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Hospital infections and hospital hygiene at Malmö General Hospital

2. Hygienic measures and their correlation with the incidence of infection

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In December 1958 an Infection Control Committee was set up at the Malmö General Hospital. This Committee had a threefold purpose: the investigation of hygienic conditions in the different departments, the drawing up of procedural rules which would apply to the entire hospital, and the introduction of improvements on the basis of certain economic calculations.

Previously it had been the practice for the head of each department, in consultation with his staff, to safeguard hygiene; as a result of this it became increasingly difficult for the Central Stores to supply all the different types of materials and liquids required.

A working committee was therefore set up within the Infection Control Committee, with representatives from the Purchasing Department, the Central Stores, the Planning Department, the Hospital Superintendent's Office, the Nurses' Instruction Section, together with the hospital Governor and two doctors from the Institute of Clinical Bacteriology. When required, members of other departments were also consulted.

The problems involved often called for fairly extensive experiments with respect to use, practicability and satisfactory results in relation to the economic implications. One of the most important aspects of the work was the investigation of available products, their prices and qualities. In certain cases entirely new products had to be designed. As the various problems were solved instructions were drawn up and printed for distribution to all relevant departments.

METHODS

Fig. 1 gives a 6-monthly review of the more important measures introduced, usually simultaneously, in all the departments. In order to exhibit these measures in relation to the incidence of infection, one of the departments has been selected as an example to demonstrate the results achieved. The year 1959 has also been included here.

In view of the relatively unqualified personnel who carry out a great deal of the work affected by the instructions, and in order to avoid major departures from the required practice, the instructions have been drawn up in considerable detail. See, for example, the specimen memorandum on thermometer disinfection (Fig. 2).

The dates when the different measures were introduced and their principal features are shown in the following paragraphs.

1959. 1 *January*–30 *June*

Memorandum on thermometer disinfection (see Fig. 2). This memorandum applied to all departments except the departments of Infectious Diseases and Paediatrics. Here primary disinfection of thermometers is carried out with a 5% chloramine solution instead of a 0·1% benzalkonium chloride solution.

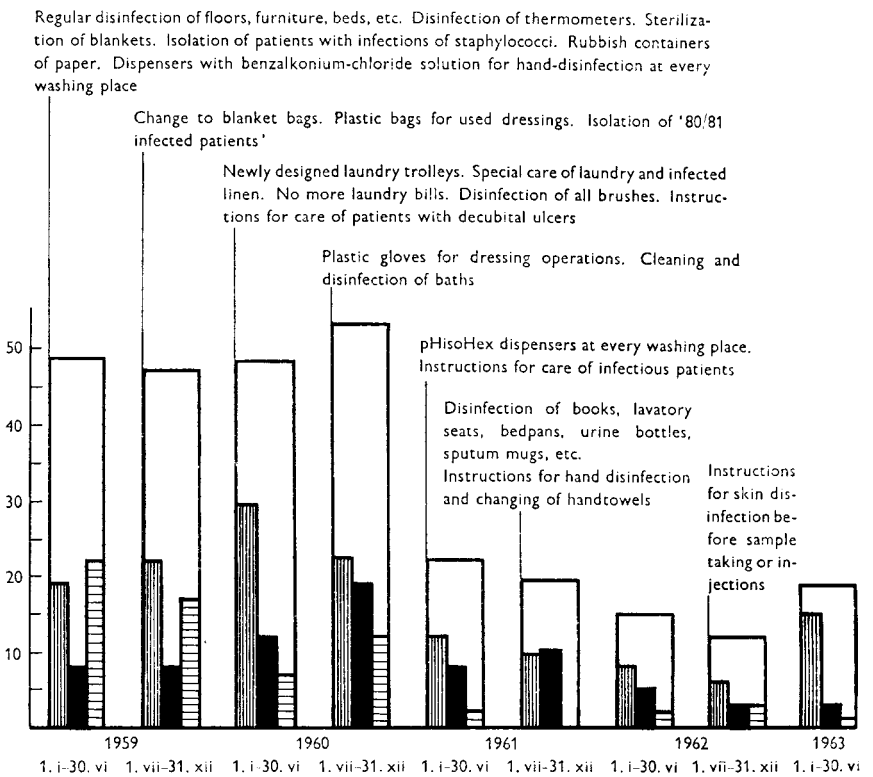

Fig. 1. Number of infections at the department of long-term diseases registered semi-annually, including information on the hygienic measures introduced during each 6-month period. □, Total number of infections; ▥, virginal strains; ■, multiple resistant strains; ▤, 80/81 strains.

