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PREVENTION OF INFANT DEATHS

LIAISON BETWEEN HOSPITALS AND HOME SERVICES

BY

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The need for ensuring the suitability of the home to which it may be necessary to discharge a premature baby has been stressed by many authorities (Hess and Lundeen, 1941; Potter, 1944; Tyson, 1944; Crosse, 1945; Ministry of Health Circular No. 20/44). To what extent disregard of this precaution (which is as important for full-term babies and those convalescing from acute illnesses as for prematures) contributes to the number of preventable infant deaths is unknown, for while investigations into the ultimate fate of prematures are not uncommon (e.g., Brockington, 1944; Asher, 1946), the follow-up of babies, full-term as well as premature, in the first year after discharge from maternity unit or hospital seems to have been neglected. A hint of what an extensive survey might show is given, however, by Collis and Majekodunmi (1943), who traced 45 premature infants that had passed through their department: 7 had died—two of these within the first month of discharge and four during the first year.

Attention was directed to this question while attempting to evaluate the efficiency of the infant health services in this area (Lewis and Blackwood, 1946). Of 31 infant deaths which were probably preventable, 7 might have been caused by discharging a baby (premature or full-term) to a household where conditions were prejudicial to the successful rearing of an infant. It has become a commonplace to speak of the importance of liaison between the hospital and the home. Like all platitudes its truth is obvious, but it happens that the attainment of really effective liaison is not as simple as would at first appear, for it raises clinical, sociological, and administrative problems that themselves have yet to be solved.

The purpose of this paper is: (i) to emphasize the need for effective liaison by describing case histories where its absence probably contributed to an infant's death; (ii) to discuss the respective points of view of the hospital and field worker and the principles underlying liaison; (iii) to suggest means by which liaison may be attained.

The Need for Liaison

The following cases illustrate the need for liaison and co-ordination of services, for in each instance death might have been attributable to lack of co-ordination.

Case Histories

Case 1.—Male, born Dec. 13, 1944, in maternity unit. One of triplets. Birth weight, 4 lb. 2 oz. (1.87 kg.). One baby died in hospital. Mother aged 26. One other child born, 1943. Normal pregnancy; W.R. negative. Hb, 66%; R.B.C., 3,700,000. Spontaneous delivery. Two surviving triplets discharged home on Jan. 10, 1945. Father (29 years old) in Forces. Home clean but overcrowded. Babies fed on breast complemented by half-cream dried milk. Lactation failed after about six weeks. The child seemed to be making good progress up to Jan. 29, 1945, but died on Feb. 8 of pulmonary congestion and bronchitis, being moribund when the doctor was called in. He thought that these babies would have been better for being retained a little longer in hospital than was the case.

Comment.—This mother had suffered from anaemia during pregnancy and had given birth to triplets. Although the home conditions were reasonably good the house was overcrowded and the mother had to cope with the two surviving triplets and the elder child of 18 months without the support of her husband, who was in the Forces. These babies should preferably have been retained in hospital until they were more firmly established.

Case 2.—Male, born Feb. 10, 1945, in maternity unit. Birth weight, 8 lb. 2 oz. (3.68 kg.). Mother aged 24; high-grade mental defective. One other female child, aged 2 years 9 months. Normal pregnancy; W.R. negative. Hb, 70%; R.B.C., 3,500,000. Spontaneous delivery. Discharged in satisfactory condition to very unsuitable home on Feb. 20, 1945. Father (31 years old) in Forces. Four people living in one small room not very clean and unfit for young baby. Breast-fed. In spite of these poor conditions the baby did well at first, but in a month or so began to deteriorate. When he was four months old he was admitted to hospital with pneumonia, and there remained for three weeks. He was discharged home, but was readmitted in a few days with an abscess of the back. He was subsequently transferred to another hospital, where he died, aged 6 months, of an abscess of the back and consolidation of the left base. He was also found to have an enlarged congenital heart.

Comment.—This baby was healthy at birth and thrived for the first few months in spite of a grossly unsatisfactory home environment. He should preferably not have been discharged to such home conditions, although it is difficult to see what the alternative could be. On discharge from hospital after pneumonia he should not immediately have been returned to the home conditions that probably had occasioned his admission.

