THE NOVA SCOTIA MEDICAL BULLETIN

Editor-in-Chief
DR. IAN E. PURKIS

Editorial Board

Managing Editor
DR. C. J. W. BECKWITH

Board
DR. I. D. MAXWELL
DR. D. A. E. SHEPHARD
DR. W. E. POLLETT
DR. A. J. BUHR

Corresponding Members
Secretaries of Branch Societies

Departments
Medico-Legal Column
DR. I. D. MAXWELL
Advertising
DR. D. A. E. SHEPHARD

Men (and Women) Wanted

The Medical Manpower Issue of the C.M.A. Journal in December gives a most illuminating picture of a situation which affects all Canadian doctors to a greater or lesser degree. Particularly because of its local application and interest, "The Future Availability of Medical Students" by the Dean of the Dalhousie Medical Faculty deserves special consideration by those of us who live in this part of the country.

My conclusion from reading Dr. Stewart's article is that the primary problem in providing adequate medical care to our area is no longer a matter of building more or bigger medical schools capable of turning out doctors in ever increasing numbers. Instead the difficulty anticipated is in the recruiting of enough suitable applicants to fill the places which will be available in the near future at Dalhousie and Memorial Universities, and it is stressed that in order to meet the situation very active measures are necessary. Of such measures Dr. Stewart suggests four, and it might be in order to consider the two to which he appears to attach the greatest importance.

Of these two, the first is the active support of the medical profession in a recruitment campaign. It is surprising and rather saddening to have him say "It is a rare exception when I have a first-year student tell me he was encouraged by his local doctor." At the same time I do not believe the fault to be completely ours. My own experience is that in the twenty years I have been in practice in Halifax I have seen many children and teenagers as patients. I have preached to them the gospel of Medicine as the best of all possible careers and have seen them in their growing years afire with enthusiasm, only to find when they had reached University age, that I had reared a generation of vipers, or to put it in another way, Commerce and Law Students. I was informed that it was not only difficult to get into Medicine but in Commerce they would be graduated, with a car, job and wife (in that order of importance) when the poor medical student was only half way through. Only in my own family did I try to be neutral in my advice. I do admit that neutrality is a somewhat elastic term and remember seeing a play in Dublin where one of the characters said "We Irish were strictly neutral in the last War. Half of us were for the British and half of us were for the Germans."

The suggestion that once in his life every doctor should recruit a good student who would not otherwise be in Medicine, should appeal to every one of us. We all like to think that while the "last enemy" always wins in the end, we do often stay his hand, and that in the sum total we have probably done a fair amount of good. If by one fell blow we have doubled our life's work, it is not a small thing. Perhaps we delude ourselves but I do not think so. I remember at one Pine Hill "At Home", a feature of the decorations was a simple country church surrounded by the tombstones of some of the more reputable and some of the less reputable denizens of that College. On one grave my name was followed by M.D. and with, to my mind, an epitaph in which grief was a shade too manfully restrained. "He saved many lives by falling in the harbour and being drowned a week after he graduated".

The second measure worth very serious consideration is that medical educators have to review admission standards. We all know very excellent doctors who have had considerable difficulty in their first University years. We have only to consider our contemporaries who have reached the highest University and Hospital posts across the land, to be reminded that there is no direct relationship between their marks in Physics 1 or Math or French and the

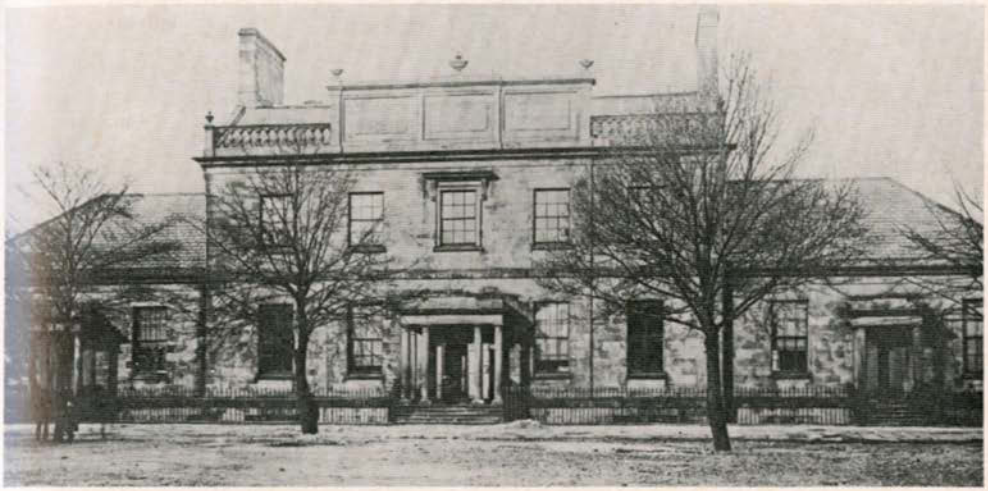
degree of eminence thay have attained. Indeed at times we may be forgiven if we thought the ratio an inverse one. It goes without saying that the standards of Dalhousie must conform with those of other first rate schools but there is still room for flexibility. A boy may be a few points short in French, but the fact that he is a poor linguist has no bearing on his future as a doctor. It is not necessary to converse with a staphylococcus in order to render it harmless just as it is more important for a paediatrician to like children than it is to have a knowledge of calculus. If standards are lowered it is true that the attrition rates will be higher in the later years of the course and that border line students must be watched more closely. If, as a result, two well motivated students are salvaged out of three, the hardship of the dropped third is acceptable.

Finally the point should be stressed that the present criteria of admission to a medical school are by no means necessarily the best, because in the making of a doctor there are too many factors which are intangible and difficult to assess. It would be a pity if the decision is made on the basis of an obstacle course in which many of the obstacles are largely irrelevant to the object for its existence. □

W. E. P.

One Hundred Years Ago

December 27, 1867



The Original Dalhousie College 1820 - 1887

It was unanimously resolved that the following should be the constitution of the Faculty, and a copy of the same to be transmitted to the Board of Governors along with the other communications.

I. The Medical Faculty as at present constituted shall be composed of two lecturers on Obstetrics and one each on Descriptive Anatomy - Surgical Anatomy - Physiology or Institutes of Medicine - Chemistry - Materia Medica and Pathology from which personnel shall be chosen a President, Dean, and Secretary.

II. The duties of the President shall be to preside over the deliberations of the Faculty, call special meetings and attend to such business as a chairman or President is generally called on to perform, in his absence the Dean or another member of the Faculty may be selected to fill his place.

III. The duties of the Dean shall be to keep a register in which the name, age, birthplace, and class attendance of all students shall be recorded, to furnish all tickets, to receive and keep account of all monies paid to the Faculty, which shall be held subject to their disposal and to report on the workings of the Faculty at the end of the session to those interested.

IV. The duties of the secretary shall be to keep a minute of all meetings of the Faculty and receive and answer all correspondence as directed by the President or Faculty.

V. Five members shall form a quorum for the transactions of business.

VI. Any vacancies in any chair whether by retirement or absence or to occur by the formation of new chairs or the redistribution of those existing shall be filled by the candidate who after being duly proposed shall receive a majority of votes each lecturer having one and the presiding officer having only the casting vote - The votes shall be given by ballott and any entitled member shall have the privilege if unable to be present of sending his ballott in a sealed envelope, marked as such, which shall be deposited by the presiding officer, with the others.

VII. No alteration of this constitution can be made without giving written notice at a stated meeting of the Faculty and not less than a week preceding that one on which such change shall take effect, and every member of the Faculty must be notified of the latter meeting and what is to be laid before them through the secretary.

VIII. The Board of Governors shall be notified of any such change.

All were present at the hour and deliberations continued until 10 p.m. when the bye-laws and regulations were agreed to unanimously, except some immaterial changes made by the Committee of Governors, the same as those a copy of which is written down on the first pages of this book.

A committee of three was formed consisting of Drs. W. I. Almon, Hattie, and Reid to confer with that of the Governors respecting the Bye-Laws.

The Meeting was of the unanimous opinion that there was no need of a secretary and A. P. Reid, M.D. the Dean was charged with the duties of pertaining to that office.

The meeting then adjourned.

(Sgd.) A. P. Reid, M.D.
Dean

MEDICAL-LEGAL ENQUIRIES

IAN MAXWELL, M.B., Ch.B.

RESPONSIBILITY FOR THE ACTS OF ANOTHER

PART III

INTERNES AND RESIDENTS

Q: *Unless we accord responsibility to internes and residents for medical or surgical care, they have every right to call us for every small matter but, under law, how much responsibility can we give them?*

A: No responsibility for medical judgment can be placed on internes. Although in most provinces of Canada, and indeed most parts of the world, internes are medical school graduates, in Dalhousie graduation follows interneship. It has been suggested that our internes are placed in an inferior position by virtue of this. There is no justification for this charge. Regulations for medical licensure everywhere in North America (though not in Europe) demand prior interneship so that internes throughout this continent are nowhere licensed physicians nor can they practice medicine. Rather they are employed by hospitals, under the supervision of staff physicians, to perform duties while gaining the experience necessary to entitle them to licensure. As, under the doctrine of *respondeat superior*, the hospital is liable for the negligence of an interne, the physician has no right to place it in jeopardy by demanding responsibility or judgment on the part of the interne, nor can he ask that the interne carry out a task beyond what could be considered the general competence of internes at a specific period of training.

Some internes are less skilled than others and the general rule might not always safely apply. Frustrating though it might prove in such cases, the wise physician would not rely on the hospital to guarantee internes of generally accepted competence and, in any orders other than routine ones, satisfy himself that the interne is able to carry them out skilfully.

If, under instruction, an interne makes a manifestly foolish error that no sensible person, medical or lay, would make, both he and his hospital may be held responsible at law. An example of this was the case of an interne who brought an electric cautery into contact with an alcohol swab, the patient being burned in the subsequent conflagration. The court held that no great knowledge of medicine or surgery was required to predict this outcome and, in affording judgment against the interne and his hospital, it likened him to the lay individual who drops a lighted match into a tank of gasoline.[1] On the other hand, while he is under the direct supervision of an attending physician, the doctor supervising him, not the hospital, may be held responsible for an interne's negligent acts.[2] This particularly applies to the operating room.

The resident is one step up the pecking order and is a licensed physician irrespective of whether the license is a full one or limited to his hospital practice. Nevertheless he remains a salaried employee of the hospital which is jointly responsible for his actions while he is on duty. Although the courts tend to lump residents, internes and nurses in the same category as "servants of the hospital", it is obvious that the position of the resident differs from that of the other two groups in that he can be held liable for medical negligence or malpractice.

In part his duties are the supervision of the work of the internes and he must share, with the hospital, as its agent, responsibility for their actions. His duties clearly extend far beyond the supervision of internes and perhaps his most important rôle is the making of emergency medical decisions in the absence of a staff physician. Were there no residents in our hospitals, the emergency cases would be placed in jeopardy if they went to the hospital. He is not, however, what is known as an "independent contractor", that is there is not normally any contractual relationship between him and the patient. In performing his hospital duties as a physician either in a supervisory capacity over the work of internes, as a physician in his own right, or in carrying out the instructions of a staff physician, the resident remains an agent of the hospital and it will be liable for his negligence. In a test case in Minnesota a

hospital attempted to pass this responsibility onto a staff physician claiming that a negligent resident was under the actual control of the attending doctor and that the hospital, therefore, could not be held liable. The court answered as follows:

> "While . . . staff doctors have the final responsibility for the care of patients and . . . supervise the activities of the resident doctor to some extent, there is nothing to indicate that this supervision extends to the duties which the residents perform as a part of the general hospital routine."[1]

Nevertheless, even in providing emergency care, the resident still is not entering into a contractual agreement with the patient. It might appear then that in the case of a resident who renders emergency care and fails to contact a staff physician, the hospital is practicing medicine. It is generally held that this is not the case; rather the hospital is rendering a service to the community by making available the services of a physician for whose action it assumes joint responsibility. The medical staff must share responsibility both to their patients and to the hospital for the correct instruction and supervision of the work of residents so that if they choose to delegate decisions to residents, as they may do under law, they can be held to account for the results of such delegation.

In summary, to answer the questioner as explicitly as possible, the ground rules as we see them are:

1. **INTERNES** are seldom licensed physicians. If they are not licensed they cannot in law make medical decisions and can only be given responsibility to carry out the clear and explicit orders of a physician.

2. **RESIDENTS** are usually licensed physicians of whom it is reasonable to demand that they engage in the practice of medicine, surgery, or obstetrics within their capabilities. A demand beyond these capabilities is improper and a physician who makes it may be held to account for exceeding the general hospital routine.

References

1. *Miami* v. *Oates*, **152 Fla.** 21, 1942.
2. *McConnell v. Williams*, **361 Pa.** 355, 1949.
3. *Moeller v. Hauser*, **237 Minn.** 368, 1952.

Inaugural Address

TO THE 114TH ANNUAL MEETING OF THE MEDICAL SOCIETY OF NOVA SCOTIA

November, 1967

A. L. Sutherland, MD, CM

Sydney N. S.

When George Saunders told me last night that I was down on the program for a few remarks, I said that I would shorten the remarks to the singular remark.

A quick glance at the program this evening showed me that I have two additional pleasant chores to add to my remark.

