Triennially, since 1954, the Ministry of Health has issued a Report concerning maternal deaths which occurred in England and Wales during the previous three years. The current Report on Confidential Enquiries into Maternal Deaths in England and Wales, 1964–66* makes depressing reading for anaesthetists. Virtually alone of the factors associated with maternal deaths, the number applied to anaesthesia was greater in 1964–66 than in 1961–63, and this rise was “proportionally greater than the increase in the number of births during the same period”. It was also proportionally greater than the increase in the number of Caesarean sections (approximately 17 per cent). The decline in the total number of anaesthetic deaths during the previous decade has been abruptly reversed, in contrast to the continued overall decline in maternal mortality (table I).

### Table I

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths due to complications of anaesthesia</th>
<th>Maternal mortality (excluding abortion) per 1,000 total births</th>
<th>Total births</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952–54</td>
<td>49</td>
<td>0.56</td>
<td>2,079,275</td>
</tr>
<tr>
<td>1955–57</td>
<td>31</td>
<td>0.43</td>
<td>2,140,376</td>
</tr>
<tr>
<td>1958–60</td>
<td>30</td>
<td>0.33</td>
<td>2,322,229</td>
</tr>
<tr>
<td>1961–63</td>
<td>28</td>
<td>0.26</td>
<td>2,550,252</td>
</tr>
<tr>
<td>1964–66</td>
<td>50</td>
<td>0.20</td>
<td>2,630,150</td>
</tr>
</tbody>
</table>

(Adapted from tables I and XXIX of the Report.)

As has become customary, the Report also makes a distinction between deaths with avoidable factors and those in which there was no evident avoidable factor. A maternal death is considered to have had an associated avoidable factor if, in the opinion of the assessors, there was “some departure from the accepted standards of satisfactory care, which may have played a part in the ensuing death”. Almost half of the number of deaths due to complications of anaesthesia had an associated avoidable factor. The number of these possibly avoidable deaths has thus increased considerably since the previous triennium, whilst the ratio of “avoidable” to total deaths has remained approximately the same (table II).

### Table II

<table>
<thead>
<tr>
<th>Year</th>
<th>Total</th>
<th>With avoidable factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1952–54</td>
<td>49</td>
<td>24 (77 per cent)</td>
</tr>
<tr>
<td>1955–57</td>
<td>31</td>
<td>24 (80 per cent)</td>
</tr>
<tr>
<td>1958–60</td>
<td>30</td>
<td>24 (80 per cent)</td>
</tr>
<tr>
<td>1961–63</td>
<td>28</td>
<td>14 (50 per cent)</td>
</tr>
<tr>
<td>1964–66</td>
<td>50</td>
<td>24 (48 per cent)</td>
</tr>
</tbody>
</table>

(Data from page 69 of the Report.)

The absolute numbers so far quoted in relation to the 1964–66 Report are likely to be underestimates. The Report deals with enquiries into 755 deaths, but in fact, as the compilers note (p. 8), “comparison with death certificates reveals that in the three years 1964–66 there were 135 maternal deaths and 41 associated therewith concerning which confidential enquiry forms were not obtained”. It is thus not unreasonable to assume that the number of deaths due to complications of anaesthesia—both avoidable and non-avoidable—was some 20–25 per cent greater than that referred to in the Report.

### Analysis of the Factors Involved

From the viewpoint of anaesthetists the Report suffers from serious shortcomings. The compilers draw attention (p. 10) to the insufficiency of detail provided in the individual reports of all deaths, and to the absence of a report from the anaesthetist concerned in a death associated with anaesthesia. It is thus not possible to glean much more than a smattering of information about the individual techniques and drugs employed.

There is a note to the effect that in most of the cases of death due to acid-aspiration syndrome, anaesthesia was induced with an

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travenous agent, followed by suxamethonium, and the lungs were subsequently inflated prior to intubation. One patient, due to have a Caesarean section, was given thiopentone 400 mg and suxamethonium 50 mg, "but it was found impossible to inflate the lungs even after intubation presumably because of bronchospasm". These observations apart, there is a dearth of information regarding the preparation of patients for general anaesthesia, of the technique used, and of the immediate postoperative care of the patients (including reference to any resuscitative measures) except for one case history to which an interesting—and perhaps "politically" useful—comment is appended. Suxamethonium and tacrine were given to a patient undergoing Caesarean section: "at the end of operation, her respiration was shallow and cardiac arrest occurred whilst she was being transferred to her ward". Comment about the anaesthetic management of the case should be superfluous, but it is worth noting that in this Ministerial Report it is tacitly assumed that there will be a postoperative recovery area in the delivery suite.