Case 3.—Female, born July 24, 1945, in maternity unit. Birth weight, 7½ lb. (3.4 kg.). Mother aged 30. Two other children aged 10 and 3 years. Normal pregnancy. Hb, 60%; R.B.C., 3,700,000. Spontaneous delivery. Father aged 30. Family living with grandmother in council house. Home reasonably good. Mother developed breast abscess and baby then fed on one breast and complementary feeds. Discharged on 15th day and gradually went downhill. Baby readmitted to hospital on Aug. 13, 1945, where it died of marasmus on Sept. 4.

Comment.—This baby was healthy at birth and should have done well. On discharge from hospital the mother was not really fit. She had been anaemic during pregnancy and had had a breast abscess. Although the home conditions were reasonably satisfactory she had to handle two other children and a husband in someone else's home, and her mothercraft consequently was inefficient. It would have been advisable for this baby (and mother) to be retained in hospital a little longer until the mother was fit and the baby firmly established.

Case 4.—Female, born Aug. 8, 1945, in maternity unit. Illegitimate. Birth weight, 5 lb. (2.27 kg.). Mother 29 years old; works in chemical factory. Pregnancy normal, but she defaulted from the antenatal clinic from April to July. Spontaneous delivery. Discharged on 10th day. Mother and baby lived at two different addresses in the five-day interval between discharge from hospital and the death of the baby on the 15th day from bronchopneumonia. The first address was in an old, overcrowded house not very clean.

Comment.—A 5-lb. baby should with experienced care have survived, but should not have been discharged on the 10th day to unknown home conditions in the care of an inexperienced mother with no resources.

Case 5.—Male, born Aug. 8, 1945, in maternity unit. Birth weight, 5 lb. (2.27 kg.). Mother aged 26 years; first baby. Normal pregnancy; W.R. negative. Hb, 50%; R.B.C., 2,700,000. Spontaneous delivery. Discharged on 10th day. Father (aged 35) a miner. Clean home. Seen at infant welfare centre five days after discharge. General condition not good; frequent stools. On half-cream dried milk three-hourly. Readmitted to hospital on Aug. 27, 1945, where it died on Sept. 11. The family doctor stated that the mother was quite incapable of looking after the child, which was frail and difficult, and she had had no opportunity of learning to handle it.

Comment.—A baby of 5 lb. should survive with experienced care. The mother had been very anaemic during pregnancy, and on the 10th day was probably not feeling fit. She had had no experience of babies previously, and clearly the care demanded by a 5-lb. infant was beyond her capacity. The mothering it received during the first critical days after discharge from hospital was inadequate, and it never recovered from the setback it then received.

Case 6.—Female, born Aug. 18, 1945, in maternity unit. Birth weight, 5 lb. (2.27 kg.). Mother aged 35. One other boy, aged 10 years. Mother rather highly strung. Normal pregnancy, but with excessive sickness and general health not very good. Spontaneous delivery. Father (aged 36) a colliery deputy. Baby on breast and complementary feeds two-hourly. Died suddenly on day after discharge—aged 10 days. Necropsy: capillary bronchitis.

Comment.—It is at least possible that this baby was infected before discharge from hospital (although it showed no signs of this) and that it would have died in any case. But it is questionable whether a 5-lb baby should have been discharged on the 9th day in the care of a rather highly strung mother whose only other experience of child-handling was 10 years previously. If the mother and child had been retained in hospital, and arrangements made with the domiciliary services for the reception of the child at home and for instructing the mother how to handle it, it might have survived.

Case 7.—Male, born Sept. 10, 1945, in maternity unit. Birth weight, 5 lb. 4 oz. (2.38 kg.) Mother aged 22. One other child, 1 year old. Antenatal clinic attended regularly. W.R. negative. Hb, 58%; R.B.C. 3,500,000. Spontaneous delivery. Father (aged 23) a miner. Living conditions fairly satisfactory; no overcrowding. Discharged from hospital on the 9th day. Mothercraft not very good. Admitted to isolation hospital at age of 3 weeks for acute enteritis, but little abnormal found. Discharged two days later, but readmitted next day with vomiting; nothing found clinically. Died suddenly the following day. No necropsy.

