Letter:
Medical Gas Cylinder with Mismatched Colour and Pin Index.

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Abstract
The medical gas cylinders have various safety features to prevent the administration of wrong gas to the patient. Most of the features have visual impact (colour, label, markings on the cylinder body) except pin index system on the cylinder valve, so error in this feature is difficult to analyze and is highly unpredictable. We had received one such cylinder in our institution where all other features (label, colour, marking) pointed to nitrous oxide except the pin index which resembled with that of oxygen.

Key Words: Safety features, Pin index, Nitrous oxide cylinder.

We want to report an incidence of mismatched safety features in a cylinder of anaesthetic gas that was supplied to us. The safety features of anaesthesia gas cylinder are pin index system, colour coding, symbol of the gas on the cylinder valve, label and markings on the cylinder body.

The pin index safety system is a safety device (introduced in 1952) which prevents attachment of a wrong cylinder to the anaesthesia machine. It is used for small cylinder valves (size E or less) with yoke type connections. The pins on the inner surface of yoke are so positioned that they fit in the corresponding holes on the cylinder valve. [1]

Table 1: Pin index & colour code of oxygen and nitrous oxide cylinders [2]

<table>
<thead>
<tr>
<th>Gas</th>
<th>Pin index</th>
<th>Colour code of cylinder</th>
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<tbody>
<tr>
<td>Oxygen</td>
<td>2.5</td>
<td>Black body with white shoulder</td>
</tr>
<tr>
<td>Nitrous oxide</td>
<td>3.5</td>
<td>Blue</td>
</tr>
</tbody>
</table>

In the incident we report, our OT attendant was having some difficulty while positioning a nitrous oxide cylinder in the yoke assembly of the anaesthesia machine. Our first reaction was to scold him that he could not even change a cylinder without making a fuss. On close inspection we found that the holes on the valve of the cylinder for the pin index safety system did not correspond to 3,5 (index for nitrous oxide), but seemed a bit further apart. On further checking the symbol on the valve, label, markings and colour coding (blue) all pointed that it was a nitrous oxide cylinder. Out of curiosity we tried attaching the cylinder to the oxygen yoke assembly, and it was a perfect fit! This confirmed our suspicion that the holes corresponded to 2.5 (index for oxygen). We did not dare to turn the gas on, because we were not sure of the contents of the cylinder. We did not have a respiratory gas analyser to confirm the nature of the gas in the cylinder. So we just sent the cylinder back to the supplier with a note that the cylinder was defective.

Oak et al have reported a similar case, from KEM Hospital Seth GS Medical College, Mumbai, India, where a nitrous oxide valve had been installed on the body of oxygen cylinder.[3] Arepalli et al from North Manchester Healthcare NHS Trust [4] and Thomas et al from Hope Hospital, Salford [5] have reported incidents where air cylinders with bull-nose fitting had been fitted to oxygen regulators. Though pin index is a safety mechanism it has fallacies. A wrong cylinder can be attached if pins are broken, two washers are placed on port and the holes on the cylinder valve are too deep. But in our case a wrong index system on an otherwise nitrous oxide cylinder was the main defect. Repeated forceful attempts may have either broken the pins or damaged the yoke assembly. So if a cylinder cannot be positioned with ease one should check for index system (after ruling out washer position, alignment of cylinder with machine, presence of pins) rather than use force.
Figure 1: Two blue coloured medical gas cylinders with pin index 2.5 (left) and 3.5 (right)

The cylinder valve is a separate unit and is placed by the manufacturer, so in our case it was a purely manufacturing error. It is interesting to note that though the label on cylinder valve was of nitrous oxide, the pin index on the same valve matched with oxygen configuration. It is a rare incidence of an otherwise nitrous oxide cylinder (blue colour coded with the right markings and label) with a wrong pin index where safety could have been breached by the safety device itself!

References