Pudendal nerve block was implicated in the death of two patients. In one case convulsions started 5 minutes after the injection of an unstated volume of 1 per cent lignocaine solution; the other death resulted from the injection of lignocaine made up with 1 in 1000 adrenaline (communication failure between the doctor and the local chemist, thus presumably a death in domiciliary practice). It is interesting in this regard to note that on 8 occasions death due to complications of anaesthesia occurred in association with forceps delivery, so presumably in 6 a general anaesthetic had been given. As, by the beginning of the triennium under review, pudendal block was already much preferred to general anaesthesia for operative vaginal delivery when the obstetric condition permitted, these figures serve to emphasize the correctness of the preference.

Respecting the total of 50 deaths due to complications of anaesthesia, 6 were of patients more properly considered as gynaecological than obstetric. Two further deaths, associated with pudendal block, have already been referred to, as have the 6 forceps deliveries conducted under general anaesthesia. Of the remaining 36 deaths, 32 occurred in patients undergoing Caesarean section, 1 during repair of a ruptured uterus, 1 during internal version and breech extraction, 1 during manual removal of placenta and 1 during repair of episiotomy—all, presumably, under general anaesthesia. Six of the Caesarean sections were elective procedures; there is no indication if there was an avoidable factor in 5 of these (2 of the patients had a phaeochromocytoma and 3 others had intra-abdominal malignancy) but the 6th patient, a diabetic, developed the acid-aspiration syndrome.

Acid-aspiration syndrome.

Eighteen of the 24 deaths with avoidable factors (75 per cent) were caused by inhalation of stomach contents, compared with 12 out of 14 (86 per cent) in 1961–63. In addition, regurgitation/aspiration was a contributory factor in 1 of 7 "doubtful" cases, and was the probable cause of 7 of the 19 deaths which were assessed as unavoidable. Thus the inhalation of gastric contents occurred in at least 52 per cent of the total number of deaths associated with anaesthesia; in 1961–63 the proportion was 16 out of 28 (57 per cent). Twenty-two (and possibly 4 more) of the 26 women known to have inhaled gastric contents developed the acid-aspiration syndrome. With the exceptions noted above, no details of the anesthetic management of these cases are given, apart from reference to 2 patients booked for—and possibly delivered in—private nursing homes, who "died as a result of anaesthesia, and facilities were not immediately available to deal with inhaled vomit".

The measures which must be taken to guard against regurgitation/aspiration and the acid-aspiration syndrome should by now be universally known. Briefly, they are:

(1) Strict dietary care during labour. The decision to stop oral feeding of a patient who has entered the phase of prolonged labour is worthy of special mention, as such a patient is outstandingly at risk should she eventually require a general anaesthetic.

(2) Alkali therapy. Without exception, all patients in labour should be given 10 ml magnesium trisilicate BPC every 2 hours, in order to maintain the pH of the gastric contents above 2.5. The same dose of antacid should also
be given to each patient just before she is taken from the ward to the theatre for an elective operation (incidentally, this measure could, with advantage and without hazard, be applied universally in all branches of surgical practice).

(3) **Gastric emptying** to be undertaken (using either a gastric tube or apomorphine) prior to induction if there is any reason to suspect the presence of a significant quantity of gastric content.

(4) **Cricoid pressure** (*Sellick's manoeuvre*) to be applied routinely in all emergency cases.

(5) **Adequate suction** immediately available during induction and at the time of extubation.

(6) **Informed help** attendant upon the anaesthetist at the time of induction and at extubation.

(7) **Endotracheal intubation** mandatory in all cases of operative delivery.

(8) **Immediate postoperative care** organized as in any efficiently-run general surgical unit.

**Haemorrhage.**

Because of the way in which the data are presented, it is rather difficult to obtain a clear picture from the Report of the significance of haemorrhage as a major causative factor of death at operative delivery. The total number of deaths associated with haemorrhage at Caesarean section has fallen from 34 in 1961–63 to 21 in 1964–66. In 6 of the latter 21 cases placenta praevia was a complicating factor, and 4 other patients had toxaemia of pregnancy, so conceivably could have had an accidental haemorrhage before operation; however, the indications for operation in the remainder of the cases were: uterine inertia (2), malpresentation and disproportion (9) and foetal distress (2). The Report notes that almost half of the number of deaths associated with haemorrhage at Caesarean section were avoidable.

