Soc. Sci. Med. Vol. 16, pp. 1619 to 1626, 1982
Printed in Great Britain

0277-9536/82/181619-08$03.00/0
Pergamon Press Ltd

RESOURCE CONSUMPTION AND FUTURE ORGANISATION OF MEDICAL WORK IN THE NATIONAL HEALTH SERVICE

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Abstract—Medical expenditure within the National Health Service (NHS) is based upon an arrangement whereby doctors share in common resources provided by the Health Authority. This arrangement is unsatisfactory when resources are contracting and leads to social regulation of medical activity. If doctors within the district work-group do not respond to the challenge of cost-containment by internal organisation, more and more externally imposed regulations will result to the detriment of patients and doctors. The continual redevelopment of organisation to permit the optimal mix of internal and external regulation should be a subject of long-term enquiry and action for doctors in each district.

SHARING IN A COMMONS

Sharing a resource in common is an organisational form evident in a variety of social activities. For example, we absolutely share the air we breathe; and most streets we drive on are public. Such a beautifully simple arrangement can have surprisingly serious consequences.

If a population shares a crucial resource in common, there is (by definition) no close match between the individual right or power to spend from or consume that resource and the social accountability for that expenditure. A number of consequences will naturally emerge. Each user will tend to expend more and more of the resource in his own activity. Competition between users will breed and the total resource will be depleted by expenditure that might not otherwise have occurred. The ratio of resource to user population will determine the likelihood of discord and disruption. If the resource keeps growing, then each user may expend more, even if wastefully or selfishly, without complaints. However, if one person or group consuming more means someone else having less, then there will be demands for an increase in the total resource or for a reduction in the numbers of users. Discord is particularly likely to develop if the resource contracts. In times of scarcity, when restraint and careful use are most necessary, the urge to use spreads and increases.

This social phenomenon ('commons pathology') can be demonstrated mathematically by considering the decision process for each user [1] (see Appendix). It was first noted by Lloyd [2] explaining overgrazing of the commons pastures, but it is a matter for common observation. Pollution results from the use of the sea or air as a commons. Beauty spots lose their charm when their open use leads to overcrowding. Overfishing, overpopulation, traffic jams, excess advertising and many other phenomena are consequences of treating some crucial resource as a commons which can be shared freely. In every case, 'sharing in a commons' leads to depredation of the resource and breeds inequity and lack of responsibility amongst users [3].

The social damage engendered by the arrangement leads eventually to the introduction of social mechanisms which restrict the freedom of the individual to use or spend from the resource. In effect, the resource is rationed. These mechanisms may be informal, but typically are most effective when enforced by law. Such mechanisms and laws are often experienced as violating previously accepted fundamental personal or social rights. The most notorious example from the past is the institution of private ownership of property, the enclosure of the commons. The most difficult current example is the regulation of reproduction to ensure zero population growth. Until social regulation is brought in, the individual is trapped in the social psychology of the system. If he does not use the resource, he suffers and others gain. If he does, he is blamed as being socially irresponsible.

COMPARISON OF U.S. AND U.K. HEALTH SERVICES

Examples of commons pathology can be found in health services by looking at the behaviour of doctors, the key decision makers [4, 5]. Certain characteristic differences in the problems of the U.S. and the U.K. health care systems can be accounted for by noting that the common resource in the former has been the patient population, while in the latter it is the local financial allocation [1]. Enlargement of the commons, the total resource, is the easy way out of the social and psychological tensions involved in sharing or rationing. This has been a factor in the explosive escalation of cost in the U.S. where money is spent to attract patients, and more patients are given more interventions. In the U.K., costs have been kept under control, but demands for increased finance are unceasing and currently seem to be leading to a resurgence of private health insurance. Competition within the NHS is for a share of the money, and patients (in the form of waiting lists and surveys of unmet needs) are used as arguments for a bigger share. This is one

reason why waiting lists will not disappear in the U.K. [6]. Despite the rhetoric of crisis, the service probably gives good value for money [7–9].

The purpose of this paper is to examine the origin, significance and future of the commons arrangement in the U.K.

