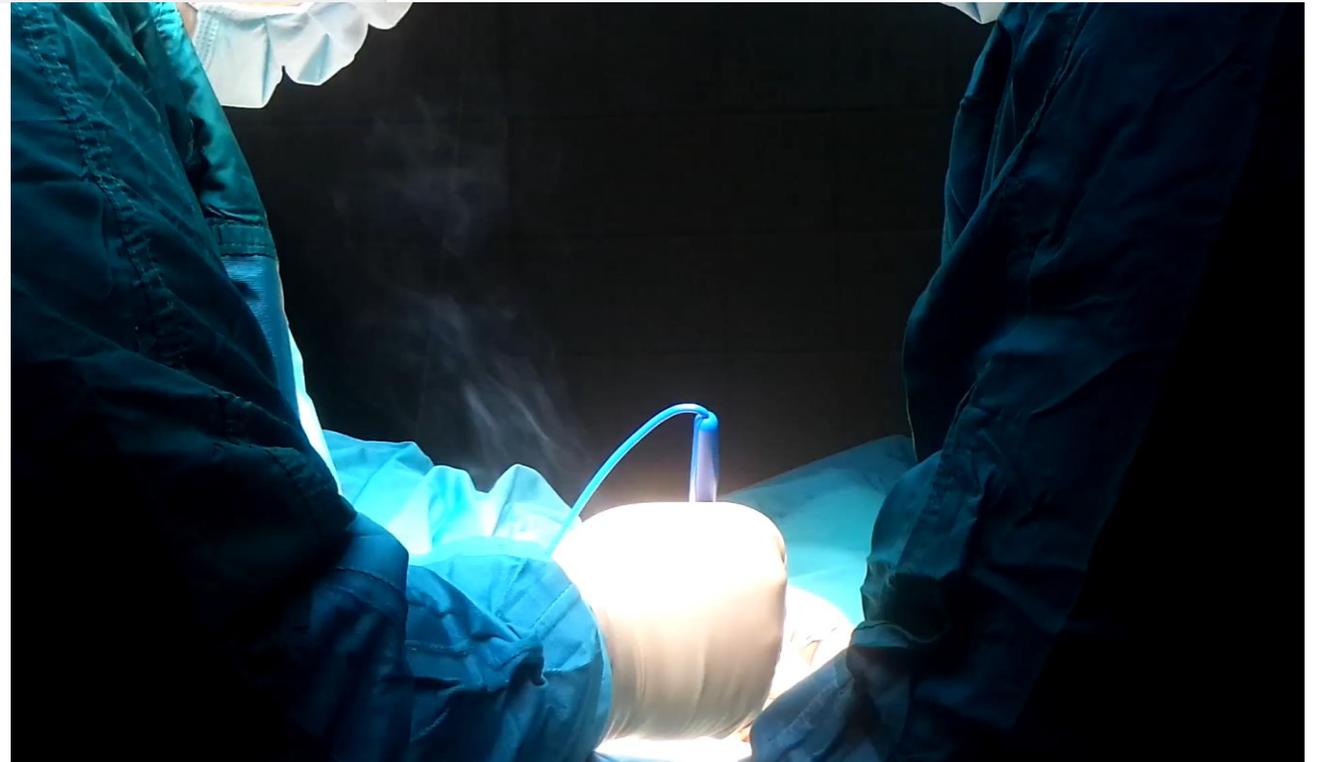


‘Hazardous surgical smoke in OR’s, towards
safety for Specialist Nurses at work:
from position statement to European policy’

Ber Oomen and Michael Elin

Surgical Smoke: The Context

'Surgical plume contains gaseous by-products which could be hazardous to the members in the surgical team, including the patient. During surgery when using devices that produces smoke/plume the team-members may respire the by-products or the ultrafine particles (UFP) may fall on the skin or one gets it in the eyes. In laparoscopic procedures the ultrafine particles in the plume may absorb into the patients' blood stream through peritoneum and cause hypoxic stress. Protection and prevention from ultrafine particles are of importance for the patients and health care personnel involved during the surgery.'



Surgical Smoke - Professional Context

EORNA position Paper - I

- Perioperative nurses report twice as many respiratory issues as compared to the general population.
 - This means that they have a disproportional higher health risk during their work
- Protecting your team and patients from the hazards of surgical smoke.
 - This means that there is an attitude required based on mutual respect and transparency.
- Attracting and retaining the best clinicians due to a healthier, smoke-free environment
 - This means that action is required
- Providing education on the risks of surgical smoke and methods for smoke evacuation
 - This means that an ongoing communication is required to avoid any avoidable harm
- Increasing smoke evacuation compliance on all surgical smoke generating procedures,
 - This means that meeting compliance is required but also to act inclusive to all possible available measures.