Comment.—Although living conditions were reasonably good, the mother had been anaemic and her mothercraft was poor. She was incapable of caring for an immature baby as well as a child of 1 year in addition to a house and husband. The latest baby suffered. Although it would have been difficult to forecast the inadequacy of the care it actually received, it would have been better for remaining in hospital until more firmly established. When the child was admitted to the isolation hospital the diagnosis was doubtful, and an error of judgment was made in discharging it after two days. This might be understandable, but in any case it should not have been discharged to the conditions which probably brought on its illness.

Principles Underlying Successful Liaison

Clearly, the death of each one of these infants was caused, directly or indirectly, by the poor "mothering" and care it received after leaving the hospital or maternity unit. Premature infants who have done well in hospital and achieved a weight in excess of 5½ lb. (2.5 kg.) still need special attention and care. But it is not only the premature that need this care. Weakly or feeble infants, those convalescing from acute illnesses, and even those born healthy and robust will fail to thrive on leaving hospital unless the careful treatment they have been used to is maintained. It should not be overlooked that in hospital they became accustomed to expert attention, and the sudden change to the charge of a relatively inexperienced mother may be more than they can withstand. When returned to a good home with a capable and sensible mother such infants will do well. But when they enter unsatisfactory households they are exposed to a serious risk. This risk may be partly averted by making provision for the care of the mother and baby (or, where the child is older, of the baby alone) beyond the period when hospital care is strictly necessary, until the baby is firmly established or has recovered from its illness, while at the same time giving the mother an opportunity of learning how to care for and handle it.

The provision of such care is not easy. The best arrangement would be a hostel where mothers and their babies could be accommodated and where special instruction would be given in baby-care and mothercraft. A hostel on the lines described by Brodie (1946) would be suitable. For the moment this must remain an ideal, although it should have a place in the infant health services of the future. Where, therefore, such post-hospital accommodation is desirable it will usually be necessary to retain the baby in the hospital or unit. This raises difficulties, not the least of which is the availability of beds and cots. But undoubtedly the chief concern of hospital administrators and paediatricians would be the risk of cross-infection. This, of course, is a danger which would have to be faced in any *ad hoc* nursery or hostel for mothers and babies, although as many of the babies would have passed the neonatal period the danger would be rather less.

Parsons (1944) considers the risk of contracting an acute infectious illness to be much greater in an institution than in the home, and, while much will depend on the institution and much on the home, in general this dictum is unassailable. Where, then, do the interests of these infants lie? Is the potential danger of cross-infection in hospital greater than the hazard of grossly unsuitable home conditions? Whichever way lies the answer—and it is unlikely that any two cases will be similar—these dangerous alternatives must be carefully

balanced. The former is a problem in hospital administration, the latter in social medicine; if infants are not to die in the no-man's-land that divides these two branches of medicine there must be the closest understanding between the hospital paediatrician and the field worker. If they are to find common ground, the one must be aware of and understand the difficulties which the other has to face and the problems which confront him. These difficulties and problems may briefly be considered.

Cross-infection in Maternity Units and Hospitals

Dealing first with cross-infection, the question most urgently needing an answer is, What are the chances of an infant becoming infected if he is retained in a children's ward or nursery? To this question, unfortunately, it is impossible to give an answer. According to a committee of the British Paediatric Association (1946), the frequency, extent, and results of cross-infection in children's wards have never been ascertained. In the absence of such knowledge perhaps the most outstanding fact to be grasped is that the onset of cross-infection may be entirely fortuitous: "In spite of overcrowding and poor hygiene, one ward may for long be without manifest cross-infection, whereas another which has every facility and is staffed by well-trained nurses may suddenly be the site of a virulent outbreak." Similarly, the seriousness of outbreaks of infection in children's wards seems to be equally unpredictable, for there is little means of foretelling how severe the infection will be. Outbreaks of so-called neonatal gastro-enteritis may have an appalling mortality, as described by Sakula (1943), when 20 out of 25 newborn infants died, and by Henderson (1943), who experienced a mortality of 69% in immature infants. An estimate of the mortality from respiratory infections is not easy, owing partly to the difficulty of diagnosing pneumonia at this early age; but undoubtedly a frank pneumonia or bronchitis would be attended by a high death rate even with modern chemotherapy. Skin infections usually take the form of a bullous impetigo, and the outbreaks described by McFarlan (1942), Benians (1943), and Nisbet (1943) were mild, causing little anxiety apart from the worry inevitably connected with staphylococcal infections in nurseries. The use of the sulphonamides and penicillin has further reduced the risk from these staphylococcal infections of the skin, and it may be that their dangers need not be exaggerated.