Memorandum on floor cleaning and disinfection. All dry brushing, dry mopping and vacuum cleaning in the departments is forbidden. Daily cleaning with a scouring cloth and warm water; cleaning agents to be used only where required. Once a week: wiping off with a scouring cloth damped with a solution of 0·1% benzalkonium chloride. Once a month: a thorough clean with cleaning agents, followed by rinsing and floor polishing. Once a year: a major cleaning operation with thorough scrubbing of all floors.

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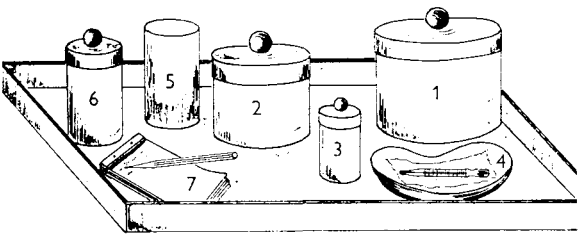

Fig. 2. Use of thermometers. Wards

1. Jar containing 0·1 % benzalkonium chloride solution. This solution is changed once daily. Used for storing *clean* thermometers.
2. Jar for 5 × 15 cm. wadding pads (suitable for length of thermometers).
3. Jar of exploration ointment, water soluble.
4. Round dish (number according to number of personnel engaged in temperature taking).
5. Jar containing 0·1 % benzalkonium chloride solution. This solution is changed each time the jar is used. Used for storing *used* thermometers.
6. Jar with lid, for used wadding.
7. Pencil and pad.

These utensils are kept in the rinsing-room, on a tray or on a shelf, or in a cupboard if so required.

Procedure

1. Place sheet of toilet paper in a round dish.
2. Take the required number of thermometers, dip the ends into exploration ointment and then place the thermometers in the round dish.
3. The dish with the thermometers, the wadding pads, the jar with benzalkonium chloride solution, the jar for used wadding pads and the pencil and block are taken to the ward.
4. The thermometers are distributed. The wadding pads are placed on the bedside stands and the patients are requested to lay the thermometers on the pads if they are removed before the nurses return.
5. The thermometers are dried off and read, after having been dipped if necessary into the benzalkonium chloride solution. The thermometers are then placed in the jar of benzalkonium chloride solution and the wadding pads into the jar with lid.
6. After at least 90 min. the thermometers are removed and washed mechanically under running, cold water. They are then replaced in the jar of benzalkonium chloride solution used for *clean* thermometers. Check that the mercury in all the thermometers is at minimum.
7. The two jars used for collecting used thermometers and used wadding pads are cleaned and boiled, or put into the autoclave, after each time they are used.

The cleaning of the thermometers should be the responsibility of one particular person.

This method of storing thermometers has two advantages: it is a satisfactory means of disinfection and it also saves time. GOVERNOR

Memorandum on bed cleaning

Daily wiping off of the metal parts of the bed, electric leads, the bed-side stand and other furniture (in cases of patients where there is a danger of infection a solution of 0·1 % benzalkonium chloride is used). Each time a new patient is to use a bed it is first disinfected with benzalkonium chloride. All mattresses must have a plastic cover. Mattresses may only be vacuum cleaned on balconies or elsewhere outside. All bedclothes and the laundry bags of infectious patients are treated with formalin before being laundered.

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Paper waste-sacks, instead of the usual containers, to be used and the sack and its contents taken directly to the incinerator or refuse station.

Patients with open infections with *Staph. aureus* phage type '80/81' are isolated as completely as possible (due to the shortage of space this can only be carried out to a limited extent).

