

PEPPER (W^m)

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THE SANITARY RELATIONS OF HOSPITALS.

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THE object of the writer is to offer a few practical suggestions on the subject of hospital construction as bearing on the result of treatment. This question, although somewhat restricted, cannot be denied a large share of importance. The rapid increase in the size of cities both in this country and abroad, is rendering necessary a rapid increase in the number and size of hospitals. Public attention, also, is being forcibly attracted to a consideration of the proper construction and management of these institutions in consequence of the real importance of the subject, and of the rapid growth of a spirit of intelligence and philanthropic interest in all great sanitary questions.

This interest has been evidenced, and, at the same time, greatly stimulated by the numerous publications which have been made of late years bearing on the question of the sanitary relations of hospitals, and especially has this been so since the appearance of the well-known article on "Hospitalism," by the late Sir James Y. Simpson, of Edinburgh, in which he endeavored to show that large hospitals are banes rather than blessings, and that the plans of construction hitherto followed are erroneous and lead to disastrous results. The numerous severe wars which have occurred during the last decade have also furnished interesting and valuable evidence as to the results of the treatment of surgical and medical cases in tents or barrack hospitals, and thus have added great importance to the study of the sanitary value and efficiency of the large civic hospitals in various countries.

The results of this investigation have been, it must be acknowledged, of a startling and momentous character. It has been shown that some few of the largest and most popular hospitals in this country and abroad are actually productive of so large a rate of mortality among their inmates, and especially among those suffering from severe wounds or who have undergone serious surgical operations, as to make it doubtful whether their existence is not an injury and a curse to the community in which they are situated.

It has been further shown that in others, where no such deplorable condition of things exists, the death-rate is still alarmingly high. In examining into the causes of this excessive mortality further, it has been shown that a considerable part of it is due to the frequent occurrence in such hospitals of cases of disease of a peculiarly fatal class — such as pyæmia (or surgical

fever), hospital gangrene, erysipelas, and the like, — affecting surgical patients especially, and which are known to be due in many instances to the diffusion of septic poisonous emanations.

Simpson collected an extensive set of statistics of mortality of certain wounds and operations in private practice and in small rural hospitals, from which he drew the conclusions above stated ; and the results derived from tent and barrack-hospital practice during recent wars, confirm the statement that in large city hospitals the rate of mortality, after wounds and surgical operations in particular, and of all diseases in general, is frequently higher than in similar cases treated in private practice, or in small isolated hospitals. Up to this point the facts are conclusive. But the more important and difficult question of their signification remains to be solved. Simpson attempted this in his usual trenchant manner. Assuming that this excessive mortality was directly and essentially connected with the hospital itself, he employed the term “Hospitalism,” to imply a peculiar fatal septic influence generated in large hospitals, and the more intensely the larger the hospital, which proved the cause of death in many cases which would have recovered under other circumstances. The conclusion followed readily that it was our duty to demolish these pest-houses, and to erect “wooden, or brick, or iron villages” as a substitute.

His data and conclusions were vigorously assailed by various authors, — notably by Mr. Holmes and Mr. Callender ; and the more recent writers who have adopted his views have usually expressed them in a modified and more cautious manner. Still it cannot be doubted that the drift of popular opinion, both in and out of the profession, has been setting against the erection or continued use of large hospitals, and in favor of substituting comparatively small isolated buildings, on the general plan of the barrack first used with so much success in our recent war. I have of late had such frequent occasion to meet with this opinion while superintending the erection of the new University Hospital in this city, — which is to be a large building, consisting of a main central structure with lateral three-story pavilions connected by a main corridor, — as to lead me to examine seriously the question of the justifiability of erecting such a structure for hospital purposes. And I beg now to offer a few informal and undeveloped thoughts on the subject, — in support of the view which I strongly embrace, — that there has as yet been no good reason advanced for an abandonment of this or some analogous mode of hospital construction.

In the first place, I confess myself unable to appreciate very highly any of the statistics which have been advanced on this question, for the following reasons :—

a. That the class of cases, the severity of the lesions, the constitutional condition and morale of the patients, are not shown to be analogous in the two sets of figures. This holds good both in rural and military as compared with civic practice.

b. That in the most convincing set of statistics, — those drawn from private practice, — it is certain that the returns do not represent fairly the average result in any given district.

c. That the statistics bear only on certain classes of cases (wounds and operations), out of the many for which hospital accommodation must be provided (fractures, medical cases, etc.).

d. That at most the statistics prove nothing against such hospitals, *per se*, but only against certain remediable abuses and errors in their construction and administration. Thus, for instance, it is evident that if certain well-known conditions, requisite for health, and especially for the successful treatment of serious diseases, be neglected or willfully departed from, increased mortality will inevitably result, whether the cases be treated in a large hospital or in small isolated barracks.

