



## BEST PRACTICE

# Proposal to make cataract surgery more sustainable

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On behalf of the Dutch Working group on Sustainable  
Ophthalmology

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## 1. Status Best Practice

It is important to mention that a Best Practice is not a formal standard, but a list of recommendations to make ophthalmic practice more sustainable. A standard is leading in medical decision making, but one can deviate from the guideline with arguments. A Best Practice is based on the official guidelines, where possible supported by evidence, and approved of by the Dutch Society of Ophthalmology (NOG). Implementation of the Best Practice is encouraged by the Society.

In the near future, all new medical standards in the Netherlands must contain a sustainability paragraph, so that the standard and best practice will increasingly show overlap.

This Best Practice has been assessed by the cataract working group (NIOIC) of the NOG and approved by the quality committee of the NOG.

This Best Practice is written for ophthalmologists and OR-nurses and technicians. The Best Practice consists of a collection of practical examples. Use this document, in collaboration with your green team, to make your cataract surgery more sustainable. This Best Practice is 'work in progress' and will be supplemented and adapted as new insights and evidence become available.

## 2. Introduction



The Dutch healthcare system has very high CO<sub>2</sub> emissions; 11 Megatons of CO<sub>2</sub> annually. (1) For comparison; the total transport sector (i.e. car, truck and air traffic) is responsible for 28 Megatons. (2) Of these 11 Megatons, almost half is due to energy consumption and medical instruments. (1). And by far the largest share of energy and medical instruments is used by the OR department: it uses up to 84 percent of the energy of the total hospital. In addition, the OR uses 30%-40% of all daily items in a hospital. (3)

Cataract surgery is the most commonly performed operation, both in the Netherlands and abroad. In the Netherlands, more than 180,000 cataract operations are performed annually. And the number continues to grow because of the aging population.

The CO<sub>2</sub> emissions of cataract surgery were calculated in the United Kingdom (UK) in 2013 using a Life Cycle Analysis (LCA). This study showed that one cataract operation produces 181.5kg of CO<sub>2</sub>. (4) This is equivalent to a 1500 km car journey with a petrol car. (5) An LCA has recently been carried out in the Netherlands (MUMC), the results of which will be presented very shortly. CO<sub>2</sub> emissions are likely to be similar to those in the UK. On an annual basis, more than 32 kilotons of CO<sub>2</sub> in the Netherlands are caused by cataract operations. This means that 0.3% of the total CO<sub>2</sub> emissions of the Dutch healthcare system are accounted for by cataract surgery.

A study from Malaysia in 2020 investigated the amount of waste produced by cataract surgery. (7) This study found an average amount of 0,83 kg waste per operation, with about half consisting of clinical (hospital specific) waste and half of general waste suitable for recycling. Whether this result corresponds to cataract surgery in the Netherlands has not been investigated.

The Netherlands is committed to achieving climate neutrality by 2050. (8) To this end, the Netherlands wants to have reduced greenhouse gas emissions of 49% by 2030. The same objectives apply to the healthcare sector, which is laid down in the Green Deal Sustainable Care. In order to achieve this CO<sub>2</sub> reduction, an annual CO<sub>2</sub> reduction of 6-8% is necessary from 2019 onwards. The NOG has also committed itself to this objective. For us as NOG members, there is therefore also an important task to make our work, in this case the cataract operation, more sustainable.

It is possible to perform cataract operations in a high-quality and safe way while using much less raw materials. A large study by Aravind Eye Hospital in India has shown that their surgical results in terms of postoperative vision are similar to those of the Western world and that the risk of infection is even lower. (9) The CO<sub>2</sub> emissions in Aravind are 6 kg per cataract operation, which is only 5% of the same operation in the UK. (4) The possibilities to reduce CO<sub>2</sub> emissions of cataract surgery are therefore already available.



More than 50% of the CO<sub>2</sub> emissions from cataract surgery in the UK and the Netherlands come from the consumption of materials, including medication, equipment and disposables. (4) Reduction in the use of materials has the most impact on CO<sub>2</sub> emissions, followed by reuse and recycling of waste (reduce-reuse-recycle principle). Therefore, our aim should be to use only the essential components and to refuse unnecessary materials.



