A History of the Glostavent

"What are you an expert on?" asked the Honorary Secretary of the AAGBI when I arrived for my first Council Meeting in 1980. "I need to allocate you to one of our committees". As neither of us was able to think of any area in which I possessed expertise I was allocated to fill a vacancy on the International Relations Committee (IRC).

The work of the committee at that time focussed on reports from anaesthetists in some of the poorest countries in the world describing the difficult conditions in which they worked who were seeking help and advice from the AAGBI.

It soon became obvious that the gulf in anaesthesia services between rich and poor countries was not only extremely wide but becoming progressively wider. In many countries anaesthesia was not a recognised medical specialty and was administered by nurses or clinical officers working under the supervision of surgeons. Equipment was generally inadequate, largely consisting of discarded draw over systems or superannuated Boyles machines which relied on frequent attention from ingenious local enthusiasts.

Attempts to introduce sophisticated modern anaesthetic machines to isolated hospitals in poor countries had proved disastrous. Although donated at huge expense they were totally unsuited to the local environment. Irregularities in the supply of electricity and oxygen and the absence of suitably skilled electronic engineers usually meant that they could not be used. They were rapidly consigned to the storerooms of African hospitals, which soon became notorious as the graveyard of anaesthesia equipment, a seemingly unstoppable process which continues unabated to this day.

In these difficult circumstances the local staff were doing a sterling job in providing any service at all, but morale was low and help a long way off. It was against this background that the IRC were requested to find affordable solutions to these seemingly intractable problems.

In the absence of oxygen cylinders draw over anaesthesia seemed the only viable option for inhalational anaesthesia. It had long been out of fashion in the UK although was still in use in the armed forces where the Tri-service apparatus had proved invaluable.[1] It was, however, seldom being taught in British hospitals although demonstrations were still given by a few enthusiastic consultants including Dr Tom Boulton in Reading and Dr Mike Dobson in Oxford.

During the 1980`s interest in the anaesthesia in the developing world became more widespread. Courses on `Anaesthesia in Developing Countries` were introduced in Bristol by Dr Zorab and in Oxford by Dr Dobson and these were heavily oversubscribed by applicants from the UK and overseas.

World Anaesthesia Society

1988 saw the formation of the World Anaesthesia Society, a group of those interested in promoting anaesthesia in difficult situations with Dr Michael Dobson as its first president and in 1989 the World Anaesthesia Newsletter made its first appearance with Iain Wilson as editor.

Oxygen concentrators had been in use for some time, mainly for domestic oxygen administration, but there was increasing interest in their application in anaesthesia and reports of their use in operating rooms began to appear in the literature.[2] Their potential was appreciated to such an extent that in 1989 the Overseas Development Administration (ODA) called a meeting of interested parties to discuss their possible inclusion in their Aid program.

In 1991, after reading an article in the World Anaesthesia Newsletter, Dr Roger Manley, who had previously introduced the Manley Ventilator, was inspired to create a low cost ventilator specifically for use in the poor countries of the developing world. Known as the Manley Multivent, it was entirely gas driven requiring a pressure of 140 KPa but designed so that the volume of driving gas required was limited to one tenth of the patient's minute volume.[3] The driving gas could be either oxygen from a cylinder or air from a compressor. The ventilator was initially priced at £500.

Preliminary trials proved very successful and it was demonstrated at several WFSA refresher courses throughout Africa. However, plans for its further development were cut short by the untimely death of Dr Manley later in 1991. Mrs Manley expessed a wish that the development of the ventilator should continue and the Penlon company of Abingdon were asked to undertake this work. It was to be known as the Manley Multivent project to be supported by the ODA and the WFSA . It was tried in several centres in the UK and the first successful use was reported from Uganda in 1992.[4]

Most oxygen concentrators at that time produced oxygen at a pressure of 35-70 KPa which is considerably short of that required to drive the Manley Multivent ventilator. However, the concentrator manufactured by Devilbiss was modified in such a way that, in addition to supplying oxygen, it had a second outlet for compressed air at 150 KPa . It was thus able to drive the ventilator and could be used in combination with the Manley Multivent.