ORIGINS AND CONSEQUENCES OF SHARING IN THE U.K.

Prior to the NHS* and health insurance, resource constraints were knitted inextricably into the doctor–patient relationship. If a patient could not afford treatment, he did not attend for it. A doctor judiciously watched costs of tests, treatments and specialist referrals as part of his professional responsibility to ensure his patient could continue in treatment and receive value for his money. This required the exercise of clinical judgement.

The role of the professional as clinically autonomous, socially free-standing, and accountable only to the patient developed in the nineteenth century [10, 11]. Large scale organisation which developed in the twentieth century and made the notion of caring for 50,000,000 people within a single institution a viable undertaking had no methods for handling such a role conception [12]. As a result, doctors were allowed to share resources available for health care. It was as if NHS medical work could be organised simply as an aggregate of the work of private practitioners but without direct expenditure constraints. Absence of administrative responsibility for expenses incurred while exercising clinical discretion was part of the crucial inducement for doctors to enter the NHS in 1948 [13] and to stay there [14]. At that time open-ended funding was assumed [15, 16] because medical demand was believed to be finite. When, for practical purposes, these assumptions hold, informal sharing is a satisfactory arrangement.

As it turned out, sharing without financial accountability contributed to a rapid growth in health expenditure all over the world. Once resources came from 'out there', cost lost meaning and significance to both doctor and patient. Clinical judgement, rather than potentially restricting costs, tended to ensure that none of the increasing numbers of conceivably relevant investigations or treatments was omitted [17]. Empirical studies of medical activity do not detect the contextual influence of sharing in a commons; organisation is taken for granted and other factors, often personal, are looked for. It is known that wide variation exists between hospitals and among clinicians and that medical activity is not solely a function of casemix and clinical factors [18, 19]. Excessive medical activity has been explained by the doctor's desire for certainty, need for activity, concern about malpractice, institutional habits or policy, patterns of payment, ignorance, thoughtlessness and response to patient demand [20–22], but rarely by the form of organisation. The focus in this literature on the abuse of the commons avoids the more urgent and painful need to consider methods for regulation of its legitimate use. It is self-evident that organisational arrangements within the medical group or between doctors and other groups can restrain medical activity, so in the next section we will look at what is happening in the NHS.

THE NHS AND THE COMMONS

The Royal College of Radiologists [23] estimate that 25% of all skull radiographs (cost: £9) are performed when the doctor is clinically certain there is no fracture. In their sample, the judgement was correct in 99% of cases. The use of such findings depends on both clinical judgement and local organisational structure. With current NHS arrangements, the doctor will find more support from his conscience (the ideal of patient care) and from his profession (the ideal of standards of practice) for ordering rather than withholding the X-ray. By contrast, no intra-psychic or organisational structure exists to ensure wise use of resources. Typically the Authority neither sanctions nor supports a decision either way.

In the NHS, the Authority can determine the size of the commons, the total resource, but lives with an absence of effective and limited procedures for controlling clinical expenditure near its point of commitment. This particularly applies to the cumulatively significant low cost activities [1, 24–27]. Closed-end funding from above [28] combined with open-ended

*It is not possible in a short paper to describe an organisation as complex as the NHS, but those unfamiliar with it may find this simplified explanation of the terms used helpful. The key terms are italicized. The *NHS* was set up by the Government in 1948 to improve the physical and mental health of the whole population and to enable the prevention, diagnosis and treatment of illness through central funding. A major reorganisation occurred in 1974 designed to bring together hospital services, the general practitioner (primary care) service, and local government public health services. Details are provided in Levitt [66].

In 1981–1982 a further reorganisation commenced aimed at (among other things) reducing the numbers of management tiers, increasing local decision-making, and simplifying the medical committee structure. This paper has been drafted so as to make the details of the reorganisation irrelevant to the argument. However, should doctors wish to heed the message the process of reorganisation provides an opportunity for action.