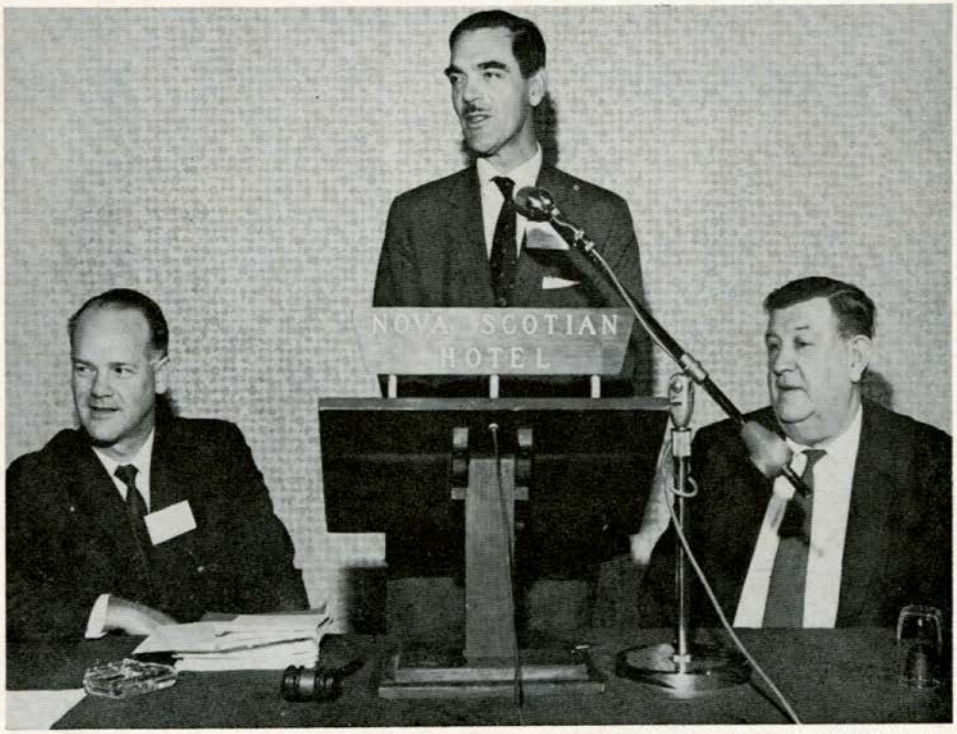
Being a good Cape Bretoner, and if either Hawker Siddley or Walter Gordon are not successful in making me march with a "Parade of Concern" out of Sydney to distant pastures, your executive and myself, with the help of our numerous efficient committees and their chairmen, will endeavour to continue to conduct the affairs of your Society with the utmost efficiency at our command.

I am exceptionally fortunate in having as number one "Boy" that most experienced and hard working Frank Dunsworth as President Elect. The first of my chores is to introduce him. Stand up, Frank, and be counted.

It is extremely likely that within the term of my tenure in office, we will launch into a Medicare Program. Your P.S.I. committee has laboured long and hard, and will continue to do so in your behalf, with the hope of making this plan as much in the interests of the profession and the public as it is at all possible.

This may be somewhat harder than you think, when the P.S.I. committee will be headed, as "Jack Charman" told me some time ago, by one of the X' in Moir's chocolates. His explanation of what the significance of the 3 XXX's in Moir's Ad means, is that of two Newfoundlanders endorsing the signature of a Cape Bretoner.

My second pleasant chore of the evening is, to present the Past President pin to Dr. George Saunders, and it gives me great pleasure to do so. □



Dr. G. McK. Saunders (Left), President and Chairman of Council, 1967, and Dr. A. L. Sutherland (Right), President, 1968, listen to the report of the Chairman of the Editorial Committee, Dr. I. E. Purkis (Centre) to the Annual Meeting of Council, at the Hotel Nova Scotian, November, 1967.

Photo Wamboldt-Waterfield

The Halifax Chronicle Herald, Nov. 27, 1967.

Valedictory Address

TO THE 114TH ANNUAL MEETING OF THE MEDICAL SOCIETY OF NOVA SCOTIA

November, 1967

G. McK. Saunders, MD, FRCS(C)

Amherst, N. S.

For the past year, it has been an honor and privilege for me to have served The Medical Society of Nova Scotia as its president. This has been one of those unforgettable experiences of a lifetime which has been very worthwhile and which, at the same time, could not have been properly achieved without the blessing and co-operation of many other people. There has been a substantial family sacrifice involved and to my wife and children I make my appreciation known. Charlie Beckwith has for many years been a pillar of strength to the passing line of presidents, including myself, and to him I extend my sincere gratitude. For a number of weeks his activities have been curtailed by illness and I am sure the thoughts of all members would be expressed by wishing him a speedy return to health and an opportunity to again assist our profession in its numerous responsibilities. On many occasions, my absence from the professional activities in Amherst has been very well covered by my colleagues in this community, and for this assistance, I extend my thanks. To the members of the Society's numerous committees and, in particular, the Executive and Physicians' Services Insurance Committee, I am appreciative of the many ways in which they have come to my assistance. During my visits to the Branch Societies, your president has always been graciously received and entertained. It is my hope to include the very few unvisited branches during my year as past-president.

During the year, the Society has been working hard at the numerous problems confronting it, both with respect to the professional and the medico-legal-economic aspects. These efforts have been carried out at both the branch and divisional level. In the interval between Annual Meetings, our numerous committees have borne the burden and have reported periodically to the Executive Committee which is your custodian. To the Branch Societies and our Committees, I would express the sincere appreciation of the profession, and to Dr. S. C. Robinson, who has been the Chairman of the Executive during the past three years, and who has helped so admirably with arrangements for the Annual Meeting, I would add my own thanks for a task well done.

After we have considered the valuable work of the clinical committees and have realized that their work enhances and ensures progress in the Society's responsibilities in the care of sick - this being in effect the essence of our "*raison d'etre*" - we must turn to the efforts of those within the profession who have become, from time to time, more intimately related to the solution of problems which, in the long run, will determine the happiness of the profession and its individual members and ultimately will contribute to the quality and standard of clinical practice. For the past few years, the matter of devising plans and advising government and government agencies regarding these plans for government sponsored physicians' services has been a primary concern of your Executive and Physicians' Services Insurance Committee. The continued prospect of early initiation of a medicare plan has presented many difficulties and questions, and one can reasonably assume that improper or inadequate solutions can only result eventually in inadequate care of the patient.

With these thoughts in mind, the Physicians' Services Insurance Committee has met on numerous occasions with the Medical Care Insurance Advisory Commission and with other government representatives. The matters discussed have included the continued right of professional freedom of all sections of medical practice, the matter of professional self-discipline and self-government with its inherent responsibilities, the comparisons of various provincial fee schedules, the costs involved in operating a private practice and the relationship this bears to our fee schedule, mechanisms by which a member of the profession may practice under Medicare and suggestions as to what would be considered adequate and satisfactory legislative measures to protect not only the patient but also the physician in the government sponsored plan.

In considering its Fee Schedule, the Society has affirmed its right and responsibility as a profession for its future development and composition. We have considered it reasonable that physicians within the various sections of our Society should consider comparative incomes on the basis of their training, responsibility, hours of work and

cost of operating their practices. We have suggested that the professional costs of services and procedures are matters which we are prepared to discuss with government and its representatives. Having agreed among ourselves to this a year ago, we have undertaken to make presentations on behalf of our radiologists & pathologists (who are in short supply) to the Nova Scotia Hospital Insurance Commission and find that we have been unsuccessful after 6 months. I must say, that to date, with this Commission, we have felt we are walking down the garden path rather than reaping the benefits that can come from discussions on a two way street. The problems facing the profession on the eve of its socialization are great, but they do not need to be aggravated by intransigence on the part of others, whom I feel may mean well, but have difficulty in convincing the membership of the profession.

The Society, I believe, has demonstrated over a period of 1½ years, through its Physicians' Services Insurance Committee that very useful discussions can be held with government agencies. In this time, we have met on 19 occasions with the Medical Care Insurance Advisory Commission and have presented and listened to matters that have been of benefit to both the profession and the Commission. It is our hope, and indeed a primary criterion of the profession's platform for participation in Medicare, that, having established a Fee Schedule, agreed to by the profession and government, it will henceforth be attached to a mutually accepted index - one that reflects costs and wages in our Province. Having established this, we can be somewhat more assured that the earnings of our members will not be eroded by inflation with the passage of time.

You will recall that during the last Annual Meeting, the Society endorsed an administrative system which would include the Society-sponsored Maritime Medical Care Incorporated. This recommendation was accepted by our government and formal conclusion of an agreement between government and Maritime Medical Care came about on July 27th of this year. Certainly, in the affairs of Nova Scotia medicine, this represents a milestone and one with which we can be justifiably proud.

On September 11th, of this year, the Medical Society moved its offices to the 15th Floor of the Sir Charles Tupper Medical Building. This suite, and the surrounding facilities, provides tremendously improved working space, and a delightful view of this fine old city. I would hope that many physicians and their wives will make use of this opportunity to visit the Medical Building and the Society's offices. On behalf of the Society, I extend to Dalhousie University and the Faculty of Medicine, our sincere thanks and gratitude for providing this space for our use.

During my inaugural remarks a year ago, it was stated that "in the months ahead the onus of self-imposed self-discipline, with its many variations, will be weightier and will try us to the sticking point". I believe that this pertains to the future, but already twelve of the months referred to have gone and the truth of this observation is becoming apparent. We have struggled with "self-imposed self-discipline" and find that it is far from a short little cliché. Instead, we have remembered that in the past it was related to a totally free enterprise system of medical care and now recognize that in a government-sponsored system, the freedom is not quite so free and that rules and regulations previously adapted to ourselves are no longer as suitable. In consequence, changes in our own laws will have to be made from time to time, to recognize the differences that have come about. The profession has always been resilient, and in the medical field, has been quick to adopt improved methods of treatment for our patients. It would seem to me that similar resilience is required in areas which relate medicine to law, politics, economics and society as a whole, so that we, as a profession, may "roll with the punch" but, at the same time, be better equipped to "bounce back" quickly in dealing with the difficulties that are certain to occur in the future.

For many years, the profession at both the national and provincial level has provided government and its representatives with its concept of physicians' services insurance, including the beliefs of non-compulsion in patient or physician participation, and subsidization of physician's insurance for those in need. In these days of increasing concern by all segments of society, with respect to rising costs and the dangers of inflation, we hear and read of apprehension in different provinces respecting the proposed Federal Medicare plan. Further consideration of an initial, more restrictive type, of medicare plan may be warranted at the present time, and the Society should be prepared to resubmit recommendations according to the beliefs we have previously formulated.

There are many other problems and areas of medical interest that physicians concern themselves about today. Two others which I would like to present in brief this evening relate to our shortage of nurses and physicians.

It is stated, as a matter of fact, that this nation has an abundance of nurses. Those of us who work in hospitals are, from time to time, aware of an apparent shortage. What is this paradox and what can be done about it?

It is estimated that there are 250,000 nurses in Canada - or 1 nurse per 80 people - one of the highest ratios, if not the highest in the world. Part of the problem appears to be that there is a shortage of nurses working in the nursing profession; another part is the number of nurse-hours devoted to actual

nursing procedures and another part of the apparent shortage relates to the high rate of turnover. It is estimated that the turnover rate of general staff nurses in public general hospitals is 61% and the minimal turnover cost is $20,000,000 per year

It is apparent that much better use should be made of those nurses already in our population, by encouraging more to resume full-time nursing employment, more to become part-time employees, by continuing to develop atmosphere and facilities in our hospitals which discourage turnover, and by utilizing nurses in jobs for which they were trained.

A look at another set of figures reminds us that, if we actually have a large number of nurses who can be utilized at present, it may not always be thus. For instance, in 1940, one in four of female students graduating from high school enrolled in a School of Nursing; in 1950, it was one in five; in 1960, it was one in ten, and it is estimated if drastic changes are not soon made, the proportion will be one in 20 or 5%. Moreover, in the 1940's, 1950's and early 1960's Canadian nursing schools persistently graduated about 400 more nurses than each preceding year. In 1966, the increase over 1965 was 99, and recent studies apparently suggest that three nurses must graduate to obtain a net gain of one working in the profession.

There are presumably many reasons why young women are not as interested in this profession as formerly. Competition for their services spreads over a broad spectrum as compared to yesterday. Some of the difficulty must rest with inadequate remuneration as compared with other professions. The nursing profession has been burdened with a long history of relatively poor financial reward, and many a good nurse has been carried along by true dedication in the Florence Nightingale tradition. Since 1959, nurses salaries in this province have been partly pegged at Nova Scotia Hospital Insurance Commission rates. This Commission, like all conscientious government commissions, is concerned about the public purse and tends to be a follower, rather than a leader in the financial emancipation of this profession in our province. It should be noted, however, that these girls are catching on fast, have established more than 700 bargaining units in Canada, and their Canadian Nurses Association is aiming at $6,000.00 per year in 1968 for beginning practitioners. At the present time, this Association is struggling to improve the median salary of a nurse teacher with her Masters Degree from the 1966 level of $6,135. They realize that, in the long run, a profession to be well staffed must be well paid.

The practical problem of the relatively short supply of nurses particularly in the Halifax area and some of our towns must be one of which the government is aware. There are very few, if any, hospitals of which I am aware, which by their own estimate, have an adequate supply of nursing staff. The shortage becomes very apparent during the summer months when some hospitals run very close to inadequate nursing care of the patient. Every effort should be made to encourage young women to again become interested in nursing as a profession, the registered nurse should be recognized as the basic unit and not downgraded, and all efforts possible should be made by our government to ensure that the pastures in Nova Scotia are just as green and attractive for our nurses as those elsewhere.

The problem of doctor shortage has already been with us for years and the prospect of Medicare in July of next year does little to improve the individual physicians' attitude to continual overwork. A recent Canadian Medical Association survey shows that 50% of physicians in this country work 64 plus hours per week, which is 1½ times the average labor work week. During this week, the average number of patients seen is 125 in smaller areas and 80 in the cities. It also noted that, whether a doctor practiced alone or in a group, the average expense of running his practice was about 33% of his gross income. The doctor's working hours, his expenses of practice, the age at which he completes his training and his responsibilities in providing for his own eventual retirement are some of the considerations required in assessing his gross income. We should also remember that high taxes, increased earnings and a shortened life span are a poor substitute for the eight hour day, five day week and regular holidays. The former will be the lot of the physician for years to come and will only improve when he can reorganize his professional life more successfully (i.e. group practice, etc.) and greatly increase the number of practitioners in his profession.

The physician-population ratio across the country was 1:879 in 1961 with the range spreading from 1:780 in Ontario to 1:1682 in Newfoundland. A satisfactory ratio might be considered at 1:750. The present ratio in Nova Scotia is about 1:1100. It is noted that the supply of physicians varies with the level of per capita income, with the number of general hospitals beds and with the proportion of the population living in urban communities. The problem of doctor shortage also involves the type of physician available. Between the years 1955 and 1965, there was 94.6% increase in specialists (to 9,423) and only a 4.1% increase in general practitioners (to 10,221) while at the same time the Canadian population increased by 18%. The increase in doctors numbered 5,984. A very high percentage of both family doctors and specialists live in the large towns and cities and when a rural area loses their lone physician, replacement is most difficult. Many familiar reasons have been cited and it seems unlikely that the situation will improve in the near future.

