thousands of men and women it may be possible to arrange for the surgeon to meet the industrial medical officers and executives regularly there in consultation and see for himself the conditions in which disease and accident arise and follow through the results of his treatment from rehabilitation shop onwards. The majority of industrial workers, however, are employed in small units, and obviously all cannot be visited weekly or even monthly; the surgeon may therefore have to be content with a general knowledge of work and working conditions, but he must always be prepared to make a special investigation when the health of his patient demands it.

As I have intimated earlier, the benefits of the liaison of industry and surgery are not limited to the physical health of the industrial casualties. Together they have much to contribute to the general happiness of mankind, together they may be called upon as the guardians of the public weal.

Of the "five fears" the fear of financial hardship was the first the legislature attempted to relieve. Attempts have now been made to banish the fear of litigation. Last year new workmen's compensation laws were introduced in which the responsibility for the payment of compensation devolved upon the State. When England first introduced workmen's compensation to the world it was a genuine attempt to secure for the injured workman a subsistence allowance during the period in which he remained incapacitated for earning. The payment of his weekly compensation bore a definite relation to his earning capacity and therefore operated as a true, although often insufficient, subsistence allowance. The new workmen's compensation laws ignore the principle of earning capacity and base payment upon the physical standard of the average man. Thus if a workman loses a foot it is calculated that his physical standard has been reduced by 30%, and after a limited number of weeks of benefit he becomes entitled to a pension of 30%. If his work be clerical he may still earn his full pre-accident wage and enjoy the additional pension for his physical injury. But what if he be a stevedore with no prospect of returning to his work? The memory that in former times he would have been entitled to 100% workmen's compensation until such time as his weekly pay-packet came within measurable distance of his old earnings can only plunge him into a more profound state of misery and fear.

I am not proposing to argue whether the principle of workmen's compensation is right or wrong or, indeed, whether it is an anachronism in these days of national insurance; but when the law was being altered it was the duty of the surgeon to point out that, far from allaying the patient's fear, this fear of financial hardship was likely to operate still more effectively in retarding the recovery of his patients. Who but the surgeon can assess that fear, and who but he has the knowledge and the authority to point out the absolute ineffectualness of basing workmen's compensation upon the average man? The "average man," conceived and born in Whitehall, is neither tinker, tailor, soldier, nor sailor; in fact, this average man has never done a day's work in his life, and yet he is set up as the 100% standard by which the casualties of industry are to be judged and pensioned.

The voice of the Royal College of Surgeons should have been raised in protest; it should have thundered at Westminster and reverberated throughout the land. Instead it remained silent. Was it silent through ignorance of industrial conditions, or could it have been that it did not recognize its responsibilities?

I have endeavoured to show that in the proper understanding and performance of his work the surgeon must maintain a close alliance with industry; that his patient's

welfare and happiness are as necessary to the successful conclusion of treatment as is the application of his operative technique; that all the treatment he has to offer is both empirical and incomplete unless he studies to understand the conditions of his patient's work and the physical strains which are involved; that the greatest benefit he has to bestow on his patient is that independence of spirit that can come only with the power to work on equal terms with his fellows; that he has a duty to place his expert knowledge at the disposal of industry for the better organization of its work and the disposal of its man-power; and, finally, that the hospital and the factory are but small parts of the world that mark the sphere of his influence.

I now repeat my question—Is there a place in the hierarchy of specialists for the consulting industrial surgeon? I leave you to supply the answer, remembering that in this age of social service industry is the threshold of social surgery.

5,000 CONSECUTIVE DELIVERIES WITHOUT A MATERNAL DEATH DUE TO PREGNANCY

BY

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In the Halifax Municipal Obstetric Service there were between Sept. 12, 1946, and Oct. 5, 1948, 5,000 consecutive deliveries after the twenty-eighth week without a maternal death due to pregnancy. This number includes all women after the twenty-eighth week of pregnancy (a) who were admitted to the Halifax General Hospital from inside or outside the borough, whether to the general medical and surgical wards, the maternity department, or the special unit for the reception of septic cases, and (b) who were delivered in their own homes by the Halifax Domiciliary Service or independent midwives. It will be seen from this that the cases are drawn from the widest possible sources. No emergency has ever been refused admission. In this series there was one death from acute myeloblastic leukaemia and therefore not attributable to pregnancy.