Three levels of danger

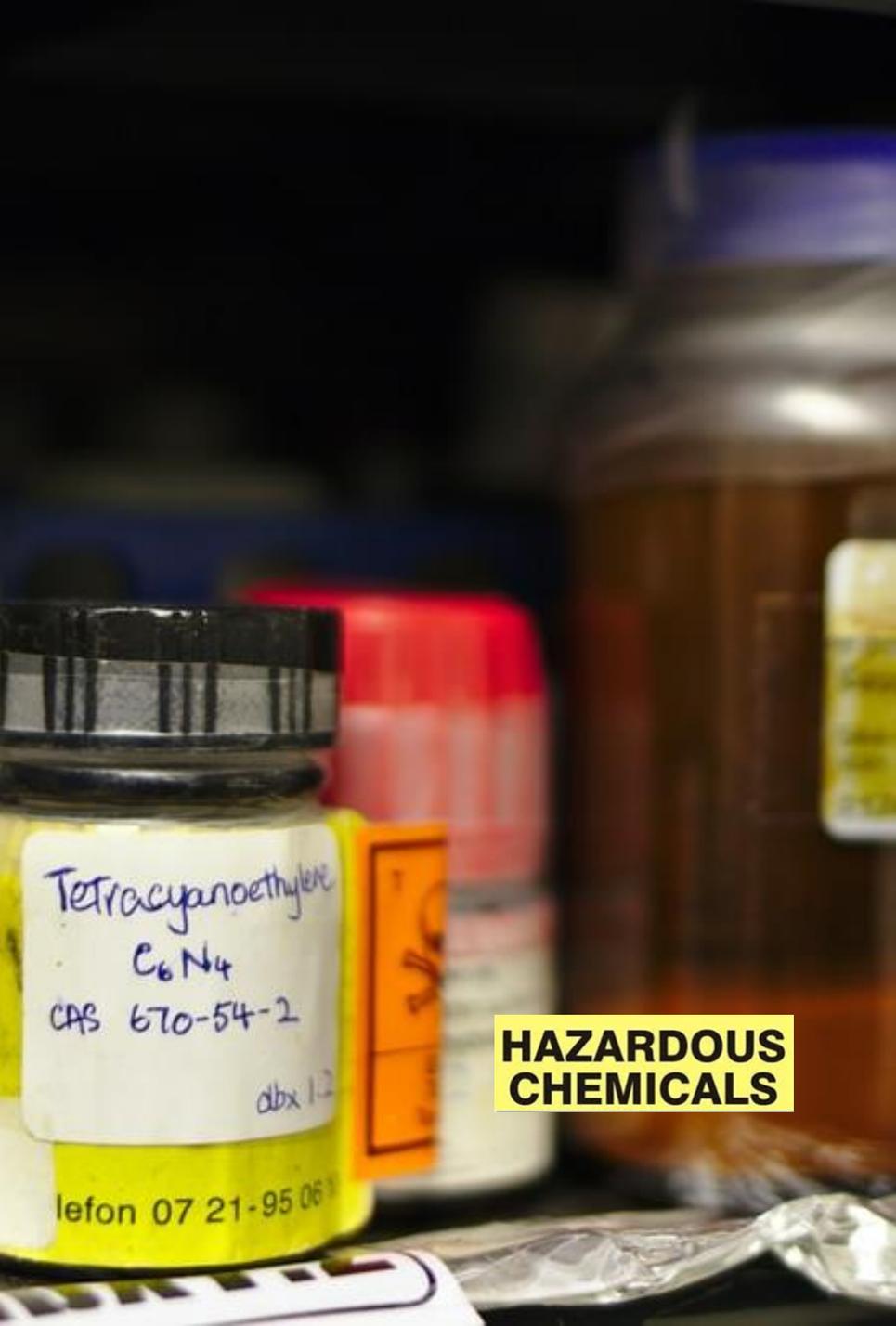
- Inhalation:
- Chemicals:
- Biohazard:



