the years. In conclusion, our AIMS system permitted a surveillance of a few indicators through manual sampling in a limited number of patients (neuromuscular monitoring) and several more by SQL extraction in a sustained and short time-consuming way through the years for all patients. Manual extraction was time-consuming and necessitated excessive workload and might not be viable in the long run, SQL extraction was very difficult to acquire in the initial phase since each query necessitated a manual validation/verification of the results in a very small number of patients for a short period of time. This procedure was necessary in order to avoid duplicate data; however, once the query was checked and validated, SQL extraction was highly reproducible through the years necessitating minimum time and human resources. Nevertheless, it required competent personnel to handle database results. Based on our experience, we suggest several possible areas of improvement using AIMS for quality assurance data:

- A back-up storing data system easily available at least 24 h in the anaesthesia machine as opposed to the server data storage system which may not easily be accessible to a non-administrator user in order to index possible missing entries.
- A direct link to the patient intra-hospital medical chart.
- A system capable of automatically uploading or downloading the patient’s information from other clinical databases available in the hospital.
- A reliable, clear, and easy to read PDF printing system.
- An intuitive access to predetermined indicators accessible to a non-administrator user.

### Declaration of interest

None declared.

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**Oxygen 93: a new option for European hospitals**

Editor—Recently, monograph number 2455 (Oxygenium 93 per centum, O2 93) has been added to the European Pharmacopoeia (Table 1). O2 93 can be obtained onsite from ambient air by means of pressure swing adsorption through molecular sieves in so-called oxygen concentrators. The O2 93 monograph, together with ISO 10083 (Oxygen concentrator supply systems for use with medical gas pipeline systems), allows European hospitals to install oxygen concentrators and feed the O2 93 produced onsite into their pipeline system, rather than oxygen obtained from gas manufacturers. Such installations have been used for about 30 yr, e.g. in more than 50 Canadian hospitals. In addition to supply considerations, relevant in remote areas, at sea, or in the military, also economic considerations may prompt the introduction of O2 93 into hospital practice. However, whether O2 93 produced onsite actually can be cheaper than buying commercially distributed oxygen in areas with a well-developed infrastructure remains an open question. Prices for electrical current and commercially available oxygen are the main variable cost factors and may change with time.

From a medical point of view, no serious aspects preclude the use of O2 93. With regard to haemoglobin’s oxygen binding capacity, O2 93 and O2 100 are equivalent. The small additional amount of physically dissolved oxygen that accompanies the increase in FIO2 from 0.9 to 1.0 in a healthy lung is of minor importance and practically irrelevant, especially as

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**Table 1 Requirements for the gaseous mixtures forming ‘Oxygenium 93 per centum (O2 93)’ and ‘Oxygenium’ (O2 100) according to the European Pharmacopoeia**

<table>
<thead>
<tr>
<th></th>
<th>O2 93</th>
<th>O2 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen content</td>
<td>90–96% (v/v)</td>
<td>≥ 99.5% (v/v)</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>≤ 300 ppm (v/v)</td>
<td>≤ 300 ppm (v/v)</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>≤ 5 ppm (v/v)</td>
<td>≤ 5 ppm (v/v)</td>
</tr>
<tr>
<td>Water</td>
<td>≤ 67 ppm (v/v)</td>
<td>≤ 67 ppm (v/v)</td>
</tr>
<tr>
<td>Nitrogen monoxide and nitrogen dioxide</td>
<td>≤ 2 ppm (v/v)</td>
<td>Not specified</td>
</tr>
<tr>
<td>Sulphur dioxide</td>
<td>≤ 1 ppm (v/v)</td>
<td>Not specified</td>
</tr>
<tr>
<td>Oil</td>
<td>≤ 0.1 mg m−3</td>
<td>Not specified</td>
</tr>
</tbody>
</table>

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O₂ 93 typically has a concentration of about 95% oxygen. Only theoretically, in some rare critical clinical situations like carbon monoxide poisoning or post-stenotic ischaemia, this additional physically dissolved oxygen could be advantageous. Furthermore, in diseased lungs, venous admixture will impede a possible increase in physically dissolved oxygen in arterial blood. Some precautions are required in minimal flow anaesthesia: O₂ 93 contains argon, typically in concentrations of 4%, considered to be biologically inert; however, a possible accumulation in a closed system has to be taken into account.

In contrast, a number of technical and particularly regulatory aspects and obstacles would have to be addressed. An additional pipeline being too expensive, the existing central gas supply for O₂ 100 would have to be devoted to O₂ 93, including back-up tanks and special outlet sockets. The medical equipment, developed and approved for use with O₂ 100, would require a number of minor adaptations to allow for ‘CE’-marking; some ventilators using oxygen analysers with internal automatic oxygen calibration, however, are basically inapt for use with O₂ 93. Finally, to avoid a transfer of liability, the manufacturer would have to change the statement for intended use to allow operation with O₂ 93. As a prerequisite, the existing tolerance limits for gas mixers in anaesthesia work stations and critical care ventilators have to be raised, to allow for a normative correct device specification and operation.

In conclusion, a transition of a European hospital’s central oxygen supply from O₂ 100 to O₂ 93 is feasible from a technical point of view, with the exception of apparatus using two-point oxygen calibration, predominantly used in intensive care. The technical norms for medical gas pipeline systems and medical apparatus presently are adapted to enable the use of the new drug, that is, O₂ 93, without breaching their requirements. Whether the market’s demand for O₂ 93 becomes sufficiently strong to initiate the changes necessary in the central gas supply and in the installed base of equipment remains to be seen.

Declaration of interest

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