Rufus Thomas (1940a) described the Croydon Obstetric Service and published the magnificent series of 3,144 consecutive deliveries conducted by this service between Jan. 3, 1938, and June 4, 1939, without a maternal death due to pregnancy. In this number there were two deaths—one from pneumococcal pneumonia and therefore not counted as a death due to pregnancy, and the other from post-partum haemorrhage on June 8, 1938 (Thomas, 1940b). This case was considered to be outside the scope of the paper, as the patient had been delivered at home by an independent midwife and admitted after delivery. It was and, so far as I know, remains the largest consecutive number of cases with the lowest maternal mortality ever reported in this country or any other. This was indeed safe obstetrics, and with Croydon as a model and Thomas's work as inspiration it has been my personal ambition and the object and policy of the Halifax General Hospital at least to equal this achievement. Although the Croydon figure has been exceeded in Halifax by 1,856 deliveries it must be remembered that Thomas did not have the help of the later and more effective sulphonamides, blood and

plasma banks, penicillin, or the advantage of the knowledge of the rhesus factor in safeguarding against transfusion accidents. On the other hand, this series began, like his, after a maternal death; but it is still unfinished, as the total number of deliveries before another death occurs has yet to be determined.

At the Royal Halifax Infirmary there is a small maternity unit which deals annually with between 500 and 600 deliveries, mainly booked cases. My association with this institution is a recent one, and as all the infirmary cases are not my sole responsibility they are excluded from the total of 5,000 deliveries described here.

Description of the Service

The Halifax General Hospital has 450 beds—115 for obstetric and 35 for gynaecological cases. The maternity beds are distributed as follows: 80 lying-in, 25 antenatal, and 10 for potentially infected or septic cases. The hospital is a Part I training school, and it must be one of the few maternity departments in the country that have never been seriously short of staff.

Almost all the emergencies from Halifax and a surrounding densely populated industrial area, with a total population of about a quarter of a million, come to the General Hospital. Apart from emergencies, only primigravidae, patients with abnormalities, cases of multiple pregnancy, and those whose home conditions are unsuitable for delivery are admitted. Cases which become septic in the hospital are nursed in the special isolation unit, to which are also admitted septic cases from the domiciliary service and the county area served. There has been no death from puerperal sepsis in any of the admissions to this block since July, 1939.

The Emergency Blood Transfusion Service for the whole area is based on the General Hospital, where, in addition to the ordinary blood and plasma bank, a supply of group O rhesus-negative blood is always kept. No patient treated by this service has been lost in seven years.

The medical staff of the two departments consists of a registrar, a senior and a junior resident obstetrical officer, and an obstetric house-surgeon. As the obstetrician and gynaecologist in charge, I live within a few minutes of the hospital.

It is one of my main functions to attend at the antenatal clinics at the hospital and at the district home in the town. At these clinics all abnormal cases, whether the departure from the normal is medical or obstetrical, are seen and followed by me throughout the remainder of the pregnancy and labour.

It is a strict rule of the department that I am informed of all emergency admissions, of abnormalities, and of any condition which might even faintly threaten the life of the mother or child. No assistant is allowed to perform any major manipulation without my being present.

The Domiciliary Service.—The Halifax District Nursing Association is a voluntary body responsible for the domiciliary midwifery in the borough. It acts in this as agent for the local authority. The domiciliary service is based on the hostel "Kirby Leas," which is a Part II training school. It is run clinically as an integral part of the hospital, and in this way there is continuity of supervision by me of the difficult and abnormal cases.

The midwives carry "pitocin" and ergometrine to give by injection, and in a case of dire emergency threatening life—e.g., ante-partum or post-partum haemorrhage—they have the right to summon the emergency blood transfusion unit on their own initiative. In other instances the usual practice of summoning the patient's doctor is followed.