I fail to see why these last conditions, — perfect cleanliness, thorough ventilation and insolation, ample allowance of air or ward space to each patient (*i. e.* entire absence of overcrowding); careful grouping of cases, so as to avoid accumulation of cases of certain classes in the same ward; uniform and suitable temperature; skillful, assiduous nursing and treatment, — cannot be as well obtained in large hospitals as in isolated small structures.

It is of course evident (as pointed out by Ashhurst and Holmes) that, if the hospital authorities allow their buildings to become so overcrowded that the patients are deprived of the needed amount of pure fresh air, while at the same time the milder cases are turned into “out-patients,” and the wards contain a disproportionate accumulation of grave cases of suppurating wounds, extensive burns, compound fractures, serious operations, or, in the medical wards, of erysipelas and infectious fevers, an increase in the death-rate will occur. Not only will more per centum die than in another hospital where the wards are filled with cases of mixed character, mild with severe, but more will die per centum of any one of these classes of grave cases than would die if treated in a hospital where there was no such unnecessary and criminal “overcrowding.” Or if, again, actuated by an utterly false conception of their duties to the community, the authorities of any hospital are induced to erect additional wards on their grounds, so as to interfere with the supply of light and fresh air to the original structure, or to convert rooms inadequately supplied with the necessary conditions into wards, it must inevitably follow that the sanitary condition of the hospital will suffer, and that a corresponding elevation of the death-rate will present itself.

Many of my hearers may be familiar with a now notorious case, — that of the Norfolk and Norwich General Hospital (England), — which has recently been made the subject of an able invective by Dr. Beverley, one of the surgeons connected with it. According to his statistics, — and they are unquestioned, — this hospital, up to the year 1862, stood almost alone in the success that attended its surgical practice; 910 persons had been operated on for stone, and 792 had recovered. On two occasions 40 cases of stone had been operated on without the occurrence of a single death. Yet during many years the hospital had been receiving a large but not an excessive and disproportionate number of cases of wounds and burns, and cases requiring surgical operation. Still, until 1862, the existence of “hospitalism,” that fatal septic influence, was not suspected. Since that time an

excessive number of the above cases has been admitted, great overcrowding has resulted, and the governors have even modified the original plan by building more wards so as to interfere with ventilation.

The pressure upon the accommodation of the hospital may be judged of from these figures :—

	1854 to 1863.	1864 to 1873.
Surgical Operations	1666	2513
Wounds	359	779
Fractures, Burns, and Scalds	271	491

It is perhaps needless to say that a frightful increase in mortality has occurred in this once model hospital. Yet I can conceive of nothing more fallacious than any argument against large general hospitals based upon such cases as these. The conclusion—the only warrantable conclusion—that can be drawn is, that so long as the business of the hospital was kept within its legitimate limits, hospitalism was unknown; but with the advent of unjustifiable overcrowding came also this dreaded and fatal result.

I cannot lay too much stress upon this question of overcrowding and imperfect ventilation, because I truly believe that the prevalence of these defects in most large hospitals of any considerable age, popularity, and wealth, has been chiefly responsible for the unfavorable results charged against so many of them. It is to be observed, also, that this evil of overcrowding is most apt to be constant and extreme in those very institutions where it can least be tolerated, and which are, for obvious reasons, most apt to be selected for statistical investigation. I refer to the large municipal hospitals in the principal cities both on the continent of Europe and in America. As these depend for support upon appropriations made by the municipal government, and are compelled to receive all applicants, there is usually no power in the hands of the hospital authorities to prevent the most flagrant and fatal overcrowding. When it is borne in mind further that the patients gathered in such institutions are from the most abject and enfeebled classes of the community; that in many instances the buildings themselves are wanting in the requirements for a successful hospital, and that it is frequently impossible to obtain from the city authorities a sufficient annual sum to properly conduct the ordinary affairs of the institution, much less to supply it with the artificial forced ventilation which is needed in such buildings, it will be no source of wonder that the rate of mortality in the municipal hospitals of Paris, Vienna, Berlin, New York, and Philadelphia, should be disgracefully high.

