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THE NOVA SCOTIA MEDICAL BULLETIN

Health Hazards — What is the Real Danger?

"There's a divinity that shapes our ends,
Rough-hew them how we will"

W. Shakespeare

In many rural communities, there is an old lurking suspicion against anyone meddling with the natural course of events. People close to the land or sea learn to live with their environment and adapt to the eccentricities that providence provides for their enjoyment, with an acceptance of her many perversities. Over the centuries, mankind developed a satisfying symbiosis with nature which produced crops and cattle, fish and vegetation, and adequate water which supplied sufficient nutrients for his needs. Disease, accident, famine, drought and war adjusted the population which propagated without the inhibition of artifical barriers.

During the past century, however an entire revolution has transferred this simple existence into one controlled by scientific discoveries haphazardly applied to the sicence of war, the building of giant cities, and the prevention of the ravages of epidemic diseases.

Apart from the ever presence impact of violence, the same explosion of scientific knowledge has brought new hazards to our existence. This *Bulletin* exposes a wide variety of biological dangers and emphasizes the intricate nature of problems.

It was the strong, musty odor of two young infants that lead the Norwegian biochemist, Dr. A. Følling, to investigate this as a clue in the explanation of their mental deficiency. The first child, born to a normal mother, developed the signs of gradually progressive mental impairment and had so pungent a smell that the child's father could not live in the same room. The second child had a similar aroma and also began to show signs of delayed mental development.

The mother took her children to Dr. Følling, the newly appointed Professor of Mental Research, at the University of Oslo School of Medicine. He decided to test for diacetic acid and applied ferric chloride to the urine to see if he could get a red-brown color. To his surprise the urine turned green. After testing some twenty litres of urine and nearly two months of hard work, he identified the mysterious abnormality of the urine as phenylpyruvic acid. Within five months of first seeing the children, Dr. Følling presented a scientific report of a new metabolic disease responsible for Imbecilitas Phenylpyruvia.

It is nearly forty years since this discovery but the understanding of the biochemistry and genetics of "P.K.U." has fascinating twists as explained by D. J.T.B. Clark in his article in this *Bulletin* on the Maternal Sufferer from this desease. Although a new generation of normally intelligent, apparently healthy young people live without the need to diet appropriately, mothers who retain the biochemical defect have a high risk of bearing deformed children.

HAZARDS OF CHILDBEARING — Mother and Child

How far should we go in investigating the possible defects in the developing fetus?

In the truly scientific sense it seems logical to elucidate the possiblity of severe deformities:

— Meningo myelocele
— Phocomelia
— Chromosomal defects

and there are thousands of structural biochemical and enzymatic abnormalities which may occur. Natural abortion, of course, eliminates many aberrations of gestation, but now we have a powerful armamentarium of non-invasive and invasive techniques which can predict with almost uncanny and icy certainty of what the fetus will constitute.

Dr. B. St. J. Brown's article on the use of ultrasonic diagnosis brings the topic vivdly to life, illustrating the tremendous advances in imaging techniques and the need for the observer to have the necessary imagination and vision to interpret video projections. Dr. E.J.T. Winsor reviews the current situation for mothers from the mother's point of view on the subject of amniocentesis. Although some twenty percent of mothers over 35 years were unaware of the availability of amniocentesis, it appears that this process is well accepted. Furthermore, most mothers in this older age group were willing to consider therapeutic abortions should amniocentesis reveal a severe congenital anomaly.

LEGIONNAIRE'S DISEASE — A Recently Elucidated Hazard

It may come as a surprise to many physicians that this disease occurs in Nova Scotia. To most of us, it is a condition confined to gentlemen in smoke-filled and air-conditioned rooms in some distant hotel in the United States.

Dr. T.J. Marrie, *et al* give a vivid description of this disease illustrating that although alcohol and diabetes may precipitate the condition, sporadic cases may occur anywhere. *Legionella pneumophilia* may be a relatively newly discovered organism but its hazards have been clearly diminished by the careful observations made in Dr. Marrie's article and by the realization that in most cases this organism is susceptible to antibiotics.

MULTIPLE SCLEROSIS — An Unsolved Hazard

Despite all technological advances in biochemistry, only a perplexing collection of clues have been discovered regarding this devastating illness. The Dalhousie Multiple Sclerosis Research Unit, under Dr. T.J. Murray's direction, is applying a team of expertise to document and investigate this baffling disease.

Hazards to our health may be rained upon us from polluted air, then they arrive in our drinking water, or may uprise from contaminated ground. They may be bequeathed to us in a defective constitution which we may pass on to future generations.

It is up to the wisdom and guidance of the medical profession and associated scientists to lead us through this maze and hope we can leave a legacy for future generations that is healthier and has fewer menacing and ubiquitous hazards. □

B.J.S.G.

Reference

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Special Interest

Dr. Basil J. S. Grogono, Editor-in-Chief of the *Bulletin*, is taking a sabbatical leave of absence from Dalhousie University and The Halifax Infirmary for a period of one year. He takes up the appointment of Orthopaedic Surgeon at Stanton Yellowknife Hospital, Yellowknife, North West Territories. We all wish him the very best for the coming year and look forward to his return.

During his absence **Dr. John F. O'Connor**, a Family Physician in Dartmouth has consented to take up the position of Acting Editor-in-Chief. Dr. O'Connor is well qualified for the task having studied Journalism in Kings College Extension Courses. He was Guest Editor for the April 1982 issue of the *Bulletin*, and has been a member of the Editorial Advisory Board of *Canadian Doctor*. He would welcome any support or suggestions that may improve *The Nova Scotia Medical Bulletin.*

Maternal PKU: The Problem of a Potentially Hostile Intrauterine Environment

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HISTORICAL BACKGROUND

The prevention of severe mental retardation through the early detection and dietary treatment of phenylketonuria (PKU) represents a triumph of the management of genetic disease by environmental manipulation. PKU is an inherited metabolic disease characterized by failure of the conversion of the essential amino acid, phenylalanine, to tyrosine, due to a defect in the liver enzyme, phenylalanine hydroxylase.[1] Unchecked, the resulting accumulation of phenylalanine produces severe, irreversible brain damage in affected infants by some mechanism which is still incompletely understood. The recognition that this could be prevented by carefully regulated dietary phenylalanine restriction begun early in life, led to the establishment throughout the western world of neonatal screening programs to identify affected infants before brain damage had occurred. As a result of early detection and careful treatment, literally thousands of young people, who formerly would have been expected to be profoundly retarded, now live active productive lives and are to all appearances completely indistinguishable from their peers.[2] Like their peers, they look forward to marrying and having children of their own. In the case of PKU, however, this is associated, in certain instances, with considerable risk to their offspring.

As the brain matures its vulnerability to the toxic effects of hyperphenylalaninemia appears to decrease. For many years conventional management of the condition therefore called for discontinuation of dietary treatment when a child entered school. Hence, there are many older adolescents and young adults with PKU who have been on unrestricted diets for many years. Some may even consider themselves "cured". The offspring of these individuals, however, face a double risk. First, they have an increased risk for inheriting PKU themselves. Since the parent with PKU is homozygous for the PKU gene, all offspring will inherit at least one mutant gene. If the other parent is a carrier of PKU (i.e. has one PKU and one normal gene), there is also a 50% chance they would inherit a second mutant gene and would therefore have PKU. In Nova Scotia, the PKU carrier frequency has been estimated to be about 1 in 60 in the population.[3] The chance that an individual with PKU would marry an unrecognized PKU carrier is also therefore 1:60 (1.6%); the combined risk of marrying an unrecognized PKU carrier and any of their children having PKU is about 0.8% — low, but still several fold higher than that of other children (about 0.06%). By itself, this is probably not very serious, for affected newborns would be picked up in the neonatal screening program in the same manner that other infants with PKU are detected.

The second risk to the progeny of individuals with PKU or hyperphenylalaninemia is much more sinister. Although the vulnerability of the brain to hyperphenylalaninemia decreases with age, the basic defect in PKU is unchanged; plasma phenylalanine levels in affected young adults increase to 25 to 50 times above normal on unrestricted diets. The offspring of these young people are therefore exposed to any potentially teratogenic effect of paternal or maternal hyperphenylalaninemia. While hyperphenylalaninemia in men does not appear to be associated with an increase in the incidence of malformations in the offspring, the situation is quite different in the case of phenylketonuric women.

In an extensive review of world experience with the outcome of maternal PKU, Lenke and Levy reported very high frequencies of mental retardation, microcephaly and congenital heart disease (particularly tetralogy of Fallot) among the offspring of hyperphenylalaninemic women.[4] The frequency of mental retardation ranged from 21% among the children of mothers with plasma phenylalanine levels of 3-10 mg per decilitre to over 90% of those born to women with plasma phenylalanine levels >20 mg per decilitre. The frequencies of microcephaly were comparable. The frequency of congenital heart disease was lower, ranging to 15%, but it was still higher in general than the frequency in the normal population (about 0.8%). Included in the survey were data from 34 pregnancies during which the women were treated by dietary phenylalanine restriction, though in only 3 cases was treatment initiated prior to conception. Compliance with treatment was variable, and no clear relationship could be demonstrated between treatment during pregnancy and the prevention of abnormalities in the offspring.

SOME UNANSWERED QUESTIONS

The observations reviewed by Lenke and Levy, though preliminary, are very unsettling. By treating PKU successfully are we creating a cohort of women of normal intelligence who are inevitably destined to produce severely retarded children due to exposure to a hostile intrauterine environment? The experience of some workers suggests that well-regulated treatment during pregnancy did in fact prevent the embryopathy of maternal PKU. Stimulated by increasing pressure to confront the issue, a group of Canadian biochemical geneticists from all across Canada met to formulate a protocol for the prospective investigation and management of maternal PKU in this country. Some of the specific questions to be addressed were: What is the

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true incidence of maternal PKU embryopathy? What are its clinical features and natural history? Can it be influenced by dietary phenylalanine restriction during pregnancy? When should treatment be begun? How restrictive should dietary treatment be? Should the diet include supplemental tyrosine to compensate for the failure to produce the amino acid from phenylalanine? Is treatment associated with increased incidence of other perinatal problems?

MANAGEMENT

In addition to providing for the prospective accumulation of data for future analysis, the group developed guidelines for what could best be called "currently accepted optimum treatment" while reserving the right to modify these as new information becomes available.

The recommended management of maternal PKU can be considered in five stages:

1. **Identification and classification.** This consists of keeping track of all infants with hyperphenylalaninemia identified through neonatal screening programs well beyond the age at which many would have been taken off diet therapy. Classification includes the determination of dietary phenylalanine tolerance (i.e. milligrams of dietary phenylalanine a woman can tolerate without increasing plasma levels to $\geq$5 mg/dl) and identifying those with defects in biopterin metabolism.[5] The feasibility of establishing a national PKU registry is currently under consideration. Although screening of women at premarital or prenatal visits has been suggested, it is not widely considered to be cost effective and would only be necessary for a few years in any case.[6] Notwithstanding, any woman who has one or more mentally retarded or microcephalic children should have her plasma phenylalanine level measured to rule out the possibility that she has previously unrecognized PKU or hyperphenylalaninemia.

2. **Education**. Girls with successfully treated PKU or hyperphenylalaninemia should be informed of the risks to their offspring as they approach child-bearing age.

3. **Controlled pregnancy.** All girls with PKU should be strongly encouraged to practise reliable methods of contraception to avoid unexpected pregnancy. Some may choose to undergo sterilization, or may find the uncertainty of maternal PKU intolerable and opt for therapeutic abortion should an unplanned pregnancy occur. In the event that therapeutic abortion is undertaken, termination by prostaglandin infusion, rather than saline injection, is recommended. Samples of maternal and fetal plasma and amniotic fluid should be obtained for quantitative amino acid analysis. The abortus and membranes should be salvaged for careful clinical evaluation to delineate the extent of dysmorphogenesis.

4. **Management during pregnancy.** While the details of optimum management of PKU during pregnancy have yet to be determined, most agree that a key feature should be carefully regulated dietary phenylalanine restriction, preferably begun several weeks before conception and continued throughout the pregnancy. The objective of the treatment is to maintain the maternal plasma level at 5 mg per decilitre without producing fetal or maternal malnutrition. In order to ensure adequate dietary intake of protein (at least 1.3 g per kg body weight), extensive use is made of phenylalanine-free protein hydrolysates similar to the Lofenalac used in the treatment of classical PKU. Great care should be taken to ensure that dietary phenylalanine intake is adequate to support growth but not so great that it increases plasma levels of the amino acid above 5 mg/dl. Since phenylalanine requirements change as pregnancy progresses, plasma phenylalanine levels should be monitored closely (at least weekly) throughout the pregnancy. Care should also be taken to ensure an adequate energy intake to achieve optimum utilization of dietary protein. Fetal growth should be monitored by ultrasound examination at monthly intervals after 12 weeks of gestation. Supplemental tyrosine (1 g per day) is recommended to compensate for the inability of the mother to meet requirements for the amino acid by the metabolism of phenylalanine. In addition, supplemental minerals (such as zinc and magnesium) are also prescribed; added pyridoxine and folic acid are recommended. It is important to emphasize that these measures do not substitute for good, routine prenatal care, including regular measurements of blood pressure, hemoglobin, urinalysis, etc.

The close supervision recommended and the need for a highly specialized, potentially dangerous diet has led to the recommendation that treatment be supervised by PKU treatment centers (see below).

5. **Postnatal evaluation and management:** Every infant born to a mother with hyperphenylalaninemia, treated or not, should be examined by someone with special expertise in the evaluation of embryopathies. Specific attention should be directed to evaluation of malformations previously reported in the offspring of mothers with PKU. In addition, the infant should be re-assessed at yearly intervals with specific attention to psychomotor and intellectual development.

IF YOU ARE A FAMILY PRACTITIONER, OBSTETRICIAN OR PEDIATRICIAN

The systems that have evolved in the Maritimes for identifying and maintaining contact with patients with PKU or benign hyperphenylalaninemia are generally considered to be very good. However, the costs of overlooking a woman with hyperphenylalaninemia are potentially considerable. Thus, while general prenatal screening for hyperphenylalaninemia is probably not cost effective, certain patients should be investigated. These are:

1. women who have ever been on dietary treatment for PKU whether or not they are currently on treatment;

2. women who have ever been found to be hyperphenylalaninemic whether or not they were ever treated by dietary phenylalanine restriction (i.e. women with so-called benign hyperphenylalaninemia);

3. women who have had one or more mentally retarded or microcephalic children, in whom the cause of the handicap is not obvious.

Investigation should include measurement of the plasma phenylalanine concentration. No special preparation of the patient is necessary; simply send 2-3 ml of heparinized plasma and requisition to Dr. D. Cole, Special Procedures Laboratory, Izaak Walton Killam Hospital for Children, Halifax, N.S. B3J 3G9. Positives should be reported to the appropriate PKU treatment centre. The management of patients with PKU in Nova Scotia is supervised by personnel of the Atlantic Research Centre for Mental Retardation in Halifax (telephone 902-424-6491); in New

Brunswick, information concerning the management of patients in that province can be obtained from Dr. C. Devadason, Director of Maternal and Child Health, New Brunswick Department of Health, Fredericton (telephone 506-453-2323); physicians in P.E.I. should contact Dr. John Craig, Director of Laboratories, Queen Elizabeth Hospital, Charlottetown (telephone 902-566-6300).

SUMMARY

PKU or hyperphenylalaninemia in women during pregnancy is associated with very high risks of mental retardation, microcephaly and congenital heart disease in their offspring. These anomalies may be preventable by carefully regulated dietary phenylalanine restriction begun before conception and continued throughout pregnancy. A 5-stage approach to management, endorsed by a national committee of biochemical geneticists concerned with the management of maternal PKU, is described. It includes: identification and classification, education of women at risk, controlled pregnancy, dietary management during pregnancy, and postnatal evaluation and management. A copy of the complete protocol can be obtained free for the asking by writing Dr. J. T. R. Clarke, Director, Biochemical Genetics Clinic, ARCMR, Clinical Research Centre, 5849 University Ave., Halifax, N.S. B3H 4H7. □

ACKNOWLEDGMENTS

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Ultrasonographic Diagnosis of Fetal Abnormalities in the Second and Third Trimester

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ABSTRACT

In recent years, ultrasonographic studies have become an established diagnostic method in all stages of pregnancy. This presentation is concerned with the diagnosis of fetal malformations and certain fetal illnesses in the second and third trimester. Our purpose is not only to recognize such abnormalities, but to identify them as precisely and completely as possible, and to indicate the lethality of such conditions. With this information, the management of the pregnancy will be better directed.

At the Grace Maternity Hospital for the past eight years, radiologists have used ultrasonographic techniques as a standard part of prenatal care. Initially, only a bistable compound B-scanning machine was available to us. Later, gray-scale conversion of this machine made a significant advance in recording tissue detail of the fetus, and normal variations or pathologic changes in the placenta and myometrium. After the early years, a second unit, comprising a linear array non-gray-scale real-time portable machine was added to the department. For the first time at this hospital we were able to make detailed motion studies and to record them on video-tape.

For the past 15 months, (January 1, 1981 — March 31, 1982) we have used an additional real-time high resolution gray-scale sector scanner, also equipped for video-tape. This machine is portable and has made a further significant advance in our capability. Now we are able to obtain high resolution gray-scale images of the fetus, placenta and uterine wall, and also extrauterine structures, combined with the facility of video-tape motion studies.

CLINICAL MATERIAL

During the last 15 months (January 1, 1981 — March 31, 1982), we have examined approximately 3,500 new patients in the second and third trimester. Six physicians have been responsible for these examinations. With the newer equipment we have been able to diagnose a number of fetal malformations and illnesses. The following ultrasonographic classification includes those conditions which we have encountered (indicated "G.M.H.")*, as well as those already reported in the literature. Within each system of the body we have attempted to place those conditions with the worst prognosis first. For the sake of completeness, we have included a few conditions which although not yet in the literature, by their very nature, are expected to be reported in the near future. We have made no attempt to present maternal conditions which affect the fetus secondarily, nor have we described the subject of fetal growth retardation which is so extensive as to be beyond the scope of this presentation.