There were 795 deliveries, and medical aid was sought 274 times.

Results

During the period under review there were 5,000 deliveries (Table I) and of these 2,498, almost half, were in women pregnant for the first time.

TABLE I.—Showing Total Number of Deliveries, Some Major Complications, and Methods of Delivery

	General Hospital	Domiciliary Service	Total
No. of deliveries	4,205	795	5,000
Primigravidae	2,377	121	2,498
Twins	58	11	69
Forceps	198	10	208
Manual removal of placenta ..	21	0	21
Caesarean section	98	0	98
Eclampsia	4	0	4
Stillbirths	104	13	117
Neonatal deaths	53	6	59

The forceps deliveries numbered 208—a rate of 4.7% in the hospital and 4.16% in the combined service. Caesarean section was performed 98 times—a rate of 2.33% in the hospital and 1.96% in the total number of deliveries. The placenta was removed manually on only 21 occasions, or once in every 238 deliveries.

There were four cases of eclampsia; only one of them a booked case, and that patient had a solitary fit after delivery. In the three unbooked cases there were nine, three, and four fits respectively. All four babies survived. The booked patient should not have had a fit, as there was ample warning, which was not heeded. I believe that eclampsia is always a preventable disease.

Live Births, Stillbirths, and Neonatal Deaths

There were 69 sets of twins in the 5,000 deliveries. The total number of births was therefore 5,069. There were 117 stillbirths, including all premature, macerated, and grossly abnormal fetuses, giving a stillbirth rate for the service of 23.07 per thousand. Of the 4,952 live births 59 babies died. The neonatal death rate is therefore 11.91.

TABLE II.—Showing Stillbirths and Neonatal Death Rates

	General Hospital	Domiciliary Service	Total	Croydon	National 1946
Total births	4,263	806	5,069	3,178	842,809
Live births	4,159	793	4,952	3,086	819,814
Stillbirths	104	13	117	92	22,915
Neonatal deaths	53	6	59	43	—
Stillbirth rate	24.63	14.88	23.07	28.9	27
Neonatal death rate	12.74	7.56	11.91	13.9	22

Table II shows the total live births and stillbirths together with the stillbirth and neonatal death rates. For comparison the figures for Croydon from Jan. 3, 1938, to June 4, 1939, and those for the whole country for 1946 are included. The latter are the "latest available provisional figures" for a complete year, and have been supplied by the Ministry of Health. The stillbirth rate for the Halifax Municipal

TABLE III.—Showing Some Causes of Stillbirth and Neonatal Death

	Stillbirths			Neonatal Deaths			Total Combined Service
	Gen. Hosp.	Dom. Serv.	Total	Gen. Hosp.	Dom. Serv.	Total	
Dystocia and intracranial haemorrhage	17	2	19	12	2	14	33
Gross foetal abnormality	19	2	21	11	0	11	32
Prematurity	5	0	5	16	1	17	22
Maternal toxæmia	14	1	15	3	0	3	18
Maceration	16	1	17	0	0	0	17
Prolapse of cord	11	1	12	0	0	0	12
Ante-partum haemorrhage	12	0	12	0	0	0	12
Cause unknown	4	6	10	0	1	1	11
Rh. incompatibility	6	0	6	3	0	3	9
Pneumonia	0	0	0	5	1	6	6
Atelectasis	0	0	0	3	1	4	4
Total	104	13	117	53	6	59	176

Service is thus 3.93 lower and the neonatal death rate 10.09 lower than the national rate.

In Table III are set out the principal causes of stillbirths and neonatal deaths, given in their numerical order. The largest number were due to trauma during labour, and these form 18.75% of the total. Gross foetal abnormality (mainly anencephaly, spina bifida, and hydrocephaly) is a very close second with 18.18% of the combined stillbirths and deaths under 1 month. Of the total stillbirths and neonatal deaths 27.84% are accounted for by gross foetal abnormality and maceration, and at the present time it would seem to be impossible to reduce the numbers from these two cases. The greatest field for improvement lies in reducing the number of stillbirths and neonatal deaths caused by trauma, prematurity, and pregnancy "toxaemia."