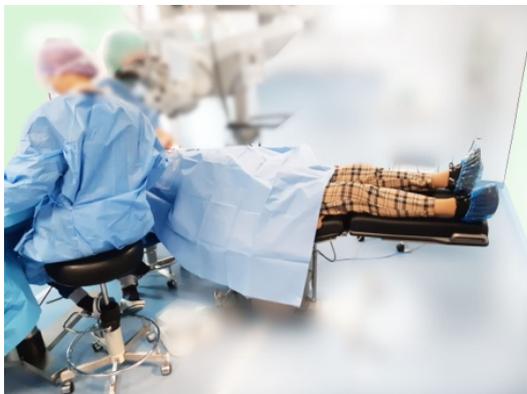
## Proposals

### Basic principles of sustainable care

By implementing the basic principles for sustainable care, such as energy saving (e.g. turning off air treatment when the OR is not in use), reintroducing reusable textiles (the CO<sub>2</sub> emissions of reusable OR gowns are many times lower than those of disposable gowns, (10)), waste separation (paper & clean plastic: See Best Practice Waste Separation, PGDO 2022) and cleaning (the microfiber cloth with water), you can already make huge profits. You can implement these measures yourself together with your green team.

### Patient gown

A protective coat for patients during cataract surgery is not necessary. See Best Practice Disposable patient gowns in cataract surgery, PGDO 2021). There is no evidence that it contributes to infection prevention and patient safety. The argument for using a patient gown is that no particles should be released from the patient's clothing that could end up in the surgical wound. This risk seems to be extremely unlikely in ophthalmic procedures. In addition, sterile draping is always used, which already largely covers the patient clothing. If there is opposition to omit a patient gown, e.g. because other types of surgery are performed in the same OR department, then a reusable, washable patient gown is a good alternative.



*The eye drape covers a large part of the patient, so that a patient gown is not necessary.*

### Shoe covers

There is no justification for putting on shoe covers if the patient is transported to the OR with a patient chair.

### Hand hygiene and the use of a disposable brush

Only use a disposable nail brush with visible dirty hands. Remove the dirt under the nails with a nail cleaner. Without visible dirt, wash the hands and wrists with soap and water, followed by disinfecting with hand alcohol. (Hand hygiene preoperative advice, Department Infection Prevention UMC Utrecht).



### **Mat headrest**

If a cellulose mat beneath the patients' head is discarded dry after the procedure, it is superfluous and can be omitted. A patient cap is often sufficient. If one expects a wet headrest, a towel or a plastic-free, compostable/biobased cellulose mat can be used. (See [www.green-it-out.nl](http://www.green-it-out.nl) for biodegradable, environmentally friendly alternatives to disposable medical products).

### **Disposable sheets on operating chair/table**

Many hospitals and clinics do not use (unsterile) disposable sheets on the operating chair or table for cataract surgery. These can be omitted. The chair or table is only cleaned afterwards with a cleaning cloth.

### **Redesign disposable procedure tray**

Together with your team and supplier, look at unused medical devices and in your current tray. Refuse and Reduce. Use a periodic check for the omission of unnecessary materials on trays. Ask for new developments in biobased materials. Minimize the size of the drape and eye sheet. Daily practice shows that the smallest drape measures 134x120 cm and the tablecloth 140x150cm.

Omit towel napkins. Consider using a maximum of 3 syringes. Have incision film delivered halved (the straight scissors will then become superfluous).

Ask for the omission of plastic bags and packaging in the tray.

No thick plastic shelves. One or two bowls is sufficient.

Maximum two or no spears, up to 5 gauzes.



**For the surgeon:**

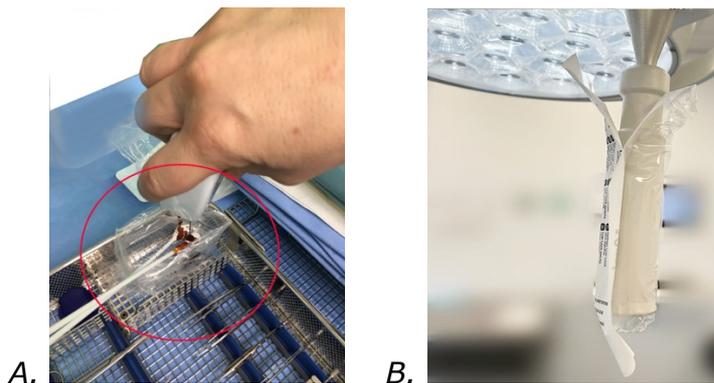
Aim for uniformity in instruments within your team. Sustainability requires as little variation as possible, with the smallest possible number of instruments and materials. Coordinate with all surgeons to work in the same way.

**For the nurse:**

The 27gauge or anterior chamber cannula can be used for both hydrodissection, vision blue and cefuroxime. It is important that the cannula is well flushed with balanced salt solution (BSS).

Plastic cover for the touchscreen is not necessary. Have it removed from the tray when it is possible to work by remote control. A sterile stick or pen can be used.

Be creative with the materials you already have; packaging can serve as a bowl, for example.



