Best Practice

Advice on making cataract operations more sustainable

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NOG NEDERLANDS OOGHEELKUNDIG GEZELSCHAP

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1. Summary

Cataract operations are the most commonly operation performed in the Netherlands, as well as abroad. In the Netherlands, annually, about 180,000 cataract operations are performed. Demographic changes mean this number will increase. A critical view on how to make this operation more sustainable is therefore important. This Best Practice will give you a headstart in achieving this.

2. Advice on making cataract operations more sustainable

Sustainable healthcare: basic principles

- **Reduce energy consumption:** switch this off energy consumers out of hours, when it is not required.
- Use **reusable theatre clothing** instead of single use.
- **Waste separation:** this will result in less waste, reusable products, less energy use, more recycling, and less CO_2 emissions. See also Best Practice on waste separation.
- **Cleaning:** use cleaning chemicals with the least impact on our environment: moist microfiber cloths will suffice in cataract operations.

ISBCS

Immediately Sequential Bilateral Cataract Surgery has been started in the Netherlands in eligible patients. These are patients where there is no comorbidity which would increase the risk of complications (see Guideline on Cataract surgery). ISBCS is more sustainable, as it means less travel, less follow ups, and it is not inferior in terms of outcomes [11]. Life Cycle Analysis shows that travel forms a significant part of carbon footprint in cataract surgery [4]. Formal studies have been planned.

To give an impression of reduction in CO_2 emissions due to reduction in patient travel in cataract pathways, an online calculator has been developed:
https://www.escrs.org/education/patient-travel-carbon-calculator

See also: Best Practice telemedicine, 2024 [21].

Patient gowns

Patient gowns are not required in cataract surgery (see Best Practice disposable gowns in cataract surgery [23]. There is no evidence that these gowns help in reducing infections or contribute to patient safety. In case of objections to it's use in bigger theatre complexes, shared with other specialties, consider using a reusable gown.

The surgical drape covers the patient adequately.

Shoe covers

There is no evidence that there are benefits from wearing overshoes whilst walking the patient into theatre.

Surgical drape

Many types and sizes of surgical drapes are available. Less is more: the smaller the better. Full body drapes are not required. The smallest surgical ophthalmic drape available measures 134x120 cm, the smallest trolley drape 140x150 cm, and can probably be reduced.

Hand hygiene and surgical scrub brushes

Surgical scrub brushes are not required. Pathogen numbers are not reduced by the use of these brushes. Theatre personnel tend to come to work with clean hands and perform the usual handwashing and use alcohol rubs. Visible dirt can be removed with nail cleaners. See also website VHIG [25].

Headrest covers

Headrest covers are often unnecessarily used, are not sustainable and not recyclable. If headrest covers are thrown away dry after use, they are surplus to requirement and it's use can be stopped. A patient hat or possibly 2 10x10 surgical swabs over the ear will suffice. Alternatively, a (tea) towel or compostable alternatives are available. See www.greenitout.nl for compostable medical alternatives. A paper cover would also do.

Arm rests

An arm rest cover is not required. Cleaning of the arm rest with a simple microfiber cloth can be done, if needed.

Procedure tray phaco

Custom packs often contain more items than required. A study by Winklemaier showed huge variation and if all hospitals would use patient drapes from the 1/3 smallest available, savings of 37% would be possible (Winklmaier 2023).

The ESCRS has developed an online tool to calculate your own pack's carbon footprint, and compare it with the minimum set available: sustainable index for disposables in cataract surgery [22].