The preceding figures only in part depict the shortage which is present and which is unlikely to be corrected in our professional lifetime. This has happened despite the warnings issued many years ago by our medical educators - it would be much worse had not the National Health Service driven many of the best in British Medicine to Canada and the U.S.A.

We cannot expect immigration to be so helpful in the future - nor can we morally encourage physicians to come from countries such as India and Pakistan where the need is so much greater than ours.

Our literate society has become accustomed to one of the highest standards of medical care in the world, and the substitution of medical personnel by paramedical and lesser trained physicians in the provision of medical services is something that neither our people or profession would adjust to lightly.

It may be that the greatest hope in eventually meeting the demand lies in the creation of more Canadian doctors and making them feel that they should remain in Canada. Neither of these are as easy to fulfill as might be first suspected. In Dr. C. B. Stewart's article entitled "The Future Availability of Medical Students" presented at the Montreal Conference on Medical Care Insurance and Medical Manpower in June of this year, many interesting statistics were presented. For instance, it is noted there averaged 47 first year medical students / million population in the U.S.A. in the years 1961-1965, with the three year average of 1961, 1962 and 1965 in Canada being 51/million. In 1965, the rate of the Atlantic Provinces was 41 and 62 in Alberta. "Only 36 persons rated as acceptable by one or more schools failed to gain admission to any Canadian medical school in 1965-66." If all of these had become first-year medical students in 1966, the rate would have been 55/million. Dr. Stewart estimates that 1,260 new physicians would be required in 1972 to replace the 2.5% lost by death and retirement and to take care of the expected growth in population. In order to graduate or license 1,260 physicians in 1972, 1,550 first year students would have to be enrolled in 1967 (includes 10% attrition and 10% loss to U.S.A.). These 1,550 first year students represent an enrollment rate of 77.5 per million in comparison with the 1965 average of 53. It is suggested that this goal is unrealistic and that to improve the chances of achieving it, financial aid to medical students is needed, and medical educators should review admission standards with the hope of salvaging a few more students.

But probably the greatest influence in producing new medical students can be exerted by the present practitioners of the art. It could be that the greatest gift a physician leaves his country is the man he has persuaded to become a physician. We must remember, that in spite of what medicare may bring to our profession, it will continue to be a very important profession. We must stir ourselves, and get represented on the Career Night panels in our High Schools and drop the occasional hint of encouragement in the ears of our conscientious, hard working and intelligent young people. Having done so, there must be a return of the receptive attitude toward the physician at all levels, and governments must encourage, rather than unduly criticize, the profession when it is at a restive time in its history.

During the past few minutes, I have tried to portray some thoughts of your president during his tenure of office. There have been others, but these seemed to represent some of the more important problems, as they come to mind. It also occurred to me that after a wearisome day a physician is drawn to the artistic accomplishment in his surroundings and that he should never downgrade the importance of this in the education of his confreres to follow. One cannot easily dismiss the importance of good literature, music, theatre and the like from the full life. We must not forget the guidance of the past, in entertaining the future, and it is my sincere wish that the deliberation of the present generation will not be wasted for those who follow us. □

Bibliography

(1) Medical Manpower in General Practice - Dr. R. L. Perkin, Medical Care Insurance and Medical Manpower, Montreal, P.Q. - June 19-23, 1967.

(2) Future Availability of Medical Students - Dr. C. B. Stewart, Conference on Medical Care Insurance and Medical Manpower, Montreal, June 1967.

NOTICE

Summer Meeting - 1968

The Medical Society of Nova Scotia

The Third Summer Meeting will be at "The Pines" Digby, July 4th, 5th and 6th. (Thurs. Fri, & Sat.)

These Meetings have been very successful and should be even more so in 1968 because of current discussions on "Medicare" in the Legislature.

Housing application forms will be enclosed in the mailing of a "Newsletter" in the near future.

C.J.W.B.

Highway Safety News

UK BREATHALYZERS PROVE THEIR WORTH: LONDON ACCIDENTS CUT BY 42%

If the world has been waiting for proof that stricter control of drinking drivers will reduce highway accidents and deaths, then Britain has brought it to us.

Why it should take proof is beyond knowing, but apparently that's the way too many people want it.

So all right - proof it is.

On last October 9, breathalyzers were put into use in Britain under stiff new laws.

One month later police were able to state with accuracy that the fatal and injury accident rate in Great London had dropped by 42 per cent from the same period in 1966.

In addition, the number of people killed in the same period dropped by 34 per cent - from 82 to 54.

Surveys conducted throughout Canada indicate that these same figures would apply in this country if impaired drivers were cracked down on - and it is interesting to note that 34 per cent of total traffic fatilities in Canada in 1966 is 1,787 people. There's many a town in our country which doesn't have that many people living in it.

Just what was done in Britain? Here it is, in brief:

The legislation which went into effect October 9 empowered a uniformed police officer to take a breath test at the roadside if:

— he had reasonable cause to suspect a driver of having alcohol in his body: or

— he had reasonable cause to suspect a driver of having committed a moving traffic offence; or

— the driver had been involved in an accident.

What followed was simple. The officer produced his portable breath tester, a tube filled with chemically treated crystals; the driver took a deep breath and blew into the tube; if the crystals turned green, on to the station.

At the station, a second breath test was offered. If it, too, indicated a high level of alcohol, blood or urine tests followed. If these indicated an alcohol blood level higher than .08, prosecution followed. The penalty on conviction:

A fine of at least $280 and/or four months' imprisonment and loss of the driver's license for a year.

What made the law work, of course, was strict enforcement. Some police went so far as to station themselves outside pubs to take tests of anybody who left the pub and entered a car with the apparent intention of driving it.

Pub owners went so far as to buy breath testers of their own and allow customers (for five shillings) to test themselves before they left and make their own choice of whether or not to drive.

The net effect was that far fewer cars were seen on London's streets at night, and those that were there were involved in 42 per cent fewer accidents.

Gives one to pause, don't it dearie?

Well, then, what's happening in Canada?

At present, police have found it so difficult to prove drunk driving charges that they rarely lay one.

On the other hand, impaired driving charges and convictions have become so common that daily newspapers in major cities only print them as a list of names, without details, under a general court column.

In other words, police are hampered in attempts at enforcement by a law which does not have teeth in it, and the public has become apathetic about the situation, as reflected in the newspapers.

And yet, hundreds of Canadians die on our roads and highways every year because of impaired drivers.

The Standing Committee on Justice and Legal Affairs sat for almost a year, heard countless witnesses on the subject of drinking drivers and breathalyzers and finally recommended on February 9, 1967, that the Criminal Code be amended to provide:

That it be unlawful "for anyone with a blood alcohol level of .08 per cent or more to drive a motor vehicle";

That initial analysis could be made by breathalyzer, with subsequent blood or urine tests for confirmation; and

That it be an offence for any person to refuse to take such a test if an officer has cause to believe the person has committed an offence under the first section.

The CHSC has been urging just such legislation for a long time and presented extensive supporting material to the Justice and Legal Affairs Committee last year and this. And we had some solid support from other important organizations.

The Canadian Bar Association has come to the conclusion that the use of breathalyzers on suspected drinking drivers is not an infringement of civil liberty (there's a limit on speed, no matter how well you drive - why not a limit on the amount of alcohol in your blood?)

The Canadian Medical Association has confirmed that breathalyzers are an accurate way to measure blood alcohol levels.

The federal government has introduced legislation to amend the sections of the Criminal Code dealing with drunk and impaired driving, very much along the lines of the recommendations.

Perhaps Parliament will take note of the British success and speed these amendments into legislation. □

Bilirubin Metabolism and Jaundice

B. W. D. Badley, MB, MRCP, FRCP(C)

Halifax, N. S.

1. Bilirubin production

(a) *Haemoglobin degradation*

The principle source of bilirubin is the normal daily destruction of about 1% of the total haemoglobin mass, bile pigment being the only waste-product formed since the released iron is stored in the liver and the globin enters the protein pool of the body and is available for the manufacture of new haemoglobin. The degradation of haemoglobin occurs in the reticuloendothelial system, particularly in the liver, spleen and bone marrow. It occurs rapidly; in the rat the mean interval between sequestration of injected labelled haemoglobin and appearance of the labelled bilirubin in bile is approximately 3 hours.[3,5] In an average adult male having a blood volume of 5 liters and a haemoglobin concentration of 15 gm per 100 ml, daily destruction of 1% of the circulating red cells produces 7.5 gm of haemoglobin from which is formed 250 mg of bilirubin[1].

Intermediate steps in the process of haemoglobin breakdown remain uncertain. Two theories of formation remain current. The traditional theory is that haemoglobin is broken down into globin and haematin – the trivalent iron complex of haeme. With the loss of iron, protoporphyrin is formed and oxidized to biliverdin which is then reduced to bilirubin.

Textural Diagram

HAEMOGLOBIN →(Minus Globin)→ HAEMATIN →(Minus Iron)→ PROTOPORPHYRIN

oxidation →→ BILIVERDIN →(reduction)→ BILIRUBIN

isomerisation

There is little experimental evidence that protoporphyrin can be converted to bilirubin, either in vitro, or in vivo and it is probably necessary for iron to remain attached to protoporphyrin for cleavage of the porphyrin ring to occur. A more recent theory[2] proposes that the alpha-methane bridge of protoporphyrin is completely oxidized with the formation of a choleglobin and finally replaced by an ether linkage. Hydrogen and globin are cleared from the molecule, and the biliverdin formed is reduced to bilirubin.

Textural Diagram

HAEMOGLOBIN →(oxidation)→ CHOLEGLOBIN →(Minus Iron)→ BILIVERDIN

reduction →→ BILIRUBIN

However, the intermediate products in this reaction have not been isolated in pure form and have been identified by spectrophtometric means only, rather than by more rigorous criteria.

Following intravenous injection of 14C - labelled sensitized erythrocytes into rats the recovery of the label in bile is much less than the injected dose, suggesting that a proportion of the haeme moeity is converted to metabolites other than bilirubin[3,5].

(b) *Other sources of bile pigment.*

Radioisotope studies using 15N- labelled glycine suggest that a minor bile pigment fraction originates from sources other than the breakdown of senescent erythrocytes. 10 to 20% of glycine ultimately incorporated into stercobilin is excreted within 10 days of the administration of the isotope[1].

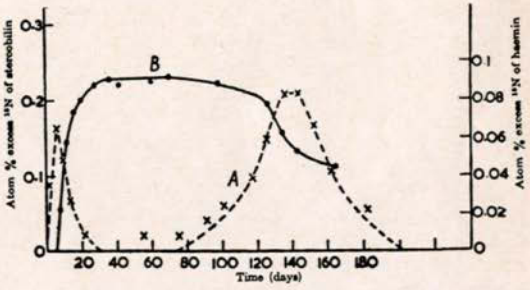


Fig. 1. N^{15} content of haemin samples (full line) and of stercobilin (dotted line) following administration of N^{15} - labelled glycine to a normal subject.

This "early-labelled peak" occurring much too early to be connected with red cell break-down, is closely linked with haemoglobin synthesis and in pathological conditions such as pernicious anaemia, congenital porphyria and thalassaemia this portion may comprise nearly 80% of excreted stercobilin. This fraction arises either from premature destruction of erythrocytes or erythrocyte precursors in bonemarrow, from haeme formed in excess or from other haeme pigments such as myoglobin or the cytochromes.

2. Bilirubin Transport.

(a) *Binding to protein.*

In its transport from reticuloendothelial system to the liver bilirubin is bound almost completely to albumin[3], although a minor fraction may be attached to an alpha-globulin. Small amounts of

bilirubin can be absorbed onto the red cell membrane, an effect which is reversed when the erythrocyte is coated with antibody[5].

In the jaundiced patient bilirubin is found in the lymph, ascitic, pleural and cerebrospinal fluid. The concentration found in CSF is not proportional to that in the plasma except in the newborn.

Elastin is the main tissue stained by bile, the degree of staining probably being associated with the amount of extravascular albumin present in the tissue.

(b) *Interference with protein binding.*

Some organic anions, such as salicylate, sulphoamides and caffeine sodium benzoate, can compete with bilirubin for binding sites on the albumin molecule, altering the pigment-binding capacity of the plasma[6, 7]. When treated with sulphamethoxpridazine, premature newborns were found to develop kernicterus more frequently than controls, despite the fact that the mean bilirubin level was lower in the treated group than in the controls[8].

(c) *Bilirubin uptake by the liver.*

The process by which circulating bilirubin is transferred from plasma into the liver cell has not been determined. Nevertheless, any mechanism proposed must account for the removal of both conjugated and unconjugated bilirubin from the albumin and movement into the interior of the cell, since it seems improbable that the observed rates of bilirubin transport could occur if a bidirectional flow of albumin were required to effect the transfer. It appears likely that uptake will occur in the absence of conjugation since once trapped within the cell bilirubin must reach the microsomes before this can occur. This need not detract from the importance of conjugation in determining the *extent* of bilirubin uptake, however, particularly if the capacity of the liver to store bilirubin is limited.

3. Hepatic Morphology

Before discussing the intraphepatic metabolism of bilirubin, the functional anatomy of the liver should be briefly reviewed. The liver is composed of single-thickness sheets of hepatic cells tunnelled minutely by two systems of channels which dovetail in such a way that they never touch each other. The terminal branches of the two systems are separated by about 0.5 mm. and as far as possible run in planes perpendicular to each other, as indicated diagrammatically in figure 2.

The terminal branches of the portal vein discharge their blood into sinusoids which surround the liver cells, the direction of flow towards the hepatic vein radicles being determined by the higher pressure within the portal system. The walls of the sinusoids are composed of a thin endothelial syncytial lining containing Kupffer cells which are phagocytic, clearing the canal system of particulate matter, old erythrocytes, bacteria and other debris, and participating in bilirubin formation. They contain few mitochondria, sparse endoplasmic reticulum and varying numbers of large lysozomes. The walls of the sinusoids have the ability to change in caliber, this faculty - plus the presence of inlet and outlet sphincters - allowing regulation of flow through a vascular area. The activity of sinusoids is intermitten, groups of sinusoids shifting their work asynchronously.