Benzalkonium chloride dispensers for hand disinfection (about 500) have been installed in the Departments of Long-Term Diseases and Infectious Diseases.

1959. 1 *July*–31 *December*

Introduction of plastic bags for collecting used dressings. Previously, used dressings were either put together with the patients' dirty laundry or were thrown into open bowls.

A rapid successive change-over to washable blanket bags in place of loose covers. Successive change-over from woollen blankets to cotton blankets, which can be autoclaved.

Special hygiene regulations for the hospital hairdresser.

1960. 1 *January*–30 *June*

Memorandum on the collection of dirty laundry and used dressings

Newly designed stackable trolleys, each carrying a sack for dirty laundry and a bucket with a plastic bag interior for used dressings, have been supplied to each department (Plate 1). Each bed team has a trolley with a sack sufficient for approximately five beds (15 kg.). The dirty sheets, etc., are not shaken, but are carefully folded and placed in the sack, which is properly tied up at the top when it has been filled. Laundry from infectious patients is collected in sacks marked with red tape and sent directly for disinfecting.

Dressings are applied or changed either before making up the beds or else no sooner than one hour afterwards. Dirty articles of clothing are placed in the laundry sack and used dressings in the plastic bag, which, in its turn, is put into the lidded bucket. When the bag is full, or the dressing operations completed, it is tied up at the top ready for incineration or removal to the refuse station.

Change of method for laundry disinfection

Instead of disinfection with formalin, infectious clothing, blankets, etc., are treated for 7 hr. in steam at 90° C.

Memorandum on the ointments tray

Utensils are kept in a dust-free cupboard. Ointments are applied with a wooden spatula, which is used only once. Hands should be washed between each patient, preferably with 70% (w/v) ethyl alcohol.

Memorandum on patients infected with staphylococci

These patients are isolated as thoroughly as possible. Staff use protective overall coats, which are kept in the room, disposable gloves, and wash their hands first in soap and water and then in a 0·1% benzalkonium chloride solution. Floors,

beds and furniture are washed daily with the same solution. Dirty laundry is put into sacks marked with red tape and all laundry and bed clothes are disinfected between each patient. Each patient has his own ointment tray, hand basin, bedpan and other utensils, where no provision is made for sterilization.

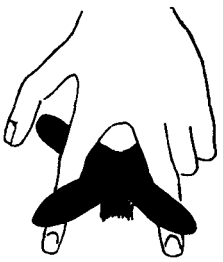

Fig. 3. The washing and disinfecting of hands.

PATIENTS

For hand washing and personal hygiene will use *solid soap*.

STAFF

Cleansing with disinfectants. For hand washing will use a *liquid disinfection* preparation (pHisoHex in dispensers).

Technique for disinfection washing with pHisoHex dispenser

1. Turn the tap with a two-finger grip, so as to dirty as little as possible (forefinger and middle finger astride the tap).
2. Wet both hands.
3. Hold one hand under the dispenser nozzle and press the pump button *once* with the other hand or forearm.
4. Rub the disinfectant liquid preparation well into both hands during at least 30 sec. (N.B. not under running water).
5. Rinse subsequently under running water.
6. Dry your hands, if needed (it is in fact better from the point of view of disinfection to let them dry naturally).

Handtowels. One towel at each washing place. Change towels several times a day. After a few hours the bacteria begin to multiply rapidly in a handtowel. This makes the towel itself increasingly infectious. *Dirty towels spread infection.*

Disinfection without cleaning. During rounds, dressings and bed linen changing, hands should be disinfected *between each patient*. This can be done by means of a spray bottle containing 0·1% benzalkonium chloride solution.

Disinfection before operations. This is prescribed by the relevant head of clinic.

GOVERNOR.

1960. 1 *July*–31 *December*

Memorandum on cleaning bathrooms

After use the bathtub is scrubbed, thoroughly rinsed and washed out with a 0·1% benzalkonium chloride solution. Each patient is supplied with a clean washing flannel. Neck bands and bath harnesses are rinsed or wiped off with a 0·1% benzalkonium chloride solution between each patient. Bath brushes are only used when quite necessary and then they are steam-treated between each patient.