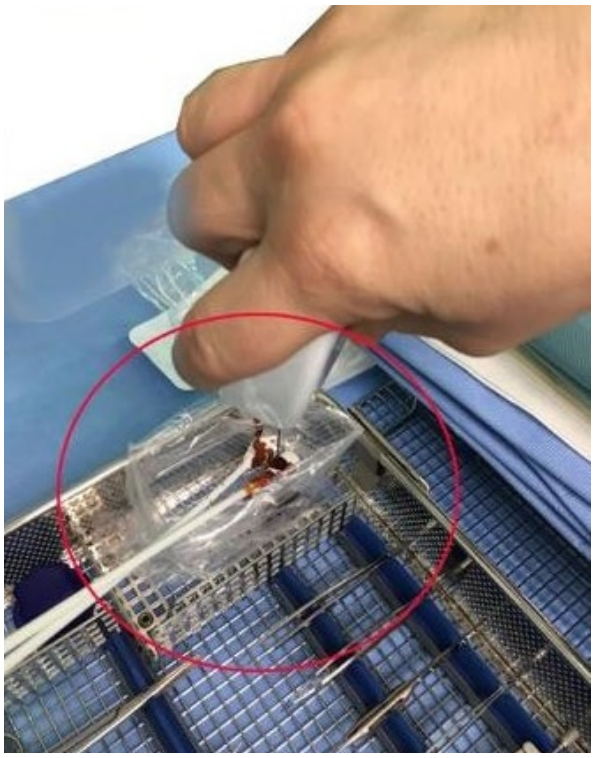
Concrete procedure tray tips:

- Intermittently, check if certain instruments are never or hardly ever used, and take them off the future trays
- Ask about bio compostable new materials
- discontinue hand drying cloths: alcohol rub will evaporate
- 3 syringes maximum: hydrodissection, capsulorrhexis, and cefuroxime
- Ask for incised adhesive patient drape to save on scissors
- Avoid big instrument containers, when smaller ones will do
- Use reusable gallipots
- One blade for main and sideport incisions
- No spears, maximum 5 gauze
- Request the smallest customset drape possible of your supplier
- Use reusable surgical gowns

For the surgeons:
Try and get to standardised phaco sets for the department, with the minimum amount of instruments and disposables.

For the scrub:
Think about parts of the set that could be discontinued, when never used. Use one cannula for BSS, vision blue, hydrodissection and cefuroxime, provided it is flushed with BSS in between uses.

A plastic cover for the screen is not required: the runner could do this, or use a sterile cotton bud or other instrument that has been used already.



***A.** Use plastic that is already on the set as iodine container.*

***B.** Use a 10 cc syringe pack as handle cover.*

Instrument set

Refuse, reduce, and optimise your instruments and the set: the smaller the better. Smaller means less sterilisation time [26].
Standardise the instrument set within your department: agree a set that will avoid superfluous instruments.
The set will include a speculum, colibri/Hoskin forcep, rhexis forcep, sweep/chopper, I/A handpiece, phaco handpiece, lens folder / injector, microscope handle covers, sleeve and condom.
If possible please use a reusable instrument tray, reducing your carbon footprint [11].

Phaco machine

There are several phaco machines on the market allowing reuse of cassettes: Rayner's Sophi day cassette. Oertli also has a machine with day cassettes.
Do not use the machine tray, as this will save a tray cover. Use your theatre trolley only, as this will save a cover, and time.

Re-usable instruments

Reduce your disposable instruments as much as possible: I/A handpieces, rhexis forceps, microscope handle covers, and metal containers can be reused. Phaco needle, sleeve and condom can be used several times, following flushing and sterilisation. The scrub should visually inspect all instruments prior to the case, and replace if required.

Here, legal and educational issues need to be considered. If the IFU (instructions for use) by the manufacturer are not followed, legal advice should be considered. Scrub trainers should educate their pupils about reusable silicone tipped I/A handpieces, for example.

An interesting development is the emergence of hybrid instruments, like a reusable I/A handpiece with disposable cannula. A formal LCA between reusable and disposable instruments will follow. Examples of hybrid I/A instruments are Kuipers instruments (Groesbeek) and US Hurricane Medical (via SyngaMedical).

***1**. Reusable bimanual irrigation/ aspiration handpiece (EVA bimanual I/A via ORC, Duckworth & Kent via Opthec, DUET handpiece via Microsurgical).*

***2**. Reusable coaxial single-handed I/A handpiece (e.g., Intertip via Microsurgical).*

***3**. Purchase two stainless steel gallipots per set for povidone-iodine and Balanced Salt Solution (BSS).*

Sterilisation

Onsite sterilisation means no transport cost and emissions, less defects in instruments, quick sterilisation and turnaround of sets leading to less sets to be purchased. Wet sets, or lack of set delivery are a thing of the past.

Reusable instruments and instrument trays

Sterilisation in cassettes and instrument trays is a sustainable alternative to polypropylene (blue) wrap, which has a big carbon footprint. Recent dutch Life Cycle Analysis proved 85% reduction on CO_2 emissions.