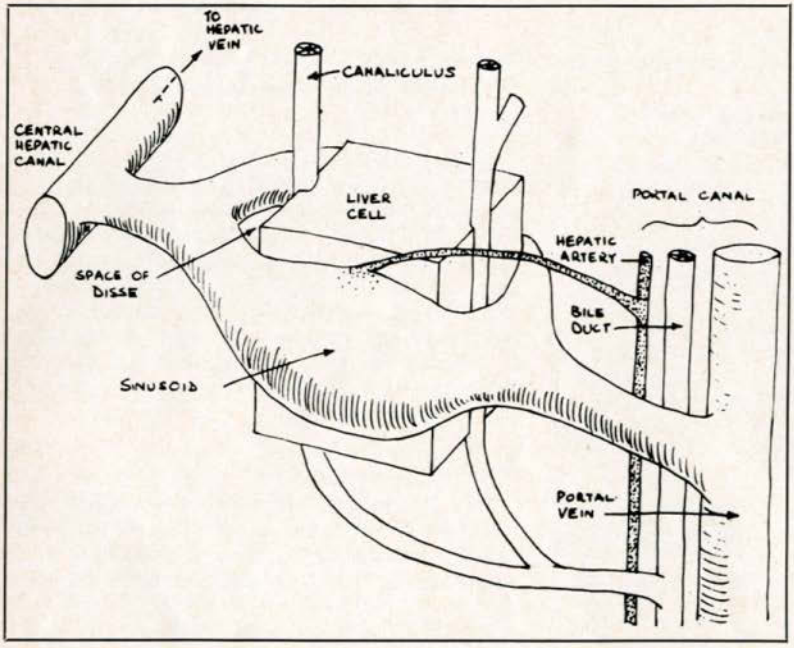


Fig. 2. Schematic relationship of the vascular and biliary systems to a single hepatic cell

The tissue space between the sinusoid and hepatic cell (the space of Disse) contains tissue fluid which drains eventually into lymphatics.

Bile canaliculi form polygonal networks around individual liver cells. The canaliculi drain into interlobar and septal ducts whose solid walls contribute to the mechanical stability of the liver before finally reaching the major bile ducts.

Terminal branches from the hepatic artery form a plexus around the portal vein and bile duct before emptying directly into sinusoids.

Microscopy of the liver cell reveals irregular microvilli projecting into the perisinusoidal tissue space and more regular microvilli into the lumen of the canaliculi. The nucleus is rich in DNA and contains one or more nucleoli. In the cytoplasm are numerous mitochondria within which takes place the chemical transfer of energy which is released into high-energy bonds of adenosine triphosphate. Endoplasmic reticulum pervades the cytoplasm and contains regularly-spaced granules, rich in ribonucleic acid, which are the seat of the synthesis of proteins including enzymes. Microsomes are dark elliptical bodies which are found near the canaliculi and contain hydrolytic enzymes.

4. Intraphepatic Metabolism

It has been known for 50 years that bilirubin, in its passage through the liver, is converted from a lipid-soluble pigment to one soluble in water. The post-hepatic pigment, present in bile and sera of patients with obstructive jaundice, gives an immediate red colour with diazotized sulphanilic acid (direct-reading bilirubin) whereas the pre-hepatic pigment, present in sera of patients with haemolytic jaundice, requires addition of alcohol before the reaction can take place (indirect-reading bilirubin)[9]. The chemical process in the liver which converts with one type to the other has been discovered only on the last decade[10,11]. The indirect-reacting pigment is free bilirubin whereas the direct-reacting pigment is conjugated chiefly as bilirubin diglucuronide. A second direct-reading pigment which contains bilirubin monoglucuronide, known as Pigment I, has been demonstrated. It has been claimed that the amount of the various conjugated pigment components in serum may be of diagnostic value, but since there are important intrinsic errors in the conventional extractions involved, such claims are probably unfounded[12], and no practical purpose is served by further dividing the pigments.

(a) *Mechanism of Bilirubin Conjugation.*

Probably the most important difference between free and conjugated bilirubin lies in solubility. During conjugation the non-polar lipid-soluble unconjugated bilirubin is converted to a polar, water-soluble compound which is able to pass the glomerular membrane into the urine. This latter property explains the absence of bile in the urine in haemolytic (acholuric) jaundice and its presence in jaundice due to regurgitation of post-hepatic (conjugated) bilirubin.

The conjugation of free bilirubin in the liver is dependent upon a series of enzymatic steps culminating in the transfer of an active glucuronide moeity from a donor substance, uridine diposphoglucuronic acid (UDPGA), to bilirubin. This transfer is catalyzed by a microsomal enzyme, glucuronyl transferase. Glucuronyl transferase activity has also been demonstrated in renal and intestinal tissues, and the appearance of conjugated bilirubin in hepatectomized dogs has been attributed to these sources. The glucuronide donor, UDPGA, is the unique substance in man through which glucronic acid is made available for conjugation. The formation of UDPGA is dependent on another specific enzyme, uridine diphosphorglucose dehydrogenase.

Although the main means of excreting bilirubin involves conjugation as the glucuronide, other detoxifying mechanisms are employed. Mild alkali treatment of bile will convert about 80% of the "direct" bilirubin into the "indirect" form. The remaining 20% has a non-glucuronide structure and has been found to consist mainly of sulphate. A small amount may occur as a carboxyl-linked methyl or glycine conjugate [15].

(b) *Conjugation in the newborn.*

Although the enzymatic apparatus for glucuronide formation in the foetal liver is deficient, the concentration of unconjugated bilirubin in cord blood is surprisingly low, even in haemolytic disease, rising sharply in the neonatal period. Radioisotope studies[16] have shown a free transfer of unconjugated bilirubin across the placenta, but impermeability to the conjugated form. On crossing the placental barrier the unconjugated bilirubin becomes bound to maternal albumin and excreted in maternal bile.

The delayed maturation of the foetal conjugating mechanism has been postulated to be a protective mechanism by which the unconjugated bilirubin is excreted by the mother via a route which would be unavailable if conjugation occurred.

A gradual increase in glucuronyl transferase activity occurs following birth and rises from about one-fifth of adult activity to comparable levels in 15 to 20 days. Uridine diphosphoglucose dehydrogenase is also deficient in the foetus, its rise in activity being parallel to that of glucuronyl transferase.

5. Secretion and Enterohepatic Circulation.

Neither of these facets of bilirubin metabolism is well understood. Little is known of the method of secreting bile from the liver cell into the biliary canaliculi except that, in mammals at least, it is dependant upon prior conjugation. Evidence suggesting this has been obtained from the Gunn strain of rat. These congenitally jaundiced animals have a deficiency of glucuronyl transferase with a resulting unconjugated hyperbilirubinaemia. Their bile is colourless, containing only trace amounts of bilirubin. Intravenously administered unconjugated bilirubin disappears very slowly, whereas conjugated bilirubin disappears at the same rate as in normal rats and is rapidly excreted into the bile[21]. These findings, which indicate the importance of conjugation for biliary excretion, are strongly supported by the observations that only conjugated bilirubin can be detected in the bile of many mammalian species.

The existence of an entero-hepatic circulation of bilirubin in man has been confirmed in experiments using labelled bilirubin, and it has been

shown that lipid-soluble unconjugated bilirubin is readily absorbed from the bowel, but conjugated bilirubin is not absorbed. On reaching the intestine the bilirubin is acted upon by the bacterial flora and enzymatically reduced to a series of colourless urobilinogens. About 50% of this urobilinogen is reabsorbed into the portal circulation and returned to the liver. Here if the liver is normal and the rate of urobilinogen return not too rapid, all but a trace is removed from the blood and re-excreted into bile, probably as bilirubin formed by reoxidization in the liver cells. The very small amount of absorbed urobilinogen not re-excreted by the normal liver (less than 4mgm daily) passes into the systemic blood stream and is removed in the urine.

Effective bilirubin excretion is dependant on mechanisms preventing or limiting biliary and intestinal reabsorption. Normally, formation of urobilinogen occurs predominantly in the lower intestinal tract, whereas absorption of bilirubin metabolites occurs maximally in an area proximal to the terminal ileum. This together with the adsorption of chromagen onto faecal material and, perhaps, persistence of the glucuronide conjugate after bacterial reduction, appears to have a combined effect in limiting the enterohepatic circulation of bile pigments. The urobilinogen in the lower intestine is excreted in the stool in quantities of about 300 mgm daily, its oxidation to urobilin giving colour to the stool.

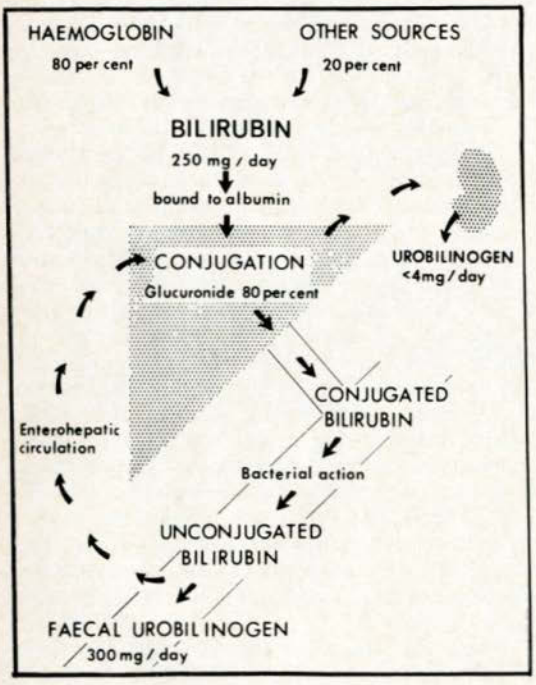


Fig. 3. Normal bilirubin metabolism.

Jaundice

Theoretically, *jaundice*, an increase in bilirubin in the blood, might arise in four different ways. Firstly, there might be an increased load of bile pigment on the liver cell. Then, there might be a disturbance in the process by which bilirubin diffuses into the cells from the sinusoids and is actively transported to the microsomes for conjugation. Thirdly, there may be defects in the actual conjugation process, and finally, there may be difficulty in the passage of bile pigment through the cell membrane to the canaliculus and thence, via the biliary tract, to the intestine.

A disturbance in one or other of these four mechanisms is probably responsible for all forms of jaundice, although in most instances knowledge is insufficient to pinpoint the exact defect concerned in an individual patient, and multiple disturbances may coexist.

(I) INCREASED BILIRUBIN LOAD.

(a) *Increased haemolysis.*

Excessive red cell haemolysis releases large amounts of haemoglobin into the circulation, the increase ranging from the normal of about 7.5 Gm to as much as 45 Gm daily[21]. There is a resultant increase in bile pigment formation, over 85% being in the unconjugated form. Even when presented with this maximum sixfold increase of bilirubin load (1500 mgm/day) the liver is able to handle it with the rise in serum level being held to between 2 to 3 mgm/100 ml. If patients with haemolytic anaemia show bilirubin values greater than 5 mgm/100 ml there is almost certainly an additional factor of hepatocellular dysfunction, although the anaemia *per se* is capable of depressing liver function. Since the bilirubin is in the unconjugated form it cannot pass the glomerular membrane and bile is therefore absent from the urine (*acholuric jaundice*).

(b) *"Shunt" Hyperbilirubinaemia.*

The occurrence of unconjugated bilirubin from sources other than mature red cell breakdown ('early-labelled peak') has already been described. (See. 1.b) A rare familial condition has been described by Israel in which unconjugated hyperbilirubinaemia occurs in the absence of recognizable haemolysis and persists following splenectomy. An exaggeration of the normal 'shunt' mechanism has been demonstrated to occur in these cases.

(II) DISTURBANCE OF BILIRUBIN TRANSPORT. (GILBERT'S DISEASE)

This, the commonest form of familial nonhaemolytic jaundice, is probably inherited as an autosomal dominant and is characterized by mild intermittent jaundice from childhood. Deepening jaundice is heralded by malaise, nausea, and liver discomfort - a picture commonly causing confusion with infectious hepatitis. The unconjugated bilirubin seldom exceeds 3 mgm/100 ml and is unaffected by corticosteroid therapy.

Since other substances are normally conjugated by such patients a defect in transport from serum to microsome appears the likely mechanism. Indeed, a defect in the uptake of labelled bilirubin by the liver has been demonstrated in patients with Gilbert's disease, which is probably not a single entity but represents a number of different conditions. The recognition of such cases following clear-cut attacks of hepatitis may not be pure coincidence. Post-hepatitis hyperbilirubinaemia may be one variant of this syndrome.

(III) DISTURBANCES OF BILIRUBIN CONJUGATION.

(a) *Neonatal ('physiologic') jaundice.*

The immaturity of enzyme systems in the newborn, and especially premature, liver has already been described (see 4.b) and represents the best example of this disturbance.

(b) *Crigler-Najjar Syndrome.*

Abnormal enzymatic conjugation of bilirubin is also found in the severe, and very rare, Crigler-Najjar type of hyperbilirubinaemia[23] in which affected infants are severely jaundiced, with kernicterus, and usually die in the first year of life. One father and daughter have been described, however, who although deeply jaundiced have remained otherwise good in health[24]. BSP excretion in these cases appears to be normal.

(c) *Inhibition of conjugation.*

Sera of normal pregnant women and newborn infants contain a substance which is found to inhibit the conjugation of bilirubin by rat liver slices. This property is shared by certain physiological steroids (pregnanediol), progesterone and others) but not by testosterone, androsterone, oestrogen or cortisol[17]. Successive infants of certain apparently normal mothers have been found to develop high levels of unconjugated bilirubin which lead to kernicterus in one-third of those affected. The sera of these infants and their pregnant mothers inhibits bilirubin conjugation to an extent of 3 to 5 times the maximal inhibitory effect of sera from normal pregnant women and their newborn[18], suggesting that the mechanism of jaundice production is probably an exaggeration of physiological inhibition of conjugation. (Lucey-Driscoll Syndrome). In survivors the resulting jaundice disappears within a month as normal conjugation mechanisms appear.

Food deprivation in newborn animals consistently retards the development of glucuronyl transferase activity, although supplemental feeding does not have an enhancing effect[29].

Novobiocin has also been shown to inhibit conjugation in vitro, and there is an increased incidence of unconjugated hyperbilirubinaemia in infants receiving this drug.

(d) *Jaundice from breast-milk.*

Breast-milk containing pregnane - 3 alpha, 20 beta-diol may be a cause of severe and prolonged unconjugated hyperbilirubinaemia in some breast-fed infants. Such breast-milk consistently inhibits glucuronyl transferase activity in vitro when compared with specimens of milk from mothers whose infants do not exhibit this syndrome[19]. On the other hand the sera from both groups of women show no difference in enzyme inhibition, suggesting that the responsible substance is either elaborated or concentrated in breast tissue.