Disposable plastic gloves are recommended during all dressing operations and bathing of infectious patients.

1961. 1 *January*–30 *June*

A total of 1386 pHisoHex hand dispensers was installed throughout the hospita during the period March–June. As these were installed, all staff were instructed by the superintendents of departments concerning the use and significance of pHisoHex. The use by the staff of solid soap for hand washing was forbidden.

Scouring rags will be thoroughly cleaned in hot water and then placed in a 0·1% benzalkonium chloride solution.

1961. 1 *July*–31 *December*

Memorandum on hand disinfection (see Fig. 3)

There will be only one hand towel at each wash place. This will be changed at least 4–6 times daily, and where necessary, even more often.

Memorandum on the disinfection of books

Books which have been borrowed by infectious patients will be disinfected in hot air for 3 hr. at 90° C., with the covers at an angle of 90° and the pages fanned out between.

Other instructions.

Bedpans, washing bowls, sputum mugs, urine bottles and similar articles will be sterilized or boiled each time after use. If this is not possible, then after careful mechanical washing they will be disinfected with a 0·1% solution of benzalkonium chloride and then dried in air.

Lavatory seats will be wiped off several times a day with a 0·1% solution of benzalkonium chloride.

Disposable plastic plates, mugs and glasses may be used for certain infectious patients.

ANTISEPTIC MEASURES

As can be seen from the aforementioned instructions, benzalkonium chloride has been selected as the general disinfectant for surfaces and articles of different types. The choice can be discussed from various viewpoints (Kjellander, 1960), but it was preceded by several laboratory and practical examinations (Juhlin & Ericson, 1960; Juhlin, Ericson & Willard, to be published) of the effects of different disinfectants (invert soaps, iodophores, Chloramine and Warexin).

It was possible to reduce the cost of this dinsinfectant considerably by distributing the original 50% solution in bottles, with appropriate dilution marks, to all the wards, each of which subsequently did its own diluting. During 1962 the total cost of benzalkonium chloride disinfectant was £2000. The use of a phenol-soap-spirit solution, a 5% chloramine solution or another invert soap solution, would have been three to ten times as expensive. The risk of skin injuries among the staff with this concentration of benzalkonium chloride is considerably less than with the prolonged use of several other substances (Medrek & Litsky, 1957). In special situations, however, when cleansing after a patient with open tuberculosis,

for example, a phenol-soap-spirit solution is used.* For daily floor washing only water is used, in order not to inactivate the invert soap.

The new laundry trolleys are a great hygienic and labour-saving improvement. The previous sack holder was difficult to handle and meant that the bed linen was usually thrown on to the floor, often together with used dressings, and then carried through the entire ward to where the sack holder was standing. These new trolleys can be pushed easily from bed to bed, besides which they are easily stored since they can be stacked one on top of the other (see Plate 1).

The previous formalin disinfection system for the laundry was replaced by a 7 hr. steam treatment at 90° C. Repeated tests had shown that this method completely destroys vegetative bacteria and often spores too. This method also saved a lot of time and space since there was no need for the unpacking of sacks for airing and subsequent re-packing.

The directives on the isolation of infectious patients could only be followed to a limited extent, since there was not much special isolation space in most of the departments. In certain situations it was possible to assemble several patients with the same type of staphylococcal infection in a small ward. The other directives concerning the handling of patients, however, were carried out in full.

One of the most difficult problems to solve was that of the complete cleansing and disinfecting of the hands of staff. Several of the published investigations deal only with pre-operative hand washing with different substances, and even though these publications give some guidance, none of them can be used as a background for the selection of cleansing and disinfecting media for the general hand washing of all types of staff. (Hopper, Beck & Wood, 1953; Göpel, Rücker & Schütz, 1958; Smylie, Webster & Bruce, 1959; Hurst, Stuttard & Woodroffe, 1960; Kjellander & Nygren, 1960; Lowbury, Lilly & Bull, 1960; Halvorsen & Hofstad, 1962).