Example of an instrument tray and cassette

Cautery

If cautery is required, use a reusable one. Alternatively, use a disposable accu-temp handheld cautery with interchangeable tip.

***1**. Reusable cautery device*

***2**. Interchangeable cautery tip and semi-disposable cautery handpiece*

Arm rest cover
Using the surgeon's gown to drape the arm rests, prevent having to use separate covers for the arm rests.

Blade
Often 2 blades are used for the main and side port incision, where in fact the keratome can be use for both.

Visco elastic
1 vial is sufficient in uncomplicated cases.

Intracameral cefuroxime and lidocaine
The cataract guideline stipulates use of 1 mg cefuroxime in 0.1 ml at the end of surgery intracamerally. The most sustainable way of preparing cefuroxime is the use of (pharmacy prepared) syringes, enabling 1 vial of Aprokam to be used for more than one case. No consensus exists in relation to the Mini Spike (B Braun).
Lidocaine can be prepared at the start of a list in a 10 ml syringe.

1. *Prepared Cefuroxime*

2. *Mini spike for B. Braun vial*

3. *10 cc lidocaine*

Povidone iodine

Please use iodine sparingly. One gallipot per session will be plenty. There is no reason not to use povidone only for one patient to reduce infection risk. No micro organism survives povidone.
This povidone can be used instead of minims, as well as skin prep.
If minims are used in a non touch way, they can be reused in other patients.

The intra ocular lens

The most sustainable lens is the one in a sustainable pack without any associated paperwork, the IFU being accessible via QR codes. Also consider using lenses with a reusable injector.

***1**. Vitan unfolder with semi-preloaded Tecnis lens. JnJVision [12]*

***2**. Monarch injector Alcon*

Adrenalin

BSS with adrenalin is medical waste and has to be incinerated. If adrenalin is not used, the BSS can be disposed of in the sink. Uncomplicated cases can be done without the use of adrenalin. Most pupils stay dilated during the length of the uncomplicated case. In teaching settings one could consider using adrenalin in the bag, or in higher risk cases.

Eyepad and shield

In many dutch eye departments eyepads and shields are no longer used. This seems safe [13-16].
If use of shield/cartella is required, it does not need to be sterile. In certain cases, where responsible behaviour post op cannot be assured (dementia, learning difficulties), consider the use of a shield. Eye pads could be considered where subtenon or retrobulbar anesthesia has been used, and there is temporary incomplete closure of the eye.

See also Best Practice eyeshield and eyepad, PGDO 2024.

Post op topical medication

See also guideline cataract surgery. Steroids and NSAID drops are used. There is no need for antibiotic ointment the evening prior to surgery. Avoid minims as much as possible, and use bottles.

3. Why this Best Practice?

Healthcare in the Netherlands has a large carbon footprint: annually 11 megaton CO_2 [1]. In comparison: transport (car, lorry, airplanes) is responsible for 28 megaton [2]. Of the 11 megaton, about half arise from medical instruments [1]. The biggest share of energy and instrument use is from operating theatres: up to 84% of all energy use in the hospital arises in the operating theatre complex. 30-40% of all items used in the hospital, are used in the theatre complex [3].

CO_2 emissions from cataract surgery has been analysed in 2013 in the UK, doing a full life cycle analysis: 180 kg CO_2 per case. This is equal to an average petrol car driving 1500km [5]. A recent LCA analysis in the Netherlands was done at MUMC (Maastricht), result of which are pending. It is expected to be similar to UK numbers. Annually, 32 kilotonnes of CO_2 emissions arise from cataract surgery. So 0.3% of all healthcare related emissions are due to cataract surgery.

A Malaysian study (2020) looked at waste generated in one cataract operation: on average 0.83KG per case, half being clinical waste and half was recyclable. No numbers are available for the Netherlands.

The Netherlands are aiming to be climate neutral by 2050 [8]. Prior to that date, the Netherlands wants to reduce emissions by 49% by 2030. Similar targets apply to healthcare, and this has been crystallised in the Green Deal Duurzame Zorg. To get to this target by 2023, as from 2019, CO_2 emissions need to be reducing by about 6-8% annually in healthcare. So for members of the NOG, we need a big joint effort, also in cataract surgery, to get to this target.