The Regional Assessors (all senior obstetricians) and their Ministry advisers, have only tentatively suggested (p. 75) that the anaesthetist might be at least in part responsible for some of the "avoidable deaths" from haemorrhage. However, it must be acknowledged that many of these deaths resulted from inadequacies on the part of the anaesthetist.

The readiness to replace serious blood loss, and the promptness with which haemorrhage of such dimension is countered, is the direct responsibility of the anaesthetist. Taking the most noteworthy example, blood loss at the routine Caesarean section—when the operation has not been performed for placenta praevia or accidental haemorrhage—may be anything from 300 ml to 2000 ml irrespective of the experience or dexterity of the surgeon.

Anaesthesia for elective Caesarean section should not be induced until two bottles of cross-matched blood have been delivered to the operating suite; having been checked, one bottle may be stored locally in an appropriate refrigerator, while the other is kept in a warm environment ready for immediate use. Only rarely does it happen that blood transfusion is required to be started after closure of the uterus, and thus in the majority of cases when the warmed blood is not used, it may be returned to the refrigerator within the "half-hour out of the storage" recommended by transfusion services. Emergency section should, if possible, be delayed until blood has been cross-matched: if necessary a rapid, 20-minute cross-match of one of the two bottles should be accepted by the anaesthetist. If haste is imperative, blood should be sent for cross-matching as a first step in the preparation of the patient for operation.

A blood-warming instrument must be part of the equipment of each delivery suite.

**The basic deficiencies.**

The contribution made by anaesthesia to maternal mortality results in the main from failure at three levels:

(a) A failure on the part of teachers of anaesthesia (specifically those of us concerned with obstetric anaesthesia) to emphasize sufficiently the principles of safety in dealing with the obstetric patient.

(b) A failure on the part of the consultant anaesthetists in the country to ensure that their juniors are given the encouragement and support which would enable them to carry out their obstetric anaesthetic duties in a manner appropriate to the principles referred to above. The consultant anaesthetists cannot, as a group, disregard their responsibilities with respect to their allied obstetric departments. The responsibilities need not entail a great amount of personal in-
volvement in the practice of obstetric anaesthesia, but on the other hand, they must not consist solely of ensuring that a duty rota of resident anaesthetists is maintained to service the obstetric department's needs.

Reading several of the sections in this Report leaves one with the strong impression that in many instances the pattern of obstetric management of the case had led to the anaesthetist's being hurriedly called in, once a decision to intervene operatively had been made, to deal with a very ill, and inadequately prepared, patient. Temporization is a classical, and extremely sound, obstetric manoeuvre. However, the time so gained should be utilized in part by ensuring that the patient will be optimally prepared for operation should such intervention become necessary—this preparation includes attention to diet and cross-matching of blood. Continued application of a policy of this order is probably best ensured by discourse at consultant level.

(c) A failure on the part of the Ministry to ensure that all obstetric departments are provided with immediately available, adequately trained anaesthetists, with the corollary that if anaesthesia staffing is not available, obstetric work should cease.

CONCLUSION

In summary, the Report stimulates the following reflections:

(1) A disturbingly high proportion of the maternal deaths in England and Wales during 1964–66 resulted from the complications of anaesthesia.

(2) The burden of responsibility for this is shared in part by those interested specifically in promoting knowledge of obstetric anaesthesia and by Ministerial policy-makers, but the major share of the blame lies with the consultant anaesthetists, acting in concert at hospital or group level, for failing to ensure that appropriate standards are maintained.

(3) Specifically, emphasis must be placed on the need for a strict dietary regimen and a proper therapy of alkali medication to be operative in all labour wards; staffing and equipment in the areas where obstetric anaesthesia is to be undertaken must be maintained at a level of standard compatible with patient safety; greater vigour must be shown in insisting that blood is made available as a preparatory measure.

(4) In view of the fact that of the approximately 400 deaths due to pregnancy and childbirth (omitting those due to ectopic pregnancy and abortions), 44 are classified as being associated with complications of anaesthesia, one is left wondering why Regional Assessors in anaesthesia are, apparently, not invited to assist in the compiling of these Reports.

ACKNOWLEDGEMENT

The author wishes to thank the Director of Publications of Her Majesty's Stationery Office for permission to reproduce material appearing in the Report.

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