On the other hand, in hospitals which depend upon private subscriptions for support, the income is scarcely ever large enough to enable the hospital authorities to admit a very excessive number of patients, and thus one very powerful check upon overcrowding exists. If, further, as is the case in very many of the hospitals in this country and England managed by private

corporations, a constant, energetic, and intelligent care is exerted in the avoidance of all defects or abuses of administration, and in the improvement of the means of ventilation and heating, it may be confidently asserted that a rate of mortality will be secured so low as to compare favorably with the results obtained in the treatment of strictly analogous cases in isolated barrack wards.¹

In using the term "avoiding overcrowding," I do not express all that I conceive to be the duty of hospital authorities in this direction. It seems to me indispensable, no matter on what plan a hospital is constructed, that certain wards should be rigidly and invariably kept in reserve, only to be occupied when from time to time the various wards in use are vacated in regular rotation for purposes of complete cleansing, or, if necessary, of renovation. The frequency and extent of such renovation must depend upon the character of cases treated in the ward, and particularly upon the occurrence of the slightest evidence of septic infection. It is to be remarked here, that such renovation of the wards of a large hospital can be more readily and far more economically effected than can the destruction and restoration of a temporary barrack. In the ordinary course of events, even when not the slightest evidence of infection has been developed, each ward should be successively vacated, say once in three or four years for three or four months, the beds scraped and repainted, all utensils renewed, the floors planed and treated anew in the original manner adopted, the ceilings and walls thoroughly cleansed and coated afresh with some non-absorbent application, the remaining wood-work scraped and repainted. If any serious cases of infection have occurred, it would be easy to hack the walls and ceilings and to replaster them, and to entirely renew the flooring.

I have had ample opportunity of observing the entire success of even less thorough renovation of old wards which had become alarmingly infected. Perhaps in few, if any, hospitals in the world is a larger proportion of cases of wounds, compound fractures, and cases requiring surgical operation, treated than in the Pennsylvania Hospital in this city. On more than one occasion, during my acquaintance with the administration of that noble charity, has one or another of its surgical wards become infected with pyæmia, or erysipelas, or gangrene, to such an extent as to induce a removal of the patients to a distant ward, a complete closure for several months, and a thorough cleansing of the infected ward. In every case, after the reopening of the ward, the results of treatment have been as favorable as in an entirely new structure. In no instance, save only in the occasional occurrence of a few cases of facial erysipelas, have I known the medical wards of that institution to present any conditions which would justify the belief that the patients there treated were subjected to any depressing septic influence.

¹ Since reading the above paper, a letter has been published in the *Philadelphia Medical Times*, November 21, 1874, by one of the surgeons of the Pennsylvania Hospital (to which reference is made further on), which confirms in the strongest possible manner the views here presented. It may be mentioned that the present building of the Pennsylvania Hospital has been in constant and most active use for 120 years.

In the case of Bellevue Hospital, New York, and of the Philadelphia Hospital in this city, the very unfavorable results obtained at certain times are, as I have already suggested, plainly attributable to gross defects of construction, and to a degree of overcrowding only to be pardoned on the score of the culpable penury of the city authorities in regard to this vital question of public health.

In the remarks I have made I have assumed that the large hospital was constructed so as to present the necessary conditions for successful treatment of the sick. I am sure that many of the great hospitals now in existence deserve richly to be razed with the ground for their utter failure to comply with these simple requirements. But I cannot draw from this the conclusion that it may not be desirable to erect new hospitals as they are required, of large, even of palatial dimensions, but in more strict conformity with sanitary conditions. These are simply :—

Free exposure to light and sun.

Free supply of pure air, — both by natural and artificial ventilation, — and thorough removal of the exhausted or foul air.

Means for securing a uniform degree of pleasant heat ; and to favor absolute cleanliness, as by the entire absence in the wards of cracks, recessed angles, etc., where dirt may collect.

The employment of the most non-absorbent surfaces, and their coating with non-absorbent applications.

Entire separation of wards.

Entire separation of all water-closets, slop-hoppers, etc., from the wards, and independent arrangements for thorough ventilation of the former.

Existence of spare wards, to be used from time to time.

It is desirable, also, that there should be in connection with every large general hospital, a couple or more of isolated wards, — each, if possible, containing also several separate small chambers, — for certain classes of cases which are not suitable for admission into a general ward. Such would seem to be, among surgical cases, extensive burns, wounds, or operations causing exposure of very extensive suppurating surfaces ; cases of traumatic erysipelas, or of gangrene ; and among medical cases, infectious fevers, erysipelas, dysentery, etc.

I am convinced that all of these are readily obtainable in a well constructed hospital at the present day ; and I am assured, from the ability and energy with which questions of ventilation, heating, and construction in general are now being investigated, that still better results will soon be achieved.