Treatment of Major Complications

A brief outline of the treatment of the major complications, the choice of sedatives and anaesthetics, and the management of the puerperium is given below.

Ante-partum Haemorrhage.—This condition is treated conservatively until there is a definite indication to intervene. In all cases, when first seen, blood is immediately taken for grouping and cross-matching. Vaginal and rectal examinations and the giving of enemata are strictly forbidden. When it becomes necessary to intervene—e.g., in the case of small recurrent haemorrhage—every patient, no matter how good her general condition, has an intravenous drip started. With blood ready to be given, the patient is examined vaginally under anaesthesia in the operating theatre. If her condition is grave from loss of blood this examination is omitted and caesarean section is performed. In eight years, with a total of 12,830 deliveries in the hospital alone, only one case of ante-partum haemorrhage has been lost, and that death occurred in 1944 from concealed haemorrhage, and therefore does not come into this series.

Placenta Praevia.—This is treated almost always by rupture of the membranes or by caesarean section. The lower-segment operation is the one invariably used. Application of Willett's forceps and plugging with the half-breech are used only on very rare occasions. Packing and the insertion of an intrauterine bag have never been practised.

Accidental Haemorrhage.—This is treated by morphine, "pitocin," plasma or blood transfusion, and rupture of the membranes. Only once in eight years has it been necessary to perform caesarean section and only once to carry out a caesarean hysterectomy for this condition.

Post-partum Haemorrhage.—An attempt is made to prevent third-stage haemorrhage by giving "pitocin," 1 ml. intramuscularly, in the following conditions the moment the child's shoulders are born: prolonged labour, uterine inertia, overdistension of the uterus, delivery under anaesthesia, the presence of fibroids in the uterus, and in any patient who has anaemia. Cases of placenta praevia and accidental haemorrhage receive ergometrine, 0.25 mg. intravenously, as soon as the anterior shoulder has been born. If the placenta is not ready for delivery in half an hour from the birth of the child, or if there is even slightly more than the average amount of bleeding, "pitocin" is given as described above. If the placenta fails to be delivered promptly after the "pitocin" manual removal is carried out. Should the bleeding be heavy and the uterus atonic, ergometrine, 0.25 mg., is given intravenously. So far the intravenous ergometrine has been successful in stopping the bleeding in every case except the one complicated by acute myeloblastic leukaemia. Resuscitative measures can then be undertaken, and the administration of ergometrine does not, in my experience, make a manual removal any more difficult should this be required. Bleeding after the delivery of the placenta is treated by intravenous ergometrine. Intrauterine douches are never used.

Pre-eclampsia and Eclampsia.—Emphasis is placed on abnormal gain in weight as an early sign of pre-eclampsia. On an average the weekly gain should not exceed 8 oz. (225 g.). The maximum normal systolic blood pressure is taken as 120 mm. Hg and the diastolic as 80 mm. Hg. Oedema is always considered to be pathological, and when, in the absence of pus,

there is albumin even in the smallest amount in the catheter specimen the disease is far advanced. Pre-eclamptic patients are treated by absolute rest in bed in hospital, with a low-sodium and low-protein diet and sedatives. Of the sedatives chloral hydrate and potassium bromide and "nembutal" are the most commonly used. If there is vomiting, sodium phenobarbitone, 3 gr. (0.2 g.), is given intramuscularly. Liberal use is made of 20% glucose solution in water intravenously in severe cases or in those with gross oedema. Ammonium chloride is also given for the latter condition. If the maximum diuresis is to be secured by the concentrated glucose solution a whole litre must be run into the vein in from 30 to 50 minutes. No attempt is made to interrupt the pregnancy unless the mother's condition is deteriorating. By following this rule the incidence of prematurity in these patients has been greatly reduced. I do not believe that chronic nephritis or permanent vascular damage is ever caused by pre-eclampsia or eclampsia; nor is a latent hypertension made manifest or "unmasked" at an earlier age by the pre-eclamptic pregnancy.