Inhalation Hazard

- Daily, smoke generated in the operating room equals about 27-30 cigarettes
- 95% of surgical plume is water vapor
- Particles of 0.3 microns can enter the alveoli of the lungs
- Small particles less than 10 microns in size can penetrate deep into your lungs, and some may even enter your bloodstream
- Exposure to such particles can affect both your lungs and your heart.
- Scientific studies have linked particle pollution exposure to a variety of problems, including: Asthma, COPD / Emphysema, Atherosclerosis and Thrombogenesis

**INHALATION
HAZARD**



Chemical Hazard

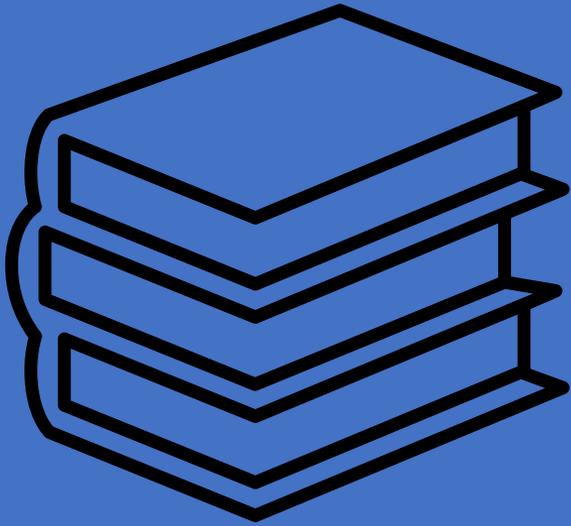
- Surgical smoke contains over 40 hazardous chemicals. These are toxic, mutagenic, and carcinogenic
- Benzene has been identified in laparoscopic surgery smoke
- Benzene diffuses across the placenta and is considered to be fetotoxic
- 2014 study indicates a hazard to surgical staff, patients, and the foetus of pregnant patients.



Biochemical Hazard

- Surgical Smoke is comprised of 95% water vapor
- Water is a carrier of viable bacteria and viruses
- Transfer of disease is possible and has been documented
- Intact and viable viruses have been recovered in plume:
 - HPV, HIV and HBV
 - Strands of Viral and Human DNA
 - Cancer Cells
 - Blood and blood fragments





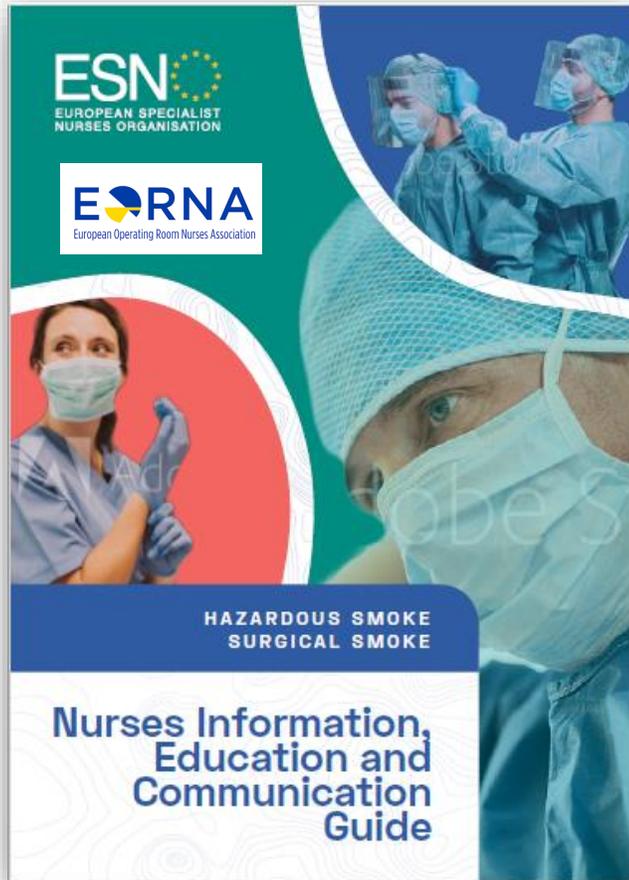
Three folded Activities

1) Education and Communication

2) Regulation and Standards

3) Policy and collaboration

1) Education – All about Surgical Smoke



HAZARDOUS SMOKE – SURGICAL SMOKE #CARING4NURSES

History of detecting Surgical Smoke

Looking at the overview of publication, there is an overwhelming amount of data collection, survey, publications, with summaries and above all recommendations. One may ask why all these data has led to good examples, new initiatives but not lead to a change in one shared policy. If you wish to be ready for the future, it's good to take a short look at data collection over the past. According to studies starting 1981, with already at that time great concerns about the safety of the healthcare professionals. Let's start in 1920 William T. Bovie developed an innovative electrosurgical unit and the founder of modern neurosurgery, and a development familiar in any thinkable operation room. The impact the modern surgical equipment has had is immense with great impact on all kind of modern surgical intervention.