The new NHS will be divided into 14 *Regions* and further divided into 192 *Districts*. The *Districts* are the operational providers of services and are controlled by appointed *Health Authorities* whose members are unsalaried and mainly non-professional. The Authority appoints a number of Chief Officers (Administrator, Nurse, Treasurer, Medical Officer) to run the services within a specified resource allocated from Region. For advice on policy, plans and major decisions, it depends on the *District Management Team* which consists of the Chief Officers together with representatives of the consultants (senior clinical medical staff) and general practitioners. The *District Medical Officer* is a *community physician* and is expected to be concerned with the health needs of the community and the integration and planning of the whole range of services to meet those needs. He works with specialists in community medicine, but has no staff and no authority over consultants. The consultants are organised through *Committees* made up by specialty (Cogwheel divisions) or geography (hospital medical committees): an overall medical committee for consultants and for general practitioners also exists and so may a District-wide committee.

expenditure from below is not a happy organisational arrangement. As a result, the Authority balances its accounts at the end of the day by surgery on major plans, policy initiatives, spending on equipment and other health service work over which it does exercise effective control. Both doctors and management are angered and the quality and quantity of services are reduced. These episodes are documented in the news pages of the various hospital and health services journals and the political pages of the medical press.

Commons organisation of doctors generates problems where the borders between abuse and use become fuzzy. For example, it can be difficult to know how much overtime is necessary and disagreement may arise between administration and doctors or among doctors and lead to a stalemate [1]. When it is believed that resources are being used inefficiently in a time of scarcity, stalemate becomes intolerable. Authorities then impose controls on overtime pay, despite the uproar from the medical profession [29].

When shared resources are contracting, ill-feeling breeds amongst doctors as well as against the profession. National factional splits within the medical profession have multiplied in the past decade and consolidated themselves as national associations to forward the interest of their members. These national groupings cut across the natural work group whose doctors are linked by service to the same patient population and by sharing of material and financial resources. The interest of these two groups differ and a doctor must handle conflicts of loyalty and responsibility not dissimilar to those of an industrial employee with his dual relations to union and firm. In the absence of adequate organisational arrangements, the Authority work-group can become riven by national disputes from without and by bitter competition from within.

THE INADEQUACY OF CURRENT ORGANISATION

Doctoring roles within the NHS are currently collegial and no explicit constraint, formal or informal, exists over practice or spending (within ethical and legal limits). The reverse case holds: doctors feel they should, at least publicly, support the claims of colleagues for extra resources as part of the practice of high quality medicine.

Two explicit forms of medical organisation (for clinicians) exist in the NHS: Committees and Management Team roles [30]. This system enables doctors to witness and contribute to major planning and policy decisions but by-passes the difficult problem of resource control in a commons. Bevan *et al.* [9] concluded that medical organisation "does not seem to be equipped for the difficult issues of rationing" (p. 101). The present system of financial control through planning and policy [31, 32] is a macro-economic method that does not and cannot deal with the sabotage (albeit unwished) of overall plans provoked by sharing and open-ended expenditure.

The need for a new non-clinical medical role which could be concerned with the organisation and evaluation of medical care systems and of the medical aspects of health service administration was officially identified in the 1960s [33]. The origins of this new 'community medicine' are to be found in the long-established public health tradition which, prior to the 1974 re-organisation, was under local government control.

Although re-organisation provided a role in the top NHS management teams for community physicians [30], the power and opportunities inherent in the role have not been fully exploited. There are many reasons for this: the nature of the work of community physicians has been under intense debate [34–36]; many of the original post-holders were drawn from the low prestige occupation of public health [37]; many new incumbents to the profession display a longing for clinical practice [38]; there is a contrast between the academic world which sees the work as based in epidemiology [39, 40] and those working in the NHS who spend most time in administration [41]. The result has been that community physicians have not always enjoyed the sympathy of their consultant colleagues [42], have not had the training, experience or ability to enable them to exert substantial influence over them and have not had the resources, administrative and statistical support, or defined responsibilities to enable them to exert leverage in medical committees.