CLASSIFICATION

1. Growth retardation in single and multiple gestation.

2. Fetal malformations and illnesses:

   i) Central Nervous System:

   i.e. neural tube defects — solitary or in combination. [often associated with polyhydramnios and if the defect is "open", elevated alpha fetoprotein in amniotic fluid].

   a) Lethal
      - — anencephaly[1] (G.M.H. 1 pt.)
      - — major (G.M.H. 6 Pts) or multiple malformation including iniencephaly, clover-leaf skull, hydranencephaly, extreme hydrocephalus, long segment spinal dysraphism.

   b) Less Deleterious
      - — encephalocele (G.M.H. 2 pts.)
      - — hydrocephalus (mild)
      - — spinal dysraphism (short segment) (G.M.H. 2 pts.)
      - — ? caudal regression syndrome

   ii) Urogenital System:

   [often associated with oligohydramnios, hence pulmonary hypoplasia]

   a) Lethal
      - — bilateral renal agenesis — Potter's Syndrome[2] (G.M.H. 1 pt.)
      - — urinary ascites plus major (cloacal) malformations

   b) Less Deleterious
      - — megacystis[3,4] (G.M.H. 1 pt.)
      - — hydronephrosis[5] (G.M.H. 1 pt.)
      - — multicystic kidney[5,6] (G.M.H. 2 pts.)
      - — polycystic kidney[7]
      - — hydro-metro-colpos and variations[8]
      - — ovarian cyst[5,9]
      - — urinary ascites

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*G.M.H. = identified on ultrasonographic study in the Department of Radiology, Grace Maternity Hospital.

iii) Musculo-Skeletal System:

[lethality is often related to the presence of microthorax, hence pulmonary hypoplasia.]
*motility studies may be useful

a) Lethal

- fatal neonatal dwarfism with microthorax and pulmonary hypoplasia

  e.g. —achondrogenesis
  - asphyxiating thoracic chondrodystrophy
  - "hyperchondrogenesis"
  - thanatorphoric dwarfism
  - hypophosphatasia (occasionally)
  - osteogenesis imperfecta lethalis
  - camptomelic dwarfism
  - diastrophic dwarfism
  - achondroplasia (homozygous)

- severe vertebral and thoracic malfomations with microthorax (unspecified)

b) Less Deleterious

- craniosynostosis
- short limbed dwarfism e.g. — achondroplasia
- phocomelia; amelia etc.
- *arthrogryposis multiplex congenita
- multiple dislocations and/or contractures

  e.g. — Larsen syndrome (usually non-lethal)
  - Pena-Shokeir I syndrome (lethal due to pulmonary hypoplasia)
  - monosomy-21 (usually lethal due to pulmonary hypoplasia)
  - conjoined twins

iv) Cardiovascular System:

[motion sudies with linear array equipment (not sector scanner) and video-tape recording]

- cardiac dysrhythmia (G.M.H. 2 pts.)
- cardiomegaly with or without dysrhythmia with or without anasarca e.g. — atrial flutter (G.M.H. 1 pt.)

v) Gastro-Intestinal System:

[dilated bowel is wider than the vertebral column —personal observation. Motility studies to show peristalsis and to differentiate from renal cysts.]

- gastroschisis[10] (G.M.H. 1pt.)**
- gastric antral obstruction[11]
- bowel obstruction (G.M.H. 1pt.)**
- atresia of — duodenum [11,12,13]
  - jejunum[14]
  - ileum
  - colon
- volvulus
- meconium peritonitis

vi) Combined Urogenital and Gastro-Intestinal Systems:

imperforate anus combined with urethral obstruction (G.M.H. 1 pt.)
[bowel may be dilated and filled with urine via fistula]

vii) Combined Gastro-Intestinal System and Thorax:

diaphragomatic hernia[15]
[is associated with pulmonary hypoplasia]

viii) Miscellaneous:

- goitre
- cystic hygroma or lymphangioma
- sacro-coccygeal teratoma[10]

ix) Fluid Collections:

[may be associated with polyhydramios: placenta may be enlarged and edematous]

- hydrops fetalis[16] (G.M.H. 1 pt.)
- polyserositis plus cranio-cervical-lymphocele (G.M.H. 1 pt.)
- ascites (G.M.H. 1 pt.)

x) Fetal Death:[1,17] (G.M.H. 5 pts.)

- collapsed cranial vault (≡Spalding sign)
- telescoped vertebral column (≡Roberts sign)
- gas in fetal vascular system and/or cerebral ventricles
- cranial halo of edema (≡Duell sign)
- absence of cardiovascular or other motion++
- cessation of growth and/or progressive diminution of BPD
- absence of midline cerebral echo

Some illustrative case reports of conditions which we have encountered are presented. We shall not illustrate conditions such as fetal growth retardation, which has already been thoroughly reported in the literature, but will limit the presentation to conditions which serve to illustrate the potential of modern ultrasonographic techniques.

CASE REPORTS

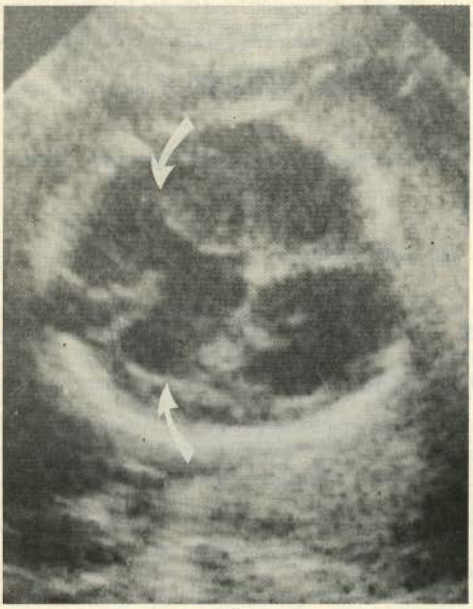
Case I. **E. (S)** A 28 year old patient, gravida 1, para 0, was referred to us at 28 weeks gestation by dates. An ultrasonographic examination performed elsewhere showed fetal hydrocephalus. There was a normal volume of amniotic fluid.

Examination at the Grace Maternity Hospital showed the fetal skull to be enlarged (BPD at 31½ weeks), and confirmed the presence of a marked degree of hydrocephalus. In addition, we found evidence of spinal dysraphism affecting the cervical spine [Fig. 1 a); 1 b)]. The patient had recurrent premature labor and finally was

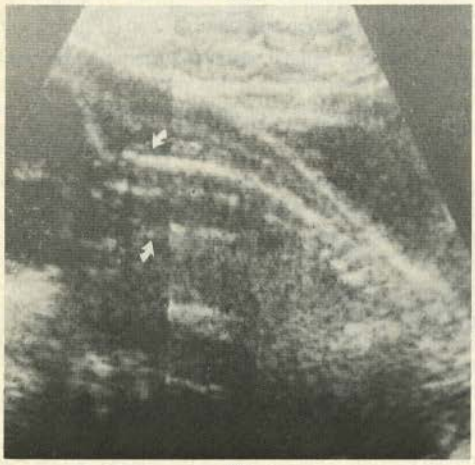
*G.M.H. = identified on ultrasonographic study in the Department of Radiology, Grace Maternity Hospital.

**Same patient

++best demonstrated by linear array equipment with or without videotape recording



(a)



(b)

Fig. 1 ***(Case I)***

Prenatal ultrasonographic examination at 28 weeks gestation.

a) The lateral ventricles are considerably enlarged. The B.P.D. measures exactly at the mean for 31½ weeks, indicating enlargement of the fetal skull, due to hydrocephalus.

b) The diameters of the cervical spinal canal are progressively and abnormally wide in a caudocephalad direction. The fetal head is on the left. This was confirmed in postnatal radiographs.

delivered by caesarean section about 24 hours after this examination.

Postnatal cerebral ultrasonographic examination of the baby confirmed the above findings (Fig. 2), as did CT examination a few days later (Fig. 3). After a surprisingly stable early clinical course, the baby gradually became progressively more lethargic and died at approximately one month of age.

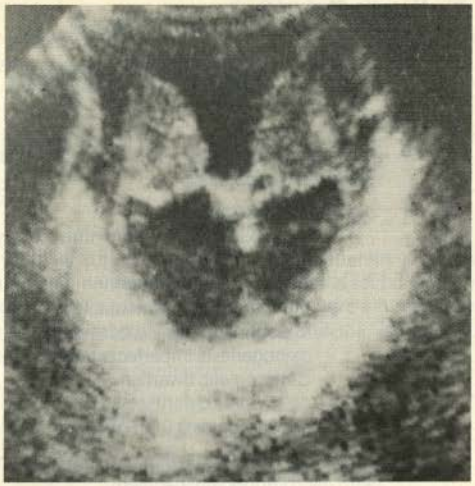


Fig. 2 ***(Case I)***

Postnatal ultrasonographic examination at about 48 hours confirms the hydrocephalus.

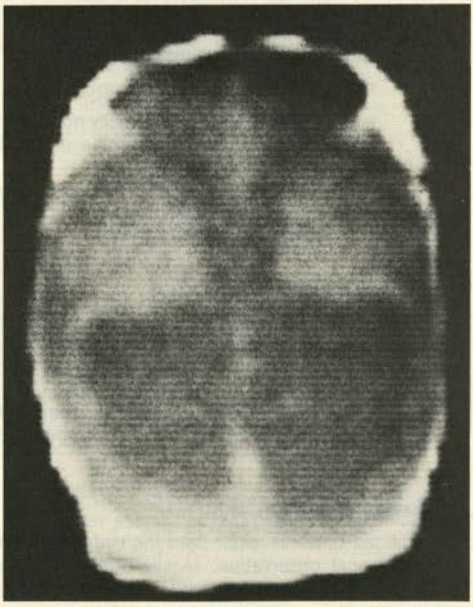


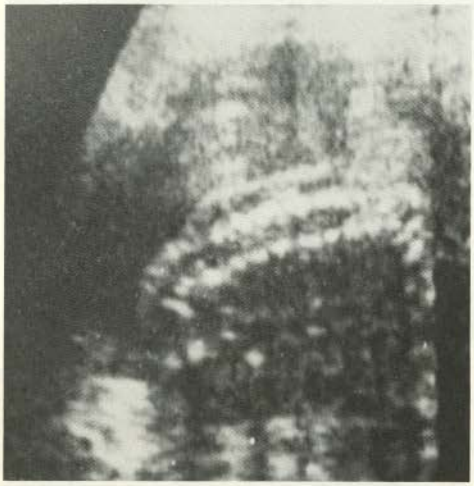
Fig. 3 ***(Case I)***

Postnatal C.T. examination was made at about 4 days of age, and confirms the hydrocephalus.

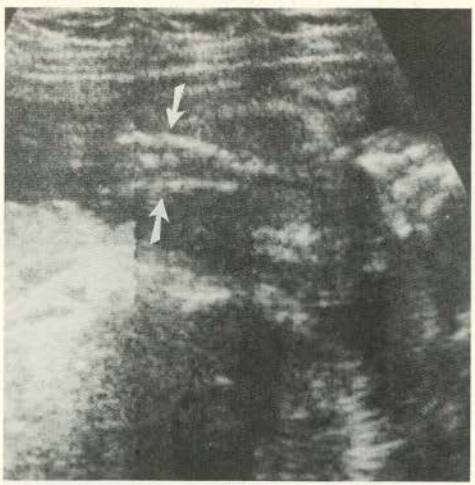
Case II. **N(J)** A 28 year old gravida 2, para 1, patient was referred to us for ultrasound examination initially at 17 weeks gestation, because of scanty P.V. bleeding. At this examination a strong suspicion of spina bifida in the lumbar region was raised. No other abnormality was identified. Repeat examination was recommended and about 10 days later there was conclusive demonstration of lumbar spinal dysraphism (Fig. 4). Movement of the lower extremities was normal. Amniocentesis was performed, and the alpha fetoprotein level was within normal limits. The previous

pregnancy had resulted in a normal healthy infant and there was no family history of spinal dysraphism. The findings were discussed with the patient and her husband, and it was decided to continue with the pregnancy. The only significant abnormality clinically was development of procidentia. At 37 weeks gestation she went into labor and there was spontaneous delivery of a baby girl weighing 2650 gm. There was a closed lumbar myelomeningocele (Fig. 5). The infant showed good power and movement of the lower extremities.

Incidental finding of multiple vertebral anomalies in the lower cervical upper thoracic vertebral column which were not recognized on the prenatal ultrasonographic examinations, are illustrated on the postnatal radiographs (Fig. 6) This does not represent another segment of myelomeningocele. Surgical correction of the lumbar myelomeningocele was performed, and the infant is doing well.



(a)



(b)

Fig. 4 ***(Case II** plus a normal patient for comparison)*

a) A normal patient: prenatal examination of a normal 18 week gestation showing a normal thoracic and upper lumbar spine The fetal head is to the left.

b) ***Case II:*** Prenatal ultrasonographic examination at 18 weeks gestation showing an abnormally wide lumbar spinal canal (arrows) typical of spina bifida. No protruding soft-tissue mass was visible. The fetal head is to the right.

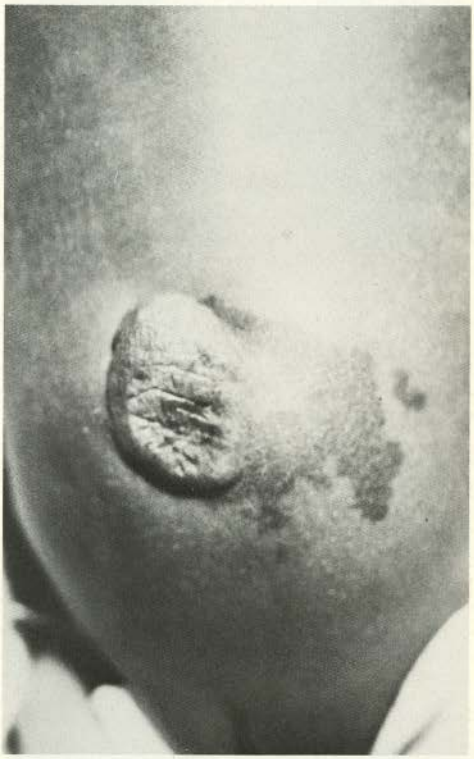
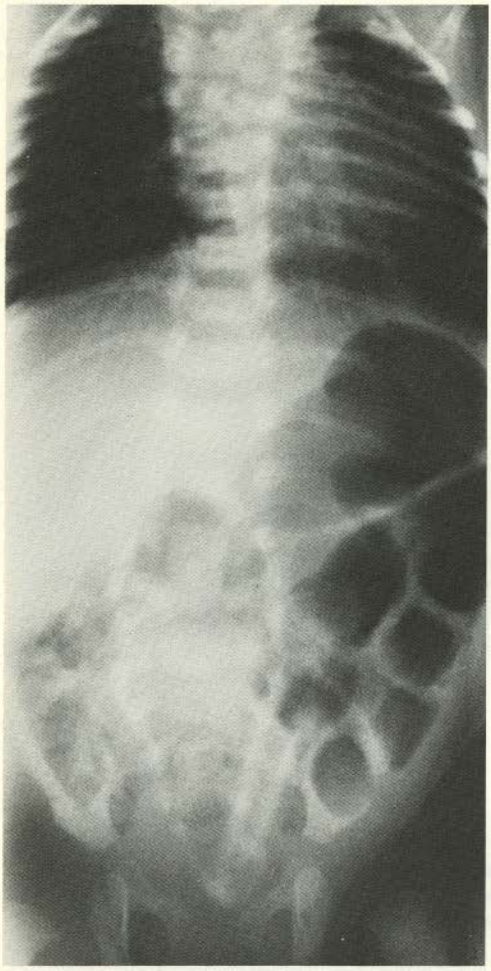


Fig. 5 ***(Case II)***

Clinical photograph a few days after birth showing "closed" lumbar myelomeningocele. The A.F.P. concentration was normal.

Case III. **R(I)** A 23 year old patient, gravida 3, para 0, A 2, was admitted because of hypertension at approximately 34 weeks gestation. The ultrasonographic examination at this time showed a normal volume of amniotic fluid. The abdomen of the fetus contained a number of fluid-filled rounded structures which could not be clearly identified as being of renal or gastro-intestinal or other origin. Motion studies showed no evidence of peristalsis, hence, a renal origin was suspected (Fig. 7). Caesarean section at 36 weeks gestation was uneventful. The infant showed no gastro-intestinal symptoms, though a mass was palpable in the left flank. Postnatal ultrasonographic examination confirmed the findings which had been demonstrated prenatally.

Intravenous pyelogram showed evidence of a duplex left renal collecting system, with function only in the inferior portion, the superior element being enlarged and non-functioning (Fig. 8). In the bladder a ureterocele was evident. Hydronephrosis of the upper half of a duplex collecting system was the most likely diagnosis; differential diagnosis included multicystic kidney affecting the upper half of a duplex system with atresia of its ureter. At cystoscopy and retrograde pyelography the former condition was confirmed.

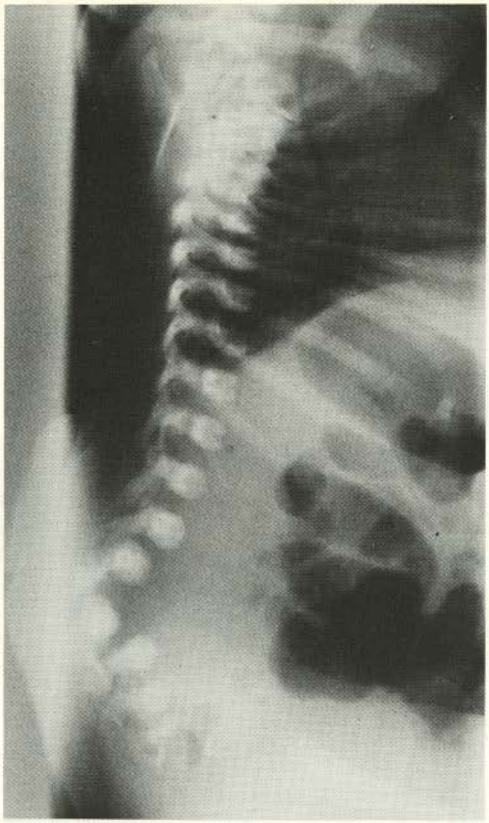


(6a)

Fig. 6a and 6b ***(Case II)***

Radiographs confirm the widening of the lumbar spinal canal. In the lateral projection, the posterior soft-tissue mass is evident posterior to a marked kyphosis. Also, unsuspected vertebral anomalies are present in the upper thoracic and lower cervical spine.