The effect however was not foreseen at that time, also because smoke and the full complexity was not realised, also because of the absence of today's detection of microscopic particles. At that time no one could foresee that those particles would contain microorganisms, toxic substances, and particles of cancer particles and microbes.

Today according to the Journal of Hospital Infection, in a range of 100,000 to 1,000,000 professionals exposed to surgical smoke plumes each year. If the smoke was safe, the risk is not an issue but the by-product of electrosurgical or laser procedures and carry many potential hazards operating room staff and patients. While patients are often under sedation or even on full respiratory system, these particles have been detected in patients urine after surgery, while these substances are absorbed in the soft tissue. This all is why a good surgical smoke evacuation is of such great importance.

What's in Surgical Smoke

Surgical plume contains gaseous by-products which could be hazardous to the members in the surgical team, including the patient. During surgery when using devices that produces smoke/plume the team-members may respire the by-products or the ultrafine particles, UFP, may fall on the skin or one gets it in the eyes. In laparoscopic procedures the ultrafine particles in the plume may absorb into the patients' blood stream through peritoneum and cause hypoxic stress. Protection and prevention from ultrafine particles are of importance for the patients and health care personnel involved during the surgery.

HAZARDOUS SMOKE – SURGICAL SMOKE #CARING4NURSES

Particles

What kind of particles are identified?

- Lorem ipsum dolor sit amet, consectetur adipiscing elit
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Aerosols

What kind of particles are identified?

Aerosols is a container concept of all small particles in the air what does not drop down due to gravity but remains in the air, both where people stay, but also is transported through indoor air systems but even outside and in the open air and even high altitudes. From 2016 to 2018 a DC-8 aircraft operated by NASA made series of flights, profiling the atmosphere from 180m to 12km above sea level from the Arctic to the Antarctic over both the Pacific and Atlantic oceans and found and measured dry size distributions from 2.7nm to 4.8µm in diameter.¹⁴

- Living cells have a size of about 5-50 microns.
- The plume generated by the use of heat producing medical devices includes ultrafine particles, UFP, of less than 0.1 microns.¹⁰
- Electrosurgical particles are 0,07 micrometres and is considering dangerous because of the chemical composition. Laser particles are 0,31 micrometres and particles from ultrasonic dissection are 0,35 - 6,5 micrometers. Viruses and bacteria may be of minor size.¹⁵

¹⁴<https://amt.copernicus.org/articles/12/3001/2019/>

NURSES INFORMATION, EDUCATION AND COMMUNICATION GUIDE 4

2) Regulation

First layer: Education and awareness

- Clean health environment: safe working environment
- Awareness : speak out and communicate
- Education : Facilitate professionals in education,

Second Layer: Regulation

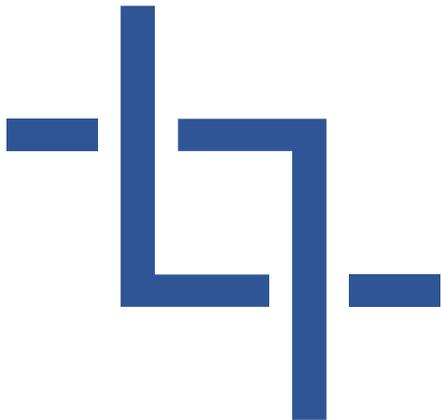
- Inter professional collaboration
- guidelines creating and implementation

Third layer: Policy

- Policy agenda with Surgical Smoke Coalition



3) Consortium



- Members:
 - Professional organisations
 - Industry
 - Regulators
- Studies and Publication
- Policy – National and European

Collaborating project



About ESNO,

ESNO is the association of European Specialist Nurses to raise their profile and position of the Nurses in advanced position

About EORNA

EORNA represents the unified voices of the perioperative field in Europe by integrating nurses, practitioners, actors and organisations with related interests. Our association provides a platform and network for members in an open and honest environment

About FoNSE

FoNSE is the ESNO foundation, where activities and project are facilitated, by their members and associate nurses from Europe and beyond

Professional health and safety is essential

EORNA position Paper- II

First things first

- **Ventilation** in the OR at least 15 – 20 airchanges/hour with a positive pressure
- When using **medical technical devices** that generates ultrafine particles, recommends effective evacuation systems and proper, correct use of the device during the whole time the device is used and at the disposal of the product.
- **Personal protective equipment** should be applied correctly for not being exposed to ultrafine particles when using these medical technical equipment.
- **Education** of hazardous situations and prevention and protection should be mandatory and held by the employer for the health care personnel when new employment, or when new equipment is introduced to the workplace.