Finally, we should mention two recent organisational developments, medical audit [43] and clinical budgeting [44], which have become popular and are being tried out on an experimental basis. It must be noted that such developments are not being introduced to regulate practice; they are tools to ensure standards are adequate or value is being obtained for money spent. Tools such as these do not, cannot, solve problems of organisation; they should follow structure and be used once the work to be done and the organisation required have been clarified and agreed.

THE INADEQUACY OF INFORMAL MEASURES

The Second Cogwheel Report [45], reflecting on the ineffectiveness of the recommendations of the First Report [46], aimed at enabling doctors to regulate their own activity, concluded that 'attitude of mind' was as important as formal organisational structure. Given that links between doctors and from them to their Management Team representatives and Advisory Committee members are usually insufficient to allow even the most rudimentary forms of intra-professional communication and control, it is not surprising that informal private and public pressure is used to influence medical attitudes or persuade doctors to "act responsibly" [47].

Unfortunately, appeals to conscience and social responsibility to get doctors to exercise clinical restraint are ineffective, inappropriate and socially damaging. First, the doctor who heeds them feels foolish as he watches a colleague use the resource; or he becomes increasingly critical of his colleagues. Second, the doctor sees the burden of restraint being borne by the patient and wonders why his patients should be singled out for privation, for example, of that £9 skull X-ray taken just to be on the safe side. The rational doctor will conclude that it is not fair on the patient. Third, such appeals to public duty from distant impersonal sources cannot compete with the immediate personal appeal from the patient. Fourth, those who

provoke guilt are acting aggressively. A doctor will feel accused and offended, and over time becomes alienated and unwilling to co-operate. When the call comes from a colleague [21, 48] the doctor must feel suspicious and confused.

Informal pressure on doctors for clinical self-restraint places individual and social values in stark opposition. For doctors, as for others, social values tend to come second unless buttressed by regulation. Such regulation may take the form of enacted laws or of explicit organisation.

ORGANISATION AND SOCIAL RESPONSIBILITY

In a society which values individual freedom, workable social responsibility only emerges from regulations which are accepted by the majority and are enforceable, explicit and fair. The management of commons pathology to ensure responsible and limited use of a social resource is therefore always organisational.

The economist, Maynard [49], considering containment of health care costs in the U.K., discounts a solution through increased personal responsibility ("new internalised practices... moral code of ethics ...'true faith' of cost minimisation") and advocates adapting payment systems to policy objectives ("fill their mouths with gold"). I have argued above that undue emphasis on personal responsibility is not only useless but morally pernicious. A system based on what sounds like bribery may work, though little is known of payment systems and policy objectives are notoriously obscure and changeable. His recommendation illustrates the principle that imperfect arrangements even if morally repugnant, coercive and unfair are judged better than none when a commons is being despoiled.

There is, however, another form of organisation which Maynard does not mention. Social regulation is not just a method available for outsiders to impose on doctors, it is an option for doctors themselves. The difference between regulations decided upon from within a work-group and those imposed on them from without are great. The former have the quality of an endoskeleton and the latter an exoskeleton.

The skeleton metaphor requires some explanation. Organisation can be thought of as a framework on which and within which work can be carried out. Organisation contains, channels and legitimates the psychological and social power required to do the work [50, 51]. In this sense, a system of regulations is like a skeleton whose function is to provide a more or less rigid framework on which the muscles can act. Doctors have psychological and social muscle: psychological muscle is based in their capacity to do medical work; social muscle is the authority vested in them to do this work, which includes the right to expend resources. These are the powers which require a framework if they are to operate effectively, efficiently and equitably.

EXTERNAL REGULATION

Exoskeletal organisation typically develops as follows. Local or national administration notes some problem (e.g. excessive use of overtime pay). Informal measures to resolve this are tried but fail. The problem is ignored in the hope that it will go away. Eventually, as resources shrink, pressures for resolution increase. The doctors involved appear unwilling or unable to tackle the problem constructively. Regulatory control is imposed locally by the administration. Political opposition by doctors erupts locally and nationally and negotiations to block the regulation commence. Finally, some watered-down version of the regulation is accepted on both sides. In this way, one small exoskeletal scale is laid down. Multiply this by large numbers of problems fought *ad hoc*, some locally, some nationally, and an exoskeleton results.