Case IV. **H(B)** This 29 year old patient, gravida 1, para 1, was referred to us having had an initial ultrasonographic examination elsewhere showing a large cyst-like structure in the fetal abdomen. Our examination showed a huge fluid-filled pyriform structure arising from the fetal pelvis, occupying most of the abdominal cavity and reaching to the level of the diaphragm, and causing anterior protrusion of the abdominal wall (Fig. 9). The mass had the characteristics of a hugely distended urinary bladder. Adjacent to it were several other much smaller fluid-filled chambers, which had no peristaltic activity demonstrable (Fig. 9). The most likely diagnosis was megacystis with cystic change or hydronephrosis in one or both kidneys. The differential diagnosis included the condition mega-cystis-hypoperistalsis syndrome. At this stage, the gross



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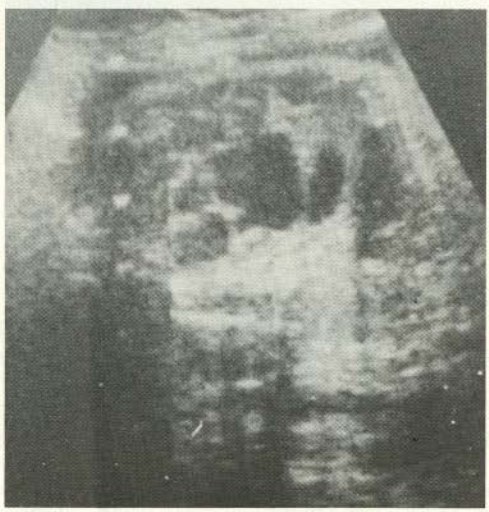


Fig. 7 ***(Case III)***

The prenatal ultrasonographic examination shows the upper part of the fetal abdomen containing a number of fluid-filled circular structures which showed no peristaltic activity. They were thought to be most likely of renal origin e.g. multicystic kidney or hydronephrosis. The vertibrae are below the cystic structures.

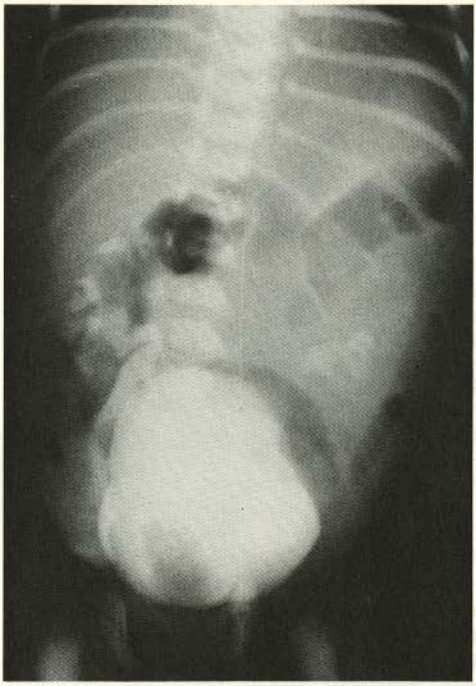


Fig. 8 ***(Case III)***

I.V.P. a few days after birth shows bilateral renal duplication. On the left side, the upper element of the kidney shows no opacification and is grossly enlarged and hydronephrotic, displacing the functioning lower element inferolaterally. Later studies confirmed the ureterocele projecting into the bladder.

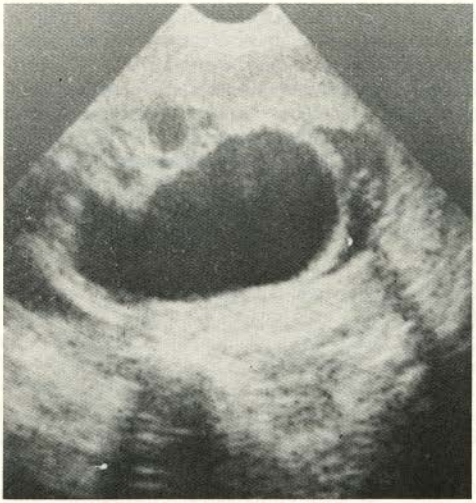


Fig. 9 ***(Case IV)***

Prenatal ultrasonographic examination reveals an enormously distended fetal urinary bladder, which reaches the level of the diaphragm and causes protrusion of the anterior abdominal wall. Several fluid-filled cyst-like spaces, which showed no motility, probably represent hydronephrosis or cystic renal disease.

distension of the abdomen with thinning of the abdominal wall may prevent normal development of abdominal musculature, the end result being "prune-belly" syndrome (Eagle-Barrett syndrome). A less than average volume of amniotic fluid was present, explained by the absence of the usual fetal urinary contribution.

Subsequently, with ultrasonographic guidance, a needle was directed through the maternal abdomen into the fetal bladder and 143 ml. urine was aspirated. The bladder refilled shortly afterwards. At the time of writing, the pregnancy continues.

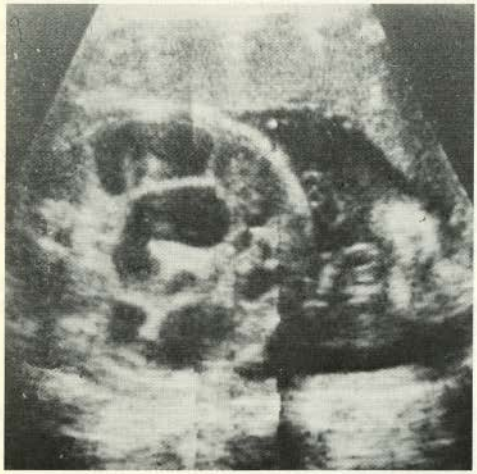
The possibility of placing an indwelling intrauterine device to drain the fetal bladder and hence to preserve the fetal renal function (as has been reported elsewhere in Canada)[18] is presently being considered.

Case V. **MACL(M.F.)** A 22 year old patient, gravida 1, para 0, at 34 weeks gestation by dates, had an ultrasonographic examination made elsewhere. An abnormality was found in the fetal abdomen, suggesting some form of bowel obstruction. The patient was referred to us for further study. Our examination shows a normal volume of amniotic fluid. In the fetal abdomen, several markedly dilated fluid-filled bowel loops were visualized (Fig. 10). These dilated loops were wider than the transverse diameter of the vertebral column, which we have found to be a useful standard for assessment of small bowel calibre at any age. Motion studies with video-tape recording confirmed the presence of frequent and extremely vigorous peristalsis in these loops, similar to what is seen in the obstructed small bowel rather than the obstructed colon. The prenatal diagnosis was, therefore, some form of small bowel obstruction. Caesarean section was chosen as the method of delivery and was performed at 36 weeks gestation, revealing gastroschisis with evidence of obstruction. The infant was transferred to the Izaak Walton Killam Hospital for Children where the necrotic extra-abdominal portion of the intestine was resected; there was jejunal obstruction at the defect in the abdominal wall, and a mesenteric duplication cyst was present outside the abdominal cavity. Inside the abdomen, only an unused micro-sigmoid colon was available for anastomosis. After appropriate surgical restoration of intestinal continuity, this infant presently has a critically short length of small bowel remaining.

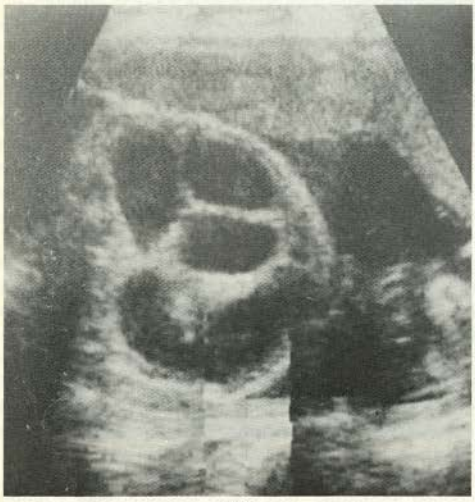
It is of interest to note that on the ultrasonographic examinations, the external portion of the intestine could not be clearly recognized and this was well explained by the clinical findings.

Case VI. **B(R)** This 30 year old patient, gravida 3, para 1, A 1, was referred to us at a gestational age of about 30 to 31 weeks by dates and BPD. One previous infant died with ascites of obscure origin. Examination of the fetal abdomen showed marked ascites, and fluid in the scrotum (Fig. 11). There was no evidence of fluid in the pleural cavities or signs of anasarca. The placenta showed no specific abnormality. The volume of amniotic fluid was within normal limits.

At 33 weeks gestation, the patient underwent uneventful caesarean section. The infant showed clinical signs of ascites. The clinical course was downhill and eventually the baby died after several weeks. Autopsy findings and special techniques revealed vacuolated cells in the liver, spleen,



(a)



(b)

Fig. 10 ***(Case V)***

a) Prenatal ultrasonographic examination at 34 weeks gestation shows several dilated bowel loops (these are wider than the vertebral column). Frequent and vigorous peristalsis was observed on real-time. The diagnosis of some form of small bowel obstruction was made. Gastroschisis and obstruction was revealed at caesarean section.

b) Note the change in pattern of loops in the same projection (confirming peristaltic activity).

and kidneys, indicating a lysosome storage disease with features resembling but not exactly identical to the condition "sialidosis".

DISCUSSION

We have reviewed our own experience, and the literature and have summarized both in the classification. Our clinical statistics show a total of 11 instances of neural tube defects (anencephaly, hydrocephaly, hydranencephaly, encephalocele, myelomeningocele, meningocele), which coincides with the expected incidence of 2-3 per 1000 deliveries in Eastern Canada.[19] This statistic also corresponds to the incidence of such defects in live births per year coded in the Medical Records Department at the Grace Maternity Hospital, which shows a mean of 11.4 infants per year (range 6-17 annually, for the years 1976-1980 inclusive). We have encountered four instances of major urinary tract abnormalities, three instances of fetal cardiac dysrhythmia, one patient with combined imperforate anus and urethral obstruction, and another with non-lethal bowel obstruction. Regarding fetal conditions characterized by fluid collections, we have seen one with anasarca from Rh incompatibility, another with anasarca and cranio-cervical-lymphocele (possible Turner's syndrome), and one with ascites from an extremely rare storage disease. Unequivocal evidence of fetal death has been recognized ultrasonographically in five patients.

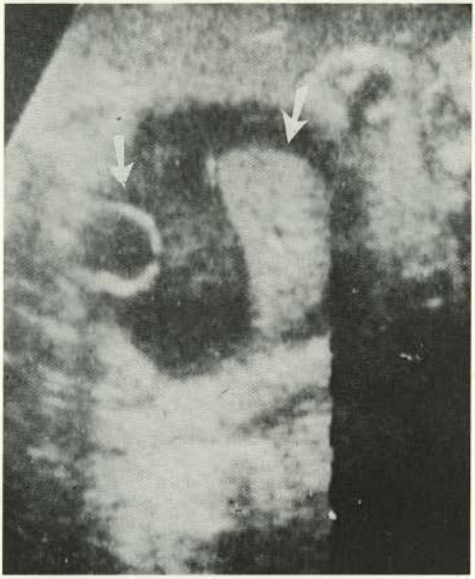


Fig. 11 ***(Case VI)***

Prenatal ultrasonographic examination at 31-32 weeks gestation revealed fetal ascites. Note the "floating liver" and the urinary bladder surrounded by intraperitoneal fluid.

High resolution real-time ultrosonographic equipment will display gray-scale images of organs and tissues in motion. To obtain maximum information, the machine must not only be calibrated for each patient but also for the region of the body being examined. Having established orientation, the examiner makes observations and interpretations of the three-dimensional moving images in one continuous mental process. This exploratory imaging process is conceptually very similar to fluoroscopy. When any abnormality is recognized, the examination is continued systematically and tailored to the individual patient e.g. if the fetal limbs are seen to be abnormally short, a search is made for other abnormalities associated with lethal and non-lethal forms of short-limbed dwarfism. With the above considerations in mind, we draw attention to the following:

a) **Objectives:**

Our objective has been to recognize and identify as completely as possible the condition under examination, particularly with regard to the lethality of the condition. The information displayed by real-time is far more complete and accurate than the static "freeze frames" or spot films selected by the examiner for the permanent record. We feel that this objective is achieved by having the initial examination performed, or witnessed and conducted by a physician trained in imaging techniques. We realize that in some centers a "screening" examination is performed by well trained technicians and the records of this examination are then interpreted by the physician. This process may be adequate for some techniques e.g. some aspects of echocardiography. However, if applied to the initital exploratory ultrasonographic study of the obstetric patient, the examination may not always be appropriately tailored for unexpected findings and will need to be repeated, with the physician in attendance, resulting in a number of unnecessary examinations.

b) **Timing of the Initial Exploratory Ultrasonographic Study:**

From our clinical experience, the major neural tube defects with a high degree of lethality will be recognized conclusively in the latter portion of the second trimester, (e.g. 18-24 weeks) or perhaps earlier. We realize that amniocentesis for genetic investigation is usually planned for about 16-17 weeks gestation, yet at this stage, conclusive evidence of neural tube defects will not always be sufficiently manifest ultrasonographically.[20] We have seen one patient in whom the spine was considered normal at 16 weeks yet at 20½ weeks and again at 22 weeks there was conclusive evidence of lumbar spina bifida. This was confirmed in the aborted fetus.

With regard to bowel obstruction, obstructive uropathy, short-limbed dwarfism, ascites and other fluid collections, these may not always have developed sufficiently for complete recognition until the third trimester.

c) **Ancillary Imaging Methods:**

i) Plain radiographs may visualize the fetal skeleton adequately in the latter part of the second trimester and thereafter.

ii) Amniography with water-soluble contrast medium will normally display the fetal gastro-intestinal tract, since the fetus normally swallows amniotic fluid. However, the fetal gastro-intestinal tract will not be displayed where there is proximal gastro-intestinal obstruction e.g. esophageal atresia. In fetal death, the gastro-intestinal tract is not opacified. Protruding soft-tissue masses, e.g. meningocele, can be shown by this technique.

iii) Fetography with oil-based medium displays the vernix-covered skin on to which the oil-based medium becomes adsorbed, producing a silhouette of the fetus on the radiographs. Abnormalities of the surface anatomy can be quite well displayed and may be very helpful in arriving at a diagnosis. However, the success of this technique depends on an intact skin surface, since the oil-based medium will not adsorb on an open neural tube defect.

SUMMARY

A review of our experience of fetal abnormalities and illnesses diagnosed by ultrasonographic studies in approximately 3500 new obstetric patients in the second and third trimester is presented. We used high resolution (gray-scale) real-time ultrasonographic imaging equipment with the capability of recording motion on video-tape; a linear array machine with video-tape added to our capability.

Real-time ultrasonographic studies are conceptually very similar to fluoroscopy and in our center are performed by a physician trained in three-dimensional imaging techniques. Our objective has been to make as complete an examination as possible, so that not only is an abnormality identified, but the examination is tailored to make a careful and thorough search for associated abnormalities, in order to make the diagnosis as complete and accurate as possible. Particular care has been taken to assess the lethality and prognosis of the condition and to obtain appropriate confirmatory studies e.g. plain radiographs, amniography, and fetography.

We observed that spinal dysraphism and anencephaly can usually be conclusively identified in the middle or latter part of the second trimester. Other conditions described are not usually clearly identified until the third trimester.

From our experience, whenever oligohydramnios or polyhydramios is suspected clinically, a careful ultrasonographic study of the fetus is indicated regardless of the findings on studies earlier in pregnancy.

Recently, several centres in Nova Scotia where obstetric care is undertaken, have become equipped with various forms of real-time ultrasonographic machines. This is a real advance, since high risk conditions can be recognized in good time for optimal management. It is only by maintaining the highest standards at all times that we can be sure of providing the most informed diagnosis, hence the best care for our patients. □

ACKNOWLEDGMENTS

My thanks are due to my radiologist colleagues Drs. E.B. Grantmyre, T.R. Lawrie, C.L. Belcourt, J.R. Jackson, D.L. Thompson, and obstetrician Dr. C. Maley for their encouragement in this work; to Dr. D.B. Fraser, Professor and Head, Department of Radiology, Dalhousie University, Dr. J.A. Collins, Professor and Head, Department of Obstetrics and Gynecology, Dalhousie University and Drs. D.R. Campbell, P. Welch, and Elizabeth Winsor for editorial assistance; to Mr. M. Cochrane and staff, Audio-Visual Department, I.W.K. Hospital for Children, and to Mary Nicholson for cheerful and unfailing secretarial help.

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References continued on page 128.

Women's Attitudes Toward Prenatal Diagnosis and Utilization of Services*

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ABSTRACT

Postpartum women were interviewed about their attitude toward prenatal diagnosis by amniocentesis. Only 15% of those eligible were actually tested and 22% were not aware that testing was available.

Since prenatal diagnosis became available in the early 70s, there has been a steady increase in utilization of this service and continued increase in demand can be anticipated.

INTRODUCTION

Because of the increased risk of chromosomally abnormal offspring for older women, a joint committee of the Canadian Paediatrics Society, Canadian College of Medical Geneticists and the Society of Obstetrics and Gynecology of Canada has recommended that, where local resources permit, amniocentesis be offered to all women age 35 or older at the expected date of delivery.[1] Similar guidelines had previously been suggested.[2,3]

Although prenatal diagnosis of chromosome abnormalities by amniocentesis has been available in most Canadian Medical Centres since the early 1970s, only a small proportion of women at risk are actually tested. Prenatal diagnosis is unique in medical care because information obtained from testing may be used to decide on continuation or termination of a pregnancy. In order to evaluate some of the factors which influence whether a woman has prenatal testing, a survey was carried out in Fredericton and Halifax.

Each year the number of conditions which can be detected by analysis of the amniotic fluid increases. However, the most common indication for testing is maternal age of 35 years or older. These women represent about 5% of the childbearing population and it is estimated that about 20% of all children born with Down syndrome are born to this group of women.[4] This report will be confined to prenatal testing because of maternal age.

METHODOLOGY OF ATTITUDE STUDY

Two groups of postpartum patients were selected for the study:

1. all women aged ≥35 years at the time of delivery irrespective of whether or not they had amniocentesis.
2. women aged 25 years at delivery.

The older women were chosen because of their increased risk of chromosomally abnormal offspring. The second group was chosen as representative of a mature age group not known to have an increased risk of abnormal offspring.

An important aspect of the study was that women who had never sought or had been offered genetic counselling were included. It was carried out from April 1977 to July 1978 at the Grace Maternity Hospital in Halifax, N.S., and from May 1978 to April 1979 at the Everett Chalmers Hospital in Fredericton, N.B.

The study was carried out by means of a questionnaire which were distributed by a project coordinator and, in most instances, responses were discussed with the patient. Topics included in the questionnaire were: attitude of the woman toward abortion of an abnormal fetus, awareness of the availability of testing, level of education, religious denomination, place of residence, family size and experience with a mentally handicapped relative.

RESULTS OF ATTITUDE STUDY

A total of 413 women participated in the study. (Table I)

Women whose baby had died or was in the high risk nursery were excluded from the study. In Halifax, 52 patients were excluded or missed and five refused to participate. In Fredericton, one patient was excluded and one missed.

