Year of publications: one in 2019, three in 2018, one in 2017, three in 2016 and two in 2015. Countries of publications: four in France, three in Spain, and one in each country,Greece, India and the United States. Publication journals: two in the European Journal of Surgical Oncology and the Surgical Oncology; one in each journal: Surgical Oncology Clinics, Toxicology Letters, Industrial Health, *Medicina y Seguridad del Trabajo*, and Indian Journal of Surgical Oncology. Table 2 presents a summary of the selected articles.

The studies describe the following categories: education and training of staff involved in HIPEC; individual and collective protective equipment; infrastructure and general guidelines.

Discussion

For the analysis and discussion of results, after reading the studies in full, the authors chose to classify the selected material into categories according to the topics covered, as presented below.

Education and training of staff involved in HIPEC

All studies address the importance of training the team involved in the procedure, not only those assisting the patient in the intraoperative period, but also the professionals who sanitize the operating room after the procedure, collect waste and perform disinfection of surgical instruments, and pharmaceuticals who handle chemotherapy.[2,3,12,13,22-27]

Table 2. Summary of selected articles

Title	Year Country	Objective	Method	Safety measures established
Cytoreductive Surgery With Hyperthermic Intraperitoneal Chemotherapy, Part II: Implementation[2]	2019 USA	To Discuss HIPEC implementation strategies; describe preoperative care and patient preparation; describe intraoperative care; identify perioperative nursing interventions.	Literature review	Policies and procedures for implementing HIPEC in hospitals; education of the care team about HIPEC; description of suitability of the operating room; description of personal and collective protective equipment.
Safety considerations for Health care Workers involved in Cytoreductive Surgery and Perioperative chemotherapy[3]	2016 India	To describe safety measures when performing HIPEC.	Descriptive study	Policies and procedures to prevent spills; staff education about HIPEC; description of suitability of the operating room; description of personal and collective protective equipment.
Techniques and Safety Issues for Intraperitoneal Chemotherapy[12]	2018 Spain	To expose techniques and technologies used in the practice of HIPEC, advantages and disadvantages.	Literature review	Staff education and training on HIPEC; indication of personal protective equipment; indication of waste collection; periodic exams for the team; management of direct contact or chemotherapy spills; cleaning of the operating room after HIPEC.
Evaluation of oxaliplatin exposure of healthcare workers during heated intraperitonealperioperative chemotherapy (HIPEC)[13]	2015 France	To evaluate air and surfaces contamination and of professionals during open technique HIPEC using oxaliplatin.	Case control	Description of personal and collective protective equipment; description of suitability of the operating room; suggested use of the closed technique to avoid direct contact with the drug.
Occupational exposure to platinum drugs during intraperitoneal chemotherapy. Biomonitoring and surface contamination[22]	2018 France	To investigate exposure to platinum compounds of medical personnel during a HIPEC procedure and a PIPAC procedure.	Case control	Description of the necessary personal protective equipment; suggested use of the closed technique to avoid spills.
Current practice in cytoreductive surgery and HIPEC for metastatic peritoneal disease: Spanish multicentric survey[23]	2018 Spain	To obtain up-to-date information on clinical practice in different perioperative areas of the CRS-HIPEC.	Descriptive study	Policies and procedures to prevent spills; staff education about HIPEC; description of suitability of the operating room; description of personal and collective protective equipment.
Is hyperthermic intraperitoneal chemotherapy (HIPEC) safe for healthcare workers?[24]	2017 France	To provide an overview of HIPEC safety.	Systematic review	Description of personal and collective protective equipment; indication of periodic exams for the care team.
Operating personnel safety during the administration of Hyperthermic Intraperitoneal Chemotherapy (HIPEC)[25]	2016 Greece	To summarize evidence on HIPEC safety considerations in order to minimize risks to the OR staff during the procedure.	Literature review	Adequacy of the operating room; selection of the care team; description of recommended periodic exams; education of the care team about HIPEC; policies and procedures to prevent spills; chemical waste management policy; proper use of PPE.
Pautas de protección frente al riesgo de exposición a citostáticos en quimioterapia intraperitoneal hipertérmica[26]	2016 Spain	To identify risks associated with the handling of cytostatics used in HIPEC.	Experience report	Description of individual and collective protective equipment; description of suitability of the operating room; staff education about HIPEC.
Professional risks when carrying out cytoreductive surgery for peritoneal malignancy with hyperthermic intraperitoneal chemotherapy (HIPEC): a french multicentric survey[27]	2015 France	To address the need for standardized practices.	Literature review	Description of personal and collective protective equipment; description of suitability of the operating room; staff education about HIPEC; policies and procedures to prevent spills; policy for chemical waste management.