*Just two examples, also come up with your own tricks.  
 A. Use packaging material (pouch) for povidone iodine.  
 B. A sterile packaging of a 10cc syringe as a lamp cap.*

**Instrument set**

Limit diversity to choppers/sweeps/forceps. Make sure that the options are not infinitely large, tune in. The instrument network contains one eyelid speculum, one colibri or hoskin forceps, a rhexis forceps, a sweep e/o chopper, irrigation/aspiration handpiece, phaco handpiece, lens injector/unfolder for the lens, microscope caps, (reusable) phaco needle, sleeve and filling chamber. Optimize your instrument set and make it small and compact. If possible, choose sterilization in a small reusable metal cassette and thereby reduce CO2 emissions. (11)

**Reusable instruments**

Remove disposable instruments as much as possible; I/A handpieces, rhexis forceps, microscope caps and steel bowls can be purchased as reusable. Phaco sleeve, filling chamber and phacon needle can be used several times. The nurse/



technician always monitors the quality of the instruments by visual inspection of all instruments prior to surgery and provides replacement material if necessary. In this point, extra attention needs to be paid to legal aspects and education. Deviation from the manufacturer's IFU (Instructions for Use) requires coordination with the hospital's legal department. It should also be noted that in a training situation other interests may play a role, such as the preference for the use of a silicone tip, which is only available on a disposable aspiration cannula.



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2.



3.

1. Reusable bimanual irrigation aspiration handpiece (EVA bimanual I/A via DORC, Duckworth & Kent via Optheac, DUET handpiece via Microsurgical).
2. Reusable co-axial monomanual I/A handpiece (e.g. Intertip via Microsurgical).
3. Purchase 2 steel gall jars per set for povidone iodine and BSS.

### Central Sterilization Department

Internal sterilization means no transport costs, fewer defective instruments, fast rotation of sets and possibility of rapid sterilization. Wet or undelivered sets are a thing of the past. All this saves CO2 emissions.

### Reusable sterilization containers

Sterilization in cassettes and containers is a sustainable alternative to the packaging in polypropylene (blue wrap), which causes a lot of waste and CO2 emissions. Recent Dutch research has shown by means of a Life-Cycle Analysis that these containers have an 85% lower CO2 emission than the blue wrap packaging (11).



Example of an instrument container and instrument cassette.



### Diathermia

If you want to use a cauter (scleral incision) consider the following. An alternative to the disposable battery-temp cauter is the semidisposable battery-temp cauter: the handpiece (with battery) can be used more often with the 'interchangeable cautery tip.' The very best is the reusable cauter belonging to the phacomachine.



1.



2.

*1. Reusable cauter 2. Interchangeable cautery tip en semi-disposable cauterhandstuk*

### Armrest operator's chair

Disposable covers for the armrest of the operator's chair are superfluous by not buttoning the surgeons' OR gown, but draping it over the armrests when taking a seat.

### Knife

The phaco is tuned to precisely measured incisions, where the sideports must be exactly 1.2mm. In the context of sustainability, it is good to mention that there are ophthalmologists who come out with 1 knife.



### Viscoelasticum

One product 'on the table' is usually sufficient for a non-complex phaco procedure.

### Cefuroxim

The Cataract Guideline recommends cefuroxime 1 mg in 0.1 ml intracameral postoperatively.

The most sustainable procedure in the standard use of Cefuroxime is the delivery of pharmacy-prepared and frozen syringes. An alternative is to use a Mini-spike® from B Braun. This allows a vial of cefuroxime to be used for a part of the day. The nurse/technician delivers exactly 0.1 ml of Cefuroxime to the ophthalmologist. Always deposit any remaining cefuroxime in the yellow sharps container.



1.



2.

1. Prepared cefuroxime 2. Mini-spike for vial of B Braun

### Povidone-iodine

The nurse pours just enough Povidone iodine into a container as needed to soak the cotton swab.

### Lidocaïne

When lidocaine is administered intracamerally, a 10cc syringe of lidocaine can be prepared in advance. The circulation drips a targeted dose (1 cc) of lidocaine sterile into a container of the instrumenting in each patient. You can use a



syringe for about 10 patients.



### The implant lens

The most durable lens comes in a compact durable packaging without leaflets but with information via QR code.

Consider choosing implantation lenses that are used with a durable reusable shooter. Ask the lens supplier for it.



1.



2.

1. Vitran unloader with semi preloaded lens from Tecnis. JnJvision (12)

2. Monarch injector Alcon

### Adrenaline

By default, do not use adrenaline in the bottle of BSS. A non-complex and short-term operation does not require adrenaline in the infusion. Most bottles do not empty and residues of adrenaline disappear into the environment. If desired, adrenaline can of course be added to the bottle of BSS in special cases or in a training situation.