Specialist Nurses Collaborative Project

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stryker[®]

Johnson & Johnson

Bibliography

1. Geiser, M., & Kreyling, W. G. (2010). Deposition and biokinetics of inhaled nanoparticles. *Particle and Fibre Technology*, 7(7), 1-17.
<http://dx.doi.org/doi:10.1186/1743-8977-7-2>
2. Ragde SF, Jorgensen RB, Foreland S. Characterisation of Exposure to Ultrafine Particles from Surgical Smoke by Use of a Fast Mobility Particle Sizer. *Ann Occup Hyg*. 2016;. doi:mew033 [pii]. [IIIA]
3. *Chemical Composition of Surgical Smoke Formed in The Abdominal Cavity During Laparoscopic Cholecystectomy – Assessment of the Risk to the Patient International Journal of Occupational Medicine and Environmental Health 2014;27(2):314 – 325*
<http://dx.doi.org/10.2478/s13382-014-0250-3>
4. Irene Brüske-Hohlfeld, Gerhard Preissler, Karl-Walter Jauch, Mike Pitz, Dennis Nowak, Annette Peters and H-Erich Wichmann. Surgical smoke and ultrafine particles. *Journal of Occupational Medicine and Toxicology* 2008, **3**:31 doi:10.1186/1745-6673-3-31
5. Peter Wick, Antoine Malek, Pius Manser, Danielle Meili, Xenia Maeder-Althaus, Liliane Diener, Pierre-Andre Diener, Andreas Zisch, Harald F. Krug, and Ursula von Mandach . Barrier Capacity of Human Placenta for Nanosized Materials. *Environmental Health Perspectives*, volume 118, number 3, March 2010
6. Sanderson, C. (2012). Surgical Smoke, *British Journal of Perioperative Nursing*, April 2012, 22, 4 122-128
7. Rioux et.Al. HPV positive tonsillar cancer in two laser surgeons: case reports *Journal of Otolaryngology - Head and Neck Surgery* 2013, 42:54
<http://www.journalotohns.com/content/42/1/54>
8. AORN Guidelines for Perioperative Practice 2017 Edition
9. AORN Guideline First Look: Guideline for Surgical Smoke Safety

References

- European Commission. (2010). Occupational health and safety risks in the healthcare sector. Guide to prevention and good practice. <http://studylib.net/doc/18917608/occupational-healthand-safety-risks-in-the-healthcare>
- European Parliament and of the Council of 18 September 2000 on the protection of workers from risks related to exposure to biological agents at work.. <https://osha.europa.eu/en/legislation/directives/exposure-tobiological-agents/77> [Accessed 2018-02-28]
- European Parliament and of the Council of 29 April 2004 on the protection of workers from the risks related to exposure to carcinogens or mutagens at work.. <https://osha.europa.eu/sv/legislation/directives/directive-2004-37-ec-carcinogens-or-mutagens-at-work>
- European Agency for Safety and Health at Work. (2003). Facts. 41 Biological agents. <https://osha.europa.eu/tools-and-publications/publications/factsheets/41>
- European Agency for Safety and Health at Work. (2014). Current and emerging issues in the healthcare sector, including home and community care. <https://osha.europa.eu/en/tools-and-publications/publications/reports/currentand-emerging-occupational-safety-and-health-osh-issues-in-the-healthcare-sectorincluding-home-and-community-care/view>
- European Commission. (2017). Directive (EU) 2017/164 of 31 January 2017 establishing a fourth list of indicative occupational exposure limit values pursuant to Council Directive 98/24/EC. <http://eur-lex.europa.eu/legalcontent/EN/TXT/PDF/?uri=CELEX:32017L0164&from=EN>

A photograph of a white sticky note on a dark wooden surface. A black marker is lying on the surface to the right of the note. The note has the text "Your questions" followed by three lines of ellipses.

Your questions

...

...

...

Thank you for
your
attention