The essential features of organisation generated in this fashion are well-known. Its requirements, accepted with resentment and opposition, are filled to the letter rather than followed in the spirit. It is the child of a counter-reaction by doctors to a reaction by administration to a violation of values shared by both. This leads to rules which are negative, inhibitory and superficial, and feel alien and unfair. Such rules often, as a side-effect, discriminate harmfully between individuals, specialties, hospitals, Authorities and other natural groupings. Not uncommonly, administrative enforcement is difficult, intrusive and labour- and time-intensive.

Such organisation is a social response to the assertion of individualism and freedom by doctors. This is most marked in the U.S., where doctors have to work within "a crazy quilt of regulation that is expensive and difficult to administer and that has a deadening effect on flexibility and innovation" [52]. Mechanic notes the paradox of asserting individual freedom when the reality is social dependence: "in trying to preserve the mirage of a 'private medical-care sector' we have developed more regulation and cumbersome bureaucratic procedures than would be necessary for a completely nationalised system. The amount of regulation in comparison to the English National Health Service is staggering" (p. 8).

SELF-MANAGEMENT

The alternative to incremental backward-looking responses by outsiders to socially-perceived problems is a continuous, forward-looking, professional response by the work group. The NHS has generated work groups of about 50–300 consultants in the Districts and the option of collective responsibility seems viable. The medical work group can *choose* to organise themselves, that is to develop mechanisms binding on individuals within the group by mutual consent. Cooperation and coordination occurs in places at present but on an emergency basis [53] or on limited matters such as drug use [54].

However, problems of resource use and distribution within Districts will arise repeatedly as the economy swings, professions change and new diagnostic and treatment approaches emerge. Doctor-based continuous organisation could ensure prompt, socially equitable and responsible resolution of problems. The requisite organisation would have to be robust and yet modifiable, able to accommodate to change within the group of doctors or elsewhere in the service. Because its prime purpose would be the delivery of a

service within resource constraints, it would have to be patient- and district-oriented rather than staff- and nation-oriented. Its task would be to facilitate medical work and its integration with other health service work. Medical work in the district could evolve in a directed-fashion and early detection of problems and rational initiation of solutions, with appropriate innovation, would be essential tasks. This would not only ensure best use of resources, but also promote respect and support for the profession as a whole.

Such organisation would not work against power groups within the profession but would relate to them in a locally appropriate fashion. Inevitably decisions would have to be made which do not suit one group or another, so voluntary participation in, and sustenance of, the social structure by all would be essential. If this occurred, the District Medical Officer and other community physicians might be sought after and valued by clinicians, because it will be more apparent that assistance is necessary in examining the balance of needs and provisions, and in handling rationing. Helping clinicians develop policy and priorities in this way was envisaged as a key part of the role for community medicine in its early years [37, 55].

This view of organisation is based on the belief that freedom only has meaning within limits. Those constrained by the limits will be more likely to respect and maintain them if they are their own creation.

Reduction of tension by tackling problems before they are socially explosive, will enhance the chance of innovative solutions and provide doctors with a sense of influence.

Because NHS commons pathology is primarily a local matter, patterns of self-management must be devised within each Health Authority. Local legitimacy rather than national sanction will determine viability. Centrally-determined national solutions are often provoked by health service power groups (including doctors) or by public indignation, but they may easily fail to engage the problems genuinely or at the appropriate depth. Often the solutions are not understood or agreed with locally.

COMPARISON OF SELF-MANAGEMENT WITH EXTERNAL CONTROL

The two organisational approaches can be illustrated using the simple example of overtime pay. The Authority rule limiting the maximum per contract takes no account of what overtime is for, or of different arrangements to provide cover. Its application is 'mindless'. As a result, it encourages all doctors to aim for the maximum and then provokes pleading for more in 'special' cases. Changing the rule, except for further limitation, is difficult.