I have thus imperfectly attempted to express some of the reasons which make me feel that the charges hitherto brought against large hospitals do not prove any essential defect, but merely that errors in construction or administration have frequently been committed.

A second important argument in favor of large hospitals seems to me to be found in the economy of their *construction* and *administration*.

In the discussion of the relative merits of different styles of hospitals, the importance of these considerations appears to be frequently overlooked. It is easy to say that it is not necessary for a city to provide hospitals for its

sick poor ; but that if it does, it is its plain duty to supply the very best kind, irrespective of expense. I think it will rather be held that it *is* the imperative duty of cities to supply ample hospital accommodation within its limits ; and also that, looking to the enormous drain which the provision and maintenance of hospitals makes upon private and public funds, it is obligatory that this should be done in the most economical manner consistent with efficiency.

a. The first element of expense in connection with the hospital is the *ground*. It is necessary that this should be well situated as regards elevation and surroundings ; it is necessary, also, that it should be of ample size, so as to ensure abundant supply of air and light. But it is also necessary that it should be in a central location, so that patients may the more readily be transported to its wards, but chiefly in order that it may secure the constant, assiduous services of the experienced and skillful physicians and surgeons in the community. It is needless to say that if the site were chosen so far from the centre of population of the city as to be where land is cheap, it would probably be so far distant from the residences of the leading medical men that the hospital would be compelled to depend upon salaried medical officers permanently attached to it. It will be conceded by all that no more unfortunate result could happen. Yet it may safely be asserted that to erect hospitals on the plan of isolated tents, or one-story barracks, will require much more than twice as much ground as is needed for a hospital of equal capacity built on the improved pavilion plan. It is sufficient to contemplate the difficulty of replacing the present hospital accommodation of London by a large series of "brick, wooden, or iron villages," as urged by Simpson.

b. It is frequently asserted that the original cost of construction is greatly less in the case of barrack hospitals. This, of course, is true of light wooden structures, or of canvas tents. But it seems to me that it has not yet been demonstrated that such accommodations are suitable for a permanent hospital organization in our climate, and for the class of patients who seek shelter in our large city hospitals. When it comes to a more substantial barrack built solidly of brick, and furnished independently with all the needed conveniences, I doubt if such accommodation can be provided, ready for use, at a cost of much less than \$400 or \$500 per patient, which approaches the cost per patient of large, handsome, permanent pavilion hospitals, constructed in the highest possible style of architectural thoroughness.

Add to this that the great, the characteristic advantage claimed for barracks and tents is that it can be afforded to tear them down and replace them by new structures at certain intervals. For it must not be overlooked that even the warmest advocates of barracks acknowledge that there is danger of septic infection if their wards are long occupied by a serious class of surgical cases. It is difficult to conceive how it would be possible to successfully conduct the large hospitals of such a city as this on a plan which required the erection of buildings at a cost of \$400 or \$500 per bed, which were destined to destruction at the expiration of five years, or sooner if evidences of septic poisoning made their appearance. I have already pointed

out that if anything less thorough than entire demolition and reconstruction is intended, it is quite as easy to renovate the wards in a large hospital as in an isolated barrack. And let me remark that in advising the construction of two or more outstanding barracks in connection with every large general hospital for the reception of certain classes of cases, I had reference to very inexpensive wooden structures, of strictly temporary character, and designed to be invariably demolished after a few years' use; though, as already remarked, I think it yet remains to be shown that such structures are as well adapted for continuous occupation in all seasons by the enfeebled class of patients who fill city hospitals, as the wards of a well-constructed hospital of large size.

c. It is only necessary to allude to the very great increase in the difficulty and cost of administration of a hospital of large capacity constructed on the plan of detached barracks. It would include a far larger outlay for heating apparatus and fuel, greater expense in the kitchen department, in attendance, etc. But this is too self-evident to require further attention.

Thirdly, in addition to the advantages of economy possessed by large pavilion hospitals, must be mentioned the great importance of facilities for clinical instruction in connection with hospitals in large cities. The division of a hospital into a series of widely detached small buildings must inevitably prevent anything like systematic clinical instruction before large classes. It would be manifestly impossible to transport very many of the most instructive cases of disease or injury to any central building where accommodations were provided for lectures. And yet, so far as the health and vital interests of the community are concerned, there is but one feature of hospitals, namely, the sanitary interests of their inmates, which is of more profound importance than the full clinical instruction which should always be conducted in connection with them.