On account of this, extensive comparative investigations on the disinfective properties of different preparations were carried out (soap, soap and rinsing in a 72% ethyl alcohol solution, 0·1% benzalkonium chloride, soap and thorough rinsing in water followed by disinfection with 0·1% benzalkonium chloride, liquid soap with 0·5% hexachlorophene, Nicasept and pHisoHex).

Ordinary soap and liquid soap with 0·5% hexachlorophene were entirely unsatisfactory. Nicasept resulted in rapid skin irritations and the soap/spirit combination was expensive and difficult to introduce. Even though it was possible in certain cases to achieve a satisfactory result with soap as a cleanser followed by benzalkonium chloride as a disinfectant, the effects were nevertheless often unsatisfactory. Both investigations gave equally satisfactory results with pHisoHex (Juhlin, Ericson & Willard, to be published).

Since ordinary bar soap can undoubtedly constitute a dangerous source of infection, (Kjellander & Nygren, 1959) and in view of the results achieved in this study, it was decided to adopt pHisoHex throughout the entire hospital as a cleansing and disinfecting medium for staff hand washing. pHisoHex fulfills practically all the requirements; good cleansing effect, 40% better than most

* Orthophenylphenol sodium, 500 g., 96% ethyl alcohol, 300 ml., 50% soap solution, 350 ml. This stock solution is diluted 1/20 before use.

soaps (Walter, 1952), good antiseptic effect established both before and during the investigations in question, persistence of action and minimum risk of allergy shown in various instances (Nelson & Stoesser, 1953; Hill, Butler & Laver, 1959), little or no risk of the fluid from the dispensers serving as a source of infection.

The only disadvantage to pHisoHex was the expense. Annual consumption cost is reckoned at £2414 as opposed to £690–£1034 for liquid soap.

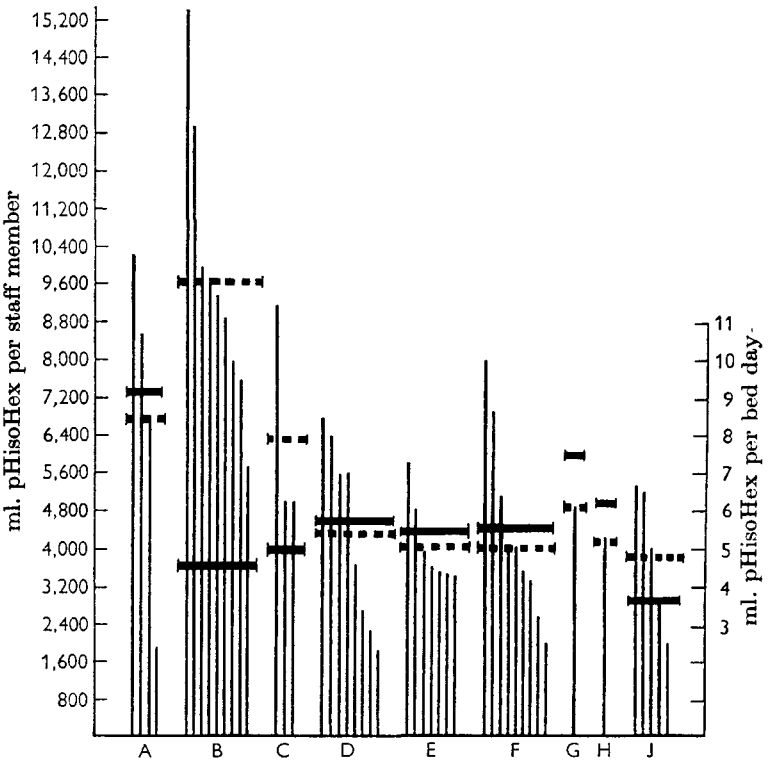

Fig. 4. Use of pHisoHex during 1962 in nine departments: A, infectious diseases; B, long-term diseases; C, internal chest diseases; D, internal medicine; E, obstetrics and gynaecology; F, general surgery; G, chest surgery; H, plastic surgery; J, orthopaedics. The columns show the use in ml. per staff member in each ward. ■■■, Mean use in ml. per staff member for each department; ▬▬ mean use in ml. per bed day for each department.

