Certification of Hypothermia Deaths

SIR,—I read with interest the article on body temperatures in the elderly by Dr. R. H. Fox and others (27 January, p. 200). The authors have discussed the subject with me and have asked me to comment on the classification of hypothermia and related conditions. Accordingly I offer the following notes.

First it must be borne in mind that any discussion of the classification of causes of death has to be based on what appears on the certificate itself; it cannot take account of the criteria on which diagnoses have been made or the completeness with which they have been recorded. In the case of hypothermia there are additional difficulties which lead to confusion. In particular, the internationally agreed rules for classifying deaths by cause specify how to select a single cause from among those appearing on a death certificate; furthermore, the classification does not have an exclusive rubric for accidental hypothermia.

In the International Classification of Diseases, (I.C.D.)¹ hypothermia falls within the rubric 788.9 (Other specified symptoms—such as chills and rigors—not elsewhere classified). Other rubrics with similar connotations are E901 (excessive cold), E904 (hunger, thirst, exposure, and neglect), and 778.3 (cold injury syndrome—of newborn). But it does not follow that every death in which hypothermia is mentioned will be assigned to one or other of these four categories. For routine single-cause statistics—as agreed by international convention—hypothermia is treated as a symptom and is disregarded when an acceptable cause is mentioned in addition. Thus when the certificate reads “bronchopneumonia due to hypothermia” bronchopneumonia is chosen. Only when there is no relevant information other than hypothermia is the death assigned to 788.9. However, if the certification suggests that exposure was a factor the case is assigned to either E901 or E904, depending on the wording.

Thus for routine tables cases with “exposure to cold” or “hypothermia” on a death certificate may appear under any of the four rubrics or, alternatively, may not be counted at all in these categories because a coincident disease is chosen. When hypothermia is certified together with a disease, the hypothermia is sometimes given as the cause and sometimes as the intervening mode of dying, this variation possibly reflecting the difficulty in distinguishing what came first when there is interdependence. In some cases the disease itself gives the clue; for example, in 1971 in England and Wales there were 15 cases in which the cause was shown as myxoedema (see table). To overcome the inevitable shortcomings of single-cause analyses we have, since the beginning of 1971, introduced an additional code to identify all cases in which “hypothermia” appears on the certificate, regardless of their assignment under the rules. A summary of the findings for 1971 is given in the table, which includes all cases in which hypothermia was mentioned as well as whole categories which relate to cold in any way.

There are two main reasons why it is difficult to arrive at any meaningful total of deaths from hypothermia. Firstly, hypothermia is frequently reported on certificates without adequate indication as to whether it

Deaths with Mention of Hypothermia or Related Concepts, Shown by Single Cause as Selected by Rules of the I.C.D., England and Wales 1971. (I.C.D. categories in parentheses.)

Cause	All Ages		Under 1		1-64		65 +	
	Males	Females	Males	Females	Males	Females	Males	Females
Myxoedema (244) ..	3	12	—	—	—	1	3	11
Diseases of the circulatory system (390-458) ..	41	79	—	—	2	1	39	78
Diseases of the respiratory system (460-519) ..	39	55	4	1	5	1	30	53
Cold injury syndrome of newborn (778.3) ..	4	0	4	0	—	—	—	—
Other specified symptoms not elsewhere classified (including hypothermia (788.9) ..	4	11	—	—	—	2	4	9
All other diseases (remainder 000-796) ..	36	27	11	2	8	4	17	21
All diseases (000-796) ..	127	184	19	3	15	9	93	172
Excessive cold (E901) ..	29	30	—	—	18	1	11	29
Other accident, poisonings, and violent deaths (E800-999 excluding 901 and 904) ..	11	26	1	—	3	4	7	22
All causes excluding E904 ..	167	240	20	3	36	14	111	223
Hunger, thirst, exposure, and neglect (E904) ..	40	47	10	19	15	5	15	23
All causes ..	207	287	30	22	51	19	126	246

is a secondary or the primary cause of death. Secondly, exposure to cold is sometimes combined with other adverse circumstances in varying and unknown amounts, both in homes and out of doors; category E904 includes cases which have no mention of cold. Of the 420 records including the word “hypothermia,” 50 were coded to category E901 and 26 to E904.

The total number of deaths in which hypothermia played some part (whether underlying cause or not) probably lies somewhere between the overall total and the total without category E904. (that is, for 1971, between 494 and 407). It is to be hoped that the 9th revision of the I.C.D., now in preparation, will take account of new knowledge of hypothermia. Even so, we shall have to continue to rely on the accuracy of certificates.

May I take this opportunity to remind doctors to be as precise and comprehensive as the information allows whenever they have to certify causes of death; hypothermia is only one example in which the circumstances of death are important for analysis and research. May I also add a note of encouragement by saying how valuable the day-to-day observations of individual doctors are when reports of them can be brought together for research.—I am, etc.,

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¹ *Manual of the International Statistical Classification of Diseases, Injuries and Causes of Death*, 2 vols. Geneva, W.H.O., 1967, 1969.