Adverse Home Conditions

It will be generally agreed that there is a positive correlation between a poor home environment and a high infant mortality rate. That there are specific and definable factors operating within such homes or households is certain, but there seems to be little definite knowledge as to what exactly these factors are or what is their relative significance. Ryle (1946) has drawn attention to the sociological aspect of this problem, and unquestionably its clarification is urgently needed. Reference is made below to an attempt to collect information which will do something to help in this direction. Without anticipating what will emerge from the inquiry, the preliminary findings indicate that the following are involved:

Conditions Affecting the Mother.—(1) Mental defect. (2) Low intelligence, but not amounting to mental defect—"mere fecklessness." (3) Mental or psychological abnormality of the mother. (4) Maternal inefficiency; poor mothercraft and homecraft; lack of parental responsibility. (5) Chronic or subacute ill-health. (6) The unmarried girl with no friends or resources.

Environmental Conditions.—(1) Unhygienic, insanitary, or overcrowded housing conditions. (2) Lack of equipment. (3) Poor economic circumstances; insufficient income; mother having to go out to work. (4) Large family of young children, so that the mother cannot give enough attention to the latest baby. These items can be added to, and it is usual to find several operating in a single household, where they form a vicious circle. The amelioration of such conditions is extremely difficult, and in the light of experience so far gained may even be impossible; no attempt is made to deal with them here, although the urgency is self-evident. Such households are called "observation households," and it is of paramount importance that their existence be ascertained as early in pregnancy as possible and the potential danger to the expected infant assessed (Lewis and Blackwood, 1946).

These two subjects—the danger from hospital cross-infection and the hazard of the home environment—are the main matters of immediate importance to be discussed by the hospital doctor and the medical officer of health. But if the discussion were to stop at this point liaison would fall far short of the ideal. Where there is any question of the home environment affecting the well-being of a baby the clinician must be made aware of the child's background and the necessary information must be in his hands at the earliest moment. This is important; for a real and permanent reduction in the infant mortality rate will be effected more readily by attending to the conditions under

which babies have to be reared than by studying their morbid pathology. Liaison should not be an end in itself but an integral part of the infant services, and it cannot be planned as a separate entity. Regard must be paid to these principles if liaison is to be effective.

Methods of Attaining Liaison

Through the courtesy of colleagues working in certain other areas I have had an opportunity of studying methods of attaining liaison there. In general, the usual practice seems to be for the maternity unit or hospital to inform the public health department of the impending discharge of a baby, to furnish a short report on the child, and to request, where necessary, for an early call to be made by the health visitor. It is no mere carping criticism to say that such "liaison" could hardly be effective. The clinician is quite unaware of the home environment: a child may be discharged to grossly unsatisfactory home conditions, and irretrievable damage may be done before the health visitor calls.

With these thoughts in mind a trial scheme was introduced in this area, based on the principles stated above. It would be premature to describe its detailed working or the results to date, but after five months' experience it has worked well. It involves the following matters.

(1) The unofficial reporting of pregnancies to the public health department by antenatal clinics and domiciliary midwives.

(2) Following on (1), the early investigation of the social, economic, and environmental characteristics of the families and households into which a baby is to be born.

(3) Based on (2), the ascertainment of observation households as early in pregnancy as possible and the maintenance in the public health department of a list of such households.

(4) Attempts to counteract or ameliorate the adverse conditions discovered to be present in observation households.

(5) The checking off of all birth notifications against the list of observation households, so that the birth of the baby into an observation household is known immediately it occurs.