When electricity was available, the oxygen concentrator was the source, both of oxygen for the breathing circuit and of pressure to drive the ventilator. If the electricity supply failed, and the concentrator ceased to function, a reserve oxygen cylinder could immediately take over both functions.

When oxygen from the reserve cylinder was required, conservation became extremely important. This was achieved in two ways. Firstly, the volume of gas required to drive the ventilator was only 1/10th of the patient's minute volume. Secondly, the oxygen used to drive the ventilator was returned to the breathing system to supplement the inspired oxygen concentration.

The ability to continue to provide inhalational anaesthesia in addition to intermittent positive pressure ventilation in the absence of either oxygen or electricity was seen as a great advantage in those countries where such situations were not uncommon.

Throughout the period 1993-5 further modifications were made. An additional flow meter for air was added and the design further modified by combining all the component parts into a single unit mounted on a mobile frame. On the upper shelf was the Manley Multivent ventilator, and the draw over breathing system with an Oxford Miniature Vaporizer.On the lower shelf was the modified Devilbis oxygen concentrator. On the side of the frame were cradles for reserve oxygen cylinders and electrical sockets at the rear. In 1994 this unit went into production, initially under the name of the Oxyvent but because of possible copyright issues was renamed as the Glostavent.

Glostavent Project

Throughout the next five years (1995-2000) the Glostavent was described and exhibited at numerous national and international meetings including the WCA in Sydney and this period saw the `Glostavent Project` initiated by Prof Rosen with support from the AAGBI and the ODA.

In 2000 the Gloucestershire Royal Hospital had a visit from The Rt Hon Clare Short, Minister for the ODA, (which was later to become known as the DfID) to inspect the Glostavent. Following this visit, and in view of the successful demonstrations in the UK, the ODA awarded a grant of £211000 for a field trial to be carried out in partnership with the WFSA in the more challenging environment of sub Saharan Africa.

Zambia, Mozambique and Malawi were selected for the trial and local co-ordinators appointed in each country to supervise their use. Before the commencement of the trial Dr David Peel visited each centre to give intensive training courses on the operation, servicing and maintenance of the Glostavents to the clinical officers and technicians.

In 2004 Dr Peel returned to Africa to review the progress of the trial, correct minor faults and prepare an interim progress report. In 2006, engineering consultant Richard Tully carried out a final review in each of the countries after which a concluding report was submitted to the DfID.[5] The trial was adjudged to have been a success and as a result of their experiences the local co-ordinators recommended their adoption throughout their respective countries.

Despite the support of the AAGBI, the WFSA and the Overseas Development Agency as well as the enthusiasm of anaesthetists in many developing countries, the Glostavent project failed to gain momentum. By early 2000 both Penlon and Devilbis were beginning to lose interest and although other companies were approached none were willing to exploit this opportunity.

Irrespective of its success in many developing countries and popularity with anaesthetists very few Glostavents were being sold. There was understandable opposition from those who wanted to maintain the status quo and many predictions that it could never succeed. As interest flagged it seemed the Glostavent was destined to join the long list of brilliant failures.

When help eventually came it was from a most unexpected quarter and began a sequence of events that led to a dramatic reversal of fortunes. On Feb 6th 2002 I was surprised to be invited to describe the Glostavent to a meeting of the Institute of Electrical engineers in London. Although the audience appeared less than enthusiastic and there were no questions, I was intercepted at the door by an engineer from Devon asking who was manufacturing the unit. When I explained that no-one seemed willing to take this on he

invited me to visit his place of work, a factory known as Primary Health Diagnostics in Bideford. A few weeks later I visited the small factory where I found items of medical equipment, ranging from mosquito nets to incinerators, in various stages of assembly. I was introduced to John Anning, the managing director, who offered to help with the production and marketing of the Glostavent.

Over the next few years there were numerous meetings between the various interested parties, after which it was agreed that production and marketing of the Glostavent would be undertaken by Primary Health Diagnostics (to be re-named Diamedica) and that Penlon and Devilbiss would continue to manufacture the components.