(e) *Vitamin K overdosage.*

The association between large doses of Vitamin K analogues and hyperbilirubinaemia in premature newborns may also be due to enzymatic inhibition, but appears to have a different mechanism since it is strictly dose-related[20].

(f) *Enzyme induction.*

Like many other hepatic enzymes, glucuronyl transferase is localized in the smooth endoplasmic reticulum of the liver parenchymal cells. Treatment with barbiturates and other drugs can cause a striking proliferation of the endoplasmic reticulum and marked increases in the activity of the enzymes.

Yaffe and his co-workers[26] have recently treated hyperbilirubinaemic infants with phenobarbital with remission of jaundice and a decrease in blood bilirubin levels. Indirect evidence for increased glucuronyl transferase activity was obtained by finding increased amounts of administered salicylamide and salicylate excreted as glucuronides in the urine.

Even more recently[27] Thompson and Williams have treated four jaundiced patients with chronic intrahepatic cholestasis for up to fifty days with phenobarbital by mouth. In all of them, the plasma bilirubin was lowered by up to 50%. Again the mechanism of this effect was postulated as being related to enzyme induction.

(IV) DISTURBANCES OF BILIRUBIN EXCRETION.

In this instance the difficulty lies in the pathway between conjugation in the microsomes of the hepatic cell and entry of bilirubin into the duodenum. Although most commonly there is evidence of mechanical obstruction to bile drainage, some forms of jaundice appear to be due to blockage within the hepatic cell.

(a) *Dubin-Johnson and Rotor Syndromes.*

The Dubin-Johnson type of hyperbilirubinaemia[25] is a familial, chronic, benign, intermittent jaundice usually seen in young people. Much of the circulating pigment is conjugated so that bile is found in the urine. The main diagnostic point is in the liver, which macroscopically is greenish-black. In section the liver cells show a brown pigment which does not contain either iron or bile and is probably a lipofuscin or melanin. Electron microscopy reveals reduction in number of mitochondria but no appreciable changes in the microvilli. Biochemically, the alkaline phosphatase may be raised and there is difficulty in excreting intravenous cholangiographic contrast material.

Rotor[26] described a rather similar picture from the Philippines, the main point of difference being the absence of pigment from the liver cells. The alkaline phosphatase level is usually at the lower limit of normal.

In both the Dubin-Johnson and Rotor types a diagnostic pattern is seen in the bromsulphthalein (BSP) excretion test. After an initial fall in the serum level, the BSP concentration rises so that the value in three hours exceeds that in 45 minutes. Injected unconjugated bilirubin shows a similar pattern with an initial fall followed by a sustained rise of conjugated pigment. This behaviour suggests a normal conjugation mechanism, but reentry of the conjugated material into the blood stream because of difficulties in transport into the biliary canaliculi. (**see Textural Diagram below**)

(b) *Obstructive jaundice.*

The most frequent cause of the clinical pattern of obstructive jaundice is blockage of the main extra-hepatic bile channels, so-called 'surgical jaundice'. This is usually due to impaction of gallstones in the common duct or to neoplasm which involves most commonly the head of the pancreas with extrinsic pressure on the duct as it passes into the duodenum, less frequently by primary involvement of the extrahepatic bile ducts or the gall bladder by inflammation or neoplasm. Distant neoplasms may cause a similar picture if metastases occur to lymph nodes in the porta hepatis. Since the obstruction occurs at a point distal to the hepatic cell the resultant hyperbilirubinaemia is composed, initially at least, of conjugated pigment. Following prolonged obstruction secondary degenerative changes in hepatic parenchymal cells are probably responsible for a subsequent rise in the unconjugated fraction.

By preventing bile pigments from reaching the intestine the stools become pale and the increased quantity of conjugated, water-soluble bilirubin retained in the circulation passes through the glomerular membrane and appears in the urine. Since bacterial degradation in the gut is prevented, urobilinogen is not found in the urine. Absence of bile salts from the intestine may cause steatorrhea with its resultant secondary effects, and their retention within the blood stream gives rist to pruritis. Biochemical hallmarks of obstruction are, in addition to conjugated hyperbilirubinaemia, increased alkaline phosphatase, due mainly to overproduction within the liver cells, and hyperlipidaemia, which may cause the appearance of xanthomas. An increase in lipoprotein is reflected by high levels of alpha - and beta globulins on serum electrophoretic strips.

(c) *Intrahepatic cholestasis.*

In some patients the clinical and biochemical picture of obstructive jaundice is encountered in the presence of patent main bile ducts, a syndrome referred to as intrahepatic cholestasis. All forms of this syndrome show common pathological features characterized by distortion and sparsity of the microvilli, vacuolization of the Golgi apparatus and conjugated bile retention in liver cells, sinusoidal epithelial cells and the canaliculi.

The mechanism of intrahepatic cholestasis is obscure. Changes in the unidirectional transport system of the liver cells, increased permeability of bile capillaries, swelling of the parenchymal cells with obstruction of canaliculi, oedema within the space of Disse, changes produced by toxins or immune reactions have all been postulated. Some, all or none of these may be operative in any particular clinical situation.

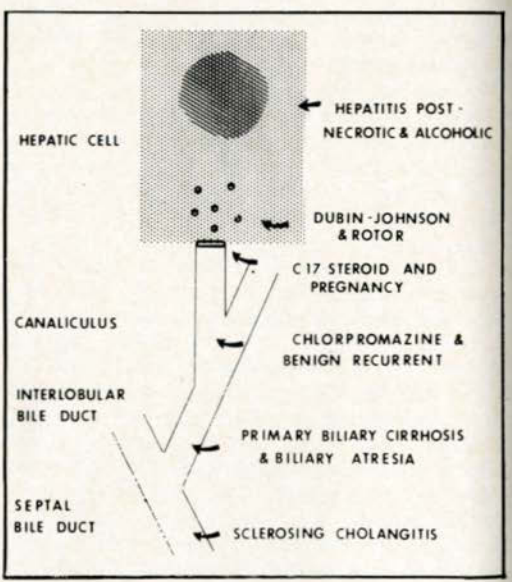


Fig. 4 Sites of intrahepatic cholestasis.

Textural Diagram

DIFFERENTIATION FEATURES OF FAMILIAL NON-HAEMOLYTIC JAUNDICE

Syndrome	Bilirubin	Urine Bile	BSP	Alk Phos.	Liver
Gilbert	Unconjugated	Neg.	Normal	Normal	Normal
Dubin-Johnson	Conjugated	Pos.	Early fall then rise	Normal	Pigment
Rotor	Conjugated	Pos.	Early Fall then rise	Low Normal	Normal

Some of the known causes of intrahepatic cholestasis will be discussed; they are grouped according to the anatomical site at which the abnormality is thought to occur.

(1) **Cholestatic viral hepatitis; alcholic hepatitis.**

Occasionally viral hepatitis may take an unusually prolonged course with deepening jaundice and progressive pruritis. After the first few weeks the patient again feels well, gains weight and has no other abnormality than icterus and hepatomegaly. Jaundice commonly persists for up to 30 weeks or even longer. A similar obstructive type of picture may occur in alcoholic hepatitis in which case the intrahepatic obstruction appears to be due to enormously distended fatty liver cells. "Ballooning" and cellular infiltration of necrotic cells which may show bile staining together with aggregation of bile pigment to form 'thrombi' may be the cause of the same phenomenon in viral hepatitis.

The mechanism of the occurence of jaundice in any case of viral hepatitis demonstrates well the multiple factors which are involved in a particular clinical situation. In addition to the obstructive element there must be difficulty "of transport of bilirubin through the damaged hepatic cells", and problems in conjugation also. Patients with any form of extensive hepatocellular damage show a diminished survival of erythrocytes, so that an additional factor of pigment overload is added to those of hepatocellular dysfunction and cholestasis.

(2) **'C-17 steroid' jaundice; jaundice of pregnancy.**

Cholestatic jaundice due to methyltestosterone was first described in 1950[27]. Several other steroids were subsequently shown to act in a similar manner. These include Danabol (delta 1 - 17 alpha - methyltestosterone), Enovid (17 alpha - ethynyl - 19 - nortestosterone) and Nilevar (17 alpha-ethyl - 19 northestosterone). All have in common the fact that they are active by mouth and are C-17 - alpha alkyl substituted testosterones. Testosterone propionate and Durabolin (19- nortestosterone phenylpropionate), which are inactive by mouth and have no C-17 substitution, do not cause jaundice.

All pregnant women show a decrease in the transport of BSP during the last trimester, and a few, probably due to a genetic predisposition, become mildly jaundiced during the same period. That the mechanism is similar to that of C-17 steroid jaundice is suggested by the fact that of 20 cases of jaundice reported following treatment with ovulation inhibitors (all of which contain the C-17 substitution), 8 had previous episodes of jaundice in pregnancy[32, 33].

Microscopic changes are slight. Light micrographs show only dilated bile canaliculi with bile thrombi, with absence of any inflammatory reaction. Electron microscopy has revealed "non-specific **pericanalicular** changes with shortening or absence of microvilli."

The jaundice is rapidly reversible on withdrawal of the drug or termination of pregnancy.

A benign, recurrent form of cholestasis occurring at the same time each year, with negative cholangiographic studies, is thought to have a lesion at the same site.

(3) **Phenothiazine jaundice.**

About 1% of patients receiving chlorpromazine develop an intrahepatic obstructive jaundice, usually within four weeks of starting the drug and unrelated to dosage. The onset may be explosive with very high levels of cholesterol and alkaline phosphatase from the outset. Clinical recovery always ensues usually within one to four weeks but occasionally the jaundice may last for more than three months.

An allergic aetiology has been suggested by the time of onset in relation to drug administration, the association of fever and rashes, eosinophilia and leukopaenia. Cellular infiltration with eosinophils and mononuclear cells is found surrounding "canaliculi and intralobar ducts."

An essentially similar picture can complicate therapy with other phenothiazine derivatives such as promazine (Sparine), prochlorperazine (Compazine), trifluoperazine (stelazine) and some non-phenothiazine drugs including para-amino salicylic acid (PAS), chlorpropamide (Diabenase) and nitrofurantoin (furadantin).

THE FOLLOWING TABLE LISTS THE DRUGS KNOWN TO PRODUCE CHOLESTASIS

Phenothiazines	**Antibacterial Agents**
Chlorpromazine (Largactil)	Sulfadiazine
Promazine (Sparine)	Nitrofurantoin (Furadantin)
Trifluoperazine (Stelazine)	Para-aminosalicylic Acid
Antithyroid Drugs	Erythromycin (Ilosone)
Thiouracil	**Hormone preparations**
Propylthiouracil	Methyl Testosterone
Methimazole (Tapazole)	Norethandrolone (Nilevar)
Miscellaneous	Methandrostenolone (Danabol)
Chlorpropamide (Diabenase)	Norethindrone (Norlutin)

(4) **Primary biliary cirrhosis; biliary atresia.**

The characteristic clinical presentation of primary biliary cirrhosis is that of a middle-aged female who insidiously develops pruritis followed at an interval of months or years by jaundice, pale stools, sometimes steatorrhoea and who is found to have a greatly enlarged firm, smooth liver, splenomegaly and xanthomas. Biochemical findings are characteristic of obstruction with little evidence of hepatocellular damage until portal hypertension and hepatic failure supervene. Survival may be up to 15 years from diagnosis and during most of that period the patient feels well.

Microscopic changes initially are those of a granulomatous reaction around "inter-lobar and

septal ducts" which show "disintegrative changes and finally disappear."

Fluorescein-conjugated rabbit anti-human gamma globulin together with primary biliary cirrhosis serum when added to an unfixed tissue section produces a coarse, granular fluorescence in over 90% of cases and may prove to be a useful diagnostic test in doubtful cases.

Atresia of the interlobular bile ducts is often associated with abnormalities in the extrahepatic bile duct system. Although the bile ducts never apparently develop in these cases, the patients may survive up to 10 years, possibly because of lymphatic drainage of bile. The clinical pattern stimulates closely that of primary biliary cirrhosis.

(5) **Sclerosing cholangitis.**

This is a rare clinical entity with only 20 unequivocal cases recorded up to 1963. It is characterized by progressive icterus with all the features of obstructive jaundice and pathological findings of diffuse inflammatory sclerosis of the "large intra-hepatic and extra-hepatic bile ducts," often with local and circulating eosinophilia and a high sedimentation rate. Although somewhat similar changes can be found after prolonged extrahepatic obstruction for periods of 10 to 15 years, the fact that cholelithiasis in this group of cases is uncommon suggests a different mechanism. Several cases have demonstrated an association between primary sclerosing cholangitis and retroperitoneal fibrosis; other case reports have linked it with Reidel's struma, thyrotoxicosis and multiple sclerosis, suggesting that this entity is a part of a widespread multisystem disorder. At least one case showed a gratifying response to corticosteroid therapy[34]. In view of recent reports of widespread inflammatory fibrosis following treatment with methysergide (sansert), one may speculate that sclerosing cholangitis will also be described following its use.