It is possible to deliver high quality, and safe cataract surgery, even when we make the surgery much more sustainable. The Aravind Eye Hospital group in India has shown us that high quality cataract surgery is possible, even with better endophthalmitis rates, where CO_2 emissions are only 5% of those in the United Kingdom. There is therefore plenty of scope to reduce the carbon footprint in cataract surgery in the Netherlands.

More than 50% of this carbon footprint in cataract surgery arises from materials, including medicines, machines, and disposables. Not using certain materials has the biggest impact on emissions, followed by re-use, and then recycling (reduce/refuse, re-use, recycle principle). Hence, we should only use the absolutely necessary materials, instruments and medications, and exclude unnecessary equipment.

4. Conclusion

In order to reduce cost, waste, and CO_2 emissions it is important to critically look at what we use when doing phaco surgery, and change our practice where necessary. This Best Practice aims to help here. To further reduce our carbon footprint we need to look at additional policies and procedures. Manufacturers and distributors need to be reminded of their responsibility, and their supply chains.

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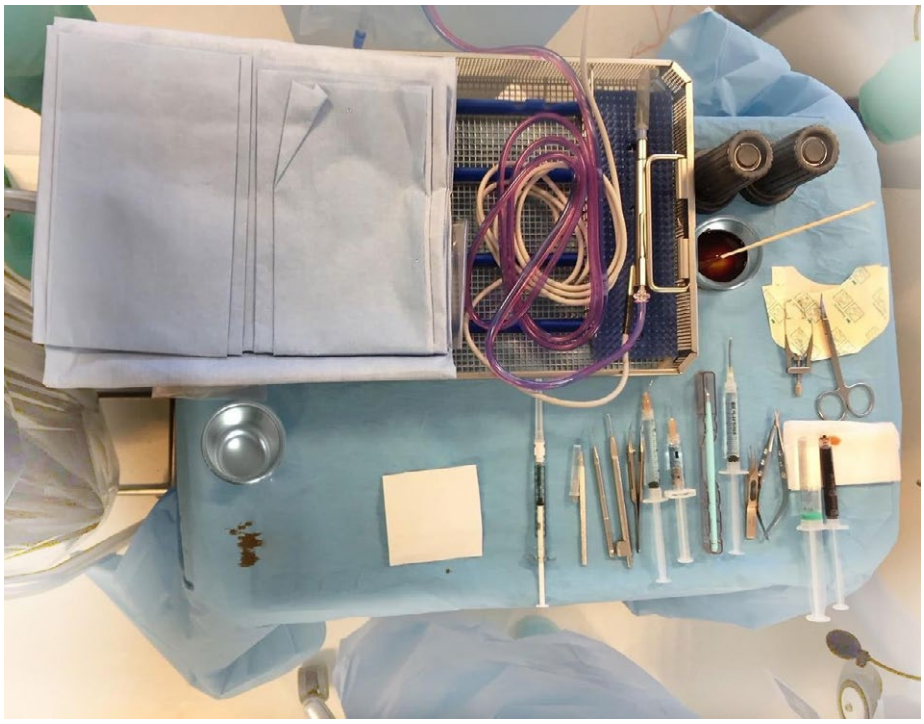
5. Example



Picture showing minimal requirements and maximum use of reusable instruments, 1 blade, microscope caps, 1 visco elastic.

6. Status Best Practice

It is important to state that this Best Practice is advisory, and not mandated: it is not a guideline. A guideline is more or less binding, though one can diverge based on sound reasoning. Best Practices are built on the foundation of guidelines, evidence based, and approved by the NOG.

Thus: one can diverge from Best Practice guidelines, though it is encouraged to implement these in your practice.

All guidelines will be incorporating, in the future, sustainability, and in so doing, converge with sustainable practice guidelines.

This Best Practice is written for eye specialists and theatre staff.
Best Practices contain many examples that can easily be implemented in current practice, without much ado. The documents are living documents, and so will change when new evidence surfaces.

Disclaimer:

- *None of the authors have declared conflicts of interest*
- *This advice has been collated based on evidence available at the time of writing*
- *This Best Practice is meant to support current processes, but is not a guideline*
- *Even though care has been taken to put this document together, the NOG cannot be held liable for its contents.*

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