Value for money of reusable versus disposable ophthalmic instruments for intravitreal injections

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ABSTRACT

AIM: The aim of this study was to follow the instruments' pathways and cost each segment to calculate whether reusable or disposable ophthalmic instruments offer better value for money for intravitreal injections.

METHODS: The cycles and costs of reusable and single-use disposable instruments used for intravitreal injections were mapped out, including purchase costs, transport to and from the place of use, opening and disposal, sterilisation, replacement, salary costs of staff involved, etc.

RESULTS: The cost of using reusable instruments for intravitreal injections (NZ$29.00) was lower than the cost of using disposable instruments ($30.51) by $1.51 per patient.

CONCLUSIONS: Intravitreal injections performed with reusable instruments offer better value for money than when performed with disposable instruments. This equates to a beneficial financial saving just for this one low-complexity case. Such savings can multiply significantly when considering the instruments used in a wider variety of ophthalmic procedures. There are of course trade-offs between safety, quality, cost and sustainability.

Public health systems have finite resources; hence, it is important to consider value for money in our daily work. Many eye departments have changed wholesale to using single-use disposable instruments for all procedures. This was initially done in the context of avoiding transmission of viral diseases such as Creutzfeldt-Jakob disease (CJD), rather than for monetary reasons. The practice has continued as it is felt single-use instruments are labour saving and convenient, even though they may not be contributing to sustainability.

Southland Hospital provides ophthalmic services to a population of approximately 110,000 people and performs approximately 75 intravitreal injections per week in the outpatient's clean room. The equipment required is minimal, but the volume is relatively high for our department.

Our hypothesis was that reusable ophthalmic instruments are more cost effective than disposable ones for intravitreal injections. Advocates of reusable instruments argue that their continued use can reduce overall costs. However, this hypothesis needed empirical validation. The aim of this study was to follow the instruments' pathways and cost each segment to calculate whether reusable or disposable ophthalmic instruments offer better value for money for intravitreal injections.

Methods

As per the Research or Quality Assurance Decision Tree, Research Ethics Board approval was not required.[1]

The cycle taken by both reusable and single-use disposable instruments was mapped out.

For reusable instruments, this involved: the purchase cost of each instrument required and instrument tray; quantifying the number of uses during the lifetime of each instrument; obtaining the instrument tray from the hospital sterilisation department; transporting the instrument tray to the clinic by a porter; opening the sterile instrument tray onto a trolley prior to each procedure by an assisting nurse; the set-up ready for injection by an injection nurse; checking and cleaning the instruments after use by an assisting nurse or injection nurse; replacing the instruments into the instrument tray; completing paperwork/tracking for the instrument tray; transporting the used instrument tray to Central Sterilisation Services Department (CCSD) by a porter; repacking the tray by CCSD staff; sterilising the instrument tray; and the storage of the instrument tray until required again.

For single-use disposable instruments, this involved: the purchase cost of each instrument

pack; transporting the instrument pack from delivery area to the clinic by a porter; opening the sterile instrument pack onto a trolley prior to each procedure by an assisting nurse; the set-up ready for injection by an injection nurse; placing used instruments into an incineration bin and packaging into a general waste bin; completing paperwork/tracking for the instrument pack; re-ordering instrument packs; the incineration bin disposal; ordering a new incineration bin.

The instruments involved were a dual-ended calliper and an eyelid speculum, as well as an instrument tray for the reusable items and a disposable plastic tray for the single-use packs. Additional items were opened (gauze, cotton buds, gallipot and hypodermic needle) for both the reusable instrument trays and single-use disposable packs. The purchase costs of the reusable instruments and single-use disposable packs were obtained from the procurement department. The cost of sterilising one instrument tray was obtained from the sterilisation department (they have set charges as they sterilise instruments for other clients outside the hospital). The time taken for the porter to pick up/deliver the instrument pack and take a full incineration bin for disposal, the assistant nurse to open the sterile pack or single-use pack onto the trolley and complete paperwork/tracking, and for the injection nurse to set up the instruments ready for injection/clean and replace instruments into the tray, and dispose of the single-use instruments into the incineration bin was timed over five random occasions during June 2021 and averaged. The salaries of the staff involved were taken from job descriptions for those posts during June 2021. The average life cycle of a reusable instrument could not be calculated accurately, so we estimated this at 60 uses per instrument based on Yoshikawa et al.[2] However, the intravitreal instruments used are not delicate and are used many times more than on 60 occasions in actual practice.

Results

In June 2021, the capital costs of purchasing a reusable instrument tray, speculum and scleral marker were NZ$152.79. This was divided by 60 for the cost per use. The cost of a single-use disposable intravitreal injection pack was $9.61. The cost of additional items (cotton tip buds, dressing pack, 30g needle) was $3.54. The sterilisation cost per item was $0.92. The cost of a sharps container was $11.75, and for landfill was $171.00 per tonne. The average salary of a porter was taken as $41,599 per annum (pa), a senior nurse as $69,500 pa, a sterile services technician as $49,000 pa and an administration clerk as $24 per hour.