TABLE I

NUMBER OF WOMEN WHO PARTICIPATED IN STUDY

	Age ≥35 Years	Age 25 Years	Total
Halifax	102	187	289
Fredericton	54	70	124
TOTAL	156	257	413

Fifteen percent of women aged ≥35 years at delivery had amniocentesis during the time period of the study (Halifax = 24/159, Fredericton = 8/56). (In order to reflect true utilization, all women ≥35 years who gave birth and who had amniocentesis are included, regardless of their participation in the survey.) The mean age of those tested was 38.4 years compared to 37.0 for those not tested ($t = 2.9$, $p<0.01$).

*The study was funded in part by the Atlantic Research Centre for Mental Retardation

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TABLE II

FACTORS TESTED FOR RELATIONSHIP TO AMNIOCENTESIS FOR WOMEN ≥35 YEARS

Variable	Categories for Analysis	Women who had Amniocentesis	Women who did *not* have amniocentesis
Attitude toward abortion of an abnormal fetus	would consider	24/26	80/130
	would not consider	0/26	34/130
	undecided	2/26	16/130
Awareness of amniocentesis	Yes	26/26	95/130
	no	0/26	35/130
Level of Education	high school or less	10/26	72/130
	university, technical, etc.	16/26	58/130
Religious Denomination	Protestant	14/26	71/130
	Catholic	7/26	42/130
	Other	5/26	17/130
Occurrence of a mentally retarded relative	none	21/26	109/130
	sib or offspring	1/26	3/130
	other relative	4/26	18/130
Family size	first child	8/26	10/130
	2 or 3 children	14/26	71/130
	4 or more children	4/26	49/130

Despite the fact that during the study period testing was available locally in Halifax and not in Fredericton, there was no difference in the percentage of women tested between the two cities.

The questionnaire responses for the older women are tabulated in Table II.

The relationship of each of the factors with a decision regarding amniocentesis was tested separately. Then, the interrelationships were measured in a series of multiway tables using the BMDP77 statistical routine P3F.[5]

The relationships are summarized in Figure 1. It was found that maternal age, attitude toward abortion of an abnormal fetus, awareness of the availability of amniocentesis and the number of previous children directly influenced whether or not amniocentesis was carried out. Education and religious denomination seemed to have an indirect influence.

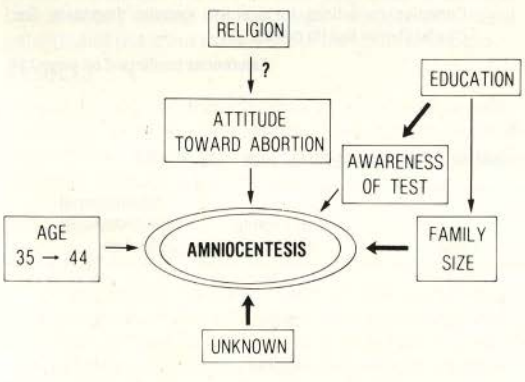

Fig. 1 Factors Influencing decision regarding amniocentesis for women ≥35 years (→ indicates probability .01<p<.05,➡ indicates p<.01).

Older women having their first child were more likely to have amniocentesis (44%) than those having a second or subsequent child (13%).

Patients were asked whether they would *consider* termination of a pregnancy if it were known that the baby would be seriously handicapped. In the total group of older women 67% (104/156) indicated they would consider pregnancy termination. Of those tested, 92% (24/26) would consider this option compared with 62% (80/130) who did not have testing.

Comparison Group

The 25-year-old comparison group who were not eligible for amniocentesis were given the same questionnaire. No significant difference was found in the proportion of women who would consider abortion of an abnormal fetus between the two age groups.

Awareness about amniocentesis and the sources of information for the two age groups is illustrated in Figure 2. Significantly more of the older women (77.6%) were aware of the availability of amniocentesis than of the younger women (59.1%). These percentages probably overestimate the useful knowledge about prenatal testing because many patients indicated awareness due to having amniocentesis for measurement of fetal maturity and did not fully comprehend the implication of prenatal diagnosis.

Many people indicated several sources of information such as radio, TV and magazines. Responses were classified as "doctor" if a doctor were mentioned, regardless of whether or not other sources were also indicated. This does not necessarily imply that the test was specifically discussed with the woman's physician during her most recent pregnancy. Of the 26 women who were tested, 9 did not mention a doctor as one of their sources of information. However, the data suggest that the difference between awareness in the two age groups may be attributed to a conscious effort by physicians to inform their patients in the over 35 year age group about amniocentesis.

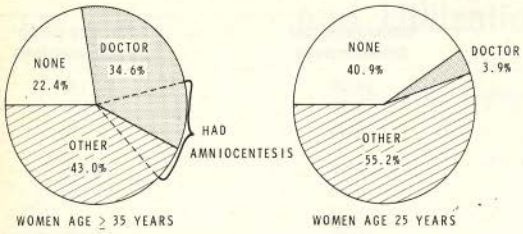

Fig. 2 Sources of information about amniocentesis.

Current Prenatal Diagnosis Service Utilization in the Maritime Provinces

The number of women tested because of maternal age has increased dramatically in the past four years. (Table III) Yet, in 1981 only 15% of those women eligible on the basis of maternal age were actually tested.

The information presented is based on the numbers of amniotic fluid samples sent to the Cytogenetics Laboratory of the IWK Hospital in Halifax only. It is possible that a few women have been tested elsewhere.

Analysis of the geographical distribution of the women tested indicates that utilization in rural areas is lower than urban area.

DISCUSSION

The proportion of urban women ≥35 years who actually had amniocentesis during the study period was about 15%. A similar study in Montreal in 1979 indicated that about 30% were tested.[6]

Awareness of the availability of prenatal testing is an obvious prerequisite for amniocentessis. In a survey conducted in two Maritime urban centres 1977-1979, it was found that 22.4% of women aged 35 or older at the time of delivery were not aware of the possibility of prenatal testing by amniocentesis. Six from a total of 28 women aged ≥40 years had not heard of prenatal diagnosis from any source at the time of delivery. Because of concern about creating anxiety among the postpartum women, it was not possible to determine what proportion of women in the study were actually offered testing during their pregnancy.

An important factor, though not necessarily a prerequisite, is the patient's attitude towards abortion if an abnormality were detected. Information from this study indicates that about two-thirds of the women surveyed would consider termination of pregnancy if an abnormal fetus were detected. In response to a similar question, Lippman-Hand and Piper found that 70% of the women they surveyed in Montreal would consider abortion if the fetus were abnormal.[6]

Experience in our prenatal diagnosis clinic suggests that fear of miscarriage or damage to the fetus and/or pain for the mother may be major factors in deciding whether or not to have amniocentesis. Low utilization of prenatal testing may also be related to the fact that the results are generally not available until about the 19th week of pregnancy.

In a few instances, unusual circumstances may determine whether or not amniocentesis was performed. For example, in our study, three women had had amniocentesis in a previous pregnancy but not during the most recent one. One of these patients requested repeat testing, but because she had an anterior placenta, her obstetrician advised against it. Another patient had had a spontaneous abortion following amniocentesis in a previous pregnancy. The third patient had recently moved from Ontario and apparently did not know that testing was available in Halifax!

From the information available now, we can anticipate a steady increase in the demand for prenatal testing. If less invasive methods of performing fetal chromosome analysis become available, the increase will be even more dramatic. In the meantime, it is important that women be provided with adequate information to allow them to make a decision about amniocentesis. This implies that laboratory, ultrasound and counselling facilities must be carefully planned in order to be able to provide appropriate services. □

ACKNOWLEDGEMENTS

Survey coordinators were Jennifer Hill and Margaret Jones. Dr. J.P. Welch assisted with the design of the study. Dr. L.C. MacLean performed the statistical analyses. The cooperation of the staff of the Dr. Everett Chalmers Hospital, Fredericton, and of the Grace Maternity Hospital, Halifax, is gratefully acknowledged.

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References continued on page 128.

TABLE III

NUMBER OF WOMEN TESTED BY AMNIOCENTESIS BECAUSE OF MATERNAL AGE ≥35 YEARS

Year	Resident of N.S.	Resident of N.B.	Resident of P.E.I.	Total	% of Eligible Tested**	Chromosomal Abnormalities Detected
1978	31	18	2	51	5.7%	2
1979	61	27 (4)*	6	94	10.5%	0
1980	75	38 (22)*	4	117	13.1%	1
1981	87	42 (25)*	7 (1)*	136	15.2%	3

*Numbers in brackets indicate the number of women tested in N.B. or P.E.I. All others had amniocentesis in Halifax.
**Calculated from estimates of total live births to women ≥35 years in the three provinces.

Legionnaires' Disease

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ABSTRACT

Sixteen cases of Legionnaires' disease were diagnosed in Halifax over a 30 month period. There was no geographic clustering and, except for one case, no exposure to known endemic areas. Thirteen patients had a severe, progressive, febrile pneumonic illness; three patients had diarrhea initially and six had an acute brain syndrome, one of whom became comatose and never recovered.

The diagnosis was confirmed serologically in 14 cases and *Legionella pneumophila* was isolated from three patients and demonstrated in lung tissue from an additional two patients by a direct fluorescent antibody technique. Fourteen patients were treated with erythromycin and thirteen were cured — the other patient progressively deteriorated and died. Three patients required assisted ventilation during the course of their illness.

INTRODUCTION

Legionnaires' disease was unknown until 1976 when 182 persons, who had attended the American Legion Convention or three other conventions in Philadelphia, became ill with a febrile pneumonic illness.[1] One hundred and forty-nine of the 182 had attended the State American Legion Convention — attack rate of 4 per cent.[1] An intensive epidemiological and laboratory investigation by the Centers for Disease Control resulted in the isolation of a new organism, *Legionella pneumophila*.[2] Analysis of stored serum samples and subsequent prospective studies revealed that this organism has been responsible for a spectrum of clinical illnesses ranging from a non-pneumonic, mild, self-limited, febrile illness (Pontiac Fever)[3] to a severe multi-system disease with predominant progressive pneumonia (Legionnaires' disease).[2,4,10]

Over the past 30 months we have diagnosed 16 cases of Legionnaires' disease. In this paper we describe these patients and relate our experience to that of other centers.

RESULTS

Table I gives the characteristics of all 16 patients with Legionnaires' disease. The case histories of seven of these patients are detailed below to illustrate the clinical spectrum of this illness.

CASE REPORTS

Case 1: (Patient 3 in Table I)

This 68 year old male with history of cigarette smoking (40 pack years), and ethanol abuse, was admitted in June 1979, with a three day history of a flu-like illness, sore throat and rhinorrhea. He subsequently developed anorexia, weight loss, chills, fever and a productive cough. His temperature was 39.5°C with signs of pneumonic consolidation over the right lower lobe confirmed by chest radiograph. His admission laboratory data included a leukocyte count of 17.1 × 10^9/l; ESR — 98 mm/hr; pO_2 58 torr on room air, and a serum inorganic phosphate of 0.54 μmol/L (normal 0.7-1.3).

Over the next seven days there was clinical deterioration with continued fever (Figure 1), tachypnea, hypoxemia and delerium in spite of therapy with penicillin, and later cephalothin, cloxacillin and gentamicin. Chest radiographs showed diffuse progressive involvement of the entire right lung and the development of an infiltrate in the left lower lobe (Figure 2 left). A lumbar puncture was normal. Erythromycin gluceptate 1 gm IV q.6.h was started. His temperature settled four days later but he continued to have progressive leukocytosis 40.5 × 10^9/L and elevation of liver enzymes. These subsequently reverted to normal. There was clearing of the chest radiographic features, leaving residual fibrotic changes and loss of volume of right lung (Figure 2 — right).

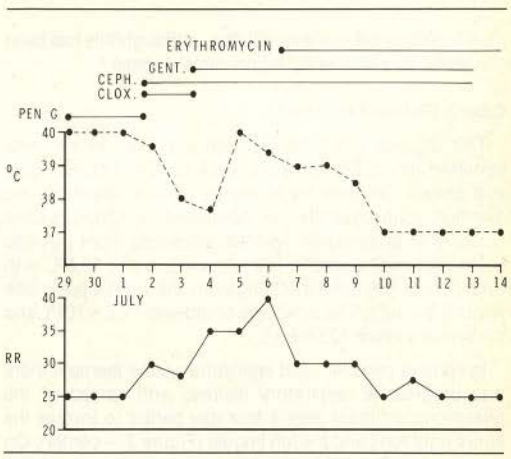

Fig. 1

Highest daily oral temperature and respiratory rate — Case 1. Pen G — penicillin G; clox — cloxacillin; ceph — cephalothin; gent — gentamicin.

Erythromycin was continued for three weeks and the patient was discharged after five weeks in hospital. Indirect fluorescent antibody (IFA) titres against *L. pneumophila* were 1:64 (acute) and 1:1024 (convalescent).

Comment

This patient, who was a smoker and an alcoholic, is the type of individual who seems to be at greater risk for Legionnaires' disease.[7] The initial hypophosphatemia may

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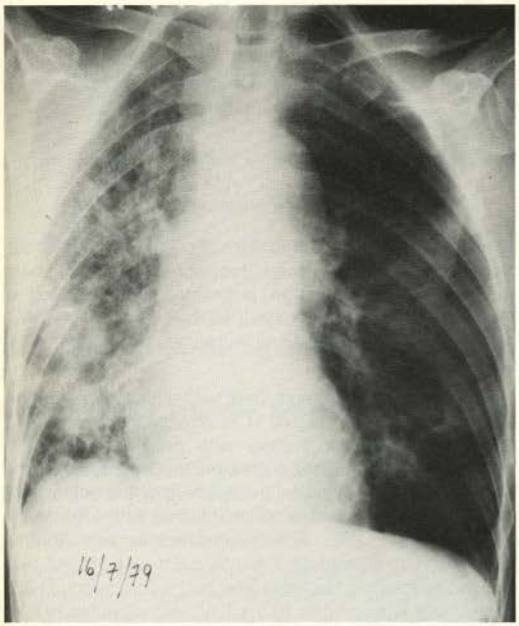

Fig. 2

Left — chest radiograph, Case 1, taken on the eighteenth hospital day. The entire right lung is involved by the pneumomic process. there is also an infiltrate involving the left lower lobe.

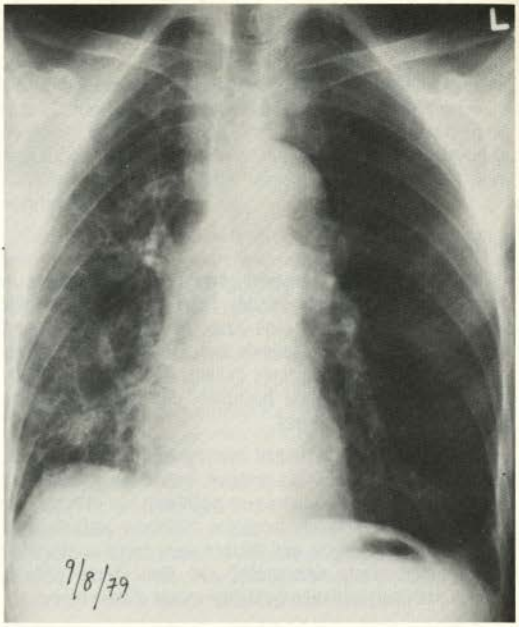

Fig. 2

Right — the pneumonic process, including the right lung has cleared. There is residual fibrosis and loss of volume.

have been related to his alcoholism, although this has been suggested as a feature of Legionnaires' disease.[4]

Case 2: (Patient 4 in Table I)

This 32 year old male, non-smoker, non-drinker, was admitted July 1979, with a one week history of chills, rigors and sweats, followed by anorexia, nausea, vomiting and diarrhea. Subsequently he developed a nonproductive cough with progressive dyspnea, wheezing, right pleuritic chest pain and headache. His temperature was 39.5°C with evidence of pneumonic changes in the right upper lobe (Figure 3 — left). The leukocyte count was 17.2×10^9/L and the serum sodium 123 mEq/L.

In spite of penicillin and later tetracycline therapy, there was progressive respiratory distress with spread of the pneumonic infiltrate over a four day period to involve the entire right lung and the left lingula (Figure 3 — center). On the sixth hospital day further progression of the pneumonia was evident (Figure 3 — right) and assisted ventilation was required. Erythromycin gluceptate 500 mg I.V. q.6.h. was started with reduction in temperature after eight days and improvement in the pneumonic process allowing extubation. A normochromic normocytic anemia and elevated liver enzymes developed. He was discharged after 22 days in hospital. IFA titres against *L. pneumophila* were 1:64 (acute); 1:64,000 (convalescent).