Six out of the ten studies analyzed emphasize the importance of addressing not only the surgical technique with the team, but the expected outcome; medications used and indication; route of administration; risks associated with the procedure, such as minimizing exposure; and management of spills and contact with the drug.[2,3,12,25-27] Another study[25] brings the regular training of the team to review processes and routines, availability of a manual with indication of each antineoplastic agent in the operating room and handling care. Three studies suggest developing and making available a protocol regarding the management of spillage, splashes and possible contact with drugs.[12,25, 27]

Although the integration of all professionals in the educational process for performing HIPEC is relevant, it is currently carried out according to the job category. Occupational Safety is responsible for the guidelines related to occupational risks of all professionals involved, but there is a need for integration of all professionals to standardize the information received. Nurses, as the OR managers, can be the link between the multidisciplinary team, guiding and supervising all professionals involved, as they are the only professionals in the team who have the vision and monitor the entire process, pre, intra and postoperatively.

Individual and collective protective equipment

In order to avoid and minimize contamination of the operating room floor in case of spillage or splash of cytotoxic drugs, absorbent and disposable sheets are recommended on the floor around the operating table.[3,12,23,26]

An article[12] suggests the use of sterile disposable absorbent drapes on the surgical stretcher in the event of spillage or splashing of chemotherapy, as well as the use of the same PPE indicated to the care team by professionals who clean the operating room after the procedure. Personal protective equipment should be changed immediately after contact with antineoplastic agents.[25]

Regarding individual protection, three studies suggest the use of waterproof and disposable surgical gowns (closed on the back, long sleeves, elastic wrist cuff) and protective goggles.[12,25,26] Waterproof shoe protectors were indicated in four articles.[3,12,25,26] Two studies recommended totally closed, easy to clean shoes for exclusive use during the HIPEC procedure.[25,26] The most suitable mask is the high-power filtering type (FFP 2 or 3) well adapted to the nose and mouth, ensuring safety in the inhalation of chemotherapy, given the vaporization generated by high temperature. It offers protection against the surgical smoke generated in cytoreduction, and must be changed every two hours.[25,27]

As for gloves, the indication differs depending on the technique, although powdered gloves are unanimously contraindicated as the powder increases drug absorption on the skin.[22,23,26] In the technique with closed abdomen, the professionals present in the operating room should use two pairs of latex gloves; for surgeons, the inner pair should reach the elbow and the outer one should reach the wrist, with changes at every 30 minutes.[3,12,25-27] In the open technique, the studies suggest the use of three gloves, since the surgeon comes into direct contact with the chemotherapy agent in the abdominal cavity to spread it inside the abdomen.[3,26]

It is important to use a closed system of chemotherapy administration for the intraperitoneal environment, wear disposable scrub pants covering shoes, discard the team's gown and other waste before leaving the operating room. In case of suspected contact of the chemotherapeutic with hands, wash them inside the room with running water and neutral soap.[26] The availability of a spill control agents kit into the operating room is recommended.[3,26]

The use of PPE by professionals involved in the procedure is extremely important, especially because toxic and uncommon drugs in the OR are used. In daily practice, we observed that professionals have doubts about which PPE is necessary, which, added to the scarcity of research on the subject, corroborates this insecurity. Waterproof disposable gowns, goggles and a mask with high power filtration are generally available for professionals involved in the procedure.

