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In conclusion, if we are to meet the goals of VISION 2020, we as eye care service providers must acknowledge the potential of equipment to contribute to these goals – and plan accordingly.

Survey methods
The Bristol Online Surveys tool was used to implement the questionnaire and to collect the data online. The questionnaire was based on the equipment in the Standard List and refined after pilot testing with the students enrolled in the International Centre for Eye Health (ICEH) Community Eye Health MSc course. The questionnaire required participants to give numerical responses and to share their comments and views.

The finalised questionnaire was circulated by email to members of the ICEH alumni network.
Ophthalmic equipment survey 2010: preliminary results

The survey was directed at the eye units of institutions in Africa, South-East Asia, the Americas, Europe, the Eastern Mediterranean, and the Western Pacific region in order to gather data on the availability of equipment. The survey was made available on the ICEH website as well as from the International Council of Ophthalmologists and VISION 2020 Links network. The survey was active between 24 January and 24 April 2010, and responses were gathered to provide information about the equipment available.

Background information on the main source of funding for each eye unit was also collected to understand the procurement and maintenance of new equipment. Overall, there were 173 responses, 55.7% of which were from tertiary hospitals. About the participants

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We received 173 responses, 55.7% of which were from tertiary hospitals. Over two-thirds of the respondents were from Africa. Background information on the main source of funding for each eye unit was also collected. Overall, half (50.9%) of the responses were from government hospitals, 21.8% were from non-governmental organisations (NGOs) or mission hospitals, and the remaining were from private or insurance company-supported institutions. In Africa, 80% were government funded, compared to only 18% in South-East Asia.

What equipment was available and working?

Overall, the private and NGO sectors were better equipped than government ophthalmic units. This was true in all regions surveyed and across the full range of equipment covered in the survey.

Cataract surgery

In total, 80% of the units reported having equipment required to provide basic cataract surgery and follow up (operating microscope, slit lamp, ophthalmoscope, and retinoscope). They had at least one that was functional (Figure 2). However, only 57% of all units had an A-scan for carrying out biometry. Without biometry, surgeons cannot select the most appropriate intraocular lens (IOL) power and patients may need optical correction after surgery. Within Africa, only 38% of the eye units reported having a functional A-scan.

Refractive error diagnosis was possible at 87% of the units who responded, as they had at least one functional retinoscope. Over 63% even had an autorefractor.

Glaucoma

Encouragingly, 78% of the units in Africa and 97% in South-East Asia reported having at least one tonometer. A total of 14% of units in Africa reported that non-functioning tonometers remained unrepaired for over a year, mainly as no one was trained to identify and manage the technical problems that occurred.

Over half of the eye care institutions responding from Africa and South-East Asia had no visual field analysers; this highlights the need to strengthen quality glaucoma management in these regions.

Equipment that had stopped working

We were interested to find out:

- In which eye units equipment had stopped working
- Why equipment had stopped working
- How long equipment didn’t work for, and why.

Continues overleaf
Where was the equipment?
Figure 3 highlights the challenges faced in the government sector (the main health service provider in many countries) compared to the NGO and private sectors. In all instances, more government eye units had equipment that did not work. Notably, 60% of the government units reported that one or more slit lamps did not work.

Why did the equipment stop working?
The causes were divided into:
- Easily manageable causes: blown bulbs, faulty electrical connections, blown fuses, etc.
- Preventable causes: poor maintenance, inadequate cleaning, breakages during transport, etc.
- Unknown or complex technical causes.

On average, easily manageable or preventable causes were responsible for more than a third of the equipment that had stopped working (Figure 4).

Breakage due to poor handling, for example, “being dropped” or “damage during travel to outreach,” raised questions about the care taken with equipment.

For how long did the equipment not work, and why?
On average, over 20% of all the eye units who responded to the survey reported that they had equipment which was not working for more than 12 months (Figure 5). In one extreme case, slit lamps were not working for over 15 years.

The key trend noted was that equipment not working for longer than a year was predominately a problem within government hospitals. For example, 59% of government units reported that slit lamps remained unrepaird for more than 12 months, compared to 3% in private settings and 0% in NGO settings (Figure 6).

Why did equipment not work for long periods of time?
One of the common reasons that equipment did not work for long periods of time was that the model was too old and that spare parts were not available; this was true for slit lamps, retinoscopes, indirect and direct ophthalmoscopes, and visual field analysers in particular.

“No-one to fix it” was a common reason given in the African region.

Lack of funding, especially in government settings, was raised as a major barrier in all regions.