Comment

This was an otherwise healthy young male who developed gastrointestinal symptoms prior to onset of respiratory symptoms. He was one of three patients in our series who required assisted mechanical ventilation. The

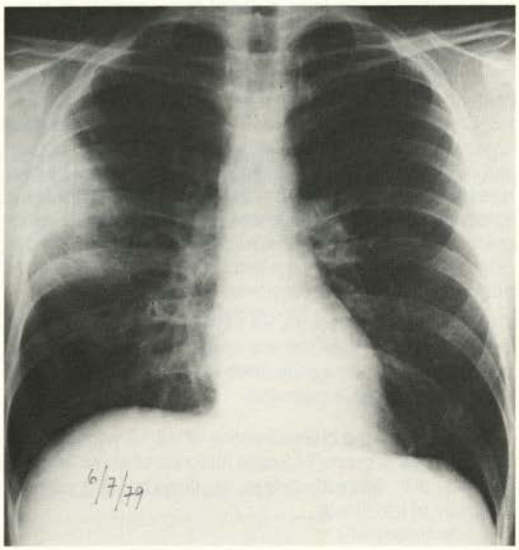

Fig. 3

Left — chest radiograph, Case 2. Note the pleural based infiltrate involving the right upper and lower lobes.

initial hyponatremia is unexplained, but may have been due to inappropriate secretion of antidiuretic hormone.[4,5]

Case 3: (Patient 5 in Table I)

This 40 year old male was admitted in July 1979, following a two week history of right pleuritic chest pain,

TABLE I

CHARACTERISTICS OF 16 PATIENTS WITH LEGIONNAIRES' DISEASE DIAGNOSED IN HALIFAX N.S. FROM JUNE 1979 TO JANUARY 1982

PT	Age	Sex	Underlying Disease	Smoker	No. of Days symptomatic P.T.A.	No. of days in hospital	Antibiotics	No. of days to become Afebrile after institution of Erythromycin	No. of days to complete clearing of chest Radiograph	White blood cell count on admission to a hospital $\times 10^9/L$	PO_2 (Torr) Inspiring Room Air	I.F.A. Titres L. Pneumophila Serogroups I-IV (Reciprocal) Acute phase	Convalescent	Other
1.	37	M	alcoholism	yes	6	14	erythromycin	3	35	12.2	60	64	1024	acute brain syndrome
2.	65	M	alcoholism hypertension diabetes mellitus	yes	6	15	erythromycin	9	120	21.0	51	256	>2048	acute brain syndrome
3.	68	M	alcoholism	no	3	36	penicillin G cloxacillin cephalothin erythromycin	4	50	17.1	58	64	1024	acute brain syndrome
4.	32	M	none	no	6	22	penicilin G tetracycline erythromycin	9	72	17.2	59	64	64,000	hyponatremia, assisted ventilation required for 8 days
5.	40	M	none	no	10	26	penicillin trimethoprim-sulfamethoxazole cephalothin erythromycin	11	90	2.8	73	64	32,000	hepatitis
6.	19	M	sequestered left lower lobe	no	?	33	none	—	—	14.9	99	64	>1024	Legionella demonstrated in resected lung tissue by direct immunofluorescence (DFA)
7.	65	F	alcoholism	no	0	45	cloxacillin erythromycin gentamicin	45+	45+	17.8		64	≥1024	coma; asssisted ventilation required; probably noscomial; fatal; legionella demonstrated in lung tissue at post-mortem by DFA; secondary infection
8.	42	F	none	yes	6	8	erythromycin	2	40	6.0		256	256	concomitant *Chlamydia trachomatis* infection; acute brain syndrome
9.	56	M	renal failure	yes	0	28	erythromycin	2	26	8.5	57	<64	<64	*L.pneumophilia* serogroup 1, isolated from lung biopsy specimen; nosocomial
10.	47	M	renal allograft rejection	no	0	27	erythromycin	1	7	7.1	62	<64	<64	*L.pneumophilia* isolated from lung biopsy specimen; nosocomial
11.	48	F	scleroderma	no	0	76	erythromycin	5	45	25.0	71	<64	512	nosocomial
12.	64	F	Ca.of breast	no	10	15	penicillin G gentamicin	4	20	13.8		64	256	acute brain syndrome
13.	76	F	ischemic heart disease	no	1	20	penicillin G gentamicin erythromycin	2	n.a.	27.1	68	<64	512	
14.	56	F	none	yes	18	41	erythromycin ticarcillin amikacin	18	>80	11.7	52	64	>1024	*L.pneumophilia* isolated; assisted ventilation required; secondary infection
15.	55	M	none	no	7	15	cloxacillin gentamicin erythromycin	4	30	11.3	67	<64	128	
16.	43	M	post renal transplant-ation	no	0	41	erythromycin	2	21	20.0		<64	512	nosocomial

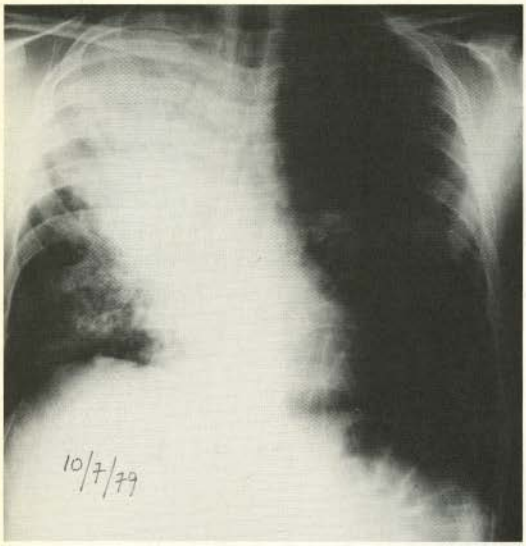

Fig. 3

Center — four days later there is a dense infiltrate involving the right upper lobe. The right middle lobe and a portion of the right lower lobe are also involved.

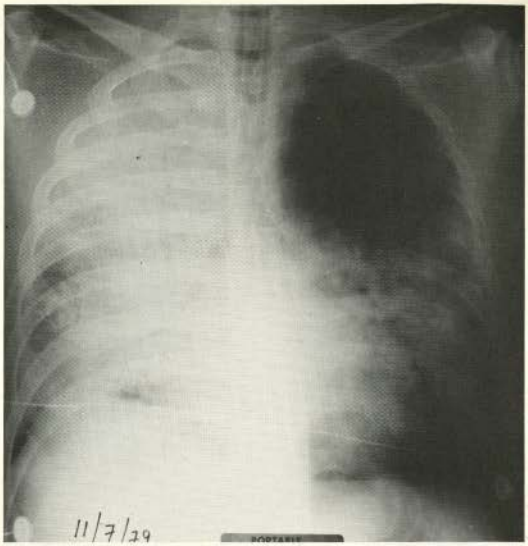

Fig. 3

Right — a chest radiograph one day after the center one showing further progression to involvement of the entire right lung, and also involvement of the left.

malaise, fatigue, poor concentration and myalgia. He later developed chills, fever, a nonproductive cough and mild diarrhea. There was no response to antibiotic therapy which included penicillin trimethoprim-sulfamethoxazole, cephalexin and tetracycline. He was a consultant engineer and had made numerous trips to Indianapolis, the most recent being two months prior to admission. At that time he developed a mild flu-like illness.

On examination his temperature was 38.5°C and clinical and radiographic signs of right upper and middle lobe pneumonia were present. Serial chest radiographs showed progression of the pneumonia to involve the right middle lobe (Figure 4 - left and centre). The leukocyte count was 2.8×10^9/L and a normochromic normocytic anemia was present. The ESR was 139 mm/hr and the liver enzymes were elevated (Table II). Erythromycin gluceptate 500 mg I.V. q.6.h. was started with clinical improvement, and after 11 days treatment he was afebrile. The leukopenia and elevated liver enzymes persisted (Table II). Erythromycin was discontinued after 18 days and the patient discharged after a three week hospital stay.

He was readmitted two weeks later with right upper quadrant pain, chills, fever and continued anemia, leukopenia and elevated liver enzymes (Table II). A chest radiograph showed almost complete resolution of the pneumonic process. A liver biopsy revealed nonspecific hepatitis. His symptoms disappeared without further therapy and he was discharged on the 12th hospital day; however his liver enzymes were still elevated when seen as an outpatient 77 days after his initial admission. A chest radiograph just prior to this showed complete resolution of the pneumonia and a small residual area of fibrosis (Figure 4 - right). IFA titres were 1:64 (acute); 1:32,000 (convalescent). Hepatitis B antigen and antibody were negative as were the Epstein-Barr and *Cytomegalovirus* titres.

TABLE II

LABORATORY DATA — CASE 3

	1st Admission		2nd Admission		Out-Patient Visit
	31/9/80-16/8/80		3/9/80-13/9/80		13/10/80
WBC × 10^9/L (4.5-10.5)	3.8	3.8	2.9	3.0	3.9
Percent PMN's	73		77	48	
Total bilirubin μmol/L (0-16)	35	14	22	10	10
Direct bilirubin μmol/L (0-4)	8	7	7	4	3
SGOT U/L (8-29)	38	50	73	73	187
SGPT U/L (1-41)	55	65	132	115	376
Alkaline phosphatase U/L (30-104)	243	240	183	163	182
LDH U/L (117-259)	155	153	187	176	217

Comment

This patient had visited an area where Legionnaires' disease was endemic (Indianapolis). He was the only patient in our series with leukopenia and he had persistent elevation of his liver anzymes.

Case 4: (Patient 2 in Table I)

This 65 year old male was admitted in December 1979 with a six day history of a flu-like illness, followed by vomiting for one day and a persistent cough with progressive dyspnea and headache. There was past history of renovascular hypertension with right nephrectomy, and

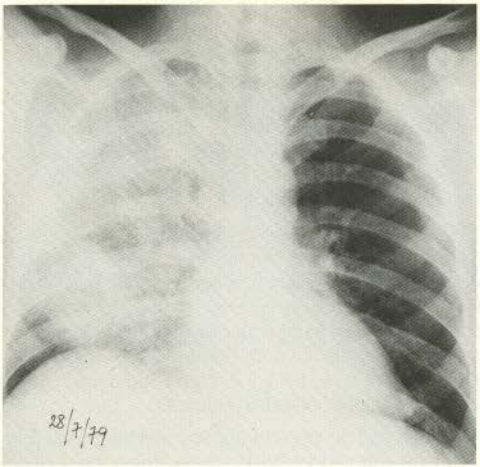

Fig. 4

Left — Case 3, chest radiograph obtained at the time of his first admission. The entire right lung is involved by a dense infiltrate.

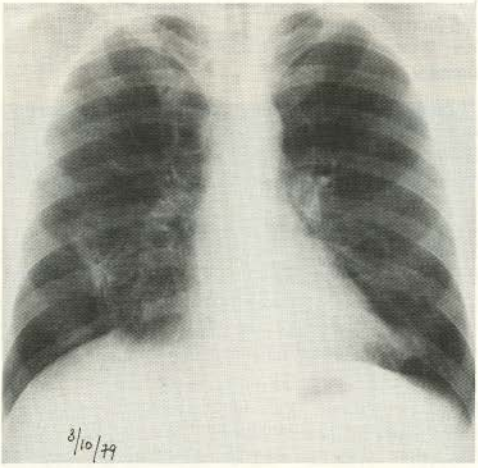

Fig. 4

Right — a chest radiograph obtained sixty-seven days after the onset of symptoms. The pulmonary infiltrate on the right has resolved leaving a small area of residual fibrosis.

alcohol abuse. His temperature was 40°C with a respiratory rate of 46 and signs of pneumonia involving the right and left upper lobes. The leukocyte count was 21 × 10^9/L with an inorganic phosphate of 0.62 mmol/L (normal 0.7-1.3) and pO_2 of 51 torr on room air. A chest radiograph showed alveolar infiltrates in both upper lobes.

Erythromycin gluceptate 500 mg. I.V. q.6.h. along with cloxacillin 2 g q.4.h. I.V. were started initially and, when blood cultures were negative, the cloxacillin was discontinued. His course was complicated by acute delerium, unresponsive to thiamine, lasting ten days with amnesia which persisted for an additional week. A CT scan and a lumbar puncture were normal. In addition, there was marked hyperglycemia requiring exogenous insulin therapy; and bleeding from the upper gastrointestinal tract. He became afebrile on the ninth day of erythromycin therapy

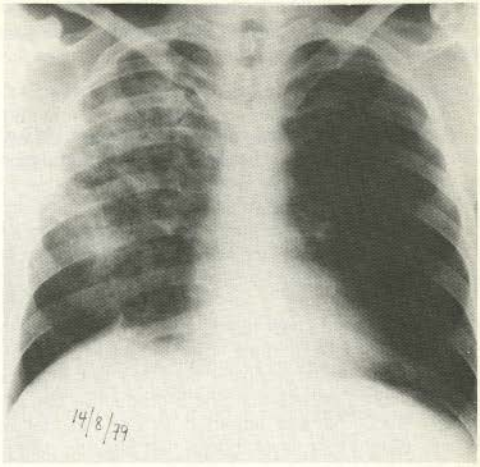

Fig. 4

Centre — chest radiograph obtained seventeen days after the one on the left and following completion of a course of erythromycin. Considerable clearing of the infiltrate has occurred.

and was discharged on the 15th hospital day. The pneumonic infiltrates cleared slowly over a period of 20 days. Residual fibrotic changes were evident. IFA titres were 1:64 (acute) and >1:2048 (convalescent).

Comment

This man with underlying cardiovascular disease, alcoholism, and latent diabetes mellitus had a complicated illness. The acute changes in sensorium may have been multifactorial in nature including hypoxia, toxemia, alcohol withdrawal and changes in cerebral vasculature due to hypertension. The long time required for radiographic clearing of the pulmonary infiltrates is noteworthy.

Case 5: (Patient 7 in Table I)

This 65 year old female was admitted in transfer from another hospital in January 1980, because of fever, cough and increasing respiratory distress eight days after a cholecystectomy. Her past history included hypertension and ethanol abuse. On examination there was marked cyanosis with a respiratory rate of 45 and signs of bilateral pneumonia along with congestive heart failure. The leukocyte count was 17 × 10^9/L and the pO_2 of 60 torr while receiving 35% oxygen by mask. A chest radiograph showed infiltrates in entire left lung and right upper lobe and pulmonary edema. There was continued deterioration requiring endotracheal intubation and assisted ventilation. Despite multiple antibiotic therapy including penicillin, gentamicin, and erythromycin, deterioration continued and she became comatose after 20 days in hospital. A CT scan and the cerebrospinal fluid were normal. Acute renal failure supervened and death occurred 45 days after admission. Post mortem examination revealed bilateral confluent pneumonia with multiple abscesses and hemorrhage. Direct FA staining of the lung tissue for *L. pneumophilia* was strongly positive. IFA titres were <1:64 (acute) and >1:1024 (convalescent).

Comment

This was the only fatal case in our series. She was

probably incubating the infection at the time of her surgery. No anatomic neurologic lesion was evident at autopsy to explain the coma.

Case 6: (Patient 6 in Table I)

This 19 year old male became ill in November 1979 with anorexia, nausea, fatigue, headache, sweats and dyspnea one day following a stab wound to the wrist. He then developed chills and fever with signs of pneumonic process in his left lung. A chest radiograph showed evidence of a left lower lobe infiltrate. Following a short course of tetracycline, there was symptomatic improvement but, one week later, left pleuritic pain and a severe nonproductive cough developed. A repeat chest radiograph showed persistence of the left lower lobe infiltrate. Over the next two months, the above symptoms gradually subsided but there was residual dyspnea on exertion and a productive cough. In February 1980, he was admitted to our hospital with anorexia, weight loss, fever, cough, left pleuritic pain and arthralgia. His temperature was 37°C and there were signs of pneumonic consolidation in left lower lobe, and an infiltrate was demonstrated radiographically (Figure 5). The leukocyte count was 9.8×10^9/L and the pO_2 was 99 torr while breathing room air. The pulmonary lesion was diagnosed as intralobular pulmonary sequestration and he underwent surgical resection of this area with relief of symptoms. IFA titres against *L. pneumophila* were 1:64 (acute) and >1:1024 (convalescent). *L. pneumophila* was demonstrated in the resected pulmonary tissue using a direct fluorescent antibody technique.

Comment

This patient's infection in November was not due to *Legionella* since his antibody titre at the time of admission to our hospital in February was 1:64. His antibody titre rose to >1:1024 while he was being investigated in hospital and *L. pneumophila* was demonstrated in the resected lung. Undoubtedly this infection would have been missed if we had not been studying all patients with atypical pneumonia. This case demonstrates one end of the spectrum of clinical presentations of infection with *Legionella pneumophila.*

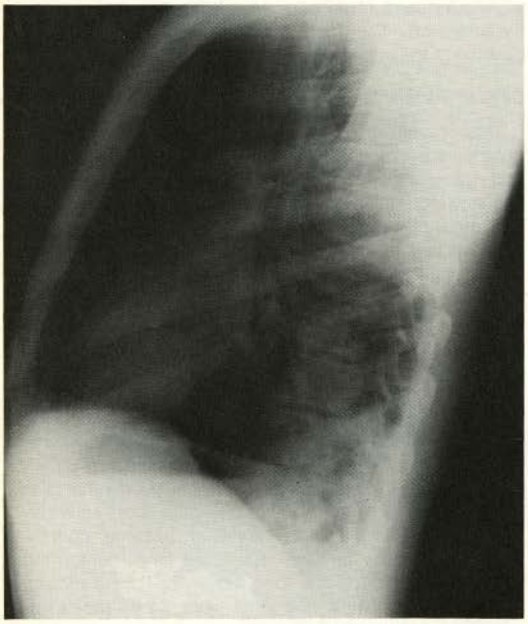

Fig. 5

Lateral chest radiograph, Case 6, showing an infiltrate involving the posterior segment of the left lower lobe.

Case 7: (Patient 12 in Table I)

This 64 year old female was admitted in November 1980 with a ten day history of fever, chills, anorexia followed by nausea and diarrhea after started on antibiotics. Six days later there was fever, nonproductive cough, confusion and disorientation. Her temperature was 38.7°C with signs of pneumonic lesions in both lower lobes. The leukocyte count was 13.8×10^9/L. A chest radiograph showed bilateral lower lobe infiltrates (Figure 6).

Penicillin and gentamicin therapy was begun with return of the temperature to normal. On day three the gentamicin was discontinued and penicillin only was continued for two weeks. The pulmonary infiltrates cleared in 20 days. Her course was complicated by the indentification of a carcinoma in the right breast requiring a mastectomy after the pneumonia had resolved. IFA titres were 1:64 (acute); 1:256 (convalescent).

Comment

This patient demonstrates that some patients with community acquired pneumonia may have a mild illness due to infection with *L. pneumophila*. The condition may mimic pneumococcal pneumonia and may seem to respond to penicillin therapy.

DISCUSSION

Infection with *Legionella pneumophila* can result in asymptomatic seroconversion, fever without pneumonia (Pontiac fever) or a pneumonic illness of varying severity as exemplified by the selected case reports of our patients.

Pontiac fever is a mild influenza-like illness with a high attack rate (95%) and no mortality.[6] Legionnaires' disease[4,5,7,8,10] is predominantly a pneumonic illness, but other organ systems may be affected. The incubation period ranges from 2-10 days. This infection has been reported in three settings:

a) Epidemic pneumonia with low attack rate (<5%) and a high case-fatality ratio.[1]

b) Hospitalized patients, most of whom have predisposing factors.[5]

c) Sporadic cases.[11,12]

The organism is widespread in nature, having been isolated from soil (which may be its natural habitat), streams, lakes, cooling towers, steam turbines and even hospital shower heads.[13] Transmission appears to be airborne or by aerosol with inhalation of the organism; and proximity to sites of excavation or construction may be risk factors.[14] No person to person spread has been documented. Most epidemics have occurred during the summer months, while sporadic cases occur throughout the year. There seems to be a definite predilection for males with a

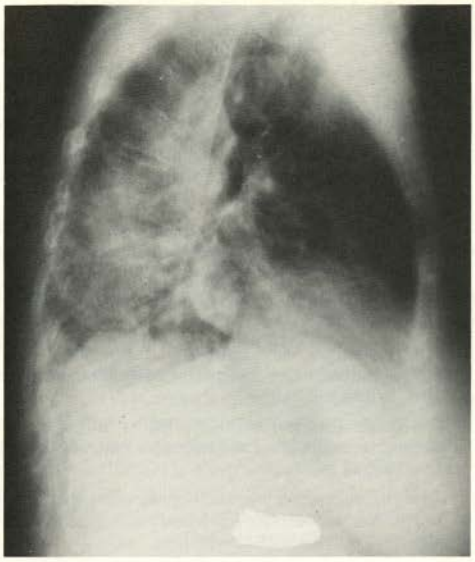

Fig. 6

Right — left lateral chest radiograph showing the extent of the pulmonary infiltrates.