By contrast, the Authority could simply determine a total sum available for overtime pay and leave it to doctors to distribute it appropriately through their own organisation. One option would be simply dividing it equally, but there would be very many other possibilities. Claims by doctors could be judged by doctors, who could respond rapidly and with initiative to altered circumstances. Any arrangements would still be subject to national agreements, but it would be clearer when regulations pursued by doctors nationally were operating to the detriment of medical care locally.

Neither approach interferes with the rights and ability of the medical group to agitate for a larger total amount for overtime. Self-management grounds such agitation in a detailed overview of local circumstances and in the context of responsible handling of the overtime resource. In addition it unites the doctors and discourages multiple discrepant individual approaches to the Authority which tend to reduce, rather than enhance, medical credibility.

Medical self-management will never extend to managing the overall context of policies, resources and other disciplines in the NHS. It could be argued, however, that enabling the medical profession within a District to keep its own house in order might increase the wider influence of clinicians still further and so undesirably reinforce medical biases and their dominance in health care. However, genuine conflicts of interest (biases) between doctors, Health Authorities (representing Parliament), Community Health Councils (representing local popular feeling) and other health service groups, are not appropriately dealt with by advocating disorganisation. Requisite organisation can facilitate the political process by encouraging the formation of a coherent medical view, by assisting in the structuring of debates, and by increasing the likelihood that doctors will implement the final decision. This paragraph digresses, however, from the main thrust of this paper, namely, arguing the need for organisation which permits cost-containment by those incurring the costs.

COST-CONTAINMENT

The medical profession probably realises that NHS resources are finite and unlikely to increase substantially. The next task for the profession, or at least for district work-groups, is to see that an organisational arrangement that depends principally on self-restraint is unworkable and unsatisfactory when these resources are shared under conditions of intense competition. As a result restrictions on medical activity must be expected to increase.

The crucial awareness yet to come is that there is still a choice in the mix of external regulation and organisation based on self-management. If choice goes by default, the profession will be increasingly managed by outsiders. Self-management would seem to be the creative option. Restriction organised from within the medical work group, however unpalatable, is the means most likely to produce tolerable practicable medical care, making sense to patient, doctor, administrator and the public.

The challenge of working out and implementing useful and usable endoskeletal organisation is implicit in recent DHSS guidance which emphasises that "marked variability between districts" is to be expected [56]. This will be difficult given the current lack of awareness amongst doctors that organisational structure is not 'machinery' but a changing and changeable human creation maintained by personal activity [12]. If social responsibility is taken seriously [57], organisation at district level should be a subject for long-term 'disciplined inquiry' by doctors (including community physicians) in the district

not just a matter for periodic governmental committees, or for some new breed of medical or non-medical administrator [58, 34].

The formulation and enforcement of medical policies by doctors working together in groups would become a matter of the greatest importance. Self-regulation of medical work would have the rationing of medical expenditure at its point of commitment as one of its primary purposes. Such rationing may be arranged so as to maximise and sharpen the use of clinical judgement. For example, working within a clearly stated budget, or within a certain amount of radiography use leaves much room for clinical discretion for each patient. However, some rationing will be explicit. For example, doctors may agree to place limits on high-cost procedures or agree to a policy like not ordering skull X-rays routinely. In these circumstances, the peer group sanction protects legal liability and reinforces ethical duty.

It is sometimes asserted that any consideration of expense dilutes the physician's primary responsibility to his patient and is therefore unethical [59]. However, Hart [60] argued that "the idealised, isolated doctor/patient relationship, that ignores the needs of other people and their claims on the doctor's time and other scarce resources, is incomplete and distorts our view of medicine". Ethics are situational not absolute, and medical activity must be seen in the current socio-economic context.

The Government's chief concern is cost-containment whatever the state of the nation's health. The severity of rationing for the public will be most dependent in the future on either producing services at reduced cost, or reducing demand for services, not on alteration in the total resources. Doctors need to know what every top manager, within health services and without, knows: "resources can be 'created' by *organising differently*" [italics in original, 61, 62].