### Eye shield and eye bandage

In several hospitals in the Netherlands, after cataract surgery, no eye shield and no bandage is used anymore and this appears to be safe. (13-16) Consider omitting an eye shield and eye bandage. In addition, an eye shield does not have to be sterile on a procedural tray, buy them unsterile for possible use.

Only in case of greater risk of rubbing (e.g. patients with dementia, or at the express wish of the patient) an eye cap is placed. For example, an eye bandage (without a plastic eye shield) may be required for cataract surgery involving a subtenon or retrobulbar injection. See also the Best Practice Eye Bandage and Eye Cap, PGDO 2022.



## 4. Conclusion

In order to achieve a reduction in waste, CO<sub>2</sub> emissions and costs, it is necessary to critically assess the material that is currently used in cataract surgery and, if necessary, to adjust it as mentioned above. This Best Practice provides a first step in this direction. In order to reduce CO<sub>2</sub> emissions even further, more measures and new insights will be necessary. To stimulate this development, below are some discussion points that we can work on together. For questions, ideas and suggestions, please contact the Sustainable Ophthalmology Project Group.

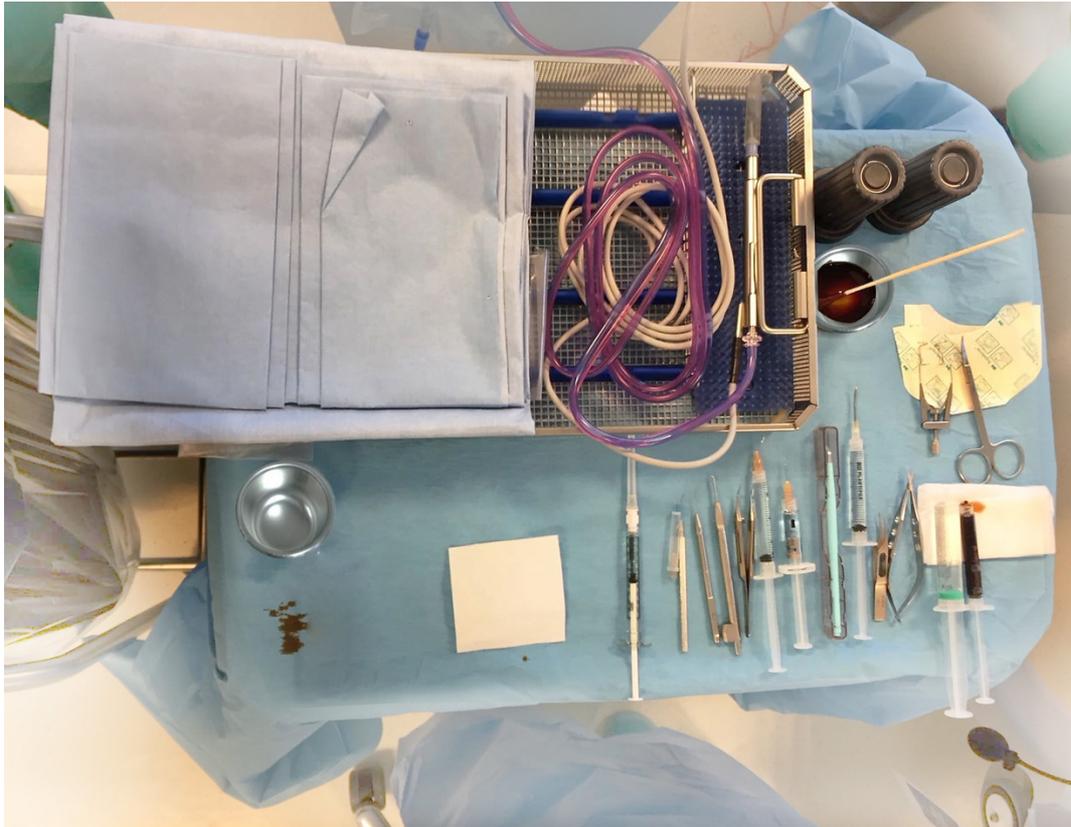
### To be discussed

- How can we reduce the amount of disposables such as tablecloth, eye sheet and surgical gowns? What minimum size can an eye sheet, tablecloth and jacket have?
- The phaco cassette causes a relatively large amount of waste. How can we design or supply it in such a way that it becomes more sustainable?
- Can we optimize the use of bottles of balanced salt solution without wasting?
- Can materials be supplied with less packaging material? For example, the delivery of 12 viscoelastic syringes in one box, instead of individual package with leaflet and stickers.

Disclaimer: there is no financial interest on the part of the authors in the companies mentioned in this Best Practice



## 5. Example



*This photo shows the minimum supplies and maximum use of reusables. (One knife, reusable instruments and lamp caps, 1 viscoelastic, etc.)*



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