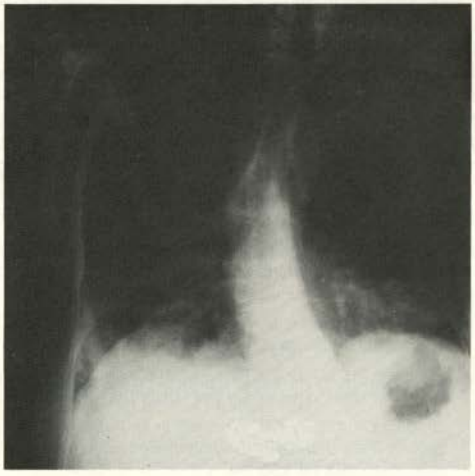

Fig. 6

Left — Case 7, posterior anterior chest radiograph showing bilateral basal infiltrates.

mean age incidence of 55 years, although it may occur at any age. (In our series there were 10 males and 6 females). Underlying chronic disease (diabetes mellitus, alcoholism, cardiovascular disease), smoking and immunosuppression (underlying malignancy, chronic renal failure with hemodialysis, corticosteroids or cytotoxic drugs) seem to carry an enhanced susceptibility to infection and an increased case-fatality ratio.[13]

On physical examination the patient may be acutely ill, febrile, and have marked respiratory distress and evidence of a pneumonic process. Relative bradycardia may occur. Confusion is common but focal neurological signs, even in the obtunded patient are unusual. Gastrointestinal bleeding, disseminated intravascular coagulation, respiratory failure, shock and renal failure may further complicate the picture.[5]

Our patients all had signs of a pneumonic process and respiratory failure requiring ventilatory assistance was evident in three patients, one of whom had progression to acute renal failure and death.

A mild to moderate leukocytosis (10,000-20,000/mm^3) with a shift to the left and an elevated sedimentation rate are usually present. Mild elevations of liver function tests occur.[5] Hyponatremia due to the syndrome of inappropriate antidiuretic hormone secretion occurs as in other types of bacterial pneumonia.[4,5] Hypophosphatemia has been noted frequently by some investigators.[5] In a previous study we found that hypophosphatemia occurred just as frequently in patients with atypical pneumonia of various known and unknown etiologies as it did in patients with Legionnaires' disease.[15] Nonspecific elevation of blood urea nitrogen, proteinuria and microscopic hematuria have also been reported in association with this disease. Arterial blood gases show hypocapnia and hypoxemia. Pleural effusions, when present, show the characteristics of an exudate or a transudate with predominance of polymorphonuclear cells and negative gram stained smears. Cerebrospinal fluid usually shows no abnormality.

No classic chest radiographic pattern has been described but, in most cases, initially there is a unilateral, diffuse, patchy infiltrate or poorly marginated round opacities centrally or peripherally.[5,8,16,17] Small, unilateral, pleural effusions may be present.[16] With worsening of the clinical state there is rapid radiologic progression to dense consolidation with multilobar and bilateral spread. Total opacification of an entire lung may be seen. Some patients have only unilateral involvement throughout. Lung abscess, cavitation or progression to adult respiratory distress syndrome have been reported but are unusual. Poorly marginated round opacities are most frequenlty seen.[15] Progression of radiographic changes was often seen in our patients for several days following institution of erythromycin therapy. In most of them, infiltrates cleared within two months; however three required three or more months and then there were residual changes of fibrosis and loss of lung volume.

A presumptive diagnosis and the selection of appropriate therapy must be made on the basis of clinical findings. The combination of a severe, progresssive, pneumonia characterized by a cough with minimal sputum production, clouding of the sensorium, diarrhea, leukocytosis and the absence of common bacterial pathogens on culture, should alert the physician to the possibility of Legionnaires' disease. This illness may be confused with other pneumonias caused by Mycoplasma, viruses (including influenza), with other infections such as Pneumocystis in the immunocompromised host, and even with pneumococcal pneumonia as demonstrated by our Case 7. Definitive laboratory diagnosis has been successful using various techniques, but is still difficult.[18] The available diagnostic tests are:

1. Culture of the organism from lung tissue, blood, pleural fluid and from respiratory secretions obtained by transtracheal aspiration, endotracheal suctioning or by bronchial washings.[9] Special culture media is necessary for growth of this microorganism.[2]

2. Demonstration of the organism by direct fluorescent antibody (DFA) staining of lung tissue, bronchial washings, transtracheal aspirates and sputum. This is one of the most rapid methods, is highly specific, but of low sensitivity.[19]

3. Indirect fluorescent antibody (IFA) titres. Demonstration of a fourfold rise in titre between acute and convalescent serum specimens or a single titre of ⩾1:256 is considered diagnostic.[18,20] The convalescent serum specimens should be collected up to six weeks after the onset of illness since some patients requrie this long to mount a fourfold rise in the antibody titre.[2,18,20]

A number of anitibiotics have shown activity against *L. pneumophila in vitro* but clinical studies support the use of erythromycin as the drug of first choice.[3-8] The recommended dosage is 2 to 4 gm/day, orally or intravenously, depending on clinical status of the patient. Rifampin is the most active agent against *L. penumophila in vitro* and shows additive or synergistic effects in combination with erythromycin. It should be reserved for use in patients who are unresponsive to erythromycin or who are immunosuppressed, and then should be used only in combination with eythromycin. The clinical response after institution of specific therapy is usually prompt with defervescence of the temperature in 3 to 4 days, but there has been a delay in some patients. Therapy should be continued for a minimum of three weeks — shorter courses being associated with relapse or prolonged convalescence. Supportive measures are necessary in the seriously ill patient with respiratory or renal failure or shock.

All of our patients except two (Nos. 6 and 12) received erythromycin therapy in the recommended dosages. Three of them had delayed responses requiring 8 to 11 days to become afebrile. Another patient in this group showed no response to therapy and progressed to death. One patient in the non-erythromycin group improved after resection of a sequestered lobe and the other seemed to improve spontaneously.

Four and perhaps five of our patients had nosocomial Legionnaires' disease. Many centres have reported nosocomial Legionnaires' disease and in some hospitals epidemics of nosocomial Legionnaires' disease have occurred.[21] Many aspects of the epidemiology of nosocomial Legionnaires' disease remain to be elucidated. However in some instances *Legionella pneumophila* in shower heads and potable water has been implicated.[22-24] In our experience, *L. pneumophila*is a common cause of atypical pneumonia in adults,[15] and erythromycin should be included in the treatment of patients seriously ill with community acquired pneumonia. □

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The Dalhousie Multiple Sclerosis Research Unit

P.R. Weldon,* R.N., B.N. and T.J. Murray,** M.D., F.R.C.P.(C),

Halifax, N.S.

Multiple sclerosis is the commonest serious neurological disease affecting young adults in Canada. It is estimated that 25,000 Canadians are affected with this disease. For reasons unknown, multiple sclerosis follows a broad band around the world, which shows more prevalence in the 40th latitude in North America and the 47th latitude in Europe.

Epidemiologic studies show that multiple sclerosis is more common in temperate climates. Areas in the world are designated high, medium and low risk areas, according to the number per one hundred thousand population. In excess of 40/100,000 is a high risk area, and this includes Western Europe, Switzerland northward, Northern United States and Southern Canada. Medium risk areas include Southern Europe, Southern United States and Australia. Low risk areas include Asia and Africa.

Halifax, Nova Scotia, is estimated to have 100 cases per 100,000 population. The high incidence of multiple sclerosis in Nova Scotia and the Atlantic Provinces led to the need for more research in this area. In January, 1980, a Research Grant was received from the Multiple Sclerosis Society of Canada to open a Research Unit in Halifax, under the Department of Medicine at Dalhousie University. Grants have been received annually since then to sponsor a research oriented unit with a large number of interrelating individuals and groups (Table I), with many research programs (Table II) and with responsibilities for investigation, management, education and research (Table III).

Referrals are received from New Brunswick, Prince Edward Island, Newfoundland and Nova Scotia. The large geographic area covered does create a few problems, however, we consider these growing pains and they are dealt with as they arise.

The basic objectives of the Unit are:

1. To develop and support research programs related to the cause and cure of multiple sclerosis;
2. To provide a large group of well-documented patients who agree to participate in various projects related to such multiple sclerosis research;
3. To maintain a close liaison with referring physicians and their consultants regarding treatment of patients being followed in the Unit;
4. To provide clinical support for various basic researchers in the area of multiple sclerosis;
5. To act as a resource for educational information for patients, families and physicians managing multiple sclerosis patients; and
6. To provide public education in relation to multiple sclerosis.

*Clinic Co-ordinator, Dalhousie M.S. Research Unit.

**Director, Dalhousie M.S. Research Unit, Dalhousie University, Halifax, N.S.

TABLE I

OPERATION OF THE UNIT

The Unit is staffed by:

Director (Neurologist)	— Dr. T.J. Murray
Coordinator (Registered Nurse)	— Pauline Weldon, R.N.
Secretary/Assistant	— Jean MacLean
Research Assistant	— Carol-Ann White

Collaborative Research Programs:

Department of Physiology/Medicine

- Dr. Martin Regan (Senior Researcher)
- Dr. Douglas Quine
- Mary Claire Quine
- Jo Beverley

Department of Urology

- Dr. S. Awad (Senior Researcher)
- Dr. R.D. Schwartz
- Dr. S. Sogbein

Departments available as resource personnel:

Dietary	Physical Medicine and Rehabilitation
Neurosurgery	Physiotherapy
Occupational Therapy	Social Work
Orthopedics	Urology
Pharmacy	

TABLE II

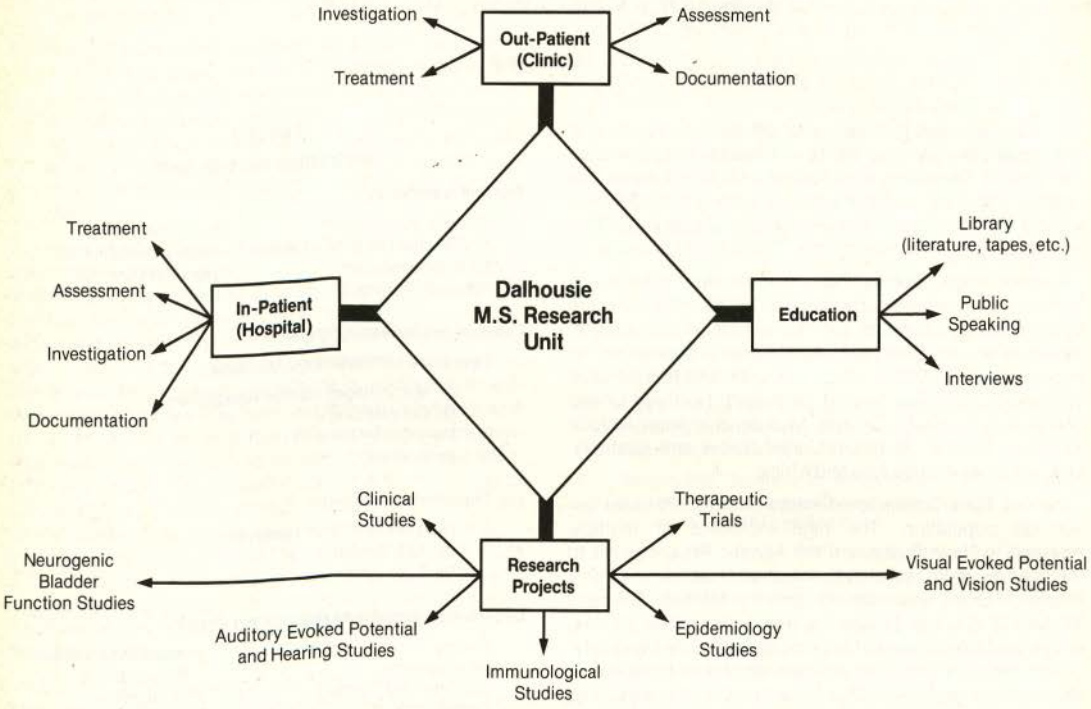
CURRENT RESEARCH PROGRAMS IN THE DALHOUSIE M.S. RESEARCH UNIT

Epidemiology of M.S. in Nova Scotia
Foci of Increased M.S. in Nova Scotia
M.S. in Various Occupations
M.S. in Children
M.S. in the Elderly
Contrast Sensitivity in M.S.
Auditory Adaptation in M.S.
High Dose Methylprednisolone in M.S.
M.S. and Cervical Spondylosis
Fatigue in M.S.
Bladder dysfunction in M.S. subtypes
Oligoclonal Banding in CSF of M.S. patients

The initial contact with patients to be involved in a research project is made by the Co-ordinator of the Unit. If they agree to participate their names are submitted to the researcher and then final arrangements are made for testing. In some instances only information or blood samples may be required by the researcher.

TABLE III

ORGANIZATION CHART OF THE DALHOUSIE M.S. RESEARCH UNIT



All research projects involving human participants at Dalhousie University must be approved by an Ethics Committee. All projects are therefore ruled ethically sound before volunteers are approached. The individual researchers explain their particular project to the volunteer, each having his own consent form to be signed.

TABLE IV

CLASSIFICATION OF THE PATIENTS EVALUATED IN THE DALHOUSIE M.S. RESEARCH UNIT.

	Male	Female	No.	%
Possible	8	17	25	12.5%
Probable	10	14	24	12.1%
Definite	45	95	140	70.4%
Not M.S.	3	7	10	5.0%
TOTAL	66	133	199	100%

Research into multiple sclerosis requires volunteer patients. Good documentation on these patients is essential. This extensive documentation determines the status, history of illness, family history, disability scales and any other questions currently being investigated. Initial documentation is done by the Co-ordinator of the Unit with the help of the patient. A neurological examination by the neurologist involved in the Unit determines the level of disability of the patient. The information is updated at each Clinic appointment and the disability scale is also kept current. It is intended to follow each patient in Clinic at least once a year. Patients who wish to take part in some activities of the Unit but are being followed by another neurologist in private practice will have their file updated by letter and periodic visits with the Clinic Co-ordinator.

Patients are accepted to the Unit on a referral basis from their family physician or consultant if (1) a patient is suspected or has definite multiple sclerosis and the family physician requests an assessment; or (2) a multiple sclerosis patient agrees to participate in research projects of the Unit.

TABLE V

DOMICILE OF THE PATIENTS EVALUATED IN THE DALHOUSIE M.S. RESEARCH UNIT.

	N	%
Nova Scotia	159	79.9
New Brunswick	27	13.6
Newfoundland	2	1.0
P.E.I.	10	5.0
Ontario	1	0.5

TABLE VI

COMPARISON OF THE PROFILE OF MULTIPLE SCLEROSIS PATIENTS SEEN AT THE DALHOUSIE M.S. RESEARCH UNIT, CONTRASTED WITH SIMILAR DATA FROM PHOENIX, ARIZONA AND LONDON, ONTARIO.

	Nova Scotia	Arizona	Ontario
Number of Patients	206	146	146
Mean Age	41.85 yrs.	48.7 yrs.	42.25 yrs.
Mean age onset M.S.	28.78 yrs.	29.6 yrs.	30.23 yrs.
Sex - Female	137 (66.5%)	85 (58%)	103 (71%)
- Male	69 (33.5%)	61 (42%)	43 (29%)
Duration of M.S.	13.07 yrs.	19.4 yrs.	13.0 yrs.
Mean Kurtzke DSS score	3.21	5.0	4.0
Rate of Progress of M.S.	.25 Kurtzke DSS/Year	.26 Kurtzke DSS/Year	.31 Kurtzke DSS/Year
Family History of M.S.	20.10%	14.5%	10.2%

A letter from the referring physician, containing a brief history and pertinent problems, is required prior to the first appointment. Following the clinic assessment by the neurologist, a consultation letter is forwarded to the family physician with recommendations for follow-up care and explanations about any current research being carried out in the Unit. We hope to promote the idea that it is the family physician and not the Unit who will tend to their on-going care, although the Clinic personnel are available for any problems or questions that arise. This is especially important because of the geographical area being covered. In most cases the family practitioners have shown a continuing interest in their patient's treatment and consult the Director of the Unit by phone when questions arise.

A library containing current books about multiple sclerosis and literature printed by the M.S. Society is available, through the Unit, to patients, families and medical personnel.

The Director and Clinic Co-ordinator have taken part in speaking engagements as time permits. These presentations have been given to medical personnel caring for multiple sclerosis patients as well as to the various Chapters of the M.S. Society of Canada in the Atlantic Region. The general public has been informed by means of displays set up in hospitals and nursing homes, newspapers, as well as radio and television interviews.

The first three years of The Dalhousie M.S. Research Unit operation have been exciting and active, and the research programs and participating researchers continue to increase. We are grateful to the patients who give so generously of their time, and to the family practitioners, neurologists and other physicians who have been so cooperative in assisting in these research programs. □

The Dalhousie Multiple Sclerosis Research Unit:
WHY PATIENTS ATTEND

Carol-Ann White,* M.Ed.,

Halifax, N.S.

Multiple sclerosis (M.S.) is the most common serious neurological disease of young adults, affecting an estimated 25,000 persons in Canada. A study by Allison and Alter (1959) indicated a prevalence rate in Halifax of 32 cases of multiple sclerosis per 100,000 population but current estimates are at leaset 100 cases per 100,000 population, or about 900 cases in Nova Scotia.

BACKGROUND TO THE DALHOUSIE M.S. RESEARCH UNIT

The high incidence of multiple sclerosis in Nova Scotia and the Atlantic Provinces has led to the need for a research unit and clinic to carefully document patients with this problem and to carry out research programs. The Dalhousie M.S. Research Unit was established in January 1980, to fill this role, with a grant from the Multiple Sclerosis Society of Canada. The Research Unit is located at Dalhousie University with administration of the Unit from the Clinical Research Centre. The M.S. Clinic itself is located at Camp Hill Hospital. As well, other laboratories at Dalhousie University participate in projects in vision, physiology, visual evoked potentials, brain stem studies, hearing, bladder function and immunological reactions in M.S. patients.

The fundamental objective of the Research Unit is to develop and support research programs related to the cause and treatment of multiple sclerosis. Secondly, the Unit provides documentation of patients who have agreed to participate in research projects. Thirdly, it maintains close liaison with referring physicians and consultants regarding the treatment of patients being followed by the M.S. Clinic. And, fourthly, it acts as an educational resource for patients, families and physicians managing multiple sclerosis and for various public groups interested in the disease. Public education is an important responsibility of the Unit, and Unit Staff have functioned as resource people to community groups, local M.S. chapters, and to physician groups in the Maritimes.

Referrals to the Unit generally fall into three categories:

1. a patient who is suspected of having multiple sclerosis;
2. a patient who has been diagnosed already as having M.S. but a further assessment of the problem is requested;
3. an M.S. patient who has agreed to participate in research projects in the Unit.