I cannot too strongly condemn rupture of the membranes in a patient with a long closed cervix. Rupture of these to induce labour in this condition should be done in only those cases in which the cervix is taken up, is beginning to dilate, and is easily dilatable and soft—a condition which has aptly been described as "ripe." If the cervix is long and closed and the patient's condition is deteriorating rapidly in spite of treatment, then caesarean section under local analgesia should be the method of delivery.

Eclampsia is treated by morphine sulphate $\frac{1}{4}$ gr. (32 mg.) and sodium phenobarbitone or "nembutal" intramuscularly. Apart from loosening the clothes, the patient is not undressed or examined in any way until she is heavily under the influence of sedatives. Glucose, 20% solution, is used in all cases. Magnesium sulphate, 50% solution, for intramuscular injection, is kept in reserve for the cases which do not respond: these are exceedingly rare. When there has been no fit for twenty-four hours the patient is examined vaginally, and if the cervix is "ripe" the membranes are ruptured. So far, caesarean section has not had to be performed for eclampsia.

Infection.—Of the sulphonamides, sulphadiazine is the drug most often used. Penicillin is reserved for cases that do not respond or for cases that are severe at the onset. As a prophylactic against infection penicillin is given to all cases of manual removal of the placenta, failed forceps, and internal version, and to those in which the membranes have been ruptured for more than twenty-four hours or the labour has been unduly prolonged. If caesarean section is to be performed on an infected or potentially infected patient a million units of penicillin are left in the peritoneal cavity and the drug is given systemically for five days after operation. In urinary infections sulphanilamide is used on account of its free solubility.

Disproportion.—The borderline cases are given a trial labour, and if this fails lower-segment caesarean section is performed. In all primigravidae in whom the head is not engaged near term antero-posterior, inlet, lateral, and outlet radiographs of the pelvis are taken. Frequent use is made of lateral x-ray films to follow the course of a trial labour, and these have been most helpful.

Cardiac Disease.—This is treated in mild cases by frequent periods of rest in hospital during the pregnancy. In the severe cases the patient may spend the greater part of the pregnancy in hospital. Caesarean section under local analgesia is reserved for the severest cases. All patients with valvular disease are given penicillin for a week after delivery in an effort to prevent infection, which even in a mild form so often leads to a marked breakdown in the cardiac reserve.

Sedatives and Anaesthetics.—Pethidine in doses of 100 mg. intramuscularly is the routine sedative used. It is often combined with hyoscine hydrobromide 1/150 gr. (0.43 mg.). Since the introduction of pethidine it is rare to have to use morphine. A "heavy" spinal analgesic is used to anaesthetize the perineum if forceps are required for a patient with respiratory or cardiac disease. Spinal analgesia is never used for other forceps deliveries or for caesarean section. In a healthy patient these operations are carried out under general anaesthesia. Local analgesia is employed for caesarean section when indicated by the general condition of the patient.

The Puerperium.—The patients are allowed out of bed on the seventh day and normal cases are discharged on the tenth day. Active movement and breathing exercises are encouraged from the very beginning. Each ward is visited daily by a physiotherapist, who conducts the exercises. During a period of eight years, with 12,830 deliveries, there have been only two deaths from pulmonary embolism.

Discussion

In addition to the series here presented there were from 1944 to 1946 in the General Hospital three separate series, of 1,050, 1,346, and 1,730 deliveries, without a maternal death, and it must be stressed that such results are the outcome of a co-operative effort on the part of the whole staff of both parts of the Municipal Service and of the general practitioners in the area.

Particularly must I lay emphasis on the loyalty and diligence of the resident and nursing staff, who have given service far beyond the power of gold to buy. The excellence of the general administrative arrangements and the ancillary services provided have contributed greatly. Other factors of importance are the large proportion of antenatal beds and the continuity of specialist supervision for abnormal cases.