Hypothermia

SIR,—The article by Dr. R. H. Fox and others (27 January, p. 200) reminds me strongly of our own discovery in paediatrics of hypothermic deaths in young infants about a generation ago. I well remember some 20-24 years ago, at the Radcliffe Infirmary in Oxford, these infants coming into the children's ward, often from large, cold, stone farmhouses and cottages in the Cotswolds in the extreme winter weather. I found the same thing happening in Northamptonshire and the North Cotswolds in 1954, when I moved there. At first we called this the “refrigerator syndrome” because extreme examples reminded one of a chicken

taken out of a refrigerator. The condition is insidious in onset, the baby still looking pink and well but becoming lethargic, going off food, and eventually developing respiratory symptoms.

We found that these babies were often exposed for bathing in an unheated bathroom or nursery, became chilled, and then were wrapped up well in clothes and blankets and again put in a large, cold bedroom or in the open air in a pram. Because these small infants lose their power to produce their own heat, they just remained cold, like the ice blocks wrapped in hessian or stored in straw in ice houses in the summertime on country estates before the days of refrigerators. I notice that Dr. Fox and his colleagues do not mention chilling in unheated bathrooms, although they mention the absence of running hot water as a possible initiating point for the syndrome. Also emphasis is not placed on the metabolic and food aspects of the syndrome. The elderly become in so many ways like infants, unable or unwilling to bother to feed themselves, and only then on the cheapest and poorest food. The wasting of tissues and loss of subcutaneous fat makes them more liable to chilling. The running down of the endocrine and metabolic systems lowers the normal body defences to chilling. Wasting of the fat reserves and the glycogen and protein reserves in muscles leaves little in the way of nutritional reserves.

The geriatricians may have a lot to learn from the past-generation experience of the paediatricians.—I am, etc.,

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Nomenclature of the New Vagotomy

SIR,—Vagotomy may be “truncal” if the vagal nerve fibres are divided cephalad to the coeliac and hepatic vagal branches. “Selective” vagotomy means the division of the vagus immediately caudad to the coeliac and hepatic vagal branches. The new vagotomy aims to cut only the vagal nerve supply to the part of the stomach that contains parietal cells.

In 1971 the Surgical Research Society asked us to suggest standardized terms and abbreviations to be recommended for use for

Term	Number who Chose the Term as			Total Score: (1st Choice = 3; 2nd = 2; 3rd = 1)
	1st Choice	2nd Choice	3rd Choice	
Acid fundal selective vagotomy	1	0	1	4
Highly selective vagotomy	6	6	11	41
Parietal cell vagotomy	12	15	3	69
Proximal gastric vagotomy	17	7	6	71
Proximal selective vagotomy	2	2	3	11
Proximal vagotomy	0	4	3	11
Secretory selective vagotomy	1	0	0	3
Selective proximal vagotomy	5	5	8	33
Selective vagotomy of the parietal cell mass ..	0	2	1	5
Super selective vagotomy	0	0	0	0
Supra selective vagotomy	0	0	0	0

gastric operations and acid tests. Our list was circularized, modified, and recircularized, and the final version as approved by the society has been published.¹ No generally acceptable term could be agreed for the new vagotomy, and we were asked to try again to reach a consensus to clarify this confusing situation, in which at least 11 terms and abbreviations have already been used to describe this single procedure.

We sent a questionnaire to 46 workers in this subject, 36 in the United Kingdom and 10 abroad, and received 44 replies. The 11 terms that have been used were listed and each person was asked to select three terms in order of preference; they were also asked if the majority verdict would be acceptable should this not coincide with their first choice.

It will be seen from the table of results that "proximal gastric vagotomy" scored most points, followed by "parietal cell vagotomy," and "highly selective vagotomy" came third, whether by counting first choice only or by a scoring system. Three workers indicated that they would not accept a majority verdict. Although "proximal gastric vagotomy" was one of the first three choices of 30 of the workers asked, it was the first choice in only 17 of the 44 replies.

We are aware of the lack of precision of all the terms that are used and also that the originators of particular variations in the technique all wish to retain the term they themselves coined. It is for this very reason that so many terms have been used. It seems to us, however, that the best term to use is the one that most people would like to use. In the interests of clarity we are ourselves using the term "proximal gastric vagotomy" for the new operation and we are recommending this term to other workers.—We are, etc.,

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¹ Gut, 1972, 13, 673.

Gastric Ulcer after Highly Selective Vagotomy

SIR,—Mr. Robert Hall's interesting report (30 December, p. 789) of a patient who developed a gastric ulcer after highly selective vagotomy without a drainage procedure raises questions which are pertinent to the surgical treatment both of gastric ulceration and of duodenal ulceration. Does highly selective vagotomy often produce gastric stasis? What length of prepyloric stomach

should be left innervated? When must a drainage procedure be added? Finally, does the innervated gastric antrum release excessive amounts of gastrin, which in turn might lead to gastric ulceration (in accordance with Dragstedt's classic hypothesis) or to recurrent duodenal ulceration?