Source of referral is usually the family doctor or the patient's neurologist. When a referral is made to the M.S. Clinic, it is requested that the referring physician send a letter outlining the patient's medical history and presenting problems. A consultation letter is forwarded to the referring physician with any recommendations for follow-up care, once the patient has been seen at the M.S. Clinic. It is pointed out to the patient during the clinic appointment that the patient's continuing care is by the physician and not the M.S. Research Unit. The referring physician, however, is welcome to consult with the Clinic if any questions or concerns arise.

Most patients are seen on an annual basis although more frequent appointments are scheduled if the patient is involved in research projects including active treatment of M.S.

At present the Unit is involved in a number of research projects. Each patient who attends the Clinic, even if only once, contributes to research as initial documentation records valuable information on the status of the patient's illness, history of the problem in the past, family history and a neurological examination with classification of the disease and disability level. If the patient has agreed to participate in any other research projects in the Clinic the project is explained to the patient and a consent form signed.

Ongoing research includes studies on the epidemiology of M.S. in Nova Scotia, the prevalence and incidence of M.S. in various occupations and populations, therapeutic effects of high dose methylprednisolone, effects of M.S. on visual contrast sensitivity, effects of M.S. on different evoked potentials in the brain, and urodynamic studies in M.S.

THE STUDY

A preliminary study was carried out at the M.S. Clinic for a ten week period to investigate patients' expectations and reasons for their clinic appointment. Each patient was seen by a research assistant who explained informally the purpose of the study and requested the patient to complete a questionnaire. This included personal data and a list of expectations and reasons under the following areas: diagnosis, treatment, education and general. The patient was asked to identify those expectations and reasons that applied to his clinic appointment that day.

The total number of patients was 39. Eight of the patients required assistance in completing the questionnaire because of a moderately high disability level, associated with impaired vision or poor motor control.

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RESULTS

Table I summarizes the demographic data. Two-thirds (N=26) of the patients were from Nova Scotia, eight from New Brunswick and five from Prince Edward Island.

TABLE I

DEMOGRAPHIC CHARACTERISTICS

	N	Age in years		
		Mean ± S.D.	Median	Range
Male	12	42.2 ± 15.04	43.5	19 - 67
Female	27	38.7 ± 12.4	36	20 - 54
TOTAL	39	39.8 ± 13.18	38	19 - 67

Out of the 22 possible expectations and reasons provided, ten patients identified only one expectation, 22 identified 2-5 expectations and seven patients identified more than five expectations.

As shown in Table II the most common response (66%) was for a check-up, under the heading treatment. Other common responses in this area were "to be seen by a neurologist" and "assessment of a specific problem". Under the heading education the most frequent response (25.6%) was "information on new treatment" while under general the highest response level (46%) was "to ask questions".

Under diagnosis, two patients chose "cure for M.S." as an expectation when in fact there is no known cure at present. No patients expected that a previous diagnosis would be ruled out.

DISCUSSION

Although the M.S. Research Unit is located in Halifax it serves the Maritime Region with many referrals from outside the Halifax area. About twice as many women as men attend the Clinic which reflects the sex ratio of the occurrence of the disease.

The nature of the disease requires continued medical attention. It was expected that a common reason for a clinic appointment would be for a medical assessment and the data does support this. Relating to this were patients' responses indicating expectations of the neurologist in assessment of specific neurological problems related to M.S.

A significant number of patients viewed the clinic appointment as an opportunity to ask questions concerning new treatment, research on M.S. or personal adjustments to the disease.

It is a difficult task to assess patients' expectations at the M.S. Clinic and even more so to determine whether or not these expectations have been met. A very practical consideration is the time scheduled for Clinic appointments. For many patients considerable time, expense and even inconvenience have been involved in meeting appointments. Given these factors a high value has been placed on the clinic appointment.

TABLE II

EXPECTATIONS/REASONS FOR APPOINTMENT

	N	%
DIAGNOSIS		
for diagnosis	6	15.4
to confirm diagnosis	5	12.8
to rule out a diagnosis	0	0
TREATMENT		
for treatment	5	12.8
to be seen by a neurologist	9	23.1
treatment of a specific problem	7	17.9
for a cure of a neurological problem	2	5.1
check-up	26	66.7
investigation (visual tests, etc.)	4	10.3
assessment of a specific problem	9	23.1
medication change	5	12.8
assessment and management of an acute attack of neurological symptoms	4	10.3
EDUCATION		
explanation of specific problem	4	10.3
explanation of disease	5	12.8
information on research	7	17.9
information on new treatment	10	25.6
information for future planning	7	17.9
GENERAL		
contact with others with a similar problem	2	5.1
opportunity to receive assurance	6	15.4
opportunity to discuss personal problems	2	5.1
opportunity to discuss social adjustments	1	2.6
opportunity to ask questions	18	46.2

As well as meeting the primary requirement to carry out research, the M.S. Clinic attempts to meet the individual patient's needs. They are encouraged to ask questions during their visit and are advised to contact the clinic if questions arise at a later date. The patients involved in the study expressed interest in many aspects of the disease and with few exceptions appeared more than willing to cooperate in research to further the understanding of multiple sclerosis. □

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Dalhousie University's Kellogg Library

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Most readers of the *Bulletin* are probably aware of the existence of the W.K. Kellogg Health Sciences Library of Dalhousie University and many have used it as a source of information and continuing medical education. For those unfamiliar with the library, it occupies the first two floors of the Sir Charles Tupper Medical Building on College Street in Halifax. The total library holdings (books, journals, audiovisual material and microforms) are approximately 143,000, and we receive about 3000 current journal titles.

Although our primary responsibility is to the staff and students of Dalhousie University, we also serve health professionals from the three Maritime Provinces. Kellogg Library is the only medical school library in Canada with this additional responsibility, and we take it seriously, even though no extra funding is provided to support our outreach services to New Brunswick and Prince Edward Island. The Medical Society of Nova Scotia and the Provincial Medical Board give us generous support, and we would welcome any additional assistance from the other two provinces, although none has been forthcoming to date.

Because our budget has not kept pace with escalating costs in recent years, we have had to increase fees for some services and institute fees for others, where previously there were none. (Table I)

TABLE I

KELLOGG LIBRARY SERVICES AND THEIR COSTS

Service	Telephone	Cost
Reference	424-2482	No charge
Bibliographies	424-2482	$5—current file (2-3 years)
		$3—each back file (2 years)
Selective dissemination of information	424-2482	$15 per year (12 printouts)
Photocopies	424-2469	$2 Minimum + 20¢ per page over ten pages
Book loans mailed to individuals	424-2469	$3 per title
Acquisitions lists	424-2458	$15 per year (10 issues)
Consulting	424-2458	Travel expenses

This article provides a brief summary of the services available to those practitioners who use or would like to use the Kellogg Library. One of the first things that any library user needs to know is the hours that the library is open (Table II). The services offered are as follows:

- *Access* to the collection through the issuing of borrower's cards, circulation of material, and loans and photocopies by mail, either directly or through hospital libraries.
- *Reference* service, computer-produced bibliographies, and acquisitions lists.
- *Consulting* service for hospital libraries and training for hospital library staff.

TABLE II

KELLOGG LIBRARY HOURS OF SERVICE

Day of the Week	September — May	June, July, August
Monday through Thursday	8:30 AM-11:00 PM	8:30 AM-7:00 PM
Friday	8:30 AM- 7:00 PM	8:30 AM-6:00 PM
Saturday	9:00 AM- 6:00 PM	CLOSED
Sunday	1:00 PM-11:00 PM	2:00 PM-6:00 PM

ACCESS

The Kellogg will issue an off-campus borrower's card to any practising health professional in the Maritimes who wants to make use of the Library. Books, journals, audiotapes, videotapes and slide-tapes may be borrowed. The Library has three coin-operated photocopiers on the second floor for self-service copying. There are also various pieces of audiovisual equipment which can be used within the Library.

You may walk into the Library and borrow material in person at any time. You can also telephone or write to us for specific items. If you need a book, audiotape or videotape, we can mail it to you. If you need a journal article, we can make and send a photocopy of it. Forms are available for requesting loans or photocopies. If the material you require is not held by Kellogg, our staff will try to locate it but, once that is done, we prefer that your local hospital or public library request it from the holding library.

REFERENCE SERVICE

Reference in any library is provided at two levels: the brief answer to a very specific question (e.g. the address of a physician in Wichita, Kansas) and the more extensive information (sometimes a bibliography) on a requested topic. In the first instance, you may call (see Table III), write or come in, and a reference librarian will try to find the answer immediately.

For a more detailed request, there are various ways of approaching the problem. You may want information on a disease with which you are unfamiliar, but only basic information rather than an extensive bibliography. In this case, the librarian would probably find you a review article,

*Health Sciences Librarian, W.K. Kellogg Health Sciences Library.

Mailing address: Mrs. A.D. Nevill, W.K. Kellogg Health Sciences Library Dalhousie University, Halifax, N.S. B3H 4H7

if there is one available, plus a book or two and some recent journal articles on your topic, and send you an information package.

TABLE III

SOME DEPARTMENT HEADS OF KELLOGG LIBRARY

Department/Title	Name	Telephone
Health Sciences Librarian	Ann Nevill	424-2458
Public Services, Head	Linda Harvey	424-2482
Technical Services, Head	Eugene Pelchat	424-3741
Regional/Interlibrary Loan, Head	Tom Flemming	424-2469
Circulation, Head	Helen Branny	424-2479

If you need as complete a listing as possible of relevant journal articles when you are beginning a research project, we can do a computer search for you, based on *Index Medicus* or any of the other computerized data bases to which the Library has access.

Like the specific question, the more general request can be done by calling, coming in person to the Library or writing to us. Computer search request forms are available at the Information Desk or by mail.

Another computer-linked service offered by the Kellogg Library is selective dissemination of information (SDI). First you describe your ongoing interests in research or patient care to us. We then formulate a Medline search strategy which will retrieve journal citations from *Index Medicus* that match your interests. This search is run on a monthly basis throughout the year and the printout is mailed to you.

Because of budget restrictions and postage increases we have had to cease the free distribution of our monthly lists of recent book purchases (acquisitions lists). However, we will be happy to supply them on a cost recovery basis, at a rate of $15.00 per year.

CONSULTING SERVICE

Kellogg Library occasionally receives requests from hospital administrators or library committees to give advice on setting up or maintaining hospital libraries. We are always happy to do this because we firmly believe that any hospital, no matter what size, needs some level of library service. The usual procedure is for a member of the Kellogg staff (most often the Health Sciences Librarian) to inspect the hospital library, meet for a short time with the hospital staff members concerned, then write a report outlining the existing situation with suggestions for improvement.

Newly appointed hospital library staff members are encouraged to spend about three days in the Kellogg Library for orientation and instruction on the regional services available. Response to this service has been positive and we feel it is useful, both to us and the participating hospitals.

SUMMARY

This article has briefly summarized the services presently offered by the Kellog Library. Table III gives the names of department heads for the various services offered.

We welcome any suggestions regarding new or extended services, as well as criticism (constructive, where possible), so that we can improve our response to the medical community.

The author gratefully acknowledges the assistance of Mr. Peter King and Miss Deirdre Harvey of the Library's Editorial Services Department in the preparation of this report. □

The Royal Way: A Recollection

Robert Warren Napier,* M.D.,

Halifax, N.S.

Groggily dozing in a steaming bath the other day, a snatch of the final stanza of a poem my wife had given me rattled through my head.

You whom God so highly favors,
Choosing you to suffer long;
Listen and you'll hear him whisper,
"'Tis the way my saints have gone".

As I very clearly remember from nineteen years back, it was entitled, "The Royal Way" and it was given me to buck me up in the tiny cell I had as a study during those horrible months after I flunked three of five finals in third-year medicine. I remembered it now — the catchy title — in a mental association with Dr. Ray MacLean who died here in Halifax three or four years after I began my own practice in this city of my birth.

In a hard-to-say way he came across to me with a fatherliness and a sponsorship that I thought the world of. He probably did not know or hang onto my name from one meeting to the next; but he was the embodiment of a good and full man. And, on returning from a year and a half in the outports of Newfoundland, it was without any real preconsideration that I called on him during one of his busy afternoon office sessions. After he realized I was an aspiring local practitioner, his initial firm adherance to his appointment schedule blended into an easy calculation. Far from a distortion of his day, it was "a good chance to have a pipe". And he ushered me in to a wonderful five or ten minutes of hardosed advice on the business of starting up a general practice. Coming across in that mixture that was Errol Flynn and Walter Pigeon at once, he explained that I need only work well and hard and I would have a wonderful practice. He wound it up with, "Bob, there's no royal way".

And now, practising mediine in Halifax, I still miss Dr. Ray MacLean. Not every day. I knew him for a relatively brief time. But I miss him. He was a man both magnetic and private; and he was the most memorable teacher I ever knew. And he was a man who had no formal association with our medical school. Indeed, had he been asked to give an instruction, it would have required an appointment several months hence. Not that he could not give a lecture unprepared; he could do that tellingly and extemporaneously — and did so constantly. He had no certificate of entitlement to a teacher's role; he was simply an extremely busy general practitioner. And he practised his general medicine and obstetrics (of which he was a master) with the grace of a natural. And he lived in a spirit that always said to me that his patients and practice were of paramount importance. But then, in meeting him in the halls of the hospitals, or the change room, or at the scrub sink, he seemed to know like an inspiration that unbelievably above this station he had given to those people who relied unswervingly on him, was the opportunity and gift, and grave obligation, to teach.

He had practised for thirty years when I met him; and he had been one of the human mainstays of the Halifax medical services in the days of World War II. It was part of the glamour of his reputation that he had handled the major part of all the obstetrics in Halifax during those years.

The charisma of the man was his very lack of charm in any affected or tailored or conscious or laboured sense. You were captivated by his verve, drive, good humour and earthiness; and on staying longer in his company, you were intrigued and prodded intellectually by the range of his knowledge and associations. And after you had left him and went about your business, your admiration was reinforced by the accidental insights you would get into the scope of this man's sensible involvements in the entire community.

Yet all of this was subtle and unexpressed. There was never the gasping, nonplussed comprehension of an amazingly rounded man and doctor. It was more a sense of serenity and reassurance that you took away from any encounter with him, or discussion that included him or touched on some area of his many participations. He did not take time from delivering babies and asking interns to slip off the forceps ("learn from taking them off how they go on, boys") to chair community drives.

To interrupt what seems to me close to a stream-of-consciousness appreciation of this citizen-doctor: I will say that there was in the man a mixture of flamboyance, complete self-confidence and a loveable modesty. Everything was important to do; but for the doing, not for the feedback of reflected glory. He was showy and highly visible; and yet it never came across as seeking personal gain or reputation. And as a quite separate thought: he did make very great material gains. But these seemed the natural consequence of the style of personal industry he developed into a lifestyle.

And to continue — nor did he take time off from steadying and directing the team effort, that gradually transforms the eye-bulging bedlam of a serious accident or emergency into the controlled and effective restoration of normalacy and health, to demonstrate the coaxing of the very best effort from everyone. And he did not leave off the running of the business and social affairs of a medical society, to manage a dislocated shoulder on the tennis courts. He had been there at the tournament predictably, because any tennis lover would snatch what moments he could to look in on the Provincial. And a dislocated shoulder is a shoulder needing reduction, and not really a dislocation of a busy general practitioner's schedule. Those other calls and rounds and meetings would all get done, and with interest and with grace, and always that serenity. Osler must have meant that same thing in his valedictory at Pennsylvania a century ago.

*Family Physician, 5513 Spring Garden Rd., Halifax, N.S., B3N 1G8

One of his arms was withered and he made use of it awkwardly; and, in stature, he was of average height but not robust. And yet he moved and talked and yes, performed, as though he belonged at stage centre. Again, not because the footlights focused there (they did, and he glowed); but rather that to be at centre stage was to be in the heart of the action; and to be effective. He was words and deeds, and they both taught practical lessons.

But he was wrong, or incomplete, in one performance. When I remember his style, and all that he accomplished, I am bent to the conclusion that his advice to me back then when I wandered out of the wilds of Newfoundland, was too absolute. *His* was a royal way. There are and will be many others like him. And it was his and is their examples — their lives that are their work — that perpetuate the breed. □

ULTRASONOGRAPHIC DIAGNOSIS OF FETAL ABNORMALITIES IN THE SECOND AND THIRD TRIMESTER

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WOMEN'S ATTITUDES TOWARD PRENATAL DIAGNOSIS AND UTILIZATION OF SERCIE

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NOTICE RE: BY-LAW AMENDMENTS

The By-Laws of the Medical Society stipulate that amendments to them may be proposed at an Annual Meeting of the Society provided they are published in the *Bulletin* at least one month prior to the Annual Meeting.

The following amendments will be presented by the By-Laws Committee at the 1982 Annual Meeting of the Society.

A. The Committee believes the Society will be served by adoption of more modern relevant rules of order.

RECOMMENDATION: 1.

THAT Article 8.4.1 of the Amended By-Laws of The Medical Society of Nova Scotia be amended to read: "Bourinot's Rules of Order, Third Revised Edition, shall be the guide for conducting all meetings of the Society."

B. The Committee believes that the age limit for eligibility for nomination as Senior Member of the Medical Society should be reduced to sixty-five and that because of the expanded membership of the Society the number named each year should be increased to four.

RECOMMENDATION: 2.

THAT Article 6.3.1 of the Amended By-Laws of The Medical Society of Nova Scotia be amended as follows: Line three delete "seventy", insert "sixty-five"; line seven delete "two", insert "four".

C. The Committee proposes that the Society create a new member category to provide Society members who have retired and/or left Nova Scotia to continue membership in the Society without having to maintain licensure in Nova Scotia.

RECOMMENDATION: 3.

THAT Article 6.1 of the Amended By-Laws of The Medical Society of Nova Scotia be amended as follows: Line four delete "and Student Members", insert "Student Members and Courtesy Members".

RECOMMENDATION: 4.

THAT Article 6.5 of the Amended By-Laws of The Medical Society of Nova Scotia be amended as follows:
(i) Delete title and insert new title "Special and Courtesy Members".
(ii) Add Article 6.5.2. "Courtesy members of the Society shall be members of the profession who have practiced in Nova Scotia, who are no longer licensed to practice in Nova Scotia for reasons other than set out in Article 6.7.3., and who have been members in good standing of The Medical Society of Nova Scotia immediately prior to relinquishing their license."

D. Recognizing the concerns regarding proportionate representation on the Nominating Committee and the fears that physicians without knowledge of Society business might be named to serve on this very important Committee, the By-Laws Committee believes that directed membership on the Nominating Committee together with one member from each Branch on it should satisfy the concerns.

RECOMMENDATION: 5.