(6) **Primary carcinoma of bile ducts.**

This also is an uncommon condition which usually occurs in patients over the age of sixty. The onset is insidious with general symptoms of ill-health, jaundice appearing late when complete obstruction of the bile ducts has occurred. Metastases are usually intra-abdominal to regional lymph nodes, liver, gall bladder or peritoneum. □

References

1. London, I. M.: *J. Biol. Chem.*, 184: 373, 1950.
2. Lemberg, R.: *Rev. Pure and Appl. Chem.*, 6: 1, 1956.
3. Darocha, T., Murawski, K., and Szymanowska, Z.: *Clin. Chem. Acta*, 7: 729, 1962.
4. Lester, R. and Schmid, R.: *New Eng. J. Med.*, 270: 779, 1964.
5. Oski, F. A. and Naiman, J. L.: *J. Pediat.*, 63: 1024, 1963.
6. Novak, M., Polacek, K. and Melichar, V.: *Biol. Neonat.*, 4: 310, 1962.
7. Odell, G. B.: *J. Pediat.*, 55: 268, 1959.
8. Silverman, W. A., Andersen, D. H., Blanc, W. A. and Crozier, D. N.: *Pediatrics*, 18: 614, 1956.
9. Van den Bergh, A. A. H. and Muller, P.: *Biochem. Z.*, 77: 90, 1916.
10. Billing, B. H., Cole, P. G. and Lathe, C. H.: *Biochem. J.*, 65: 774, 1957.
11. Schmid, R.: *J. Biol. Chem.*, 229: 881, 1957.
12. Ibbott, F. A. and O'Brien, D.: *Pediatrics*, 34: 418, 1964.
13. Grodsky, G. M. and Carbone, J. V.: *J. Biol. Chem.*, 226: 449, 1957.
14. Schmid, R. and Axelrod, J.: *Arch. Biochem.*, 70: 285, 1957.
15. Isselbacher, K. J. and McCarthy, E.: *J. Clin. Invest.*, 38: 645, 1959.
16. Schenker, S., Dawber, N. H. and Schmid, R.: *J. Clin. Invest.*, 43: 32, 1964.
17. Lathe, G. H. and Walker, M.: *Quart. J. Exper. Physiol.*, 43: 257, 1958.
18. Lucey, J. F., Arias, I. M. and McKay, R. J.: *Am. J. Dis. Child*, 100: 787, 1958.
19. Arias, I. M., and Gartner, L. M.: *Nature (London)*, 203: 1292, 1964.
20. Waters, W. J., Dunham, R. and Bowen, W. R.: *Proc. Soc. Exper. Biol. and Med.*, 99: 175, 1958.
21. Crosby, W. H. and Akeroyd, J. H.: *Amer. J. Med.*, 13: 273, 1952.
22. Israels, L. J., Suderman, H. J. and Ritzmann, S. E.: *Amer. J. Med.*, 27: 693, 1959.
23. Crigler, J. F. and Najjar, V. A.: *Pediatrics*, 10: 169, 1952.
24. Sugar, P.: *Arch. Int. Med.*, 108: 121, 1961.
25. Dubin, I. N. and Johnson, F. B.: *Medicine*, 33: 155, 1954.
26. Rotor, A. B., Manahan, L. and Florentin, A.: *Acta Med. Philipp.*, 5: 37, 1948.
27. Werner, S. C., Hanger, F. M. and Kritzler, R. A.: *Amer. J. Med.*, 22: 325, 1950.
28. Fog, J. and Jellum, E.: *Nature (London)*, 198: 88, 1960.
29. Zuelzer, W. W. and Brown, A. K.: *Amer. J. Dis. Child*, 101: 87, 1961.
30. Ostrow, J. D., Hammaker, L. and Schmid, R.: *J. Clin. Invest.*, 40: 1068, 1961.
31. Schmid, R.: *Ibid.*, 37: 1123, 1958.
32. Eisalo, A., Jarvinen, P. A. and Luukkainen, T.: *Brit. Med. J.*, 2: 426, 1964.
33. Thiulin, K. E. and Nermark, J.: *Ibid.*, 1: 584, 1966.
34. Bartholomew, L. G., Cain, J. C., Woolner, L.B. and Utz, D. C.: *New Eng. J. Med.*, 269: 8, 1963.
35. Ostrow, J. D.: *J. Clin. Invest.*, 41: 1628, 1962.
36. Yaffe, S. J., Levy, G., Matsuzawa, T. and Baliah, T.: *New Eng. J. Med.*, 275: 1461, 1966.
37. Thompson, R. P. H. and Williams, R.: *Lancet*, 2: 646, 1967.

Review Articles

Lester, M. and Schmid, R.: *New Eng. J. Med.*, 270: 779, 1964.
Sherlock, S.: *Brit. Med. J.*, 1: 1359, 1962: *Ann. Int. Med.*, 65: 397, 1966.
Cracco, J. B., Dower, J. C. and Harris, L. E.: *Mayo Clin. Proc.*, 40: 868, 1965.

Postpartum Hemorrhage*

Reprinted from the Canadian Medical Association Journal August 7, 1965, Volume 93.

A 39-Year-Old white married woman, pregnant for the seventh time, had an expected date of confinement of March 12, 1961. She was seen by a physician at three and six months. Her first pregnancy was terminated at term with low forceps and the remaining five pregnancies terminated spontaneously. She had two previous anterior colporrhaphies and, because of these operations, the attending physician had consulted the operating surgeon during the current pregnancy and a trial of labour was agreed upon.

The patient was admitted to hospital at 12.10 a.m. April 15, 1961, with uterine contractions every five minutes. The membranes were intact and she had a bloody vaginal discharge. Her temperature was 99° F., the pulse rate was 88 per minute, the respirations were 20 per minute, the blood pressure was 162/100 mm. Hg, the fetal heart rate was 132 per minute and the urine showed a trace of albumin and sugar.

At 2.10 a.m. on April 15, 1961, she received carbromal 4 grains and pentobarbital sodium 1 1/2 grains (Carbrital Kapseals). From 7.00 a.m. to 3.00 p.m. she had uterine contractions approximately every five minutes and the fetal heart rate was 132 per minute. Her contractions caused her no distress.

Radiographic pelvimetry was reported as follows: "The anteroposterior diameter of the inlet is 11.8 cm.; the transverse diameter of the inlet is 14 cm.; the anteroposterior diameter of the midpelvis is 11.9 cm.; the transverse diameter of the midpelvis is 11 cm.; the posterior saggital diameter of the outlet is 7.5 cm. and the transverse diameter of the outlet is 10.7 cm. This is a vertex presentation. There is some posterior tilting of the coccyx. The maternal pelvis has average dimensions. The fetal skull cannot be measured owing to its position. In the single view in which it is partly visualized it appears larger than the average."

The patient spent most of the day in a wheelchair and did not mind her contractions. On April 15, 1961, at 5.45 p.m. (17 hours after her admission) the membranes ruptured spontaneously. In the afternoon the patient was given hydrochlorothiazide 50 mg. and reserpine 0.125 mg. (Hydropres) and phenobarbital 1 ½ grains. A rectal examination was done at this time and the presenting part was recorded as high.

At 10.15 p.m. on April 15, 1961, the blood pressure was 200/100 mm. Hg, and 5 g. of magnesium sulfate was given intramuscularly. At this time the patient was minding her contractions, which were occurring every one and one-half minutes.

At 11.00 p.m. on April 15, 1961 (22 hours after admission), the patient experienced perineal pressure and she was transferred to the delivery table where a prolapsed cord was discovered. The attending doctor was notified and a sterile preparation was done.

The patient was placed in the Trendelenburg position, and a colleague of the attending physician who was in the hospital made an unsuccessful attempt to replace the cord. After the arrival of the attending physician, a 10 lb. 8 oz. male was delivered stillborn at 12.30 a.m. on April 16, 1961 (24 1/2 hours after admission) by a version and extraction with Piper forceps to the aftercoming head. The third stage was 15 minutes, after which the patient received 0.5 mg. of methylergobasine intravenously.

The blood loss immediately post partum was excessive. The patient was placed in the Trendelenburg position. Her breathing became laboured and the pulse weak, and oxygen therapy was started with a nasal catheter. She was given one ampoule of nikethamide intramuscularly and 5 mg. of nalorphine intramuscularly.

The excessive bleeding persisted despite continuous massage of the fundus, and a second 0.5 mg. of methylergobasine was given intramuscularly. The hemorrhage continued and the patient died approximately two hours after the delivery of the infant.

A complete postmortem examination was carried out. The following excerpts are from the postmortem report: "The peritoneal cavity contained a small quantity of slightly blood-stained fluid but the peritoneum appeared healthy. There was a hematoma of the left broad ligament. The uterus was of normal puerperal size, containing no blood, and had a clean placental site on the anterior fundal wall. The vault of the vagina was almost completely transected by an oblique ragged tear 80 mm. in length, throughout the whole thickness of the wall, centred on the left posterior aspect of the vagina. There was extensive hemorrhagic infiltration in the surrounding soft tissue, especially in

*This series of articles arranged by an editorial subcommittee of the C.M.A. Committee on Maternal Welfare, and originally published in the Canadian Medical Association Journal, is being reproduced in the Bulletin at the request of The Medical Society of N. S. Committee on Maternal and Perinatal Health, by kind permission of the Editor of the Canadian Medical Association Journal.

the left broad ligament, the vesical-uterine space and extending into the space of Retzius. This tear was well separated from the sutured episiotomy at the viginal outlet."

The autopsy on the baby reported: "The baby boy weighed 4800 g. There was very extensive bruising of the deep tissue of the scalp and to a lesser extent of the pericranium. A moderate subdural and subarachnoid hemorrhage and two dural tears were present. One dural tear measured 30 mm. long in the upper anterior falx cerebri and one measured 20 mm. which almost divided the tentorium cerebelli and extended from the centre of its free edge almost through the occipital attachment."

Decision of Committee on Maternal Welfare

The conclusions subsequently reached by the Provincial Committee on Maternal Welfare after a review of the case were: "This is a practically preventable direct maternal death. The preventable patient factor was that she did not avail herself of adequate prenatal care. The preventable professional factors are as follows: A review of the radiographic pelvimetry films showed a transverse presentation rather than a vertex presentation as reported to the attending physician. If this abnormal presentation had been reported to the attending physician, a Cesarean section would probably have been done rather than a version and extraction approximately seven hours after the rupture of the membranes. Other factors favouring a Cesarean section were the history of two previous pelvic-floor repairs and the current toxemia with this pregnancy. Version and extraction is an exceedingly risky obstetrical maneuver and should rarely, if ever, be done for transverse presentation because of its association with uterine rupture. The birth canal was not explored to confirm the presence of the laceration which caused the postpartum hemorrhage. There was markedly deficient blood replacement."

Discussion

This woman was pregnant for the seventh time and had toxemia of pregnancy and a history of two previous anterior colporrhaphies. At the beginning of labour, the presenting fetal part was floating when she was admitted to hospital, 44 weeks pregnant. It was an error to attempt a vaginal delivery in a woman with such a history.

The radiographic pelvimetry films were reviewed; they were of poor quality and revealed a transverse presentation. The radiologist's interpretation should have been definite regarding this abnormal presentation. Some obstetricians routinely review all the radiographic pelvimetry films which have been made on their obstetrical patients. If this had been done in this case, it is unlikely that this abnormal position would have been overlooked. If this had been recognized, it is likely that a Cesarean section would have been performed and the maternal death prevented.

A version and extraction in a woman pregnant for the seventh time under trichloroethylene (Trilene) approximately seven hours after rupture of the membranes is an exceedingly risky procedure with a high maternal and fetal mortality. Attempting such a procedure under inadequate anesthesia, with the use of trichloroethylene, was compounding the error. The degree of the trauma produced is clearly demonstrated by the pathological findings on the mother and fetus.

Immediately following operative obstetrical procedures, the physician has a duty to confirm the integrity of the complete genital tract. This was neglected in this case. If such an examination had been done, the vaginal laceration would probably have been recognized and successful hemostasis and repair of the vaginal laceration accomplished.

Postpartum hemorrhage is an acute emergency necessitating additional professional assistance which was not obtained in this case. One of the most obvious omissions in this instance was the failure to provide for adequate blood replacement. All hospitals entrusted with obstetrical care should have a prearranged, rapid method of massive whole blood procurement and replacement.

This maternal death has been considered to be ideally "preventable" under the terms of reference of the Provincial Maternal Welfare Committee and there is no implication of any negligence.

Summary

A maternal death, caused by severe postpartum hemorrhage, in a woman pregnant for the seventh time was reviewed by the Provincial Committee on Maternal Welfare and was considered preventable. Severe hemorrhage in this case was occasioned by an extensive vaginal laceration. □

Female Stress Incontinence
A REVIEW OF FIFTY CASES*

O. H. MILLARD, BA, MD, CM, FRCS(C)**
C. L. GOSSE, BSc, MD, CM, FACS†
Halifax, N. S.

Urinary stress incontinence in the female, as manifested by leakage of urine when straining, lifting, coughing or sneezing, is much more common than one would expect. Many women in the middle age group suffer from this affliction in varying degrees, and it is only when the incontinence becomes severe, and wetting occurs with a slight increase in intrabdominal pressure, that the patient is moved to complain to her physician. These are the patients who are referred to the urologist and who serve as the basis for this report.

Anatomy and Physiology.

The normal and abnormal physio-anatomical relationships which are of importance in the development of stress incontinence have been elucidated by the studies of Rolnick[1] and of Lapides,[2, 3, 5] who have demonstrated that urinary continence in the female is not maintained by sphincters at the bladder neck or along the urethra. Anatomical studies and dissections have failed to demonstrate an internal sphincter at the bladder neck in either the male or the female; they have demonstrated that the external sphincter in the female is poorly formed in contrast to that in the male.

Lapides[2] has shown that three factors are important in maintaining urinary continence in the female: urethral length; tension in the urethral walls, and the posterior urethrovesical angle. When these factors, are in the normal range, and associated with normal pelvic musculature and fascial supports of the bladder, stress incontinence does not occur.

It is felt that in the female with stress incontinence, the normal fascial and muscular supports of the bladder give way in varying degree, resulting in descent of the bladder with telescoping and shortening of the urethra, relaxation of the urethral walls, and flattening of the posterior urethrovesical angle. Childbearing, with dilation and stretching of the *levator* sling, contributes in large degree to this downward displacement of the bladder, an effect which may be accentuated by moderate obesity.

The problem of treating of female stress incontinence has been approached in many ways and the literature of past years testifies that no one method is completely satisfactory. Various procedures, such as narrowing the bladder neck by sutures, (Furniss[6]); constricting and elevating the bladder neck from below, (Kelly[7], Telinde[8]); various muscle and fascial sling operations, (Martin, Turner, and Goodwin[9]), have all resulted in some measure of success, especially in the hands of their advocates.

Of all procedures designed to relieve stress incontinence, urethrovesical suspension as advocated by Marshall, Marchetti and Krantz[10] has resulted in a higher percentage of cures than any other. This procedure aims at relieving stress incontinence by correcting the anatomical cause of the condition. The approach is similar to that of a retropubic prostatectomy, and the repair is accomplished by means of sutures placed along the urethra and bladder neck to restore urethral length, the tension in the urethral walls and to elevate the urethra upward and forward behind the pubic symphysis. Suspension of the bladder behind the anterior abdominal wall, by suturing the area above the bladder neck, to the anterior rectus fascia, serves to prevent the bladder from being forced downward by the abdominal contents.