While the Glostavent was being demonstrated in numerous countries and receiving interest, at the Diamedica factory two brilliant engineers, Robert Neighbour and Richard Tully, completely overhauled every component of the Glostavent in the years 2005-2010. Weekly visits to the Gloucestershire Royal Hospital during this time enabled them to maintain close contact with the requirements of anaesthetists both from the UK and from many overseas countries.

In 2007 John Anning resigned from Diamedica and Robert Neighbour became managing director. He had complete confidence in the Glostavent project and made its production and marketing the priority of Diamedica. With two world class engineers focussing their considerable expertise, the problems that had previously seemed insoluble were tackled in rapid succession. Every component of the Glostavent was critically examined and if it did not meet the highest engineering standards was immediately overhauled. This resulting in a series of presentations and papers.[6,7,8]

By 2008 a standard version of the Glostavent was finalised and has been in production ever since.[9] It is now being used in over 50 countries and has proved to be both reliable and popular with the users, and is seen to provide value for money. In addition, a portable version has also been introduced which has also proved especially popular in emergency and disaster situations in the wake of earthquakes , tsunamis and conflict.[10]

One of the reasons for the success of the Glostavent has been the high degree of customer satisfaction due to the excellent after sales service, even in the remotest areas. This has included extensive training in the understanding, use and care of each unit.

The huge demand for the Glostavent has undoubtedly resulted in increased safety of anaesthetic practice in many parts of the world. Moreover, this has been achieved, not by throwing money at the problem, but by conservation of resources, avoidance of waste and a restoration of the culture of thrift.

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TAX NEEDN'T BE TAXING

Disclaimer: This article tries to explain tax issues for anaesthesia trainees and where more information can be found. The authors are not trained tax advisors. Both the authors and the AAGBI are not able to offer professional tax advice, and will not accept responsibility for any liabilities. Contact a professional tax advisor or Her Majesty's Revenue & Customs for more information.

To establish how commonly anaesthesia trainees have problems with pay or income taxation, we conducted a survey in West Midlands deanery. 310 trainees were emailed and 80 (26%) completed the survey. Questions asked included:

- **have you had pay or income tax issues in your last rotation?**
- **have you ever had pay or income tax issues?**
- **have you had issues with student loan deductions?**
- **has pay or tax ever been explained during hospital induction and would that be beneficial?**

Survey Results

71% respondents stated that they had pay or tax issues at some time. In their most recent post, 44% of trainees who responded had pay issues and 56% had tax issues. The main problems were: emergency tax code, wrong tax code and delay in the issue of a P45. Tax issues varied from £400 to £10,000.

23 of 80 trainees (29%) had student loans of which 15 (65%) had problems with loan deductions each time they rotated. 94% of the trainees said pay or tax has not been explained during hospital induction. 61% said they would benefit from a payroll department presentation explaining pay and tax on each induction.

This survey demonstrated that many trainees are having difficulties with their tax each time they rotate to a different hospital. As a result, we will try to explain tax codes, how to check you are on the right code, what you can claim as tax deductable income, how to check your pay scale is correct, and how to rectify issues.

Rates of pay

Don't be fooled into thinking that "rates of pay" on your payslip relates to your pay scale. This number is your basic pay (before banding) and increases with increasing years of experience. To check you are on the correct pay scale, look at the table on page 13 of the 2010 Pay Circular, available at http://www.nhsemployers.org/Aboutus/Publications/PayCirculars/Documents/Pay%20Circular_MD_1_10.pdf.

Tax codes

The tax year runs from April 6th to April 5th. Your tax code is made of numbers and a letter. Multiplying the number by 10 gives your total earnings before you pay tax. The letter 'L' usually follows this number, which means you are eligible for personal allowances. You only receive personal allowances on your first job (i.e. any locum work or second job will not be eligible for personal allowances). The standard code is 810L.

The code 'D0' means all income is taxed at 40%. This should be used for locum work, when your total earnings exceed the 40% tax bracket. 'D1' is used for earnings in a second job to be taxed at 50%. The code 'BR' stands for Basic Rate, when all earnings are taxed at 20%. This is often used when you change jobs and haven't yet received a P45 for your previous job and have not completed a P46 prior to the first payday.