THAT Article 12.3 of the Amended By-Laws of the Medical Society of Nova Scotia be amended as follows: Delete Articles 12.3.1; 12.3.1.1; 12.3.1.2; and 12.3.1.3 and insert new Article 12.3
"12.3 The Nominating Committee
"12.3.1 The Nominating Committee shall be composed of one member from each Branch Society. This member shall be the immediate Past President of the Branch Society. Each Branch Society is entitled to appoint an alternate member who shall be the President of the Branch Society. The President of The Medical Society of Nova Scotia, if present, shall be Chairman thereof. In the absence of the President the Committee shall elect its own Chairman."

RECOMMENDATION: 6.

THAT Article 12.3.2.1 of the Amended By-Laws of The Medical Society of Nova Scotia be deleted.
"(b) Nominating Committee SEE 12.3.1".

RECOMMENDATION: 7.

THAT Article 12.3.2.3 of the Amended By-Laws of The Medical Society of Nova Scotia be deleted.

E. The Committee suggests that with the trend to earlier retirement and its attendant loss of various privileges and opportunities for earning income, the dues for members having reached age 65 should be reviewed.

RECOMMENDATION: 8.

THAT the Finance Committee review the membership dues for members who have attained the age of 65.

The 18th Meeting of Council/129th Annual Meeting
The Medical Society of Nova Scotia

November 18-19, 1982
Hotel Nova Scotian, Halifax

'Hello .. Help Line'

In spite of the availability to the public of a large number of social agencies, clubs, church groups and other organizations dedicated to helping people, the Help Line continues to play its role in the community. That the telephone number for the service is listed in the phone book beside the emergency numbers of the police and fire department may give some indication of its importance to the public. However, many members of the medical profession may not be aware of exactly how the agency works, what it strives to do for those who call, and what it offers to the more than eighty volunteers who take their shift answering the telephone. The following information may, therefore, be of interest.

"Hello--Help Line"-that is the response that 24,000 callers heard in 1981. There are eighty-five volunteers manning Metro's Help Line--which is a twenty-four hour a day, seven-day a week counselling, information and referral service. The Help Line began in 1969 as a pilot project through the Maritime School of Social Work and it has since developed into an agency administered by a Board of Directors and funded through the United Way and government grants.

The majority of callers are men and women who are lonely, frightened or confused, and who need someone to listen to their concerns. The volunteers are trained in active listening and can help the caller identify the root of the problem. The volunteers assist the caller in identifying viable alternatives to resolve the issue. Many of the callers seem to use the Help Line to help them cope with stress. When things become unbearable, or when they have difficulty sleeping, etc., people will call to talk about the situation (or "get it off their chest"). Frequently, callers will end the conversation because they have become more calm, relaxed and better able to cope.

It seems that the success of the Help Line is due, in part, to the amount of time that the volunteer can spend with each caller. It is not unusual for a call to last up to an hour or more. Many of the callers benefit from a "sounding board" and need to test their concerns on someone who doesn't know them — they tell us that they have never expressed their fears before calling the line. The job of the volunteers is to reassure the person that it's okay to feel the way they do. And they try to offer constructive alternatives for solutions.

Most of the volunteers on the line are lay counsellors and do not try to solve the caller problems for them; and, if there is a problem which should be referred to a professional, then that is done. A large number of calls are referred to other agencies or groups. For example: the largest group referred to is the Social Services Department; the next largest is Legal Aid and then agencies dealing with women's concerns, etc.

The Help Line is probably best known for its work with suicidal callers. There were 95 of these calls in 1981. They are dealt with by the volunteer, and where appropriate, in conjunction with the appropriate law enforcement agencies and/or medical facilities. Some callers ask the volunteer to call the hospital, or the police for them because they have changed their minds after having already taken an overdose of pills/drugs.

Many senior citizens call for reasons that range from the need to talk to someone because they are lonely or isolated, to the need for the correct number to get volunteer snow shovellers. Young people call because of peer relationships, dating problems, and concerns relating to sexuality. Two major themes that recur are housing and finances, which reflect the economy and employment situations. A problem which is of particular importance at this time is the need for emergency housing for women who require a temporary place to stay.

The Help Line also has a "visual ear", which is an extremely important link to the deaf community. Anyone in the community with a visual ear can communicate with the Lineworkers after hours, which is particularly important if an emergency arises.

The volunteers on "the line" are recruited and trained by the agency. The training is usually a weekend session when professionals address relevant topics such as sexuality, effective communication, suicide, loneliness, drugs and alcohol, etc. Then the volunteers are placed on two or more shifts in order to become familiar with the operation of the line.

The volunteers also derive benefit from the agency. Many students of Social Work, Medicine, or Theology are able to translate theory into practice regarding things such as counselling, and communication. They get a practical look at one aspect of their chosen career.

The volunteers who are retired are able to use their life experiences and skills to benefit the community and to keep themselves active. All volunteers gain an insight into the problems and concerns of the members of their community and, because we are a central referral agency, the Line workers become very familiar with the resources available in the community to the public.

Most important of all, volunteers work for an agency like the Help Line because they want to use their energy and skills to help others. But many more people are needed as the agency's aim is to have two volunteers for every shift, which will enable us to deal with even more callers who are seeking our help. □

Dale MacArthur, B.A., B.Ed., and
Joy Buhr, M.A.O.T.
Halifax, N.S.

Correspondence

To the Editor:

RE: OVERSEAS BOOK CENTRE

The Overseas Book Centre, a Canadian voluntary organization, has been providing textbooks free of charge to institutions in the Third World for over 20 years. Last year, we shipped 216,150 kg. of books to 1,887 recipients.

Our Halifax branch is currently in need of medical texts and journals to fill requests from hospitals in Malawi and Tanzania. We realize that physicians frequently update their personal libraries, and we would like to take this opportunity to solicit donations of older (but still useful) texts that may otherwise be discarded.

If you can help, our office telephone number is 429-6009. Our mailing address is P. O. Box 8892, Halifax, B3K 5M5. Your contribution to OBC is a long term investment in the future of mankind.

Sincerely yours,

Nina Ross
Coordinator
Overseas Book Centre

To the Editor:

RE: VICTORIAN ORDER OF NURSES

It is my pleasure to have assumed recently the position of Regional Director of the Victorian Order of Nurses for Nova Scotia. Many of you have patients receiving assistance from VON nurses and some may have questions regarding the fee structure. I hope the following information will be helpful and invite you to forward guestions or comments to me.

In twelve Branches across Nova Scotia, the VON is providing nursing care on a visit basis to individuals and their families in the home. The VON is commonly associated with the care of senior citizens. In 1981, 80% of 87,897 visits were made to persons over 65 years of age. These visits are instrumental in postponing institutionalization and maintaining a sense of independence and self-determination.

VON service is available to *all age groups* and incorporates the continuum of health care. Examples include health assessment and teaching, medical-surgical care, rehabilitation and palliative care. Branches have also developed special programs; such as school, college and occupational health programs; senior citizen counselling; footcare and health assessment clinic. Currently we serve 82% of the population and are striving to expand our geographical area and range of services in response to health care needs and in cooperation with other health agencies. Input from physicians regarding service gaps is welcomed.

VON service is based on a philosophy which believes in comprehensive, coordinated and compassionate health care in the home and it encourages individuals and their families to be as independent as possible. Since 1897, the VON has recognized the health and cost benefits of care in the home. Many provinces contract with VON for Home Care Services. We are pleased to be assisting in the Nova Scotia Home Care Pilot Project in West Pictou.

The VON is a *voluntary non-profit* community health agency. It enters a community on request by the citizens and is assisted in its operation by a community Board of Directors which contributes expertise and community insight. The VON operates on a fee-per-service basis but provides service according to *NEED*. Consequently, the fee is often adjusted or waived. Nevertheless, approximately 80% of funding is derived from individual and community support including patient fees; third party payments, donations including United Way, memoriams and bequests; and VON fundraising. Voluntary agencies such as VON are an effective blend of the professional and volunteer in sharing responsibility for health care. We propose that the effectiveness and contribution of voluntary agencies deserves careful consideration in assessing our health care alternatives in Nova Scotia.

VON care is performed by Registered Nurses, in cooperation with the physician. If you have patients who would benefit from care in the familiar or supportive surroundings of home or if you have recommendations or questions regarding service, please contact us.

Sincerely,

Mary Theresa Comer, B.A., B.Sc.N.,
Regional Director,
Victorian Order of Nurses for Nova Scotia □

Personal Interest Notes

Dr. Franklin M. White has already commenced his new task as Professor and Head of the Department of Preventive Medicine, Dalhousie Faculty of Medicine. An Australian by birth, he brings enthusiasm and a great deal of experience to bear upon a wide range of health hazards. His previous interests and papers range from Legionnaires Disease, to personal experience as a miner, survey assistant, pump operator and an epidemological investigator in Labrador.

Dr. Matthew Spence has been reappointed to the Medical Research Council for a three-year term. He is Director of the Atlantic Research Centre for Mental Retardation. Six hundred thousand dollars has been allocated to regional development of organ transplantation at the Dalhousie Faculty of Medicine. Other projects include biotechnology and the development of devices for scanning and investigation of brain disorders. Thus, Dr. Spence's position on the 21-member Council whose annual budget is one hundred million dollars is a vital one for Nova Scotia.

Dr. Alistair Munro has been appointed Professor and Head of the Department of Psychiatry at Dalhousie University. Originally from Glasgow, he was Psychiatrist-In-Chief at the Toronto General Hospital. His aim is to develop a clinical program in psychiatry that meet the local needs. An interesting clinical syndrome Monosymptomatic Hypochondriacal Psychosis has been described by Dr. Munro. Patients affected by this condition have a morbid impression that they are infested with worms. The condition is thought to be due to an abnormal neuro-transmitter in the brain.

Dr. R.O. Jones has been awarded the Medal of Service of The Canadian Medical Association. He has also been elected Honorary Fellow of The British Royal College of Psychiatry, its highest award. He will be receiving his certificate of distinction during a ceremony in London, in November.

Dr. T.J. Murray, Professor and Head, Division of Neurology, Department of Medicine, Dalhousie Faculty of Medicine, has been elected President of The Canadian Neurological Society.

Dr. Stewart Huestis, who recently retired as Professor and Head of the Department of Neurosurgery at Dalhousie University, has been elected President of the Canadian Neurosurgical Society.

CMA APPOINTS NON MD AS SECRETARY GENERAL

Mr. B.E. "Woody" Freamo has been appointed Secretary General of The Canadian Medical Association (CMA); the first non-physician to serve as senior administrative officer of the Association in it's 115 year history.

The 59 year old executive and medical economist was born and received his early education in Renfrew, Ontario. He left a university education at the University of Toronto to serve 4 years as an R.C.A.F. bomber-navigator during World War 2. It was during service overseas that he met and married the former Lily West from Yorkshire, England. The Freamo's have four adult children Terry, Peter, Linda and Michelle.

Mr. Freamo has served the Medical profession of Canada for almost 35 years. With the Ontario Medical Association (OMA) between 1947 and 1957 he administered the free medical care plan for Ontario welfare recipients, organized by the Government of Ontario and the OMA, that existed before the establishment of medicare. Following service as Assistant Secretary of Economics of the OMA, he joined the CMA in 1957 as Secretary of the Department of Economics. Appointed Executive Secretary of the CMA in 1965 he has also served as Executive Vice-President of MD Management Ltd., the Association's wholly-owned subsidiary that manages pension plans and investment programs for the 36,000 physician members of the Association.

Mr. Freamo succeeds Dr. R.G. Wilson, who resigned last fall, as the CMA Secretary General.

TERRY FOX MARATHON OF HOPE

Projected expenditure for the next five years exceeds twenty million dollars. Approximately $1,290,000.00 has been reserved for Nova Scotia for special inititative research. This includes molecular mechanisms of mutation by chemicals that cause cancer. A tissue culture laboratory is also being developed.

Last year, the Terry Fox Run generated $420,000.00 for Nova Scotians. This year even more is anticipated.

OBITUARIES

Dr. Harvey F. Sutherland (75) Sydney, N.S. died on June 29, 1982 at home. He graduated from Dalhousie Medical School in 1933 and practised General Medicine in Guysborough and Glace Bay, and later, Otolaryngology in Sydney. He retired in 1971 due to ill health. Our sympathy is extended to his wife and family.

Dr. Arthur M. Marshall (83) of Halifax, N.S. died at The Victoria General Hospital on Sept. 6, 1982. Born in Halifax he graduated from Dalhousie Medical School in 1922 and later did Postgraduate studies in Surgery. He practised Medicine and Surgery until 1972. We offer our sympathy to his wife and family.

Dr. H. Harold Tucker, (58) of Moncton, N.B. died in Moncton on September 13, 1982. He graduated from Dalhousie Medical School in 1951. After Postgraduate work he practised Neurosurgery in Halifax from 1956 to 1972 and was Chief of the Neurosurgery Department of Moncton Hospital for the past 10 years. Our sincere sympathy is extended to his wife and family.

Dr. Robert R. Prosser, died on May 13, 1982 in Halifax: He was a graduate of Acadian and Edinburgh Universities (Psychiatry) and served in India with the India Medical Service for seventeen years. He was Director of Mental Health in New Brunswick since 1947. He retired in Yarmouth, Nova Scotia, his birth place, and lived there until his death.

NEW MEMBERS

The Physicians listed below have joined The Medical Society of Nova Scotia between July 1, 1982 and August 31, 1982. A most cordial welcome is extended by the Society.

Dr. D.C.G. Bethune	Halifax
Dr. B.A. Demont	Glace Bay
Dr. G.I.R. Gibb	New Glasgow
Dr. J.M. Gray	Herring Cove
Dr. J.E. Guptill	Halifax
Dr. J.R. Hamilton	Antigonish
Dr. Katalin Kovacs	Dartmouth
Dr. G.R. LaRoache	Halifax
Dr. R.D. Mullan	Kentville
Dr. N.L. MacDonald	Halifax
Dr. O.C. MacIntosh	Antigonish Co.
Dr. R.D. Nowicki	New Glasgow
Dr. G.M. Patey	Digby
Dr. P.H. Poulos	North Sydney
Dr. G.P. Reardon	Halifax
Dr. D.E. Roberts*	Manitoba
Dr. D.E. Sinclair	Halifax
Dr. D.J. Scott	Bedford
Dr. D.B. Vair	Dartmouth
Dr. C.D. White	Halifax

*Recent graudate of Dalhousie University Program

Book Review

Private Practice. . . .Surviving the first year. Jack D. McCue, M.D. 304 pp. D.C. Heath and Company, Lexington, Massachusetts and Toronto, Ontario, 1982. $15.95 (US) ISBN 0-669-044121-1

Most medical school graduates are taught little regarding the task of setting themselves up in a medical practice. For those lucky enough to join an existing group of physicians, they will probably learn most of the important points such as office management, hiring employees, medical records, appointments and billing from their peers.

This book has been written primarily for those who are less fortunate. The author has accumulated data, related mainly to practice in the U.S.A., and uses them to help the reader to plan his own type of office. The text is well interpersed with examples and case histories which make it very readable. In the rest of the book, he covers such diverse topics as different types of scheduling, seven rules for making a successful practice, becoming a boss and how to cope with the stress of being in practice.

Although very thorough, there are some areas which could have been expanded. His list of medications for a primary care practice included: Xylocaine, oxygen, morphine, diphenhydramine (injectable), dextrose-50%, I.V. set-up and a resuscitation kit. This list is hardly exhaustive.

Two things were not mentioned which might be important to some — the timing of the physician's listing in the telephone directory and the advertising of their new practice. The "yellow pages" are probably the life-line of the new physician in a city. Therefore, planning to open a new office around the time that the new telephone directory is published would be appropriate. Although the book refers the reader to the local medical society for advertising advice, it does not warn him of the possible result. In my own case the three insertions in the local paper, besides being expensive, brought only one patient but what seemed like dozens of insurance agents!

After reading this book, the trepidation of the novice stepping through the university gates can be tempered with a sense of excitement and satisfaction as he sees his plans evolve. "Surviving the first year" compliments material available from the C.M.A. and would be well worth browsing through before taking the plunge. □

ADVERTISERS' INDEX

DALHOUSIE MEDICAL STUDENTS' SOCIETY

sponsor a Seminar on International Medicine

entitled

"AN INTERNATIONAL PERSPECTIVE ON WORLD HEALTH"

to be held on

SATURDAY, 15th JANUARY, 1983

time: 9.00 a.m.-4.30 p.m./place: Tupper Medical Building

Guest Speaker: DR. JOHN HAMILTON
Nutrition, Population, & Health Sector
World Bank, Washington, D.C.

Dr. Hamilton will also deliver the 'Friday at Four' Lecture on Friday, 14th January, 1983, at 4 p.m. in Lecture Theatre 'A', Tupper Medical Building.

ENQUIRIES to: Division of CME, 10th fl. Tupper Building, Dalhousie University, Halifax, B3H 4H7

Tel: 424-2061

ANATOMY DEPARTMENT DALHOUSIE UNIVERSITY

Teaching Fellowship

A position is available commencing September 1, 1982 and terminating June 30, 1983. Duties will include the teaching of Gross Anatomy to Occupational Therapy, Physiotherapy, Medical and Dental students. Applicants should contact Dr. D. G. Gwyn, Professor and Head, Department of Anatomy, Dalhousie University, Halifax, Nova Scotia, Canada, B3H 4H7 or by telephone (902) 424-2053.

Orthopaedic Surgeon

MIDWESTERN MULTISPECIALTY GROUP HAS OPENING FOR **ORTHOPAEDIC SURGEON.** INCENTIVE PAY PLAN. GROUP LOCATED IN PLEASANT COMMUNITY CONVENIENT TO CHICAGO. CONTACT: R. FINN (815) 725-4631.

"Permanent position or locum tenens for a **GENERAL PRACTICE** available immediately for approximately 1200 residents on Long and Brier Islands, Southwestern Nova Scotia. Area has service of Public Health facility and nurse. Subsidy available. Contact Freeport Village Commission, Freeport, Digby County, Nova Scotia B0V 1B0. Phone (902) 839-2053."

F I T N E S S N O W • A N D H O W

How not to get fit

Once and for all we'd like to clear up a few misconceptions about fitness. None of the following approaches represents a sensible way to get fit:

1. The "drive yourself til you drop" approach.
2. The "more it hurts the more it works" approach.
3. The "make up in an hour for what it took you ten years to lose" approach.

The plain fact is that exercise does not have to hurt before it is doing you some good. Real gains start long before you reach the pain barrier.

If you want to get fit, you have to get active. Do it...but don't overdo it. This is the sensible approach to fitness. And it works.

Can you get fit without struggle, without strain, without pain? AND HOW!

PARTICIPACTION