Infrastructure

It is suggested to adjust air conditioning to higher pressure inside the operating room.[3,12,25] High efficiency particulate air filters (HEPA) are indicated.[25,27] Although this recommendation exists, in the daily practice of some Brazilian hospitals, the HEPA filter is not used in the room where this type of procedure is performed.

General guidelines

It is recommended to close the doors of the operating room during intraperitoneal perfusion chemotherapy [17,26] and put some identification on the outside with a sign indicating HIPEC in progress.[2,12,25,26]

The importance of preparing the chemotherapy in a laminar flow hood is highlighted, using a Luer lock syringe (connection tip with a threaded needle) when the medication is transported in order to avoid splashes and use a leak resistant container identified as chemical material for the transport of chemotherapy.[25] In institutional practice, the manipulation of antineoplastic agents is exclusively performed by a pharmacist with specialization in Oncology, in a laminar flow hood. The transport is carried out in an exclusive container with a spill kit by a trained professional regarding possible spillage.

In relation to care for the team involved in the intraoperative period, the recommendation is to restrict the entry of people into the operating room during the procedure.[3,12,25] Selection of professionals should be considered not only by their technical skill, but also based on their health history and current health state, with the recommendation to avoid immunosuppressed individuals; pregnant women; breastfeeding women; women with a history of abortion or birth of children with malformations; women with upcoming plans to have a child; past history of hematologic disease; previous chemotherapy or radiotherapy treatment; severe skin disease; those under treatment with immunosuppressive drugs; allergic to chemotherapy agents or latex.[3,12,25,27] The team must be careful regarding exposure to bodily fluids of patients undergoing HIPEC within 48 hours of the procedure.[12,25]

Keep records of professionals exposed to chemotherapy during the procedure and while cleaning the room for health surveillance purposes.[27] Three other studies report the importance to perform and regularly monitor the occupational exams (every six or 12 months) of the entire team and collect data on the frequency of participation in the procedure and if there was any contact with chemotherapy.[3,12,25] The following are recommended: brief referral to the Occupational Medicine evaluation of the professional who had direct contact with the antineoplastic agent; in case of contact with the skin, wash with running water and neutral soap; in case of eye contact, rinse abundantly with isotonic ophthalmic solution for 15 minutes. Professionals working in areas where there is administration of anticancer drugs are evaluated every six months by Occupational Medicine and also in the event of an accident with the drugs.[3]

Disposal of waste generated during the procedure, both surgical materials and clothing and surgical drapes, must be performed in rigid, leak resistant containers identified with a "chemical material" label.[3,12,25] A study guides to follow current standards of the health regulatory agency of the country regarding the identification, disposal, collection, storage and transport of chemical waste. In operating rooms, reservoirs are made available for disposal of waste according to the biological risk, which are handled only by hygiene professionals.[25]

When cleaning the operating room after the procedure, the use of neutral soap and water or 70% isopropyl alcohol is suggested, repeating three consecutive times.[3,12] Avoid using bactericidal disinfectants, as they may react with the chemotherapeutic agent.[12] As for surgical instruments, the studies suggest washing them with running water and neutral soap three consecutive times before removing them from the operating room.[3,12] The care and sanitation teams undergo training on proper waste disposal provided by the Work Safety Engineering.

The general guidelines presented show the importance of the performance and involvement of the entire team of professionals in the HIPEC, emphasizing the need for training.

The production was scarce and some articles found in databases were not available for full reading, thereby making their inclusion impossible. Little clarity was identified in the methodological description of some studies.

The review provides evidence to support nurses' decision-making, bringing recommendations for the daily practice in operating rooms where this type of procedure is performed, allowing for better professional safety.

Conclusion

Recommended measures for occupational safety of professionals involved in the intraoperative period of patients undergoing HIPEC include: team training; use of specific individual and collective protective equipment; necessary infrastructure, such as adjusting the air conditioning to higher pressure inside the operating room; and general guidelines regarding the organization of the operating room, waste disposal, cleaning of the room/materials used and monitoring the occupational health of the team involved in the surgical procedure.

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