Fig. 4 shows the consumption during 1962. The individual columns show the consumption of pHisoHex, in ml. per staff member, for each ward in the various departments. Consumption varies considerably both between the different departments and between the different wards in each department. In several cases this may be explained by the fact that the older wards have fewer wash places, which naturally results in a reduction in washing frequency (ward A: 29 dispensers for 28 beds, ward B: 15 dispensers for 36 beds). In other cases the nature of the patients, material, type of treatment, etc. play an important role, for example: in the Department of Long-Term Diseases a fairly small staff looks after a large number of patients. Here the character of the treatment provides more frequent

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contact between each individual patient and staff member, which results in a higher washing frequency. In other departments, or special wards with a large number of specially trained personnel for different duties, contact between staff and patients is not so frequent, resulting in a lower pHisoHex consumption per staff member, as in Plastic Surgery. The heavy dotted lines at right angles to the columns show mean consumption in ml. per staff member in each department. The

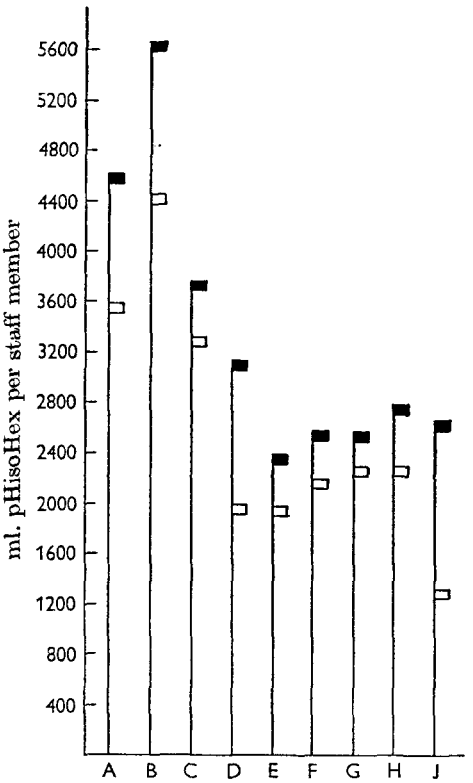

Fig. 5. Use of pHisoHex during the periods 1 October 1961 to 1 April 1962 and 1 October 1962 to 1 April 1963 at the nine departments. A–J, see Fig. 4. □, Ml. per staff member during the first period; ■, second period.

Departments of Infectious Diseases, Long-Term Diseases and Internal Chest Diseases have a much higher consumption per staff member than the others, all of which have about the same level of consumption.

If, on the other hand, we look at the mean consumption per bed day (shown on the table by the heavy unbroken lines) it will be seen that the Departments of Infectious Diseases and the Chest Surgery show the highest consumption, while the Departments of Long-Term Diseases and Internal Chest Diseases show the same or a somewhat lower consumption than the other departments. This latter division of consumption in relation to the number of bed days probably gives a more accurate picture of the hand disinfection requirements in relation to the number of patient contacts. Reckoned in ml. per bed day, the consumption of the

Department of Orthopaedics is much lower than any of the others. No particular explanation can be given for this.

On account of holidays and annual major cleaning operations, ward work varies in intensity during different parts of the year. As a rule, from 1 October to 1 April there is no interruption in the ward work procedure, and because of this the consumption of pHisoHex in this period was checked during two successive years. Fig. 5 shows only the mean consumption in ml. per department and per staff member (for technical reasons it was impossible to reckon consumption per bed day).

Common to all departments is a rise in consumption from the first half year period to the next. This rise is the result of a more steady consumption in departments of different types and also of an absolute increase in several of the departments. The Department of Orthopaedics has shown the largest percentage increase; in this case consumption was doubled.