(6) Where the birth of a baby from an observation household (observation baby) occurs in hospital, an immediate written report on the home circumstances is sent to the hospital doctor, who is thus made aware of the home background.

(7) When a baby under 1 year old is admitted to hospital for an illness the fact is reported to the public health department. If the baby is found to be from an observation household a report on the home conditions is sent to the hospital doctor.

(8) When a baby from an observation household (either born in hospital or subsequently admitted) is considered to be ready for discharge, a discussion takes place between the hospital doctor and the medical officer of health with special reference to the question of cross-infection and the adverse home environment.

This scheme, here briefly described, is not devoid of administrative difficulties, but these can be ironed out. It places the onus for initiating liaison on the public health department, where it should rightly belong, and makes the medical officer of health responsible for reporting to the hospital when the home environment is not satisfactory—a function which is properly his. The problem of effective liaison is put in its right perspective; it is not regarded as a separate entity, but is co-ordinated with the other aspects of the plan. It is hoped, moreover, by the ascertainment, investigation, and follow-up of observation families and babies to collect information which will throw light on those sociological factors known to maintain a high infant mortality rate. With the coming cleavage between the hospital and domiciliary services it will be the more necessary for liaison and co-ordination to be placed on a solid basis.

Summary

The need for close liaison between maternity units and hospital and home services, especially public health departments, is emphasized by describing case histories where lack of liaison might have resulted in an infant death.

The principles underlying effective liaison are discussed. There are households where the successful rearing of a baby is made hazardous by specified adverse environmental conditions, and in such cases it may be necessary (pending the provision of suitable *ad hoc* hostels) to retain mother and baby in hospital for a period. In such cases the risk of cross-infection must be balanced against the dangers of the home environment. In all such cases a full

report on the home conditions and environment should be supplied to the hospital doctor by the medical officer of health.

A trial scheme is briefly described by which effective liaison and co-ordination may be attained as an integral part of the infant health service.

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OBSERVATIONS ON VASCULAR INJURIES

WITH SPECIAL REFERENCE TO THE VALUE OF SYMPATHECTOMY IN LIGATION OF MAIN VESSELS*

BY

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My experience of vascular injuries is limited to those cases reaching a base hospital in Egypt between October, 1942, and October, 1945, consisting principally of aneurysms. A few recent injuries of blood vessels due to local shooting and stabbing affrays were admitted, and there were a few secondary haemorrhages requiring ligation of main vessels.

Altogether 41 main arteries were ligated. With one exception every case was submitted to sympathectomy 14 days before or at the time of operation on the artery. Prof. Paterson Ross, at Hill End Hospital, for one reason or another ligated 15 main vessels, also preceded by sympathectomy. It is with the results of ligation of primary arteries that I wish to deal here. The solitary point I hope to make is that ligation of a main vessel should be accompanied by sympathetic denervation of the limb. Ligation of the main artery of a limb carries with it a considerable risk of gangrene. This is especially so in gunshot wounds because, as a rule, many collateral vessels are injured at the same time. Sir George Makins collected a series in the war of 1914-18 in which the primary artery had been ligated and the fate of the limb left to the collateral blood flow. The percentages of cases complicated by gangrene according to arteries involved were as follows:

TABLE I

Subclavian	..	25%	Femoral	..	25%
Axillary	..	16.6%	Popliteal	..	41.6%
Brachial	..	23%			

Averaging these cases, gangrene occurred in 26%. The popliteal artery is especially dangerous. Most surgeons would agree that ligation carries a risk of at least 40%, and many would assess the risk considerably higher. Apart from frank gangrene, depleted blood flow leads to ischaemic necrosis of muscles with crippling contractures, fibrosis, wasting of muscles, and nerve palsies. Even if these grosser manifestations are not seen, inadequate blood supply to the muscles is revealed in the lower extremities by intermittent claudication. The fate of the limb after ligation depends on the collateral circulation. Every effort must be made to expand it quickly. Blood pressure must be maintained by transfusion. The limb should be kept below the level of the heart by blocks under the head of the bed. The affected limb should be kept cool and the rest of the body warm to aid sympathetic release. The surest method of

* A short paper read before the Association of Surgeons of Great Britain and Ireland, May, 1946.