In total, 60% of the units indicated that they had no reporting system or log for faulty equipment. Furthermore, there was no designated person to take responsibility for the equipment that did not work. This could help to explain the delays in arranging for repairs.

Nursing staff in only 31% of the units had received any form of training to maintain or clean the equipment.

Specialist training for technicians was available for only 33% of the eye units overall. In total, 51% of the eye units reported having access to the services of a trained general technician. One of the respondents pointed out that access to a general technician was not sufficient: “We have two medical technicians who are looking after all the medical equipment in the hospital. We need somebody who can [teach] them ophthalmic instrument maintenance.”
The impact of equipment that did not work

Some eye units have had to cancel or reschedule clinics and operations when their equipment broke down. Outreach programmes in almost 20% of the eye units were cancelled at some point due to lack of operating microscopes, which meant that screened patients have had to be turned away.

For both outreach services and those at the clinic, the inconvenience to patients is great, particularly in rural areas where patients often have to travel long distances. Long-term or repeated cancellations result in disappointment and loss of trust. This can damage the reputation of the eye care service and will have an impact on its ability to attract patients in future.

The impact of breakdowns was described as “increased waiting times for patients”, “delays due to sharing of equipment”, and “referral without a proper examination.” In addition, inability to conduct a proper preoperative assessment (due to non-functioning slit lamps) increases the risk of complications and poor visual outcomes.

Delays and cancellations are frustrating for eye care staff and have an impact on their motivation; this will in turn diminish their ability to deliver high-volume, high-quality services. As a result, retention of trained professionals in poorly equipped centres may become a challenge.

Problems with donated and surplus equipment

Donations reported by respondents included sophisticated diagnostic equipment which was not a priority requirement. These included equipment for fluorescein and indocyanine green (ICG) angiography, optical coherence tomography (OCT), and a Heidelberg Retina Tomograph (HRT).

Some donated equipment was not working because it required specific accessories that were either difficult to obtain or unaffordable. One of the respondents noted as follows: “[...three donated virectors but only one is working. From the beginning they needed different accessories that must be bought in order to use the machine.”

Some donated equipment no-one knew how to use. Respondents also did not know why some items were given to them (in some cases, the items were purchased by central government suppliers). These items included lasers for retinal photocoagulation, phacoemulsification machines, and retinoscopes. In one instance, a respondent reported being unable to use donated retinoscopes “because their training is in [a] French system.”

Some equipment was donated “without warranty or instructions for use and handling,” as reported by an African respondent.

Other equipment, such as A-scans, ultrasound appliances, OCT, and Yag lasers, had been purchased but was awaiting assembly for a long period of time (over six months). There are several possible reasons: because the equipment was not really needed, because there was no-one assigned to take responsibility for it, or because there was no-one who was able to assemble it.

Recommendations

- All clinical staff should be trained in basic maintenance of commonly used equipment for a district level eye unit.
- When new equipment is purchased, staff should be instructed in the basic care and maintenance that the equipment requires.
- Every unit must nominate an “equipment person” who has a keen interest in maintaining equipment. This person should be supplied with a clear job description, which includes maintaining an inventory list for equipment and spare parts, reporting on the functionality of equipment, and tracking repair work. This person should have undergone at least some basic training in equipment maintenance.
- More ophthalmic and biomedical technicians need to be trained in ophthalmic equipment maintenance.
- A module on the maintenance and repair of commonly used equipment found at the district eye unit should be developed and embedded into the training curriculum of all mid-level eye care workers.
- Local or regional equipment maintenance and repair training centres should be established.
- Donors of equipment should inform the potential recipient what is being donated and what support (consumables, spare parts, maintenance, water and electrical supply) will be required. Before accepting the donation, the recipient must ensure that they can fully support the equipment and that they have the budget to do so (see article on page 32).
- New items of equipment should be purchased with all spare parts and consumables for at least the first year of use (see article on page 34).
- Arrangements need to be made ahead of time for the maintenance and repair of both donated and purchased equipment.
- Newly purchased equipment should be installed by the manufacturer or supplier, where possible, and training given to staff on the basic care and maintenance that the equipment requires.

Equipment is central to service delivery and quality and is closely linked with the motivation of eye care personnel to do their job. More efficient, effective, and long-term use of equipment will be possible if eye units are able to acquire appropriate equipment which meets their needs, which they are trained to use and care for, and which they can afford to maintain.

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References

2. See page 36 for details on how to get a copy of the Standard List.