CONCLUSION

The increased differentiation, specialisation and scope of medical and health work over the last 20 years has taken place without due regard for the necessary integrating mechanisms [63]. This is particularly noticeable in the work of doctors within the NHS. The current organisational structure of medical work, which involves competition and sharing of a common resource, is unsatisfactory and socially damaging when resources are static or falling.

Kinston [1] pointed out that there are two easy short-term solutions to the tensions of sharing. The first, increase in the total resource, attractive to doctors and Authorities, is now ruled out. The second, reduction in the numbers of users, for example by keeping medical posts empty, may become more and more attractive to Authorities [64].

The difficult long-term solutions are organisational. Progressive external restriction will result if doctors within districts do not see the need for organisation based on mechanisms under their control. Lack of attention to this problem will lead by default to social controls from without. Such a retreat from reality and responsibility is serious; it is the psychosocial equivalent of capitulation to a police state [65].

Acknowledgements—The author is a member of a research Unit funded by the Department of Health and Social Security to respond to requests from individuals and groups within the National Health Service for assistance with problems of organisation. Iden Wickings, Ph.D, commented helpfully on the manuscript.

APPENDIX

(modified from Kinston [1])

Let R be the total amount of a crucial resource for use in common by a population of doctors, size P. The ratio R/P influences the likelihood of social tragedy and lies at the root of continuous righteous demands for an increase in R or reduction in P. Given fixed R and P, we can consider the logic of a rational and responsible doctor who wishes to expend part of the resource, r.

Then:

Gross gain to doctor	$= r$
Loss to total resource (R)	$= r$
Loss per member of P	$= r/P$
Gross loss to doctor	$= r/P$

Utility to doctor = gross gain − gross loss $= r - r/P = r(1 - 1/P)$.

The size of both r and P will therefore be influential in determining the value to the doctor of expending r. If, as is usual in health services, P is large (over 50) then $1/P$ is very small and the utility approximates the gross gain independently of r or R (see Fig. 1). The likelihood of spending is not independent of r or R because both r and R will be relevant to significant others. Typically r/R is too small to be the concern of the political authority; and r/P, the loss to each colleague, is also very small. The doctor, having thought matters through, will then go on to expend r.

The problem is that each doctor is logically bound to think in this fashion. The expenditure then $= P \cdot r(1 - 1/P) = Pr - r = Pr$ (if r is small and P is large). Pr will now tend to be a significant depletion of R, depending on the size of both r and P. Even if Pr/R were small, the process will be repeated over and over again, n times. Inevitably, nPr will be a significant drain on R.

As P increases, group control over expenditure becomes more important, both because the total, R, is likely to be larger, and because each user is likely to feel less respon-

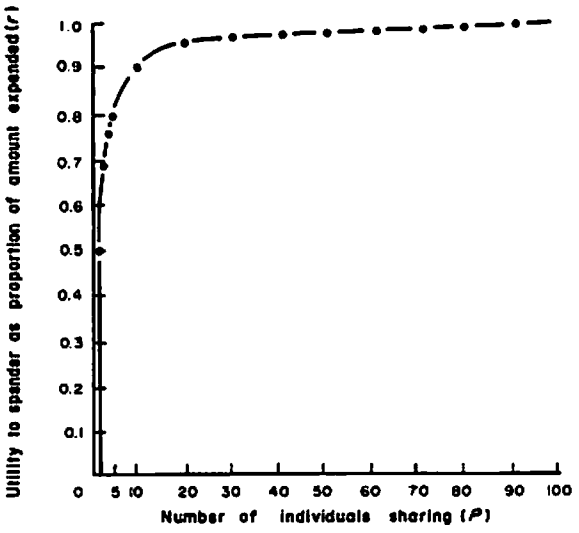

Fig. 1. As the number of individuals sharing a resource increases, the utility to the spender of spending a small amount of it increases very rapidly (see Appendix text).

sible for the whole. However, with increasing P and R, the loss for each act of resource use becomes too small for each user to be concerned in monitoring it. At some point there will be no alternative but social regulation either from within the group or from without.

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