The figures for consumption reported so far apply only to the wards. Total consumption for the entire hospital for 1962 amounted to 941 cans (4000 l.) of pHisoHex. This was used by a total of 2017 staff members (doctors, nurses, domestics, doctors' secretaries, physiotherapists, vocational therapists, midwives, junior nurses, student nurses, laboratory assistants and ward cleaners) which gives a mean consumption of 1866 ml. per staff member during 1962, compared with 5482 ml. per staff member in the nine departments investigated. Thus the total cost of pHisoHex during 1962 was £3212 (46,579 Sw. crowns); for the same year the number of bed days was 508,325, which gives a mean consumption of 7·4 ml. per bed day at a cost of 1·51 pence (0·09 Sw. crowns), compared with 5·4 ml. per bed day for the nine departments investigated. The latter figure does not include consumption in operating theatres, general consulting and service departments.

DISCUSSION

When evaluating the effects of the hygiene measures which have been carried out, one is faced with considerable difficulties. There are many extraneous factors which may affect the results; for example the presence of one or several actively infectious persons in a department, the creation of special wards within a department and the introduction of new, more effective, antibiotics.

In the investigations in question it has been possible to influence the effects of certain of these factors. Several years before the investigations were begun, the nose and throat flora of all staff in certain departments and wards were examined fairly regularly, and in certain cases treated. In 1958 it was made compulsory for all personnel with manifest staphylococcal infection to report it. These individuals were put on the sick list and given treatment, though they did not thereby suffer financial loss. The latter provision was made in order to encourage as many infected people as possible to report. Departments where the internal organization has meanwhile been more or less radically changed have not been included in the data. There have been no changes in the principles of examination, such as might result in a reduction in the number of tests. On the contrary, as the hygienic

work intensified, increasingly great care has been devoted to taking tests in every form of infectious state, even those of a rather prosaic character.

Detailed investigations carried out in surgical and infants' wards on the effects of the introduction of single hygienic measures have been published (Knörr & Wallner, 1957; Ravenholt, Wright & Multhern, 1957; Gillespie, Simpson & Tozer, 1958; Felton, Willard & Bass, 1959; Frappier-Davignon, Frappier & St-Pierre, 1959; Myers, Nimeck & MacKenzie, 1959; Plueckhahn, 1961; Caplan, 1962). Naturally, the scope of such investigations must be limited. The investigations reported in this paper have rather been based upon completely routine infections from eight different departments. These departments contained 1079 beds (331,340 bed days), and all belonged to a University Hospital with a total of 1872 beds (508,325 bed days). At this hospital a series of hygienic measures has rapidly been introduced and the frequency of infection investigated. It might therefore be possible for this type of follow up to be used to reflect more realistically the results which may be derived from different measures in practice.

The hygienic measures introduced in 1959 and 1960 were intended mainly as an attempt to reduce the sources of bacteria by tightening up the cleaning and disinfecting regulations for floors, furniture, bed clothes, etc., by isolating personnel with clinical staphylococcal infection, by treating the carriers with nose ointment and in certain cases with antibiotics and, as far as possible, by isolating '80/81' patients. Despite these measures, however, the frequency of infection continued to rise in 1959 and 1960 (for the two 6-month periods of 1960 see Ericson & Juhlin, 1965, fig. 1). The increase of the 'multiple-resistant' strains was particularly disturbing since the difficulty of treating patients effectively and the high frequency of '80/81' infections was a constant threat to the staff, who in many cases had to report sick with furuncles and similar complaints. In both figs. 1 and 2 of the previous work (Ericson & Juhlin, 1965) one notices in 1961, meanwhile, a distinct decline in the frequency of infection in all nine of the departments which were investigated. In certain of the departments this decline began during the first 6 months and at others during the second 6 months. The only measure which can be temporally associated with this decline in the frequency of infection is the introduction of pHisoHex as a hand disinfectant for all ward staff. This took place in April–June 1961. Many earlier investigations have shown the importance of thorough pre-operative hand disinfection for operating-theatre staff and have also reported the frequency of post-operative infections and their origins. Here, however, the pre-operative hand-washing procedure, the usual combination of soap-spirit, was not altered, so that in this case this factor cannot affect the result. Furthermore, the Department of General Surgery shows a very low frequency of infection: 1·41% in 1960 and 1·11% in 1962, compared, for example, with the Department of Long-Term Diseases: 15·78% in 1960 and 3·8% in 1962. These results demonstrate the vital need for a perfect hand disinfectant for specialist ward staff.