It is this procedure that is employed in the Department of Urology at the Victoria General Hospital for the relief of stress incontinence. It is sometimes slightly modified in keeping with the physical and anatomical principles involved.

In the assessment of cases of stress incontinence a careful history and physical examination, together with urine culture, residual urine determination, pyelography and cystoscopy, are necessary to exclude other causes of urinary incontinence, such as overflow incontinence, urgency incontinence, neurogenic bladder, fistula, urethral injury or diverticulum, ectopic ureter, etc. Cystoscopy is performed with the patient awake in order that incontinence may be demonstrated with the patient coughing with a full bladder. At the time of cystoscopy a modification of the Marshall test is used to determine whether restoration of urethral length and tension will re-

*From the Department of Urology, Victoria General Hospital and Dalhousie University.
**Assistant Urologist, Victoria General Hospital, Lecturer in Urology, Dalhousie University, Halifax, N. S.
†Head of Department of Urology, Victoria General Hospital, Professor of Urology, Dalhousie University, Halifax, N. S.

lieve the incontinence. The test consists of elevating the urethra, bladder neck and anterior vaginal wall by applying upward pressure with two fingers in the vagina, while ensuring that constriction against the symphysis anteriorly does not occur. If this manoeuvre prevents stress incontinence on coughing, then we feel that a urethrovesical suspension is likely to affect a cure.

In cases where incontinence is difficult to evaluate or is transitory in nature, or where bladder descent is not marked, we advise a regimen of pelvic exercises and weight reduction once investigation is complete. This will sometimes relieve the incontinence, and is well worth trying especially in younger women who are not grossly obese and whose musculature can be rehabilitated.

Materials and Methods

Analysis of results in this series of cases of stress incontinence treated by the Urology Department of the Victoria General Hospital has been carried out by reviewing hospital charts and the replies to a mailed questionnaire. Sixty-five questionnaires were mailed out, and 50 persons responded. These 50 cases are reviewed in this report.

No cases less than six months post-operative have been included in this study. All charts and questionnaires have been reviewed and the results tabulated by one person.

Results

The age of patients in this series ranged from 31 to 79 years, with an average of 52 years.

When charts were reviewed to determine the number of deliveries which had occurred in these cases of stress incontinence, it was found that, of 45 patients in whom this could be determined, 13.3% had not borne children and 86.7% had from one to nine children, with an average of 3.7. Obstetrical injury was not found to be a factor in the development of stress incontinence in this series.

Urinary infection was identified pre-operatively in 40% of the cases. The predominant organism on culture was E. coli in 75%.

60% of the cases in this series had had some form of gynecological surgery. There was a history of hysterectomy, by either the vaginal or abdominal route in 25 patients (50%). A considerable number of these cases had also had anterior repairs at the time of hysterectomy. Five patients, or 10%, had undergone a previous anterior repair for stress incontinence, with no relief or only temporary relief of symptoms. One woman had three previous anterior repairs performed without relief of her symptoms.

The average duration of symptoms was five years prior to operation, but ranged from six months to 20 years.

Residual urine determinations were recorded prior to surgery in 44 cases. In 35, or approximately 80% of cases, there was no residual urine. In nine cases residual urine varied from 1.5 to 7 ounces. One patient with a residual volume of 7 ounces was known to have neurogenic vesical dysfunction.

The relationship of obesity to stress incontinence is difficult to determine on the basis of a review of charts. In this series the height and weight of the patients were not always recorded, either by nurses or by the individual performing the physical examination. In many cases, however, physical examination noted that the abdomen was obese. In the entire series of 50 cases, only 10 cases, or 20%, were known **not** to be obese from the height, weight, and physical examination as recorded on the charts.

No significant association with other diseases, such as bronchitis, hernia, etc., was demonstrated in this series.

The average post-operative hospital stay was 13.7 days in the entire series.

From the questionnaires it was ascertained that a good result, as defined by complete absence of symptoms and a cure of the stress incontinence, occurred in 40 cases, or 80%. A fair result, as defined by improvement but with occasional incontinence, was noted in six, or 12%; and only four patients, or 8% of the series, felt that they were unimproved by their operations.

It is felt that the results of this survey are sufficiently interesting in some areas to merit further discussion.

Discussion.

The relation of parity to stress incontinence has been noted by other authors, but it is interesting that in this series 13% had not borne children, and thus did not have birth trauma to account for their symptoms. Perhaps the most important factor in stress incontinence is a pelvic musculature which is inadequate to support the pelvic viscera and which allows descent of the bladder.

Urinary infection as an accompaniment of stress incontinence was found in 40% of cases in this series, and this would perhaps raise the question that some of these patients were suffering from urgency incontinence due to infection. This question, however, was carefully considered, and any patient in whom infection was thought to be a factor was first treated to clear up the urinary infection, and a reassessment made of the incontinence. In some cases there was improvement, but in none was it sufficient to justify a decision against surgery.

The factors responsible for the high incidence of pre-operative urinary infection are thought to be cystocele with and without residual urine, and the shortening and widening of the urethra due to the telescoping effect of bladder descent, with consequent ascending infection from the vagina through this widened, relaxed urethra. In a few cases pyelonephritis has been demonstrated to be the cause of the infection.

An interesting finding was that 25 cases, or 50% of this series, had had a previous hysterectomy. Of the total number, 75% had had some previous form of gynecological surgery. This is in no way intended to incriminate hysterectomy as a causal factor in stress incontinence, but it does raise the possibility that removal of the uterus with its ligamentous supports from the pelvic walls may remove some measure of support of the bladder base, and in turn allow more downward pressure from the abdominal contents. Ten cases in this series dated the development of stress incontinence from a previous hysterectomy.

The average duration of symptoms of five years is in keeping with the reluctance of individuals to undergo surgery or even visit their doctors for this condition until the social and hygienic aspects become intolerable.

The finding of residual urine is important, but not in itself a contraindication to surgery for stress incontinence. This can usually be corrected by partial cystectomy, with vesicopexy at the time of surgery, or transurethral resection of the bladder neck, and therefore need not cause undue concern.

Post-Operative Care and Complications.

In the early part of this series it was our practice to keep these patients confined to bed for five or seven days in the hope of preventing the repair from breaking down as a result of too early ambulation. During the past few years, all patients have been ambulatory within 48 hours post-operatively without any ill effect.

TABLE I
Postoperative Complications in 50 Cases of Urethrovesical Suspension

Post-operative Complications	No. Cases
None	30
Wound infection	5
Residual urine post-operatively	10
Catheter difficulties	12
Osteitis pubis	1
Persistent urinary infection Post-operatively	6
Operative mortality	0

Post-operative complications (Table I) at first glance may seem disproportionately large. All incidents, however, which in any way sufficed to make the post-operative period less than tranquil have been noted. Thirty cases recovered very smoothly, and had no post-operative disturbance.

There were five wound infections, an incidence of 10%. These all cleared uneventfully on drainage and antibiotics, with compresses where necessary.

10 cases showed residual urine post-operatively as proven by catheterization. It is our practice to remove the catheter on the seventh post-operative day, and institute catheterization for residual urine every eight hours. If catheterization on two occasions shows no residual urine, it is discontinued. If a residual of over 4 ounces is obtained consistently, the patient is catheterized eight-hourly until it approaches zero. This procedure has resulted in satisfactory voiding in all cases except two. One of these cases had an undiscovered hypotonic bladder, and the other case required trans-urethral resection of the bladder neck. All patients remain on urinary antiseptics post-operatively for at least two weeks and usually for a month.

Twelve cases are noted to have had catheter difficulties. These cases had post-operative bladder spasms due to irritation from the indwelling catheter, severe enough to cause leakage of urine around the catheter, and requiring antispasmodics and sedation for their relief.

Urinary infection was not uncommon post-operatively, having occurred in at least six cases. These cases responded well to dilation of the urethra and antiseptics. We also think it wise to carry out urethral dilation four to six weeks post-operatively, since narrowing of the urethra by the sutures occasionally occurs. In fact, we tend to err in narrowing the urethra and elevating the bladder too much, because it is easy to correct voiding difficulties afterwards, whereas leaving it too lax may result in an incurable failure. One woman in the entire series developed osteitis pubis post-operatively. This responded slowly to bed rest, diathermy, and steroids, and her final result was excellent. We feel from our experience that osteitis pubis must have some etiology other than that of injury to the periosteum of the symphysis or infection in the retropubic area. Our experience in retropubic prostatectomy has not demonstrated any greater incidence of osteitis pubis than in the present series of urethrovesical suspensions.

Summary.

The results in a series of 50 cases of urethrovesical suspension for female stress incontinence have been presented.

The absence of operative mortality and the low incidence of significant morbidity, combined with an 80% cure rate and a 92% improvement rate, indicate that urethrovesical suspension is at present the operation of choice in the surgical management of female stress incontinence. □

References

1. **Rolnick, H. C. and Arnheim, F. K.:** *J. Urol.*, 61: 591-603, 1949.
2. **Lapides, J. et al:** *Surg., Gynec. & Obst.*, 111: 224-31, 1960.
3. **Lapides, J.:** *J. Urol.*, 80: 341-53, 1958.
4. **Woodburne, R. T.:** *J. Urol.*, 84: 79-85, 1960.
5. **Lapides, J.** *et al*: *J. Urol.*, 84: 86-94, 1960.
6. **Furniss, H.D.:** *Am. J. Obst. Gynec.*, 9: 503-506, 1925.
7. **Kelly, H. A.:** *Gynecology*, D. Appleton & Co., New York, 1928, pp. 821-23.
8. **Te Linde, R.:** *Operative gynecology*, 2nd ed., J. B. Lippincott Co., Philadelphia, 1953, pp. 184-189.
9. **Martin, D. C., Turner, R. D. and Goodwin, W. F.:** *Urology Survey*, 13: 111-127, 1963.
10. **Marshall, V. F., Marchetti, A. A. and Krantz, K. R.:** *Surg., Gynec. & Obst.*, 88: 509-518, 1949.

INSTRUCTIONS TO AUTHORS

Members and others wishing to contribute to *The Bulletin* are invited to submit their material to the Offices of The Medical Society, Sir Charles Tupper Medical Building, Halifax, N.S. In general the rules laid down for the *Canadian Medical Association Journal* and published therein under the heading "Instructions to Contributors".

Material should preferably be typed on one side of paper 8½ x 11 inches, with wide margins. Carbon copies are not satisfactory. Any table, illustration etc. quoted from another published source must have the permission of both author and publisher.

Opinions expressed in articles appearing in *The Bulletin* do not represent the policy of The Medical Society of Nova Scotia unless specifically stated to do so.

The Audio-Visual Division of Dalhousie Medical School

D. A. Gibson, AIIP, RBP, FRPS*

Halifax, N. S.

The name of this Division was selected for want of a more descriptive term. Other names for comparable departments are "Medical Illustration", "Medical Photography", etc.; these have a particular connotation associated with them, so the term "audio-visual" was chosen because it would cover all the activities that are contemplated.

It is intended that this Division will be a production unit capable of preparing any visual or audio-teaching aids that might be needed to facilitate medical instruction in the coming years. For this reason it was decided that facilities should be provided in one unit for the three audio-visual disiplines: photography, art and television, thus encouraging a close working partnership between them.

A unit designed around this basic concept is now nearing completion in the basement of the Sir Charles Tupper Medical Building. The facilities being provided are: medical illustrative and graphic art; medical and scientific still and motion picture photography; a broadcast quality television system. The greatest single problem ahead is to provide a satisfactory service in all these areas with only the moderate staff that can be made available for this purpose in a medical school. A promising solution would seem to be by utilizing the experts in one media to assist with another; perhaps a photographer with training in lighting and movie camera techniques might stand in as a television camera-man, or a graphic artist experienced in the preparation of graphs and charts might draw diagrams and prepare titles for television.

The Tupper Building has been wired so that the television signal from the camera may be originated in any part of the building and displayed on a monitor (television set) in any other part of the building. (fig. 1) In so doing, the picture from the camera is first sent to the central television control room (fig. 2) where it can be recorded if necessary on a video-tape recorder, or modified and mixed with another television signal, then sent simultaneously to one or more lecture rooms or other viewing areas. (This concept of the television system is the brainchild of Dr. A. J. Lewis, Audio-visual Coordinator for Dalhousie Medical School). It is likely that most television teaching will be from previously recorded video-tapes because of the advantages gained through tape editing and slick inserts of diagrams, ECG's, X-rays, etc. It is hoped that the teaching hospitals will soon be connected to this T.V. system.

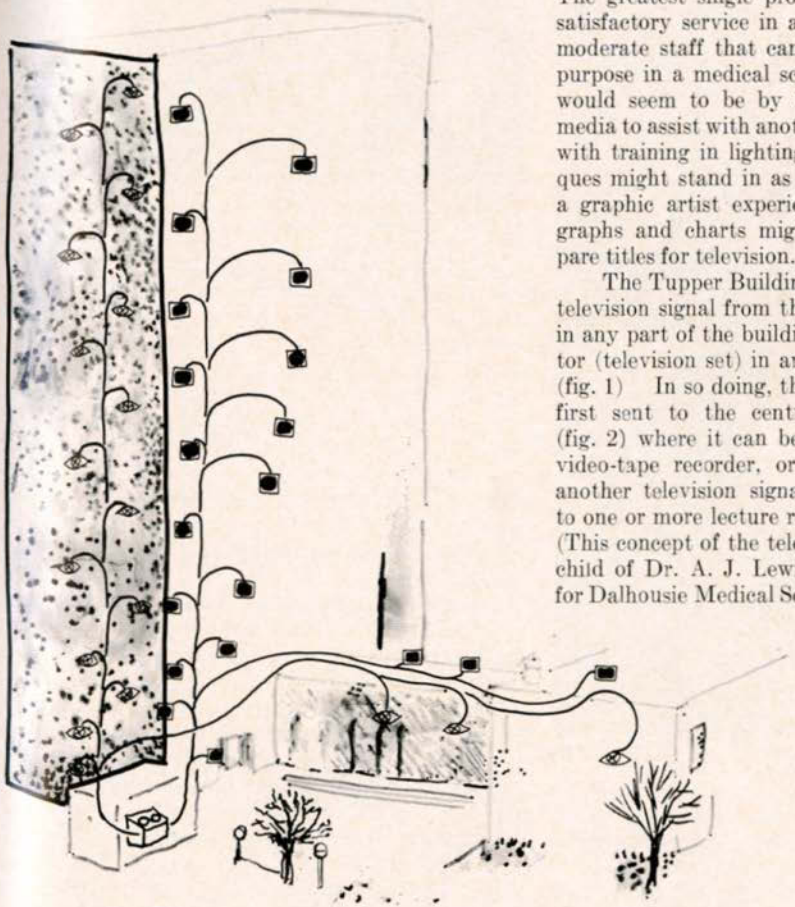


Figure 1 - A schematic diagram of the Sir Charles Tupper Medical Building showing the television wiring network, and the centralization of switching and video-tape facilities.