Gastric emptying was found by three groups of workers¹⁻³ to be normal after highly selective vagotomy in dogs, while a fourth group⁴ found that the operation produced gastric stasis. In rabbits truncal vagotomy without drainage led to gastric ulceration in 11 of 12 animals and selective vagotomy of the entire stomach to gastric ulceration in five of 10 animals, while none of 12 rabbits subjected to highly selective vagotomy developed gastric ulceration.⁵ In man gastric emptying of fluids,^{6,7} of food and barium,^{8,9} and of a radioactive "normal" meal¹⁰ was found to be satisfactory after highly selective vagotomy. There has been little clinical evidence of slow gastric emptying in the 230 patients who have undergone highly selective vagotomy in Leeds in the past four years, and the tests of gastric emptying which were performed more than one year after highly selective vagotomy the operation yielded no evidence of stasis.^{6,9} Two patients complained of foul flatulence and four of frequent vomiting in the early months after highly selective vagotomy, but in each case these symptoms disappeared with the passage of time. Only one patient has subsequently required the addition of a drainage procedure for the relief of gastric retention. Several hundred tests of gastric secretion performed three months to four years after highly selective vagotomy provided no evidence of "hidden" gastric stasis. Volumes of resting juice in the stomach after an overnight fast were low, and food residues were not found.

Another crucial question is how much of the stomach should be left innervated. In highly selective vagotomy¹¹ the main anterior and posterior nerves of Latarjet, with their terminal branches to the antral region, are preserved. The course of these nerves is constant, and they are visible in at least 90% of patients. The average length of stomach remaining innervated is 5-7 cm, but the point is that dissection should begin proximal to where the nerves cross on to the stomach. In a few patients with large stomachs this may be as much as 8 or 9 cm from the pylorus. Professor Amdrup, who routinely "maps" the extent of the antrum at the time of operation (which he terms "parietal-cell" vagotomy) finds that the antrum-corporis junction is, on average, 7-9 cm from the pylorus. Thus we would advise anyone who is thinking of trying the operation to start with slim patients, in whom the nerves are easy to see. Also, if he is in doubt,

it is probably better to leave too much stomach innervated than too little, because there is evidence³ that highly selective vagotomy may represent an unnecessarily extensive vagal denervation of the stomach. Professor Amdrup, for example, achieves similar clinical results to our own by means of a slightly less extensive denervation of the stomach.

What proportion of all patients with duodenal ulcer coming to operation require the addition of a drainage procedure? In the first year we "drained" approximately 10%, in the second and third years 5%, and in the past year none at all, although we would certainly "drain" the stomach of any patient who had gross, decompensated pyloric stenosis with an atonic "soup-plate" stomach on barium-meal examination. In the past 18 months we have treated 10 consecutive patients with clinically manifest pyloric stenosis by highly selective vagotomy plus simple digital dilatation of the stricture, without a drainage procedure. These patients are now in good health. The finding of a very scarred, distorted, and somewhat stenosed duodenum does not imply that a drainage procedure is necessary, *provided* that before operation the patient did not have clinical pyloric stenosis.

There is no evidence of "excessive" gastrin release after highly selective vagotomy. In dogs highly selective vagotomy leads to a 47% increase in acid output from a Heidenhain pouch,² but truncal vagotomy with¹² or without¹³ drainage leads to an even greater increase in acid output. In man truncal vagotomy has been shown to produce a significantly greater increase in fasting plasma gastrin concentration than does selective vagotomy.^{14,15} Preliminary data on gastrin levels in patients after highly selective vagotomy^{16,17} suggest that they are little different from preoperative levels. We have studied acid output in response to a liquid meal of meat extract in patients more than one year after highly selective vagotomy (antrum innervated) or truncal or selective vagotomy plus pyloroplasty (antrum denervated).^{18,19} The mean acid response was found to be no greater after highly selective vagotomy than after truncal vagotomy and pyloroplasty or selective vagotomy and pyloroplasty. We also vagally denervated the antral mucosa in dogs and found that the secretory response to various test meals was undiminished.²⁰ The best evidence, however, that gastrin release is not "excessive" after highly selective vagotomy is that not a single patient of our own or of Professor Amdrup's and Dr. H. E. Jensen's (300 in all) has developed recurrent duodenal ulceration in the past four years. Recurrent ulceration after vagotomy with pyloroplasty is characteristically early,²¹ usually within two years of the initial operation. Thus it now seems unlikely that the incidence of recurrent ulceration after highly selective vagotomy will be higher than the incidence after vagotomy and pyloroplasty. As with any type of vagotomy, it is essential that highly selective vagotomy should be a complete vagotomy of the parietal cell mass, as shown by the finding of a negative insulin test in the early postoperative period.—I am, etc.,

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