The majority of handbooks emphasize the importance of good hand hygiene in all hospital treatment work, (Williams, Blowers, Garrod & Shooter, 1960; Williams & Shooter, 1963) and in the investigation dealt with in this paper no reduction in

the frequency of infection was achieved until improved hand hygiene for staff members had been introduced. The vital significance of optimal hand disinfection in the struggle against nosocomial infections is illustrated by the following comparison. From October 1959 through the whole of 1960 dispensers containing 0·1% benzalkonium chloride were used for hand disinfection, after washing with soap, in the Department of Long-Term Diseases; nevertheless the frequency of infection was not affected in this department until soap-benzalkonium chloride was replaced by pHisoHex (see Fig. 1). The number of dispensers was the same for each antiseptic.

The pronounced decline in the frequency of infection during 1961 can hardly have been the result of unknown or temporary circumstances affecting all eight of the departments at the same time. This decline must have been the result of improved hygienic measures. Even though there is good reason to believe that pHisoHex was the measure largely responsible for the decrease in the frequency of infections, it cannot be said that the other measures were of no consequence at all. It is quite possible that the final measure, i.e. pHisoHex, was introduced at just that time when the preceding measures had combined to produce a situation in which the introduction of pHisoHex could cause a decline in the frequency of infection.

The decline in the frequency of infection continued in most of the departments during 1962 also. Of particular significance was the pronounced reduction in '80/81' infections (a reduction of 66·4%) and in infections with multiple-resistant strains (a reduction of 33·3%) in the complete material from all eight departments (Ericson & Juhlin, 1965, Table 3). In certain of the departments the decline was even more pronounced, for example, in the Departments of Internal Chest Diseases and Obstetrics and Gynaecology, where there was a 70% reduction in infections with '80/81' and 'multiple-resistant' strains. As mentioned previously, in the Department of General Surgery the frequency of infection was comparatively low, only 1·41–1·11%, but despite this the number of infections here was reduced by a total of 31% (Ericson & Juhlin, 1965, Table 2).

Similarly, the number of staff members who had to report sick or stay away on account of staphylococcal infections decreased from fifty-four in 1960 to thirteen in 1962.

Approximately 2000 hospital staff members have now used pHisoHex for over two years. A questionnaire distributed by the superintendents of the clinics to all staff members revealed that fourteen people suffered skin irritation, mainly dryness, through the use of pHisoHex and twenty-six people through the use of benzalkonium chloride. Thirty-two of these forty individuals were subjected to careful examinations in the Department of Dermatology. Epicutaneous tests were carried out with undiluted pHisoHex, 1% hexachlorophene in vaselin, and 0·1% benzalkonium chloride in aq. dest. on all thirty-two individuals. None of them showed any reaction to the pHisoHex or the hexachlorophene after 48 or 72 hr., while two reacted to the benzalkonium chloride. These two were able to use pHisoHex without discomfort. No less than fifteen out of the thirty-two were found to have suffered from eczema before beginning to use pHisoHex or benzal-

konium chloride, while six had also experienced difficulties with other kinds of washing agents or soap. During the investigations, objective lesions of a minor nature were visible in seven of the individuals while five of them suffered eczematous lesions. There was no evidence of allergy to pHisoHex during the course of these investigations.

The cost of these hygienic measures is more than compensated by the reduction in complicated infections. Indirectly this can save a large number of bed days and also decrease the number of days of sickness and absence from work for staff members.

SUMMARY

A hygienic programme, which has been developed and maintained during several years at a large Swedish university hospital, is presented in detail. The composition and working methods of the Infection Control Committee are described and some economic calculations given. The possible connexion between the hygienic measures and a marked decrease of the incidence of infections is discussed. This decrease did not occur until a satisfactory method for the routine hand disinfection had been introduced, using a commercial antibacterial cleaner containing 3% hexachlorophene.

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EXPLANATION OF PLATE 1

Stackable trolleys, showing sack for dirty laundry and bucket with plastic bag interior for used dressings.

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(*Facing p.* 48)

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