*Director, Audio-visual Division, Faculty of Medicine, Dalhousie University, Halifax, N. S.

Figure 2 - The television control room demonstrating the equipment racks which are being installed, and the video and audio switching consols. A small studio and camera is visible through the sound-proof window in the background.

Figure 3 - Adjusting the chemistry in the automatic film processing machine.

Anticipating that the medical school will have a growing need for lantern slides and photographic prints for publication, an attempt is being made to automate many of the photographic procedures: most black and white negatives in either sheets or rolls can be processed (developed) dry-to-dry in five minutes (fig. 3), and prints can be developed and fixed in twelve seconds. Tests are being made which will almost certainly enable one hundred slides or more per hour to be made from certain types of artwork. (fig. 4) A method is being developed which will enable some research negatives to be printed quickly, easily and with excellent quality by a laboratory technician with no photographic training. By such means it is hoped that supply can keep ahead of the demand for photography to help research and to assist the lecturer in the next few years.

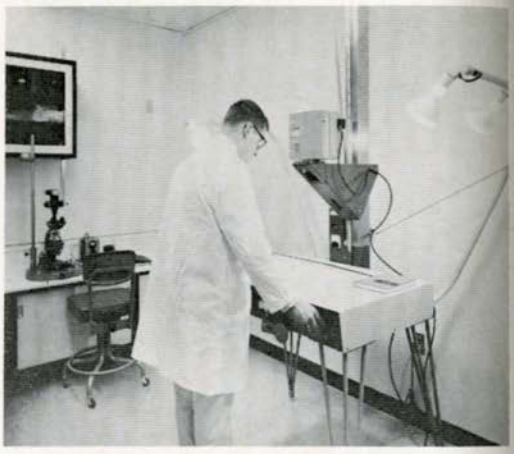


Figure 4 - A microfilm camera which is being modified to bulk produce teaching lantern slides.

It is quite difficult in any medical illustration unit to provide for all the needs for artwork and graphics. The modern medical school appears to have an insatiable appetite for graphs, charts and tables. In addition, anatomical and surgical drawings are needed; also displays, cartoons, and posters. With the coming of television, single concept films and longer teaching films, animation drawings will be a most valuable aid to the understanding of the more difficult concepts that are to be taught. Somehow, it is hoped, a small art team will be assembled which can collectively supply all these talents. (fig. 5.)

During the 1950's and 60's many new audio-visual techniques have been developed and many different kinds of projection equipment used; some of it is inexpensive and easy to use, some quite the opposite. Although new and improved projectors will continue to appear on the market, the basic projection systems do seem to be settling down into certain patterns, with teachers at each level of education picking out the methods best suited to their needs. The 2 inch (35mm) slide is certain to remain the backbone of visual teaching aids in medicine. 16mm films are likely to remain the international standard for teaching films for some time to come, but they will have competition in a few centres from the new Super 8mm format.

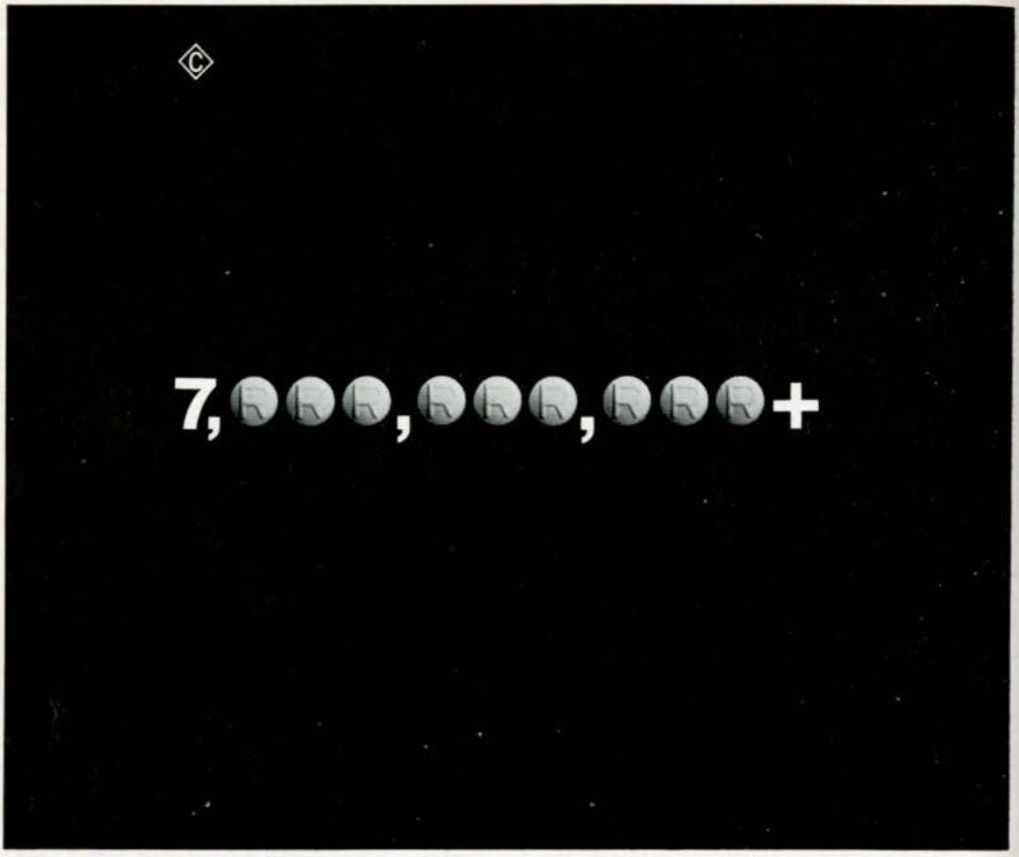
Figure 5 - The artists' area.

This film gauge has some definite merits in particular circumstances, and has exciting possibilities and a definite future in the new media of "single concept" films, often prepared as film loops. The film loop enables an individual student to learn with the aid of a moving picture; he inserts a cartridge containing a film one to four minutes in length into a simple viewer, and can watch the film repeatedly, stopping the action to examine a single frame where necessary. This technique is particularly suited to displaying manipulative procedures; for example, the steps of a lumbar puncture.

Schools are finding the overhead projector a most useful tool and it is becoming popular in medical teaching at every level. This machine supplies an answer to projecting home-made graphics to a moderately sized audience where the facilities to prepare lantern slides are not available. It also does an excellent job of projecting X-ray films, or portions of X-ray films up to 10 inches square onto the screen.

The newest tools of the visual educator are closed-circuit television and video-tape. The potential here is considerable, but a great deal has yet to be learned about its use in medical teaching. It has a proven role in the fields of psychiatry and surgery, but this is only a beginning. If the need is there, television can bring a picture to the classroom from almost any situation or location. It may enable students to participate actively with a clinician whilst viewing the action from a distance, or see through the eye of the surgeon whilst a sigmoidoscopy is performed. Like other visual media however, some expertise and forethought must go into the television production if the student's interest and attention is to be maintained.

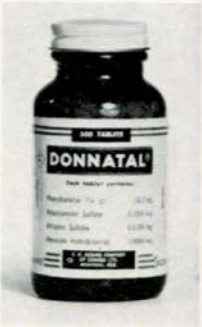
It will be some time before all the services of the Audio-visual Division are in full swing; but hopefully, development of the Division may keep pace with the demands made upon it by the expanding Dalhousie medical school and the associated research activities. Providing that staff with talent and imagination can be attracted to help in this development, the facilities available in the Tupper building are capable of producing the best of audio-visual teaching aids. □



More Donnatal® is prescribed by physicians than any other antispasmodic.

After more than a quarter of a century and over seven billion doses, Donnatal is still prescribed by more physicians than any other antispasmodic. Consider the effectiveness, dependability, and safety that must characterize a medication for it to achieve such long-lasting and wide-spread acceptance. Seven billion doses! If Hippocrates could have started prescribing Donnatal in 430 B.C., he would have to have given it to over 2,670 patients t.i.d. for them to have taken over seven billion doses by 1966!

For full prescribing information, consult product literature, or Vademecum International.



In each Tablet, Capsule or 5 cc. Elixir		In each Extentab®
0.1037 mg.	hyoscyamine sulfate	0.3111 mg.
0.0194 mg.	atropine sulfate	0.0582 mg.
0.0065 mg.	hyoscine hydrobromide	0.0195 mg.
16.2 mg. (¼ gr.)	phenobarbital	(¾ gr.) 48.6 mg.

A. H. Robins Company of Canada, Ltd., Montreal, Quebec A·H·ROBINS

Medical Complications of Heroin Addiction

In a group of ninety-six narcotic addicts observed in a New York city hospital, a number of major medical complications were diagnosed. One fifth of these were related to the respiratory tract and included pneumonias and embolic disease of the lung.

In the United States today from 60,000 to 120,000 persons are addicted to opiates or habituated to them. Approximately 90 per cent take heroin. Other thousands of people use opiates illicitly at times.

This report is concerned with major medical complications of heroin addiction, many of them related to the respiratory tract. It is based on a review of the literature and an analysis of 100 episodes in 96 patients observed at Bellevue Hospital, New York City, between January 1963 and May 1966.

The pulmonary complications were of three types: embolic pneumonia or lung abscess, or both; upper-respiratory-tract acquired bacterial pneumonia; and pulmonary fibrosis or granulomatosis, or both. These comprised 21 per cent of the complications in the Bellevue series.

Overdose. An overdose of an opiate is one of the most dreaded complications of narcotic abuse. It may be due to misjudging the amount of drug in an adulterated packet or of taking too large a dose after being off drugs completely for a time.

In two patients in the Bellevue series, overdose was characterized by tachypnea, cyanosis, and a bilateral pulmonary infiltrate.

The mechanism of lung edema secondary to overdose is obscure. It is not clear whether pulmonary edema is a direct consequence of opiate action or the result of an allergic response.

Pneumonia. Fourteen patients had bacterial pneumonia. Each had chills, fever, cough, and pleuric chest pain, and evidence of focal disease on physical examination and chest X-ray.

Sputum cultures showed pneumococci in seven cases; Hemophilus influenzae in one, S. aureus in one, and Klebsiella pneumoniae in one. In no case was more than one lobe affected. All the patients responded to appropriate antibiotics.

Embolic pneumonia. Five patients had apparent embolic disease of the lungs. In three the source appeared to be the site of heroin injections, the other two patients had tricuspid endocarditis.

Pulmonary Fibrosis, Arteritis, and Granulomatosis. Arteritis and thrombosis or granulomatosis, or both, due to such foreign bodies as talc or cotton fibers have been reported but are rare complications of drug abuse. None was seen in the patients in this study. However, the increasingly frequent intravenous administration of a variety of tranquilizers, sedatives, and stimulants together with heroin may result in a sharp increase in the prevalence of these unusual pulmonary complications.

Other Complications

In the non-pulmonary field, complications include endocarditis, hepatitis, tetanus, malaria, transmitted by unsterile needles, which was a complication not found in this series and such miscellaneous conditions as abscesses at the site of injection, cellulitis, thrombophlebitis, and bacteremia.

The surprisingly high percentage of the patients with bacterial pneumonia is interesting. There was no evidence that the pneumonia could be correlated with periods of unconsciousness or with debility. Whether its occurrence was actually heroin-related or whether the findings in this series are a coincidence is not clear. If the pneumonia were a direct consequence of heroin use, a possible explanation might be the depressive effect of this drug and other opiates on the cough reflex.

Pulmonary Edema

The pulmonary edema and congestion induced by heroin overdose are also interesting. The underlying mechanisms are not understood, but may be profound hypoxia, opiate-induced histamine release, activation directly of the kinin system with resultant changes in vascular permeability, or an acute allergic reaction. The last is unlikely in that pulmonary edema may occur on the victim's first "mainline" heroin experience.

Regardless of the mechanisms, the therapeutic approach seems clears - nalorphine or a similar drug (if the respirations are very slow), supportive therapy, and, if hypoxia and cyanosis are severe or persistent, oxygenation by use of a positive-pressure

---

Donald B. Louria, M.D.; Terry Hensle, B.S., and John Rose, B.S. *Annals of Internal Medicine*, July, 1967.

[1]Reprinted from the Abstracts of the National Tuberculosis Association, December, 1967.

Printed through cooperation Nova Scotia Tuberculosis Association.

apparatus. Ordinarily, antibiotics, diuretics, rotating tourniquets, and cardiotonics such as digitalis are not needed.

Perhaps it is inevitable that discussion of the medical complications will result in further demands for maintenance narcotic treatment as public health policy.

While some complications could be reduced if addicts were given their drugs under controlled circumstances by physicians, it is also likely that the increasing venality of traffickers in narcotics will result in greater unpredictability as to exact dose and thus present the addict with the risk of inadvertent overdose. The concept that maintenance drug therapy is the panacea is spurious.

Drug Withdrawal

From the medical point of view, the treatment of drug overdose is withdrawal of the drug. Since the greed of traffickers and pushers has resulted in the sale of progressively less potent packets of heroin, withdrawal is now relatively easily accomplished. Therefore, the solution of the problem of the addict does not depend upon physiologic needs but on the efficacy of rehabilitation.

Current experiments on maintenance require evaluation over a prolonged period of time before a valid judgment can be made. It may be that narcotic antagonists such as cyclazocine offer opportunity for rehabilitation without maintaining the patient on addicting drugs. Likewise, any one of several rehabilitative experiments that do not use drugs may be found to be effective.

In any case, at our present state of knowledge, reports such as this on the medical complications of addiction can best be used not to advocate one or another of the many rehabilitative efforts, but rather to alert physicians and others to these complications and to subserve educational purposes in an attempt to convince young persons in endemic areas that illicit narcotic users incur immense risks of untoward reactions and infection that may result in irreparable physical damage or death. □