Of the therapeutic agents, blood, plasma, penicillin, and the sulphonamides have played a great part. It is important to give blood in adequate amount; for example, one greatly exsanguinated woman received 10 pints (5.68 litres), and at one stage two veins were being used at the same time to give the blood under pressure of oxygen. Such treatment has been made possible by the wonderful facilities provided by the Leeds Regional Blood Transfusion Service. Glucose 20% solution, too, has played its part, and Dieckmann (1942) has stated that the proper use of hypertonic glucose solution in pregnancy is one of the outstanding accomplishments of modern obstetrics. In third-stage and post-partum haemorrhage, ergometrine, given intravenously, has proved life-saving and deserves to rank in importance in obstetrics with penicillin.

These potent remedies together with modern methods of anaesthesia are great advances, but the most important single factor is the skill and ready availability of the senior staff to deal personally with abnormalities. It can be shown that the maternal mortality rate in the cases delivered in the General Hospital is lower than the rate for the borough as a whole.

In the last ten years the borough deliveries numbered 14,833, with 43 maternal deaths—a rate of 2.89. In the same period the General Hospital, dealing with almost all the emergencies from inside and outside the borough, had 14,324 deliveries with 24 deaths, giving a rate of 1.67. And it is noteworthy that part of this decade was before the introduction of blood banks and penicillin, and that as late as 1946 (the last year for which complete figures are available) the national rate was 1.43.

In the Ministry of Health Report (1937) Halifax was shown to be the county borough with the blackest maternal mortality record in the country. It occupied an almost equally unenviable position in the R.C.O.G. Report (1944), in which for the years 1939 to 1942 it was placed seventh in a list of county boroughs with the highest rate in England and Wales. This, however, was largely due to the eleven maternal deaths in Halifax in 1940; only two of these occurred in the General Hospital and one on the Domiciliary Service.

It is true, then, to say that the high rate for the borough in a list of county boroughs with the highest rate in deaths in the General Hospital or on the Domiciliary Service, where in the same ten-year period there were 4,389 deliveries with the death of only one woman.

Summary and Conclusions

Along the lines suggested by the Royal College of Obstetricians and Gynaecologists (1944) we have attempted to bring about the integration of the hospital, antenatal, domiciliary, and specialist services in the Halifax Municipal Obstetric Organization.

Between Sept. 12, 1946, and Oct. 5, 1948, there were 5,000 deliveries after the twenty-eighth week without a maternal death due to pregnancy.

The stillbirth rate in the series was 23.07 and the neonatal death rate 11.91.

A brief summary of the treatment of some major complications has been given.

The Halifax General Hospital has a large proportion of cases from the county area, and therefore the number of its deliveries in the last decade almost equals the total ascribed to the borough.

In this ten-year period the maternal mortality rate in the General Hospital was 1.67; in the Halifax Borough it was 2.89.

The belief is expressed that the most important single factor in reducing maternal mortality is the provision of skilled staff to deal with abnormalities.

This series began after a maternal death from pulmonary embolism and continues without a maternal death attributable to pregnancy at the time of writing (Oct. 6, 1948).

I am grateful to the M.O.H. for Halifax, Dr. G. C. F. Roe, for permission to publish these results and for the statistics relating to the Borough. My thanks are due to Mr. H. I. Deitch, medical superintendent and surgeon to the General Hospital, for his great help in many difficult cases and for encouraging the development of the maternity department of the hospital.

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A STATISTICAL AND CLINICAL REVIEW OF 107 CASES OF ECTOPIC GESTATION

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Ectopic pregnancy is a condition encountered by all clinicians engaged in general medical and surgical practice. The management usually falls to the gynaecologist, but the problem of the differential diagnosis concerns all, and in many cases the operative treatment has to be done by the general surgeon.

Keeping that in mind, we have undertaken a survey of all cases of ectopic pregnancy occurring in a busy municipal hospital over a ten-year period. The findings are instructive in showing that the question of aetiology has not finally been settled. It is, however, in the sphere of diagnosis that we believe the value of such a survey lies. The various symptoms and physical signs are evaluated in the light of the case records and an attempt is made to ascribe to each its true place and importance. The treatment and general results are also considered.

Despite the enormous literature on ectopic gestation, few recent surveys of this type have been made, and nearly