It is impossible to overestimate the practical importance of the question we have been considering. It can scarcely be supposed, if the unbounded abuse which has of late years been heaped upon large hospitals of permanent construction, should be continued, that the private generosity upon which so many of them, in America and England, depend for their entire support, will not be checked. It cannot be doubted that for certain classes of cases, isolated barrack or tent hospitals of temporary character are the best possible form. It is very certain that, in times of war, when a sudden and temporary increase in the demand for hospital accommodation arises, such structures have been highly efficient, and that reliance should be placed exclusively upon them, instead of allowing the permanent civic hospitals to be overcrowded by the reception of unusual numbers of serious cases. It is also evident that for military and marine stations, where the hospital site can be selected without reference to the surrounding population, where the cost of administration is defrayed by governmental appropriations, where the extent of accommodation required may vary rapidly and even the permanence of the institution is indefinite, where the medical staff is immediately attached to the hospital, and no demand exists for clinical facilities, that barrack hospitals present many

points of advantage. On the other hand, I have endeavored to suggest some of the practical considerations which make it probable that most of the necessary hospital work of great cities can be done, and well done, in large, substantial buildings, located in central positions.

As to the question of the actual relative merits of large hospitals and of isolated barracks, there probably exists considerable diversity of opinion. I can merely say that I am not aware of any statistics in existence which afford us the means of positively determining the question. It appears to me that there is needed for that purpose a large series of observations upon the mortality in a *well-constructed* and *well-administered* general hospital in one of our large cities, and in isolated barrack or tent wards in the same location, receiving the same run of cases, which should be subjected to the same method of treatment. It will not, I trust, be long before such sets of statistics are before the world. In the mean time, the general considerations I have attempted to express, as well as others, which time will not permit me to touch upon, compel me still to believe that it is possible to construct a large hospital with such due provision for ventilation, and to administer it with such constant, unswerving regard, not to the grand total of cases treated and operations performed, but to the sanitary conditions of the inmates, as that it shall prove a safe shelter for the sick and suffering, a successful field for medical and surgical practice, and one of the noblest gifts of an enlightened, intelligent, Christian community to the poor who are intrusted to their care.

I will not close without one word of appeal to all who hear me in behalf of this important subject. The papers and discussions which have been prepared by some of my colleagues, who have devoted much study to the construction of hospitals, are of themselves sufficient to show how much attention is being devoted to this question, and how much advance is being made in our knowledge of the materials and mode of construction, and of the methods of heating, ventilating, and disinfection; and to assure us that eventually the best modes of securing all the sanitary requisites in a hospital will be clearly determined.

But there is a matter of at least equal importance, on which, as a medical man connected with several hospitals, I may speak without hesitation. I allude to the vast importance of the proper administration of hospitals. The single instance I have quoted to you of the Norwich Hospital is sufficient to demonstrate the terrible results which may follow an injudicious or careless mode of conducting such an institution. It is too much the custom in all great hospitals, here and elsewhere, to trust the control of the sanitary interests of the hospital solely to the medical staff, while in many instances the governors or managers are little more than the trustees and executors of a trust fund invested for the support of the institution. It must be acknowledged, however, that for manifest reasons, the medical staff are not the best persons to keep watch over the sanitary condition of the hospital. Conscious of their own pure zeal in relieving suffering and disease, willing to lavish their time and best efforts in the service of the poor without remuneration, they are too frequently tempted to urge or sanction

the admission of deserving cases into the hospital wards beyond their strict lawful capacity. Intensely interested as they are in the treatment of the dangerous cases which constantly fill the wards, there is a risk that their attention is too closely riveted upon the actual duties of the day, to allow them to take at the same time a comprehensive view of the general results of the administration of the hospital as a whole, and of the sanitary condition of the building. To secure constant and critical attention to these all important matters, there is needed a superintendent possessing a high degree of ability, executive power, and acquaintance with hygienic laws; as well as more study and watchfulness on the part of the managing board of these institutions, which should invariably contain a full proportion of medical men not connected in any way with the medical service of the hospital. It is impossible that, with a clear business-like inspection of the results of the operations of the hospital, and of its general sanitary condition, such as would be given by a board composed partly of experienced men of business, partly of medical men, any grave departure from the correct principles of administration, or from average success in the results, should remain unnoticed and fail to receive whatever attention might be needed to rectify it. So that I would close by repeating my firm conviction that, with correct modes of construction and organization, and with a proper system of administration rigidly enforced, large permanent hospitals will be found to yield good average results in the treatment of medical and surgical cases, and that very many of the grave charges which have been brought against them will prove to have been evoked by the *abuse*, not by the proper use of these institutions.

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