The average timings were: 20 minutes for retrieving and delivering from the sterilisation department; 2 minutes for the opening instruments onto trolley by a nurse; 3 minutes for checking/cleaning/repacking instruments after use by a nurse; 3 minutes for completing paperwork to return items to the sterilisation department by a nurse; 5 minutes for ordering and purchasing of procedure packs by the supplies department; 1 minute for the disposal of the sharps/waste after a procedure by a nurse; 5 minutes for the ordering and purchasing of sharps bins; and 20 minutes for the transport of sharps bins for disposal.

The total cost of using reusable instruments for intravitreal injection was $29.00, and the cost of using disposable instruments for intravitreal injection was $30.51. Hence, the cost of using reusable instruments was lower than using disposable instruments by $1.51 per patient. This equates to a saving of $5,889 pa for our department just for this one low-complexity case.

Discussion

Our small study shows that intravitreal injections performed with reusable instruments offer better value for money than when performed with disposable instruments. In our small department, this saves over NZ$5,000 per annum just for intravitreal injections alone.

Intravitreal injections are now the commonest procedure in ophthalmology and are increasing. Exact numbers are not known, but in 2022 there were approximately 17,000 intravitreal injections in the Auckland District Health Board for a population of approximately 1,600,000.[3] In Australia and New Zealand, the majority of units use custom intravitreal injection packs with disposable instruments.[4] Extrapolating the numbers of injections from Auckland nationally to New Zealand, then moving wholesale to reusable instruments could save approximately $77,000 nationally. Additionally, it is likely that ophthalmic reusable instruments are used more than 60 times each, which further reduces their cost per case. If similar figures hold true for other ophthalmic procedures that require a greater number of instruments, then there are even more very significant savings to be made by using

reusable rather than disposable instruments.

Disposable single-use instruments became popular due to their convenience and fears of viral contamination (e.g., CJD): hence, their perceived safety in preventing viral transmission. It is assumed that they also reduce the cost and time of maintaining reusable instruments, which require proper storage, handling, cleaning and sterilisation procedures. Disposable instruments additionally eliminate the risk of damage or malfunction of reusable instruments, which can compromise the quality and safety of medical procedures. Disposable instruments are especially useful for emergency situations, where time and resources are limited and infection control is crucial. Disposable instruments can reduce the risk of surgical site infections by 50% compared to reusable instruments.[5]

The vast majority of intravitreal injections are administered by allied health professionals and have been shown to be safe.[6] Some units use injection assistant devices, which standardise and speed up the injection procedure.[6,7] In the United Kingdom, using the InVitria injection device was less painful, quicker (by 1½ minutes) and cheaper than using conventional instruments.[7] However, the InVitria is comparatively expensive in New Zealand, costing $23.70 versus $9.62 for a procedure pack of disposable instruments.

Costs can be significantly reduced by the appropriate prescribing of intravitreal injections with regard to their effectiveness and frequency for different diseases. Careful consideration should be given to discontinuing intravitreal injections when patients are unlikely to improve in terms of vision after central retinal vein occlusion.[8]

Surgeons generally prefer to use reusable instruments due to better build quality, better materials (titanium rather than stainless steel), ease of use, feel and improved safety (less tagging of tissues). However, reusable instruments also have some drawbacks:

- The need for proper cleaning, sterilisation and maintenance of the instruments, which can increase the operational costs and the complexity of the processes.
- The risk of contamination or infection due to inadequate or faulty sterilisation, which can compromise the safety and the quality of the procedures.
- The possibility of wear and tear or damage to the instruments over time, which can affect their functionality and performance.

Reusable instruments generally have a lower carbon footprint than disposable instruments. Although reusable instruments require energy-intensive sterilisation, disposable instruments performed worse across all categories of ecological and human health harm, including climate change, metal/mineral and fossil fuel resource depletion and water scarcity.[9] These impacts were due to material processing, instrument production and sterilisation procedures.

Additionally, disposable single-use instruments also pose other significant challenges for the sustainability of the healthcare system and the environment:

- The cost of purchasing, transporting and disposing of disposable single-use instruments, which can increase the financial burden on healthcare facilities and patients.
- The generation of large amounts of medical waste, which can contribute to greenhouse gas emissions, pollution and resource depletion.
- The potential loss of valuable materials and components that could be reused or recycled.
- The ethical and social implications of discarding medical devices that could be beneficial for low-resource settings or humanitarian crises.

In summary, while cost effectiveness remains a central consideration, balancing safety, sterility and environmental impact is crucial when evaluating reusable versus disposable ophthalmic instruments for intravitreal injections.

COMPETING INTERESTS
The authors declare no competing/conflicts of interest. Originally presented as a video poster at the 2022 Royal Australian and New Zealand College of Ophthalmologists New Zealand Branch Annual Scientific Meeting.

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